Air Quality Action Plan: Inverness. Highland Council

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Experts in air quality management & assessment

Document Control

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Executive Summary

This Air Quality Action Plan for Inverness has been prepared to address concentrations of nitrogen dioxide (NO_2) to which people are exposed to at the junction of Academy Street and Queensgate, for which an Air Quality Management Area (AQMA) has been declared. The document is part of a statutory process for which local authorities are required to work towards improving air quality in locations where health based air quality objectives are not met.

Six broad areas of Action have been established to help deliver better air quality, with specific measures then identified for each of these Actions areas. The categories of Action are as follows:

- Action 1: Promote Smarter Travel Choices.
- Action 2: Actively promote low emission vehicles and supporting infrastructure.
- Action 3: Use the planning system to ensure that air quality is fully considered for new development.
- Action 4: Traffic management to reduce emissions in locations within the AQMA.
- Action 5: Communication to inform the public about health impacts of Air Pollution and how they can change behaviour to reduce emissions and reduce exposure
- Action 6: Continue to monitor and assess air quality in line with Government guidance on LAQM.

These Actions are evaluated in terms of their impacts on:

- air quality;
- cost;
- feasibility or practicability; and
- timescale for implementation.

An implementation plan is outlined, which includes a time scale for implementation for each measure and funding source. Ultimately the delivery of this Action Plan is dependent on adequate levels of resourcing, both for capital costs and staffing.

Inverness is the fastest growing city in Scotland and hence it is to be expected that traffic levels will increase in future. The measures highlighted in this Air Quality Action Plan should reduce concentrations of NO_2 at the relevant sensitive receptors, although it is too early to say exactly what impacts they will have on improving air quality. The Council is continuing to monitor air quality at several locations within and around the AQMA and has started real time monitoring on

Queensgate. The results of the monitoring will be made available through the annual review and assessment reports along with proxy measures for quantifying improvements.

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1 Introduction and Aims of the Plan

1.1 It is now well documented that air pollution adversely affects human health. Poor air quality has both long- and short-term health impacts, particularly for respiratory and cardiovascular health, including increased hospital admissions and premature death. The impacts are not distributed equally, with the effects on life expectancy being greatest for the elderly and those with pre-existing heart and lung conditions[1]. The World Health Organisation estimates that some 80% of outdoor air pollution-related premature deaths worldwide are due to heart disease and strokes, while 14% of deaths are due to chronic obstructive pulmonary disease or acute lower respiratory infections and 6% of deaths are due to lung cancer. The majority of health evidence relates to particulate matter (PM), but evidence associating nitrogen dioxide (NO_2) with health effects, including premature deaths, has strengthened substantially in recent years (Committee on the Medical Effects of Air Pollution, 2015).

1.2 Within the Highland Council area, air quality is generally very good. However, a location in central Inverness has been identified where pollutant levels are high. This location is at the junction of Queensgate and Academy Street. Local streets are relatively congested, with tall buildings either side of the road creating street canyons which reduce the dispersion of pollutants. The consequence is that annual mean NO_2 concentrations have exceeded the air quality objective, and an Air Quality Management Area has been declared by the Council.

1.3 The Action Plan set out in this document aims to reduce NO_2 concentrations, so as to meet the air quality objective. There is a growing body of evidence of the health effects arising from exposure to both NO_2 and particulate matter, and it is important that measures that reduce NO_2 do not inadvertently increase emissions of particulate matter, as there is no threshold for health effects of particulate matter (PM). In most cases, actions to reduce NO_2 should also reduce PM, especially where the actions aim to reduce traffic, but there may be some measures which increase PM, such as the use of certain exhaust treatment systems.

1.4 At a UK level, the Environmental Audit Committee published its third report on Air Quality in December 2014, which concluded that recommendations from its previous two reports had not been implemented. It concluded that the UK Government must act urgently to:

Meet EU nitrogen dioxide targets as soon as possible;

Engage with local authorities to establish best practice in tackling air pollution across the UK;

Adjust planning guidance to protect air quality in local planning and development; and

[1] Within the Highland Council area air pollution is estimated to account for up to 57 premature deaths per annum attributable to particulate matter $PM_{2.5}$
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/332854/PHE_CRCE_010.pdf

Examine fiscal and other measures to gradually encourage a move away from diesel vehicles towards low emission options.

1.5 Defra has produced Air Quality Plans to reduce nitrogen dioxide concentrations in major cities throughout the UK (Defra, 2015). Along with a suite of national measures, the Air Quality Plans identify the need to establish Clean Air Zones within five Zones (Birmingham, Leeds, Southampton, Nottingham and Derby) where exceedences of the EU limit values for nitrogen dioxide have been forecast in 2020 and beyond. Within these Zones, lower-emission vehicles will be encouraged. The precise nature of these Clean Air Zones is still to be decided. Following a High Court ruling, the outcome of the UK Air Quality Action Plan has been described as 'too optimistic' and it is likely that additional Clean Air Zones in the UK will be required.

1.6 Road transport is the main source of emissions in relation to NO_2, and to a lesser extent for particulate matter, with diesel vehicles likely to be making the biggest contribution within the AQMA. In particular, stop-start traffic (i.e. acceleration and deceleration) results in higher emissions.

1.7 This Air Quality Action Plan aims to reduce air pollution within the Inverness AQMA, in order to reduce the health impacts of current concentrations. It sets out how Highland Council, and its partners intend to act to locally reduce emissions of relevant pollutants. The document is part of a statutory process for which local authorities are required to work towards improving air quality in locations where health based air quality objectives are not met.

2 Context of Air Quality within Highland Council

Air Quality

2.1 Under Part IV of the Environment Act 1995, Local Authorities are required to review and assess air quality in their areas and to report against objectives for specified pollutants of concern, to the Scottish Government. For each air quality objective in the Regulations, local authorities have to consider whether the objective is likely to be achieved. Where it appears likely that the air quality objectives are not being met, the authority must declare an AQMA. Following the declaration of an AQMA, the authority must then develop an **Air Quality Action Plan** which sets out the local measures to be implemented in pursuit of the air quality objectives. Prompted by the Review and Assessment process, an AQMA has been declared in Inverness. The AQMA has been declared for NO_2 at the junction of Academy Street with Queensgate, with the main source of emissions being from road traffic (particularly where congested), often exacerbated by a lack of dispersion due to surrounding buildings.

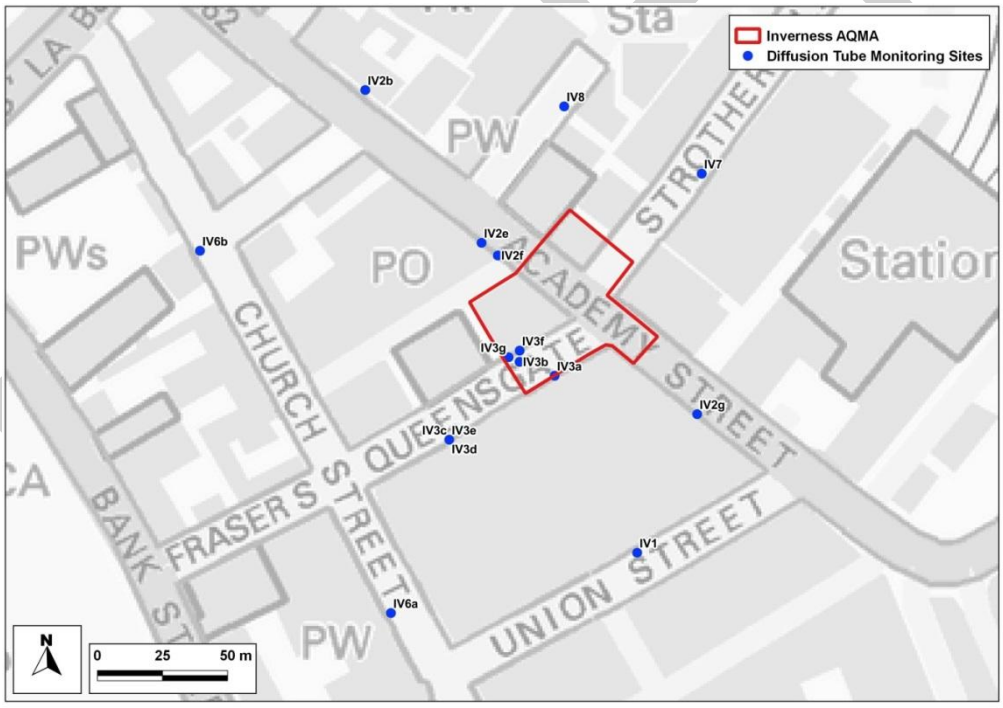

Figure 1: Inverness AQMA Showing Diffusion Tube Monitoring Locations

Source Apportionment

2.2 The overall contribution made by emissions of nitrogen oxides from motor vehicles, which includes both nitric oxide and NO_2, to measured NO_2 concentrations depends on a number of factors, including how the different species react in the atmosphere; in particular the reaction of nitric oxide with ozone, and the amount that is emitted directly as NO_2 (primary NO_2). Figure 2 shows the

contribution from different vehicle types to NO_2 concentrations including background, with the same information illustrated in **Figure** 3 as percentage contributions. At most of the locations in central Inverness (and in particular those where the objective is exceeded), the largest proportion of emissions is from buses, followed by cars. It should be noted that a UK average emission factor for buses has been used, which does not take into consideration the composition of the Inverness bus fleet, which includes 6 electric buses and a high proportion of Euro V buses.

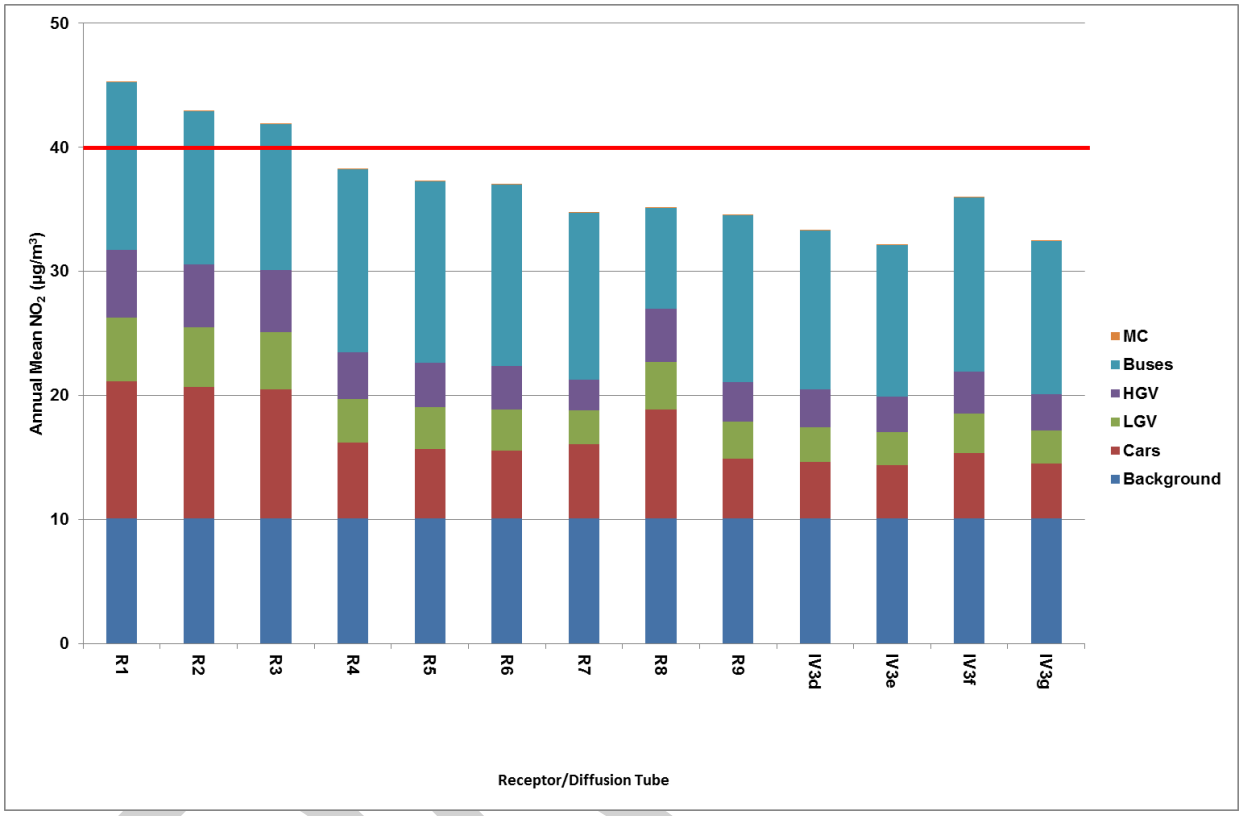

Figure 2: Apportionment NO_2 Concentrations by Source including Background (2014)

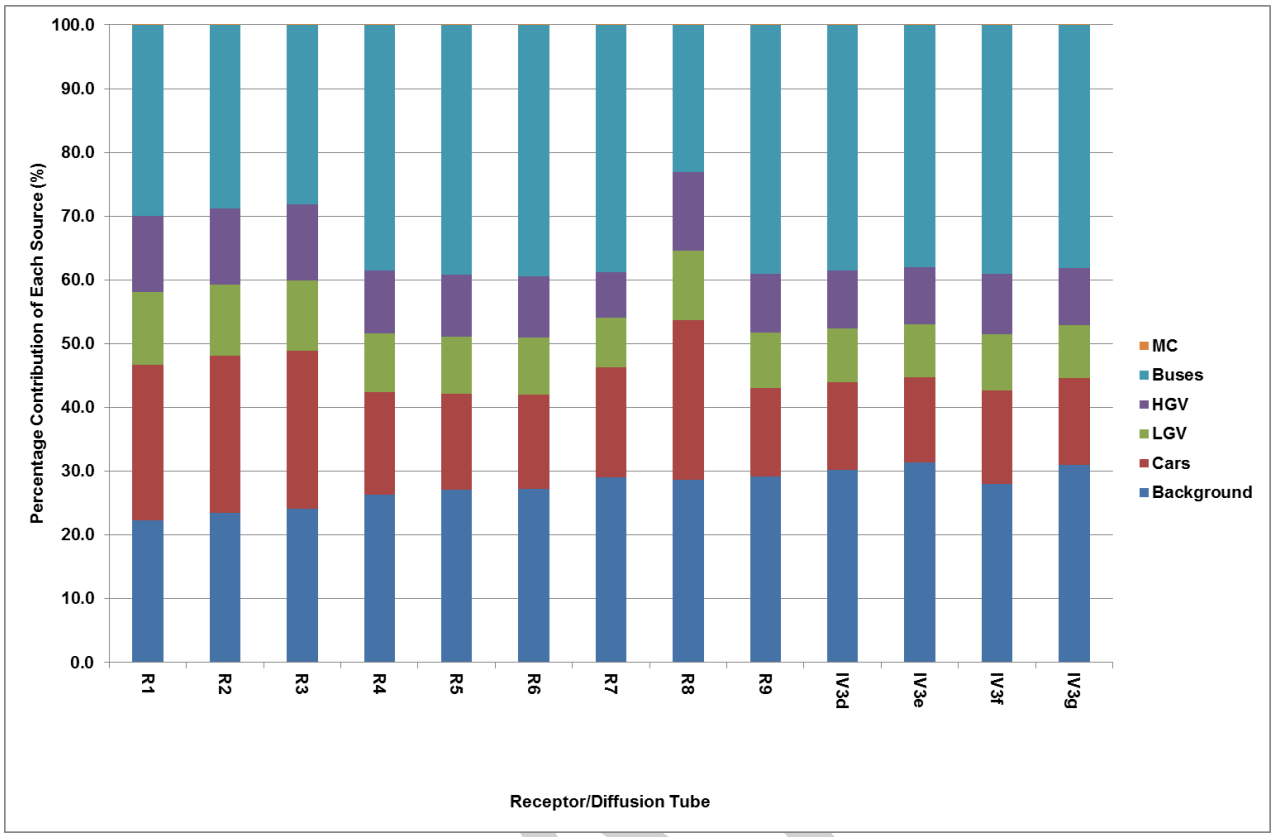

Figure 3: Apportionment NO_2 Concentrations by Source including Background as percentages (2014)

Improvements Required

2.3 The degree of improvement required to meet the annual mean objective is defined by the difference between the highest measured or predicted annual mean concentration and the 40 µg/m^3 objective level. The highest nitrogen dioxide concentration within the study area is that predicted by the model at Receptor 11 at second floor level (47.7 µg/m^3), requiring a reduction of 7.7 µg/m^3 in order for the objective to be achieved.

2.4 It is conventional to consider the improvement required in terms of the nitrogen oxides (NO_x). Different vehicle types are characterised by different proportions of primary NO_2 emitted, and so the reduction in NO_x required to achieve the nitrogen dioxide objective depends on the types of vehicle being managed. For example, the required degree of reduction of NO_x emissions will be different if it is brought about through reducing car emissions compared with reducing bus emissions. For the purposes of calculating the indicative data in Table 1, it has been assumed that any emission reductions are achieved without altering the composition of the vehicle fleet.

2.5 Table 1 shows that, at R11 (Second Floor) a NO_x reduction of 21.3 µg/m^3 would be required to achieve the objective. This equates to a reduction of 24.5 % in local road traffic emissions at this receptor location.

Table 1: Improvement Required in Annual Mean Nitrogen Dioxide and Nitrogen Oxides Concentrations in 2014 to Meet the Objective

Receptor	Required Reduction in Annual Mean Nitrogen Dioxide (NO_2) Concentration		Required Reduction in Road Nitrogen Oxides (NO_x) Concentration	
	µg/m^3	% of total predicted NO_2	µg/m^3	% reduction in road NO_x
R1 (First Floor)	5.3	11.7	14.3	17.9
R2 (First Floor)	2.9	6.9	7.8	10.7
R3 (First Floor)	1.9	4.4	4.9	7.0
R1 (Second Floor)	0.2	0.6	0.6	1.0
R11 (Second Floor)	7.7	16.2	21.3	24.5

2.6 It should also be borne in mind that congestion, which increases emissions, particularly where stop start traffic is common, and the local street topography (i.e. 'street canyons' which limit dispersion) are important contributors to the high concentrations. The latter cannot be affected, but measures to reduce congestion can be an effective Action Plan measure, alongside measures to reduce NO_x emissions.

Robustness of Data/ Uncertainty

2.7 There are many components that contribute to the uncertainty of modelling predictions. The road traffic emissions dispersion model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them. There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms.

2.8 An important stage in the process is model verification, which involves comparing the model output with measured concentrations. Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of current year (2014) concentrations.

2.9 Historically, large reductions in nitrogen oxides emissions have been projected, which has led to significant reductions in nitrogen dioxide concentrations from one year to the next being predicted. Over time, it was found that trends in measured concentrations did not reflect the rapid reductions that Defra and the DfT had predicted (Carslaw, Beevers, Westmoreland, & Williams, 2011). This was evident across the UK, although the effect appeared to be greatest in inner London; there was also considerable inter-site variation. Emission projections over the 6 to 8 years prior to 2009 suggested that both annual mean nitrogen oxides and nitrogen dioxide concentrations should have

fallen by around 15-25%, whereas monitoring data showed that concentrations remained relatively stable, or even showed a slight increase. Analysis of more recent data for 23 roadside sites in London covering the period 2003 to 2012 showed a weak downward trend of around 5% over the ten years (Carslaw & Rhys-Tyler, 2013), but this still falls short of the improvements that had been predicted at the start of this period.

2.10 The reason for the disparity between the expected concentrations and those measured, relates to the on-road performance of modern diesel vehicles. New vehicles registered in the UK have had to meet progressively tighter European type approval emissions categories, referred to as "Euro" standards. While the nitrogen oxides emissions from newer vehicles should be lower than those from equivalent older vehicles, the on-road performance of some modern diesel vehicles has often been no better than that of earlier models. This has been compounded by an increasing proportion of nitrogen dioxide in the nitrogen oxides emissions, i.e. primary nitrogen dioxide, which has a significant effect on roadside concentrations (Carslaw, Beevers, Westmoreland, & Williams, 2011) (Carslaw & Rhys-Tyler, 2013). In relation to this study, the figures presented are as robust as they can be in light of the various uncertainties outlined above, but the figures should be interpreted as the best available estimates of concentrations within the study area.

2.11 Quantification of measures has not been possible within the context of this Action Plan. Uncertainties surrounding the impacts of the measures (such as the impacts of a smarter choice travel package in terms of modal shift, or the impacts of a communication strategy) mean that these impacts cannot be translated into concentration improvements.

3 Existing Policies, Strategies and Programmes

Cleaner Air for Scotland. The Road to a Healthier Future

3.1 Cleaner Air for Scotland. The Road to a Healthier Future (CAFS) was published in November 2015 and is a national cross-government strategy that sets out how the Scottish Government and its partner organisations propose to reduce air pollution further to protect human health. The document sets out the Scottish Government's vision that '*Scotland's air quality will be the best in Europe*' and then sets out a number of measures within different policy areas in order to work towards achieving this vision. In addition, a new National Modelling Framework (NMF) is proposed, which will provide a significant proportion of the quantitative evidence for the National Low Emission Framework (NLEF) also described within the document. The NMF will provide a standardised approach to modelling air quality at both regional and local levels, ensuring consistency across Scotland. The NLEF is designed to enable local authorities to appraise, justify the business case for, and implement a range of, air quality improvements options related to transport (and associated land use).

Local Transport Strategy

3.2 The most recent Highland Local Transport Strategy covered financial years up to 2013/14. The Highland Council LTS Vision is as follows:

> *Through its Local Transport Strategy, the Highland Council seeks to enable and facilitate sustainable development and economic growth; support, include and empower communities through transparent decision-making, and establish an integrated transport network which supports safe and sustainable environments in which people can live, work and travel.*

3.3 LTS objectives include the following:

> *Environment: Manage/reduce the impacts of transport on the natural and built environment;*
>
> *Health: Increase levels of cycling and walking to promote health improvement and modal shift;*
>
> *Traffic reduction: Where appropriate consider targets for reducing traffic, although noting the variation in conditions and requirements between rural and urban areas.*

3.4 The LTS has a sub objective '*To protect and enhance the current air quality of the Highland area*'.

Local Development Plan

3.5 The Inner Moray Firth Local Development Plan was adopted on 31 July 2015. The document sets out the policies and land allocations to guide development in the Inner Moray Firth area over the following 20 years. It sits alongside the Highland-wide Local Development Plan which was adopted in 2012. The Highland-wide Local Development Plan has the following Policy 73 addressing air quality:

> *Development proposals which, individually or cumulatively, may adversely affect the air quality in an area to a level which could cause harm to human health and wellbeing or the natural environment must be accompanied by appropriate provisions, such as an Air Quality Assessment, (deemed satisfactory to the Local Authority and SEPA as appropriate) which demonstrate how such impacts will be mitigated. Some existing land uses may have a localised detrimental effect on air quality. Any proposals to locate development in the vicinity of such uses and therefore introduce receptors to these areas (e.g. housing adjacent to busy roads) must consider whether this would result in conflict with the existing land use. Proposals which would result in an unacceptable conflict with the existing land use to air quality impacts will not be approved.*

3.6 Alongside these Local Development Plans, the Council has published the Inverness City Centre Development Brief (2012) which identifies opportunities for the regeneration and enhancement of the City Centre. The Development Brief refers to a number of opportunity sites on and around Academy Street, and provides guidance on the layout and uses appropriate to each location. A review of the Development Brief will be carried out in 2016 with a draft document to be reported to the City Committee in the autumn.

Climate Change

3.7 In 2007, Highland Council signed Scotland's Climate Change Declaration. In becoming a signatory of the Declaration, Highland Council has made a commitment to cut greenhouse gas emissions, set timescales and targets for action and publish an annual progress report. This commitment (previously voluntary) has now been replaced with mandatory climate change reporting to the Scottish Government. The Council is working with partners to address climate change issues in the Highlands, as outlined through Commitment 7 in the Highland First programme (“7. Helping Communities Reduce their Energy Use and Costs. The Council, with partners, will support communities to reduce their energy use and associated carbon emissions and costs.”). There are a variety of projects currently being developed to deliver improvements in energy efficiency which will also reduce greenhouse gas emissions. It would also be beneficial that these projects deliver wider air quality improvements where possible.

Smart Cities Project

3.8 The Smart Cities Project is a European-funded project incorporating all 7 Scottish Cities looking at developing 'smart city' infrastructure. Funding has now been approved and the work programmes are likely to include a wireless, adaptable, integrated Urban Traffic Management System for Inverness, which would then enable other projects such as adaptive bus priority, real time transport displays, integrated ticketing and the development of smart parking to be implemented.

Physical Activity Strategy

3.9 The Physical Activity Strategy for Highland (Active Highland Strategy) is currently in development with community planning partners and other key agencies. The main themes relate to encouraging physical activity from the earliest age and throughout life, maintaining and improving Highland's active infrastructure (people and places including the natural environment) and improving the opportunities to participate in sport. The Physical Activity strategy will support some of the measures outlined in this plan, particularly those relating to active travel.

4 Actions for Improving Air Quality

4.1 Some of the following Actions are already underway, with others in the early planning stages, or do not have funding associated with them yet. The Actions therefore have different likely implementation timeframes. There are 6 broad Actions and for each of them, specific measures have been included.

Evaluation Approach

4.2 The Actions are evaluated in relation to their expected impact on:

- air quality (i.e. reduction in emissions or concentrations);
- cost;
- feasibility or practicability of option (including the wider non-air quality impacts); and
- timescale for implementation.

Air Quality Impact

4.3 Air quality impacts have been classified to represent 'low 'to 'high' impact. The higher the impact, the greater the improvement in air quality, i.e. the greater the reduction in NO_2 concentrations. For each Action, the expected reduction in annual mean NO_2 concentrations has been determined based on professional judgement, drawing, wherever possible, on experience gained from other studies. It should be noted that the impacts on air quality are judged in relation to the impacts within the AQMA(s). So, for example, an Action may have wide reaching benefits, but only be slightly beneficial within the AQMA(s). The following classification scheme has been used:

Low: *imperceptible* (a step in the right direction). Improvements unlikely to be detected within the uncertainties of monitoring and modelling;

Medium: *perceptible* (a demonstrable improvement in air quality). An improvement of up to 2μg/m^3 NO_2, which could be shown by a modelling scenario. Improvement is not likely to be shown by monitoring due to confounding factors of the weather; and

High: *significant*. Improvement of more than 2μg/m^3 NO_2. Can be clearly demonstrated by modelling or monitoring (a significant improvement is likely to be delivered by a package of options rather than by a single intervention).

Cost

4.4 The implementation of the measures set out in this Action Plan are dependent on securing a sufficient and consistent level of funding both to support any additional staff that may be required,

and to deliver the programme. In line with current Government guidance, it is not necessary to carry out a detailed cost-benefit analysis. Rather the aim is to provide a broad indication of costs so that the proposed measures can be ranked according to the cost and the expected improvement to air quality. Costs are represented as follows:

'Very Low' cost is taken to be £10K and under;

'Low' cost is taken to be £10 - £50K;

'Medium' cost is £50 - 500K;

'High' cost is £500K - £2 million; and

'Very High' cost is over £2 million.

Feasibility

4.5 The feasibility of individual measures is not straightforward to quantify. The following factors have been taken into consideration:

- alignment / synergies with other Highland Council initiatives, strategic initiatives such as The Highland-wide Local Development Plan, The Inner Moray Firth Local Development Plan or Local Transport Strategy;
- wider non-air quality impacts (social, environmental or economic);
- stakeholder acceptance / "political" feasibility; and
- source of funding available or possible.

The Feasibility has been judged as follows:

Low feasibility;

Medium feasibility;

High feasibility.

Timescale

4.6 The timescale for the implementation of measures has also been considered. The following classifications have been used: **Short-term** relates to those measures that can be implemented within the 2016/17 financial year; **Medium-term** relates to those implemented within 2-5 years; **Long-term** options are those which are 6+ years.

Action 1: Promote Smarter Travel Choices

4.7 The traditional approach to meeting the demand for an increasing number of cars in towns and cities has typically centred around the implementation of 'hard measures' which are based on physical improvements to the transport network, such as creating road space, traffic controls, etc. In recent times this established approach is increasingly being recognised as unsustainable, with a tendency to create places that are based around the motorised vehicle and are not for people who wish to use more active and sustainable forms of transport. The use of 'softer measures' is gradually being seen as an important aspect of creating multi-modal environments. 'Softer measures', sometimes referred to as 'smarter measures', are defined as interventions that are designed to influence behaviour away from single occupancy car use to more active and sustainable forms of travel such as walking, cycling, public transport or car sharing.

4.8 The use of 'softer measures' is already embodied in Highland Council policy and central to the Council's strategy for sustainability is the removal of barriers to cycling and walking and the development of an efficient public transport network within urban centres such as Inverness. Enhancing the train station environment (including cycle parking) is already underway through the Scotrail Abellio franchise. A Statutory Quality Partnership[2] is also currently under negotiation with Stagecoach, which may provide a means for implementing actions relating to buses specifically. All schools have developed Safe Travel Plans which are supported by Highland Council Road Safety team. There are a number of initiatives incorporated in these plans which support Active Travel. SEPA has developed an air quality teaching package in association with North Lanarkshire Council (http://www.learnaboutair.com/index.html) which could also be used in schools within Inverness[3].

4.9 In 2011 an Active Travel Audit of Inverness was undertaken (Halcrow Group Ltd, 2011), with the overall aim of assessing where best to apply available funding in order to increase the potential for active travel and ideally to see an increase in the numbers of people choosing to walk or cycle. It was concluded that existing levels of active travel in Inverness are high, with both walking and cycling far exceeding the national average. Inverness is a rapidly expanding city and it should be a priority to maintain and promote active travel to and from new developments. The Scottish Government target of 10% of all journeys by bike by 2020 published in the Cycling Action Plan for Scotland is achievable in Inverness, perhaps more so than in other cities. This target should be used to assist in the leverage of funding for infrastructure improvements and for the promotion of Inverness as a "Cycling City". For example, Bike and Go is now available for bike hire at Inverness Station.

[2] An SQP is an agreement between a local authority and public transport operators as defined in the Transport (Scotland) Act 2001. The local authority provides facilities for the operation of public transport and key to the scheme is that to use the facilities, bus operators need to satisfy the standards of service set by the transport authority.

[3] More details about the package can be found at http://media.sepa.org.uk/media-releases/2015/changing-our-children-s-choices-to-tackle-air-pollution/

4.10 The Council is currently investigating options for improving the area around Station Square and the Victorian Market, and connections to and from the rail and bus stations. It is also investigating longer term options for achieving a better balance between pedestrian, cycle and traffic movement on Academy Street, including streetscape improvements that could complement the Inverness Townscape Heritage project launched in October 2015.

4.11 In addition, a pilot project for integrated ticketing on public transport is currently underway in Lochaber. Whether this initiative extends to the rest of the Highland area will be reviewed. In the context of this Action Plan, integrated ticketing should encourage use of public transport, and hence is supported. It is not however included as a specific measure because it is considered that within the AQMA it is likely to have minimal impact.

4.12 Specific measures will include;

- enhancement to train station and cycle parking;
- further encouragement of active travel, including supporting infrastructure, such as cycle lanes, cycle priority etc., where necessary;
- making Academy Street more pedestrian friendly (wider pavements, crossing points etc);
- developing a Cycling Strategy to encourage greater levels of cycling and support the 'Cycling City' concept;
- developing Travel Plans for Highland Council and other major employers, potentially including ecodriving lessons;
- engaging with schools
- promotion and encouragement of online tool for car sharing (http://ifyoucareshare.com/).

Options considered but not taken forward as part of this plan are:

- a Park and Ride (because of minimal impact on the AQMA);
- a Car Club (previously tried and investigated - business case doesn't demonstrate viability);
- feasibility study of wider bike hire scheme in Inverness (not popular and existing schemes already available privately);
- integrated ticketing on public transport (see text above).

Table 2: Evaluation of Action 1

ACTION 1	Promote Smarter Travel Choices
Air Quality Impact	Emissions from transport form the biggest single contributor to NO_2 concentrations in Inverness. Increasing the use of public transport and active travel, such as walking and cycling, as well as car sharing, should reduce single occupancy car use and hence improve air quality, as well as mitigate against climate change. It is judged that initially benefits to air quality would be **Low**, but should progressively increase over time depending on the level of investment. **Low/ Medium** impact depending on level of investment.
Cost	The cost of implementing smarter choices options as an overall package would be **Medium** to **Very High**, although the costs of individual options would be **Low** to **Medium**.
Feasibility	**High** feasibility as politically acceptable. Aligns with Highland Council policies. Positive impacts for health, climate change gas emissions and potentially noise.
Ownership	Highland Council.
Partners	HiTrans, Scottish Government, Cycling Scotland, Sustrans.
Funding	Scottish Government, European Regional Development Fund, developer contributions (based on policy/ supplementary guidance).
Timescale	**Short** to **Long** term.

Action 2: Actively Promote Low Emission Vehicles and Supporting Infrastructure

4.13 Highland Council is already promoting Electric Vehicles, through the installation of an electric charging point in the Cathedral Car Park, Asda, as well as those in a number of hotels, the Highland Council car park, Inverness College and Scottish Government Inverness. This action will enhance the promotion of Electric Vehicles in particular and Low Emission Vehicles more widely. It will also include measures to investigate the feasibility of reducing emissions from the taxi sector, either through reducing idling within the vicinity of the AMQA, or reducing emissions on a more widespread basis by using the taxi licensing system to reduce emissions from the taxis. European Regional Development Fund funding is currently being applied for to create an Active Travel Hub at Rose Street Car Park and to increase electric charging points.

4.14 Also proposed is an ECO Stars Fleet Recognition Scheme, which is a free scheme that aims to help fleet operators improve efficiency, reduce fuel consumption & emissions and thereby make cost savings. The scheme provides recognition for best operational practices, and guidance for making improvements. Originally set up in South Yorkshire in 2009 by the four local councils, the scheme has now been adopted by numerous other council areas across the UK (including some in Scotland) as well as several cities across Europe.

4.15 Specific Actions will include giving reasonable consideration to the following:

- investigating the feasibility of increasing the number of low emission buses in Inverness. Discussions will be needed with bus companies and funding through the Bus Investment Fund explored;
- limiting buses to those above a particular Euro standard (this could be implemented through the SQP[4]);
- introducing further electric charging points in Inverness town centre and on the road network in the Highlands;
- investigating using lower emission vehicles within the Council's fleet which are likely to be used within Inverness;
- using the taxi licensing system to reduce emissions from taxis;
- feasibility study investigating the use of parking charge differentiation for low emission vehicles;
- promotion of the Ecostars system for lorries, buses or taxis.

Table 3: Evaluation of Action 2

ACTION 2	**Actively promote low emission vehicles and supporting infrastructure**
Air Quality Impact	As the proportion of Ultra Low Emission Vehicles such as electric vehicles increases, emissions of NO_x and PM_{10} will decrease and concentrations will reduce. There will need to be a large swing towards electric vehicles before improvements are measurable. Therefore initially benefits to air quality would be **Low**, but should progressively increase over time depending on the level of investment.
Cost	Costs will largely be dependent on the level of investment gained. In order to make a difference to the vehicle parc[5], it is considered that the overall investment would need to be **High** or **Very High**. The costs of individual options (such as Ecostars) would be **Low** to **Medium**.
Feasibility	**Medium** feasibility.
Ownership	Highland Council
Partners	Switch on Scotland, HiTrans, Bus operators, Taxi operators.
Funding	Switch on Scotland, Bus Investment Fund, Scottish Government Air Quality Grants.
Timescale	**Short** to **Long** term.

[4] The mechanism for implementation would be investigated but could include a Traffic Regulation Condition.

[5] Total number of vehicles in use

Action 3: Use the planning system to ensure that air quality is fully considered for new development

4.16 Inverness is the fastest growing city in Scotland and the associated potential growth in traffic that this is likely to generate means that this action is critical to ensure not only that air quality improvements come to fruition, but that the status quo is maintained. It is imperative that the planning system is utilised to ensure that new development can support the Air Quality Action Plan, rather than hinder its implementation. It is recognised that this action relates both to developments that may increase emissions of pollutants, and those which may introduce relevant exposure into areas which are already polluted.

4.17 The Highland Wide Local Development Plan (April 2012), Policy 73 states that:

Development proposals which, individually or cumulatively, may adversely affect the air quality in an area to a level which could cause harm to human health and wellbeing or the natural environment must be accompanied by appropriate provisions, such as an Air Quality Assessment, (deemed satisfactory to the Local Authority and SEPA as appropriate) which demonstrate how such impacts will be mitigated.

Some existing land uses may have a localised detrimental effect on air quality. Any proposals to locate development in the vicinity of such uses and therefore introduce receptors to these areas (e.g. housing adjacent to busy roads) must consider whether this would result in conflict with the existing land use. Proposals which would result in an unacceptable conflict with the existing land use to air quality impacts will not be approved.

4.18 Supplementary Guidance (SG) on air quality could be used to prescribe how the above policy will work in practice. An SG document could include issues such as which types of development require an air quality assessment, considerations for air quality assessments, technical details of what needs to be included, as well as determining the significance of the predicted impact on air quality and defining when mitigation would be required, and the sorts of mitigation which should be considered. At a practical level, much of this information is already included within the EPUK/ IAQM Planning Guidance and it is suggested that this is used as the basis for local decisions on when an air quality assessment is required, and what that assessment should include. There is potential for additional air quality guidance within the forthcoming update of the Supplementary Guidance on Developer Contributions.

4.19 Specific Actions will include:

- ensuring that relevant planning applications are identified in consultation with EH officers. This should include both introducing relevant exposure into central Inverness streets, and ensuring that developments generating traffic which may impact on the AQMA are fully addressed;

- ensuring that planning applications with potential air quality impacts are fully assessed for their impacts, at relevant locations using appropriate methodologies (methodologies could be outlined within a Supplementary Guidance Document);
- ensuring that appropriate mitigation is not only proposed but also implemented where any relevant impacts are identified;
- encouraging Travel Plans for relevant new developments;
- encouraging Electric Vehicle infrastructure through the planning system;
- providing information re: sustainable transport for residents of new developments.

4.20 Option considered but not taken forward is:

- the compulsory purchase of existing flats within the AQMA (as not politically acceptable)

Table 4: Evaluation of Action 3

ACTION 3	Using the planning system to ensure that air quality is fully considered for new development
Air Quality Impact	In the longer term, the air quality impact of ensuring new development takes air quality into consideration is likely to have a **High** impact on air quality. In the shorter term, the impact will be **Low**.
Cost	**Low** cost for Highland Council.
Feasibility	**High** feasibility assuming political will.
Ownership	Highland Council.
Partners	Scottish Government, Developers.
Funding	Section 75 Planning Obligation.
Timescale	Short to Long term. Ongoing over the timescale of the Local Development Plan (and beyond).

Action 4: Traffic management to reduce emissions in locations within the AQMA

4.21 Controlling the road network to ensure that traffic flows smoothly will be critical to the success of this Action Plan. Inverness was the first city in the UK to implement a SCOOT (Split Cycle Offset Optimisation Technique) system which uses current conditions in real time to allow a quick response to any changes, through changes to the traffic light phasing. In addition to this, a major new link, West Link, will complete the link between the Dores Roundabout and the A82 at Torvean, crossing the River Ness. A new river crossing should help reduce congestion in the city centre.

4.22 As the largest component of local NO_x emissions is buses, they also need consideration. This Action Plan will not provide detailed plans for reviewing bus routes, but instead proposes a review of bus movements in central Inverness, the outcomes of which will be used to inform the way forward.

4.23 In addition, a study investigating specifically the phasing of traffic lights (plus any other measures) at the junction of Queensgate and Academy Street using microsimulation modelling is proposed, subject to funding. Measures, which aim to smooth traffic flow, rather than reduce traffic, are not well characterised by modelling using traditional methods which rely on average speed emission factors. Therefore, it is proposed that microsimulation traffic modelling coupled with instantaneous emission factors could be used to more accurately identify emissions for different scenarios based on acceleration and deceleration profiles. Emissions changes would then be modelled using the ADMS-Roads model to calculate concentration changes, particularly at relevant locations.

4.24 Specific measures will include:

- using the SCOOT system more effectively to ensure traffic is not queuing on Queensgate/ Academy Street. This may be undertaken as part of the Smart Cities initiative;
- study using microsimulation modelling to more accurately investigate impacts of traffic light phasing at the Queensgate/ Academy Street junction;
- reviewing bus movements round Inverness, both in terms of routes in and out of the bus station, bus stops and routes around the city centre;
- completion of West Link;
- investigating the feasibility of shortening delivery hours to reduce delivery vehicles causing congestion at peak hours in central streets; and
- investigating the feasibility of taking refuse collection vehicles out of the city centre at peak times.

4.25 Option considered but not taken forward is:

- banning traffic from Academy Street (as not feasible).

Table 5: Evaluation of Action 4

ACTION 4	Traffic management to reduce emissions in locations within AQMAs
Air Quality Impact	Reviewing the bus movements, and implementing recommendations in a way that would be positive for air quality could potentially have a **medium** impact on air quality. West Link is likely to have a minimal impact, but may take some traffic out of the city centre. Reducing potential additional congestion due to delivery vehicles stopped in peak hours will have a **low** impact. SCOOT may also have a **medium** impact.
Cost	**Low** to **Medium** for the specific measures, other than West Link which is being implemented anyway.
Feasibility	**Medium** feasibility.
Ownership	Highland Council.
Partners	HiTrans, Bus Operators.
Funding	Potential SCOOT funding from Scottish Government. West Link already funded.
Timescale	**Short** to **Long** term.

Action 5: Communication to inform the public about health impacts of air pollution and how they can change behaviour to reduce emissions and reduce exposure

4.26 Air quality is a key issue for Public Health, as exposure to high levels of air pollution can have adverse effects on the health of the population. This is because pollutants can exacerbate conditions such as asthma, and contribute to the risk of developing respiratory and cardiovascular disease, as well as lung cancer. These conditions are more likely to be present in people living in areas of deprivation, and nationally, evidence highlights linkages between the most deprived areas experiencing the worst air quality, thereby exacerbating health inequalities.

4.27 Active travel would lessen these health inequalities, as well as improve the health and wellbeing of people and achieve positive public health outcomes. For example, if people choose to walk and cycle more there would be a reduction in transport pollution, as well as an increase in physical activity. Not only will this increased activity lead to a reduction in obesity levels, and health conditions associated with obesity, evidence shows that exercise improves mental wellbeing, leading to greater feelings of revitalisation and a reduction in depression and anxiety.

4.28 An active travel map for inverness has been produced by Hitrans and Highland Council, utilising funding from the Bus Investment Fund, and real time information on bus stops has been expanded. In addition, the Inverness City Partnership has produced a leaflet for the public which encourages cycling by highlighting how commuters and tourists can

cycle in and around Inverness.

4.29 Specific measures will include:

- communicating with residents within the AQMA about the issues and this Action Plan;
- improving bus information provision;
- further Real time bus information;
- supporting existing campaigns for active travel, such as the Inverness City Partnership initiatives;
- providing appropriate signposting to car parks and other destinations (where possible routing cars on a more appropriate direction away from Academy Street);
- improving communications within the Council (to ensure that other policy areas don't conflict with air quality improvements). This would initially entail a workshop for Council Officers to raise awareness of the issues.

Table 6: Evaluation of Action 5

ACTION 5	Work with Public Health colleagues to inform the public about health impacts of Air Pollution and how they can change behaviour to reduce emissions and reduce exposure
Air Quality Impact	**Low** in relation to the AQMA, but required as a complementary measure to traffic management, Smarter Travel and Low Emission Vehicles.
Cost	**Low** cost for each of the elements of this measure. As a whole the Action is likely to be **Medium** cost.
Feasibility	Highly feasible option as it aligns with existing initiatives etc.
Ownership	Highland Council
Partners	NHS Highland, HITrans, Bus Operators.
Funding	Scottish Government Air Quality Grants and Public Health funding.
Timescale	**Short** to **Medium** term.

Action 6: Continue to monitor and assess air quality in line with Government guidance on Local Air Quality Management

4.30 The Scottish Government is currently consulting on changes to LAQM, with changes to the reporting process likely in order to simplify procedures for local authorities. It is also likely that some objectives will be dropped from LAQM, but with $PM_{2.5}$ to be included within the process. Highland Council currently monitors extensively for NO_2 and this Action will retain this commitment.

The monitoring will assist in assessing the impacts of this Air Quality Action Plan, as well as ensuring that new development does not cause exceedences of the air quality objectives.

4.31 In order to get the most out of the air quality monitoring within the AQMA, and to potentially track the traffic impacts of any measures implemented, it is judged that traffic monitoring should be undertaken on a permanent or regular basis at the Academy Street/ Queensgate junction. It would also be helpful in prioritising measures, to understand the Origin-Destination of those travelling within the AQMA and the reason for their journeys.

4.32 Specific measures will include:

- continuation of monitoring within Highland Council, focussed on the Inverness AQMA, but also in other strategic locations;
- operation of new real time monitoring site in Queensgate;
- annual assessment of air quality against air quality objectives, as specified by the LAQM process, with reports to Scottish Government and the public;
- a review of measures set out in this Action Plan on a regular basis, to ensure they are up to date and being implemented; and
- traffic monitoring (counts and Origin-Destination study).

Table 7: Evaluation of Action 6

ACTION 6	**Continue to monitor and assess air quality in line with Government guidance on Local Air Quality Management**
Air Quality Impact	None directly in relation to LAQM, but acts as evidence base for measures.
Cost	**Low** cost (per annum) to Highland Council.
Feasibility	**High** Feasibility
Ownership	Highland Council
Partners	SEPA, Scottish Government.
Funding	Scottish Government funding for monitoring site. Internal budget for Review and Assessment and traffic monitoring.
Timescale	Ongoing.

5 Consultation

5.1 Under Schedule 11 of the Environment Act, local authorities are required to consult on their draft Air Quality Action Plan. It is important to have involvement of all local stakeholders to ensure the success of the Action Plan. This Action Plan has been drafted through a partnership approach in particular with (transport and public health), planners, Business Improvement District manager and climate change officer.

5.2 The measures have also been consulted on through a workshop with Elected Members on 5th October 2016. There was discussion around the measures, and it was agreed that the priority measures, in terms of quick delivery, were considered to be:

- the cycling strategy;
- investigating the feasibility of increasing the number of low emission buses in Inverness (including tour buses where possible);
- investigating using lower emission vehicles within the Council's (Inverness based) fleet;
- investigating using the taxi licensing system to reduce emissions from taxis;
- reviewing bus movements around Inverness, both in terms of routes in and out of the bus station, bus stops and routes around the city centre; and
- investigating the feasibility of shortening delivery hours to reduce delivery vehicles causing congestion at peak hours in central streets.

5.3 In addition, a consultation exercise was undertaken using the online questionnaire tool 'survey monkey' between 14th September and 9th October, which was advertised through various forms of social media and the local press. Respondents were asked whether they agree, disagree or neither agree nor disagree with each of the measures in the draft Air Quality Action Plan and then asked for further comments. The results of this consultation are included in Appendix A1. Stakeholders included:

- The Scottish Government;
- SEPA;
- Councillors;
- local residents within and bordering the AQMA;
- relevant local businesses, community groups and forums;

- taxi operators;
- Business Improvement District;
- Road Haulage Associations;
- Freight Transport Association;
- Confederation of Passenger Transport;
- Public Transport Operators; and
- The general public.

5.4 All measures have a general agreement associated with them. The most popular measures are those relating to buses, in particular investigating the feasibility of increasing the number of low emission buses, reviewing bus movements round Inverness and the provision of more bus information, including real time information. The largest disagreement relates to the feasibility of a wider bike hire scheme in Inverness and this has since been taken off the measures list. Other less popular measures (i.e. those with a greater proportion of disagreement) include making Academy Street more pedestrian friendly, differential parking charges for LEVs and investigating the feasibility of shortening delivery hours to reduce congestion.

6 Implementation Plan

6.1 To implement the Action Plan measures, Highland Council will work jointly with all relevant partners, particularly planners and transport planners and bus operators. To secure the necessary air quality improvements, all local stakeholders and Highland Council must be involved.

6.2 Ultimately the delivery of this Action Plan is dependent on adequate levels of resourcing, both for capital costs and staffing. Funding sources have been highlighted in the evaluation tables.

6.3 The implementation and effectiveness of the Action Plan will be carefully monitored through the monitoring of NO_2 concentrations at relevant locations within Inverness. In addition, other indicators such as traffic flow, proportions of different categories of vehicles, use of public transport and levels of cycling will be incorporated. There will be regular reviews of the Action Planning proposals, which will be reported on an annual basis to the Scottish Government. These reviews will include both direct air quality monitoring information, as well as information on proxy measures such as traffic counts. The following table includes a more refined timescale for implementation, in the format outlined in the Template for Air Quality Action Plans published by the Scottish Government.

Table 8: Measures within the Action Plan

	Measure	EU Category	EU Classification	Lead Authority / Dept	Planning Phase	Implement-ation Phase	Key Performance Indicator	Progress to Date	Estimated Completion Date	Comments
1	Enhancement to train station and cycle parking	Transport Planning and infrastructure	Public transport improvements-interchanges stations and services	Development and Infrastructure	n/a	Completed	n/a	Complete	n/a	Supported by HiTRANS Active Travel Officer
	Further encouragement of active travel	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	Development and Infrastructure	n/a	Ongoing	Level of awareness		n/a	Supported by HiTRANS Active Travel Officer
	Making Academy Street more pedestrian friendly (wider pavements, crossing points etc)	Traffic Management	Strategic Highway Improvements			2017	Delivery of scheme			
	Cycling Strategy to encourage greater levels of cycling and support the 'Cycling City' concept	Promoting Travel Alternatives	Promotion of Cycling			2017	Delivery of Cycling Strategy			
	Travel Plan for Highland Council	Promoting Travel Alternatives	Workplace Travel Planning			2017	Delivery of Travel Plan			
	Engage with schools	Promoting Travel Alternatives	School Travel Plans			Ongoing	Number of schools with Travel plans			Every school now has a school Travel Plan in Highland

	Measure	EU Category	EU Classification	Lead Authority / Dept	Planning Phase	Implement-ation Phase	Key Performance Indicator	Progress to Date	Estimated Completion Date	Comments
	Promotion and encouragement of online tool for car sharing	Alternatives to private vehicle use	Car and lift sharing schemes			Ongoing	Number of users			
2	Investigate the feasibility of increasing the number of low emission buses in Inverness.	Promoting Low Emission Transport	Other			2017/18	Delivery of feasibility study	n/a		
	Limits on Euro standards of buses (this could be implemented through the SQP)	Promoting Low Emission Transport	Other			2017/18	Implementation of SQP			Funding through SQP
	Further electric charging points in inverness town centre and on the road network in the Highlands	Promoting Low Emission Transport	Procuring alternative refuelling infrastructure			Ongoing	Number of electric charging points installed			
	Investigating using lower emission vehicles within the Council's (Inverness based) fleet	Promoting Low Emission Transport	Other			2017/18	Number of Low Emission Vehicles in Council Fleet			
	Investigating using the taxi licensing system to reduce emissions from taxis	Promoting Low Emission Transport	Taxi licensing conditions			2017/18	Investigation complete			

	Measure	EU Category	EU Classification	Lead Authority / Dept	Planning Phase	Implement-ation Phase	Key Performance Indicator	Progress to Date	Estimated Completion Date	Comments
	Feasibility study investigating the use of parking charge differentiation for LEVs	Promoting Low Emission Transport	Priority Parking for LEVs			2017/18	Delivery of feasibility study			
	Ecostars	Promoting Low Emission Transport	Other			2017/18	Implementation of scheme	n/a		Air Quality Grant Available
3	Ensuring that relevant planning applications are identified in consultation with EH officers.	Policy Guidance and Development Control	Other Policy		n/a	Ongoing	None		n/a	
	Ensuring that planning applications with potential air quality impacts are fully assessed for their impacts, at relevant locations using appropriate methodologies	Policy Guidance and Development Control	Other Policy		n/a	Ongoing	None		n/a	
	Ensuring that appropriate mitigation is not only proposed but also implemented where any relevant impacts are identified	Policy Guidance and Development Control	Other Policy		n/a	Ongoing	None		n/a	

	Measure	EU Category	EU Classification	Lead Authority / Dept	Planning Phase	Implement-ation Phase	Key Performance Indicator	Progress to Date	Estimated Completion Date	Comments
	Encouraging Travel Plans for relevant new developments	Promoting Travel Alternatives	Other		n/a	Ongoing	Number of Travel Plans implemented		n/a	
	Encouraging Electric Vehicle infrastructure through the planning system	Promoting Low Emission Transport	Procuring alternative refuelling infrastructure		n/a	Ongoing	Number of charging points requested		n/a	
	Providing information re: sustainable transport for residents of new developments	Policy Guidance and Development Control	Other Policy			2017/18				
4	Use SCOOT system more effectively to ensure traffic is not queuing on Academy Street. This may be undertaken as part of the Smart Cities initiative	Traffic Management	UTC, Congestion management, traffic reduction			2017/18				
	Study using microsimulation modelling to more accurately investigate impacts of traffic light phasing at the Queensgate/ Academy Street junction	n/a	n/a			2017/18		n/a	2018	Grant funding potentially available

	Measure	EU Category	EU Classification	Lead Authority / Dept	Planning Phase	Implement-ation Phase	Key Performance Indicator	Progress to Date	Estimated Completion Date	Comments
	Review bus movements round Inverness, both in terms of routes in and out of the bus station, bus stops and routes around the city centre	Transport Planning and infrastructure	Bus route improvements			2017/18	Review undertaken	n/a		
	Completion of Phase 1 of West Link	Traffic Management	Strategic Highway Improvements			2017	Completion of Phase 1 of West Link	Currently under construction	2017	
	Investigate the feasibility of shortening delivery hours to reduce delivery vehicles causing congestion at peak hours in central streets	Freight and Delivery Management	Quiet & out of hours delivery			2017/18				
	Investigate the feasibility of taking refuse collection vehicles out of the city centre at peak times	Freight and Delivery Management	Quiet & out of hours delivery			2017/18				
5	Communicate with residents within the AQMA (and more widely) about the issues and this Action Plan;	Public Information	Via the internet	Highland Council Env Health	n/a	2016 and ongoing		Already undertaken successful consultation exercise	Unknown	
	Improve bus information provision	Public Information	Other	HITRANS		Ongoing				

	Measure	EU Category	EU Classification	Lead Authority / Dept	Planning Phase	Implement-ation Phase	Key Performance Indicator	Progress to Date	Estimated Completion Date	Comments
	Real time bus information	Public Information	Other	HITRANS		2017				European Regional Development Fund
	Support existing campaigns for active travel	Public Information	Other	Development and Infrastructure		Ongoing		Step Count Challenge Big Bike Revival Active Travel Map for city		In conjunction with HITRANS
	Appropriate signposting to car parks and other destinations	Transport Planning and infrastructure	Other	Community Services		2017				
	Improve communication within the Council (Workshop for Council officers)	n/a	n/a	Chief Executive		2017	Workshop completed	n/a	Ongoing (2017 for workshop)	
6	Continuation of monitoring within Highland Council, focussed on the Inverness AQMA, but also in other strategic locations	n/a	n/a	Highland Council Env Health	n/a	ongoing	Reporting of monitoring data on an annual basis	Already completed APR for 2016	n/a	
	Operation of new real time monitoring site in Queensgate	n/a	n/a	Highland Council Env Health	n/a	March 2016	Reporting of monitoring data on an annual basis	Monitoring site in location	n/a	

	Measure	EU Category	EU Classification	Lead Authority / Dept	Planning Phase	Implement-ation Phase	Key Performance Indicator	Progress to Date	Estimated Completion Date	Comments
	Regular assessment of air quality against air quality objectives, as specified by the LAQM process, with reports to Scottish Government and the public	n/a	n/a	Highland Council Env Health		ongoing on an annual basis	Reports submitted on an annual basis	Already completed APR for 2016	n/a	
	A review of measures set out in this Action Plan on a regular basis, to ensure they are up to date and being implemented	n/a	n/a	Highland Council Env Health	n/a	ongoing on an annual basis	Reports submitted on an annual basis	n/a	n/a	
	Traffic monitoring (counts and Origin Destination study)	n/a	n/a			To be in place by 2017 then ongoing on an annual basis				

7 Summary and Conclusions

7.1 This Air Quality Action Plan sets out 6 broad Actions, for which specific measures have been included. The Actions are as follows:

- Action 1: Promote Smarter Travel Choices.
- Action 2: Actively promote low emission vehicles and supporting infrastructure.
- Action 3: Use the planning system to ensure that air quality is fully considered for new development.
- Action 4: Traffic management to reduce emissions in locations within the AQMA.
- Action 5: Communication to inform the public about health impacts of Air Pollution and how they can change behaviour to reduce emissions and reduce exposure.
- Action 6: Continue to monitor and assess air quality in line with Government guidance on LAQM.

7.2 At this stage, it has not been possible to quantify emissions reductions for specific Actions. It is considered that in order to achieve the annual mean nitrogen dioxide air quality objective, a combination of the above measures will be required. In the short term, it is considered that traffic management measures are likely to have the greatest impact within the AQMA. It will still be important to invest in smarter travel choices, low emission vehicle infrastructure and communication with the public, which will all reduce concentrations, and hence improve health across a wider area of Inverness.

7.3 Inverness is the fastest growing city in Scotland and hence it is to be expected that traffic levels will increase in future. Although this should be counteracted by improving vehicle emissions and a greater number of low emission vehicles on the roads, monitoring should continue across Inverness to ensure other locations do not trigger exceedences of the relevant objectives.

7.4 The measures highlighted in this Air Quality Action Plan should reduce concentrations of NO_2 at the relevant sensitive receptors, although it is too early to say exactly what impacts they will have on improving air quality. The Council is continuing to monitor air quality at several locations within and around the AQMA and has started real time monitoring on Queensgate. The results of the monitoring will be made available through the annual review and assessment reports along with proxy measures for quantifying improvements.

7.5 This Action Plan will be updated as and when required. The Air Quality Action Plan supports the policies of Highland Council, as well as the CAFS.

8 References

Carslaw, D., & Rhys-Tyler, G. (2013, July). *Remote sensing of NO2 exhaust emissions from road vehicles*. Retrieved from http://uk-air.defra.gov.uk/assets/documents/reports/cat05/1307161149_130715_DefraRemoteSensingReport_Final.pdf

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Committee on the Medical Effects of Air Pollution. (2015). *Statement on the Evidence for the Effects of Nitrogen Dioxide on Health.* COMEAP.

Halcrow Group Ltd. (2011). *Inverness Active Travel Audit. Final Report.*

9 Glossary

AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
BID	Business Improvement District
CAFS	Clean Air for Scotland. The Road to a Healthier Future
COMEAP	Committee On the Medical Effects of Air Pollution
Defra	Department for Environment, Food and Rural Affairs
EH	Environmental Health
EPUK	Environmental Protection UK
Exceedence	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
HITRANS	Highlands and Islands Transport Partnership
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LEZ	Low Emission Zone
µg/m^3	Microgrammes per cubic metre
NLEF	National Low Emission Framework
NMF	National Modelling Framework
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides (taken to be NO_2 + NO)
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date.
PM_{10}	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
$PM_{2.5}$	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
SCOOT	Split Cycle Offset Optimisation Technique

Section 75 The increase in land value which results from planning permission being granted, mainly accrues to the owner of the land, but a levy or tax may be applied to divert some of the planning gain to the public sector. This diversion of funds is made under a Section 75 planning obligation (Section 75 of the Town and Country Planning (Scotland) Act 1997).

SEPA Scottish Environment Protection Agency

SG Scottish Government

SQP Statutory Quality Partnership

Standards A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal

10 Appendices

A1 Consultation Responses from Survey Monkey

A1.1 A Consultation exercise was undertaken using the online questionnaire tool 'survey monkey' between 14th September and 9th October. Respondents were asked whether they agree, disagree or neither agree nor disagree with each of the measures in the draft Air Quality Action Plan and then asked for further comments. This appendix summarises the outcomes of this consultation exercise, both in relation to each of the 6 sections of measures and by production of the comments in full.

Smarter Travel

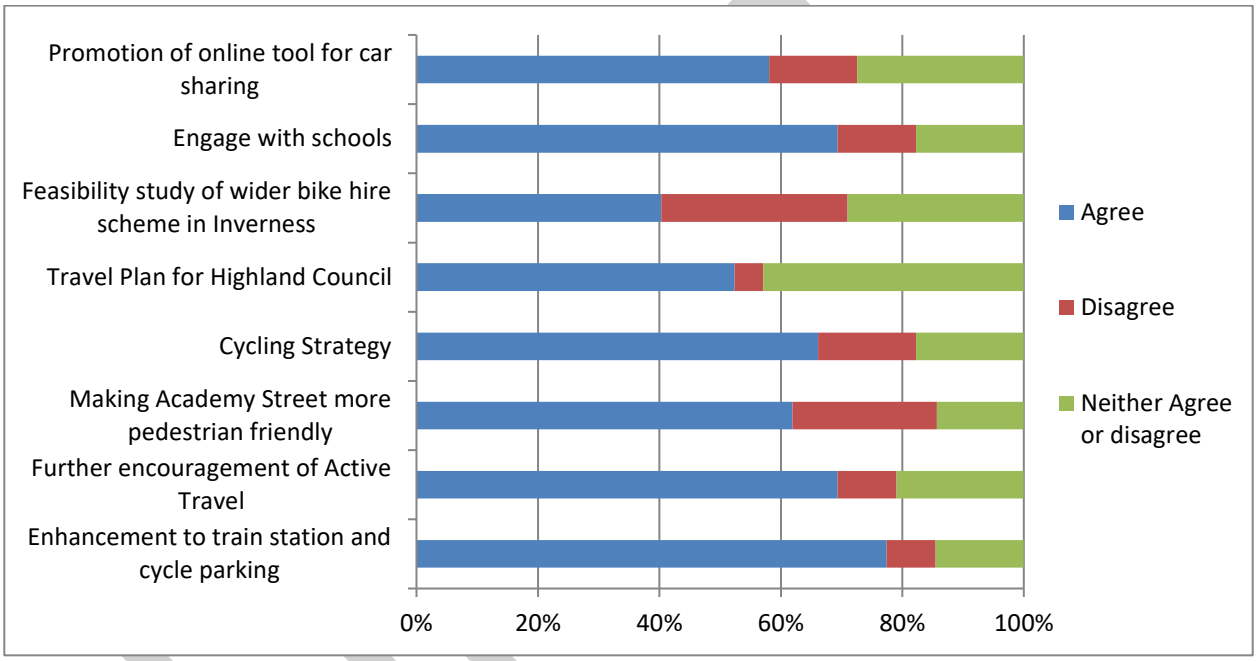

Figure 4: Responses to Consultation Questions relating to Smarter Travel

Table 9: Comments in relation to Smarter Travel

Individual Comments
Encourage park and ride? Promote increased bus priority measures through Inverness from all key corridors into the centre
As far as bike lanes go - Inverness is lagging far behind other cities.
Pedestrianise the city centre.
Pedestrianise the city centre except for deliveries, buses (replace all entering city with electric buses too) and cycles and get some decent road bypass plans to take people from one side of the city to the other with ease.
Maybe a park and ride option outside of town.

Individual Comments
Better promotion of safe cycling routes AND absolute clarity about where cycling is/ isn't permitted, with appropriate enforcement measures.
Better cycle networks. Many more people would feel safer cycling if there were better cycle paths in place.
Buses and trains are expensive, it is more economical for me to travel with my husband and three kids from dingwall to Inverness town centre by car than train or bus regularly. I would take buses and trains more often if they were cheaper and connected to more areas. I would cycle more if I knew I would have reliable bike paths that were safe for myself and a bike trailer for the kids. This applies to town and also the dingwall to Inverness route. More space for bikes on trains would be useful too. I think one of the most useful things you could do for the town centre and this issue would be cycle lanes. Having lived in Portland, Oregon, USA I really came to appreciate the availability of cycle lanes and when I returned home to the Highlands I was surprised to find so few for practical travel purposes.
The vast majority of roads in Inverness are barely suitable for the amount of vehicles that use them, let alone adding cyclists to the mix.
Total pedestrianation of Union Street/Church Street/Queensgate. Bus only lane in that area, with restrictions on delivering vehicles.
Encourage the local bus company to use more electric buses and also to bring Euro 6 Hybrid buses to Inverness .Also look into the need for so many vehicles using the Union st,Church st and Queensgate circuit
Academy St to be a public transport, taxi, cycle only zone. There is not enough thought for cyclists. The relatively new area around General Wade Rd, Leachkin, are not cycle friendly, the rds are too narrow. A form of safe cycle route from Inverness, Beauly
Pedestrianisation and cycle paths and park n ride on city boundaries
We cannot permit the city centre to become totally inaccessible to city residents - it will kill off what's left of local, non shopping mall based enterprise, in a city with diminishing parking accommodation, and which is becoming a bit of a joke nationwide
Bike hire hasn't worked
I often see vehicles in Inverness stationary with idling engines, there has been significant research which suggests that stationary vehicles with idling engines emit more damaging particles than vehicles moving. Taxis, buses and delivery vans are the main culprits. Implementing Fines and warnings to drivers would help as they often don't realise the consequences of their behaviour. This could be done with some sort of educational campaign which spells out the number of premature deaths caused by air pollution. It would also make sense to reduce the number of busses which have to stop on queensgate as they often have nowhere to go and sit waiting for a space. Giving bus and coach drivers an education in turning off their engine when they are going to be stopped for more than a minute would also help

Individual Comments
The cost of using THC operated car parka should be considered. If it was more affordable to park in Inverness people would use the facilities like Rose Street Multistorey to access local services on foot. Coupled with greater pedestrianisation of Academy Street and streets feeding into it I think this would not only meet the air pollution and environmental concerns but also encourage economic growth and increase footfall to services around the bus station and side streets which are mostly occupied by independent stores and increased footfall would help support them. Bus and taxi only and cycle space would be the best option for the city I feel. Academy Steet suffers so much because it's just not a nice or pleasant place to be. It's the only place I have lived where the main thorofare is arguably the most deprived area in terms of attraction and seevice standards. It could be such a great economic hub. I can picture Academy Street, and the general city centre, being similar to the high street in Dundee. Slapping permits and annual fees increases will not solve the problem.
The whole bus timetable for Inverness needs a radical overhaul. It is not an integrated transport solution in its present form. Hydrogen and electric buses should get maximum support and higher taxes imposed against worn out, aging diesel stock. The diesel only train services in the Highlands contribute vast amounts of particulates and they often sit IDLING their filthy unfiltered engines in the railway station - that adds to the high levels of gases and particulates in the Academy Street station area. Therefore the Council should pursue and lobby for electrification of Highland trains. The "Drew Bikes" have been an expensive disaster and no more similar schemes should be adopted. Likewise, making pavements wider in the Academy Street / Queensgate Junction area will only slow traffic, causing even more particulate and gas pollution.
The roads are full of pot holes which makes cycling dangerous and uncomfortable. Resurface the roads for cycling and make clear cycle areas to encourage cycling and provide covered cycle areas to secure your cycle in the town
Change the traffic system through church to busses and taxis only. It may be argued that it would affect businesses however there's plenty car parking around the coty centre including rose street and east gate, it would reduce traffic in the area
Park and ride for commuters
Engage with parents who drive their children to school
Pedestrianise the city centre, and allow traffic to park on the outside from centre. Once the new city bypass is finished, there is little reason as to Academy street and Castle street needing to be used as a route for people to short cut there journey home.
Traffic should switch engine off when stationary to stop pollution. Keeping traffic moving will also reduce pollution. Buses need to cut engine when stationary similar to cars stop start system.
I've been living in la scala appts at bottom of strothers lane for 10 years ...black dust deposits on my windows worry me...there needs to be a reduction in traffic in the town
Make the area more cycle friendly.
Bike hire scheme was a failure and it put an existing bike hirer out of business
Wider footpaths do not promote cycle travel. pedestrians move in random manner, often with headphones. its not always safe to mix cyclists and pedestrians.

Low Emission Vehicles

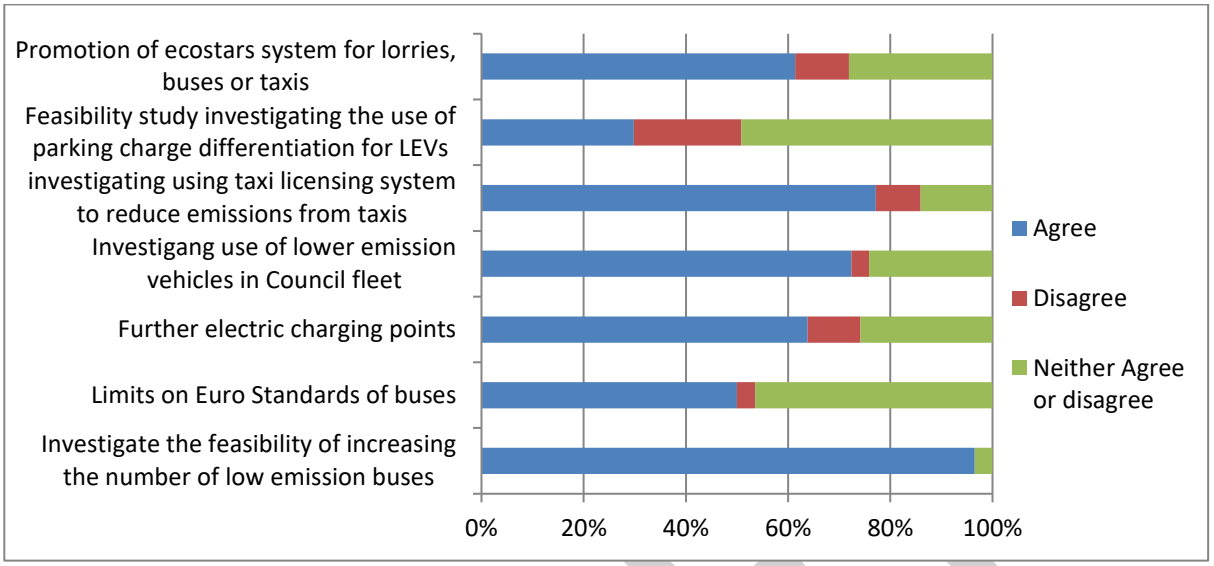

Figure 5: Responses to Consultation Questions relating to Low Emission Vehicles

Table 10: Comments on Low Emission Vehicles

Individual Comments
Improve electric vehicle infrastructure consider Union st or queensgate
A train link to the airport, also to other outlying places where a line already runs - Culloden for instance.
Promotion of engine switch off when stopped, waiting or parked. This is particularly important for diesel vehicles. Council vehicles should lead the way on this - which they currently don't.
This would appear to offer the quickest improvements. I use the bus service from Westhill to town weekdays and much of the fleet is old and would appear to be unfit to meet EU standards. It should be a clear requirement for any bidder to run the bus service.
I think busses are among the worst air polluters. They are also excessively noisy. Pressure must be applied by the council on bus companies to switch the entire fleet of public transport busses to zero emission vehicles within 5 years. Also, look at the feasibility of applying levies to diesel powered tour busses and hgv's entering the city centre.
Bigger efforts to make bus use more attractive to people ,better more straightforward bus routes , more bus shelters, improve the environment for passengers waiting for buses at Falcon Sq. , the shelter there is inadequate and advertise bus services better, possibly mail drops with route/timetable info.
Low emission buses are the big win with more infrastructure for ev being a great start. A local incentive in place before loans run out in early 2017

Individual Comments
The "service" provided by Stagecoach is atrocious: meaningless, incomprehensible timetables they don't adhere to, digital displays at city centre bus stops that may be accurate in theory but bear no relationship to what's actually happening, limited or non-existent evening service... I'm entitled to free travel and would happily use a decent service, but in the circumstances the car is often the only viable option. Having seen public transport in various other places around the world, i am embarrassed at the execrable standard here. I should add, to be fair, the electric buses are a move in the right direction and the drivers are generally pleasantly helpful. Though the Farraline Park staff are less reliable. I don't know the relationship - financial, statutory etc. - between HC and Stagecoach, but the latter need the threat of losing their licence to operate. After their predatory scheduling a few years back, they have a monopoly and don't seem to have the slightest interest in providing a good service. Get that sorted and the pollution problem will be greatly alleviated!
Simply stop giving commercial companies [taxis] preferential treatment over those afforded to rates paying residents -get rid of them, out of the city centre
Too many taxis
Electric vehicles could be offered reduced or free parking cost at council and other publicly owned car parks in the Highlands. Encouraging ownership of electric cars and hybrid through the councils car lease scheme would also help. The most effective method of improving air quality would be implementing a ban on diesel vehicles from the centre of Inverness. Paris and Oslo plan to do this from 2025 so why not Inverness
More charging points are fine but it should be noted that the existing ones are often broken (eg. The Cathedral Car Park was reported broken by many for several months and nothing was done). Likewise, the electric point in Drumnadrochit was installed but not even connected for over a year. Differential parking charges that penalise petrol cars are unfair because in the rural mountain areas current electric technology is simply not a viable option for these motorists. Many only come once or twice per week to Inverness but must therefore park for long periods.
Implement engine stop system in traffic for buses. Reduce the number of buses having to stop at the post office. The bus station is only 100m away. improve the traffic flow through the town there are traffic lights ever 100 to 150 m this causes conjestion and excess emissions. Keep the traffic flowing smoothly remove some of the traffic lights
At the bus stops the bus sl driver should shut down his engine
Build a big parking structure in Longman for example, which can accommodate both rose street and eastgate parking structure. Run a electric shuttle bus to town centre to which the cost could be included into the parking ticket.
buses parked and idling in strothers lane is so polluting in this residential area
More electric buses

Planning System

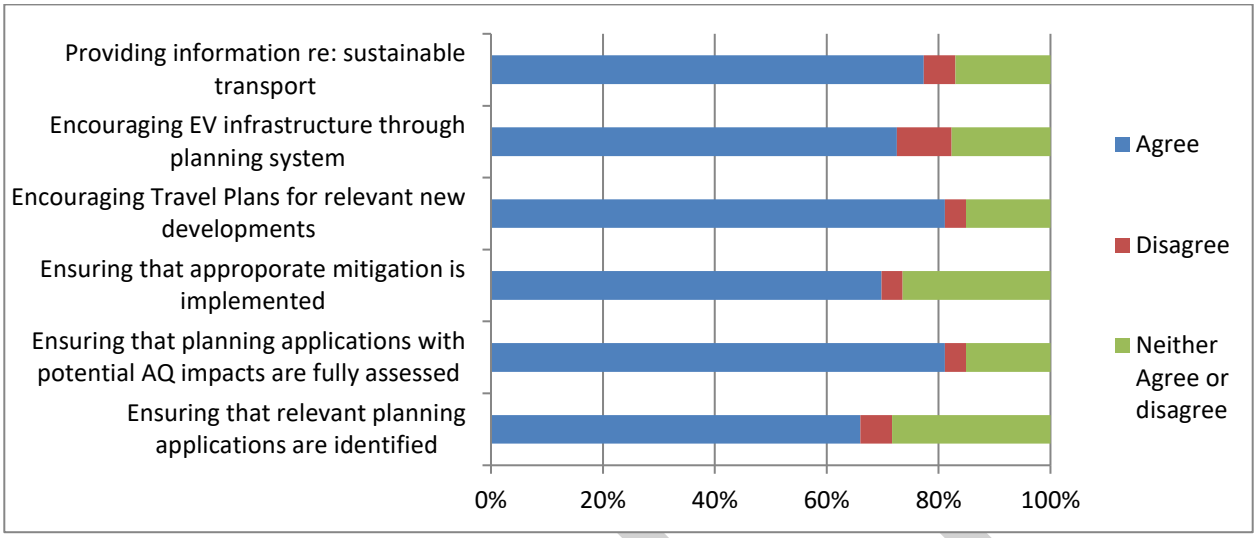

Figure 6: Responses to Consultation Questions relating to Planning

Table 11: Comments on the Planning System

Individual Comments
House Developers to consider supporting bus services during start up, ensure that adequate bus stop infrastructureforms part of
to provide infrastructure for car sharing schemes
Making car parking charges higher at Rose Street and other sites and actively ticketing cars i.e. Traffic wardens to reduce desire to take car. Also provide better and safer places to leave bikes. Make Academy street a vehicle free zone.
Planning system should take account of the factors which encourage walking, cycling and public transport use. Developers should be required to include cycle parking (preferably covered) and charge points for electric bikes as well as vehicle parking etc. Electronic board at all new bus stops should be mandatory as should a requirement for timetable boards to be updated at every timetable change.
Bus routes established in new developments while they are in build rather than let residents rely on cars.
Another example of coercing change by law - a indication that the argument doesn't stack up in the view of the public
New houses built should need to have electric charging points installed. This would help to normalise electric vehicle ownership
"Encouraging Travel Plans for relevant new developments" is not enough. New Planning Applications for sites involving multiple homes / other premises should have Conditions imposed that require electric charging points and a proper public transport system paid for (along with the necessary new roads) by Developers.

Individual Comments
Fully electric vehicles are not sustainable in the highlands with such long distances travelled by most people and so few places to charge them in rural areas. The money would be better spent improving the traffic flow and reducing conjestion
Enable a scheme to encourage and make it easier for people to buy electric cars in the Highlands.
More parking per house required
electric cars are not without environmental impact, better to encourage, foot, cycle and public transport.

Traffic Management

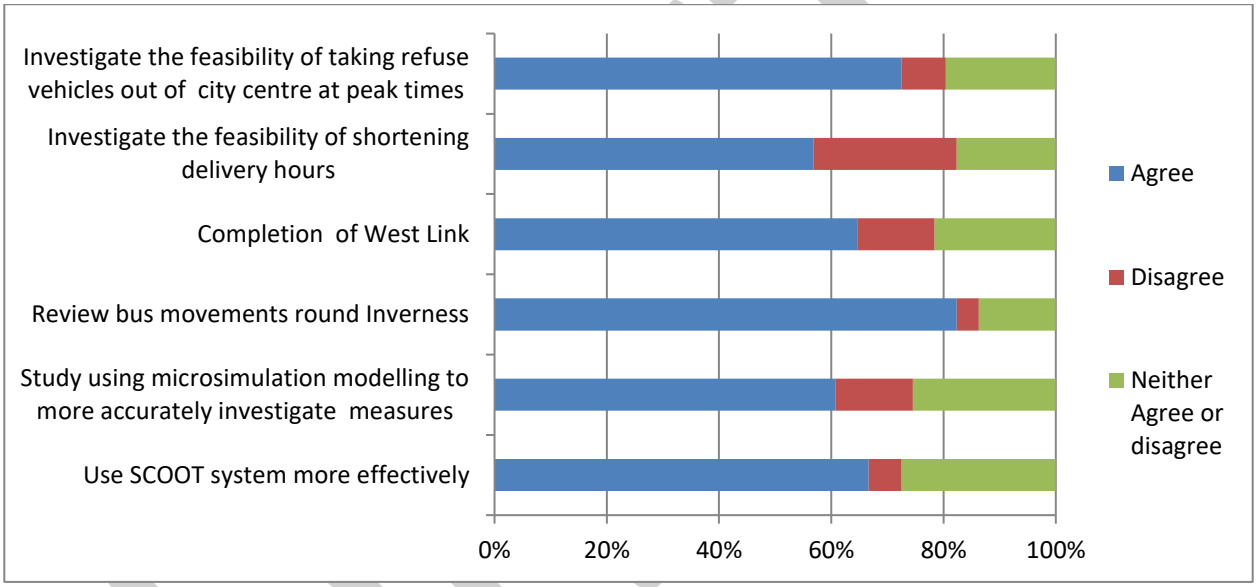

Figure 7: Responses to Consultation Questions relating to Traffic Management

Table 12: Comments on Traffic Management Measures

Any improvement of traffic flow in the centre is welcome , Shore St roundabout should form part of any improvement works this is a major pinch point and doesn't flow well . Movement of buses across the city is a matter we are willing to consult over but ultimately we as a commercial business will route buses where there is demand utilising the major routes primarily - We are keen to see infrastructure improvements
The west Link is only one solution - another better access to Stadium Road from the west would help and Parking outwith the centre - ? a Park and Ride maybe.
There could definitely be advantages to taking big vehicles out of the city at peak times.
Not sure why the impacts of traffic light phasing requires microsimulation modelling. Surely the emissions levels should be measured to create a baseline and re-measured as any phasing changes are made.

Reviewing bus timetables and the tendency for buses to end up in queues of two of three together at peak times. I see this every week day. Raigmore Hospital is another hot spot for queuing buses, surely not healthy for patients or staff.
Charge for car use in central Inverness
If the traffic lights in Inverness as a whole were actually programmed and synchronized, this would alleviate a number of problems. Also a reduction in the number of pedestrian crossings...
PRIORITY SHOULD BE GIVEN TO REROUTING BUSES AS MANY BUSES AS POSSIBLE AWAY FROM ACADEMY STREET TO UNION/CHURCH/FRASER STREETS WOULD BE A MAJOR FACTOR IN REDUCING EMISSIONS
Scoot system referred to but not explained Completion of West link..should head from Dores round about and west not calling the current route back into Torvean Don't shorten delivery hrs but have them overnight
The west link is a terrible and anti democratic mark against the highland council. Shame on those involved.
Refuse collection should be at night in any case, in the city centre. The evidence of recent simulations do not appear to work or effective with current adjustments to traffic lights and vehicle flows. If the traffic routes and flows were correct, and the infrastructure adequate, then we would not have vehicles queuing. Current initiatives are appalling, and lacking success
Too many taxis in Inverness at the moment, clogging up streets. Bus station should be used more instead of Queensgate, stop them idling when waiting as well
Instead of using SCOOT system more effectively to ensure traffic is not queuing on Academy Street, traffic lights should be switched to flashing amber or turned off altogether at times of low traffic. Whenever the traffic lights break down in Inverness it is clearly a fact that traffic is much more free flowing and there is much less congestion.
From previous comments there are too many traffic lights in the town centre causing congestion and limiting free flow of traffic remove some lights phase them better use smart lights that adjust timing dependent on traffic resurface roads to make smoother lower noise streets use electric buses in town centre
Westlink should be a tunnel All Lights need to be scoot
Increasing road capacity will lead to that capacity being used and therefore increase pollution. The council should not promote car travel.

Communication

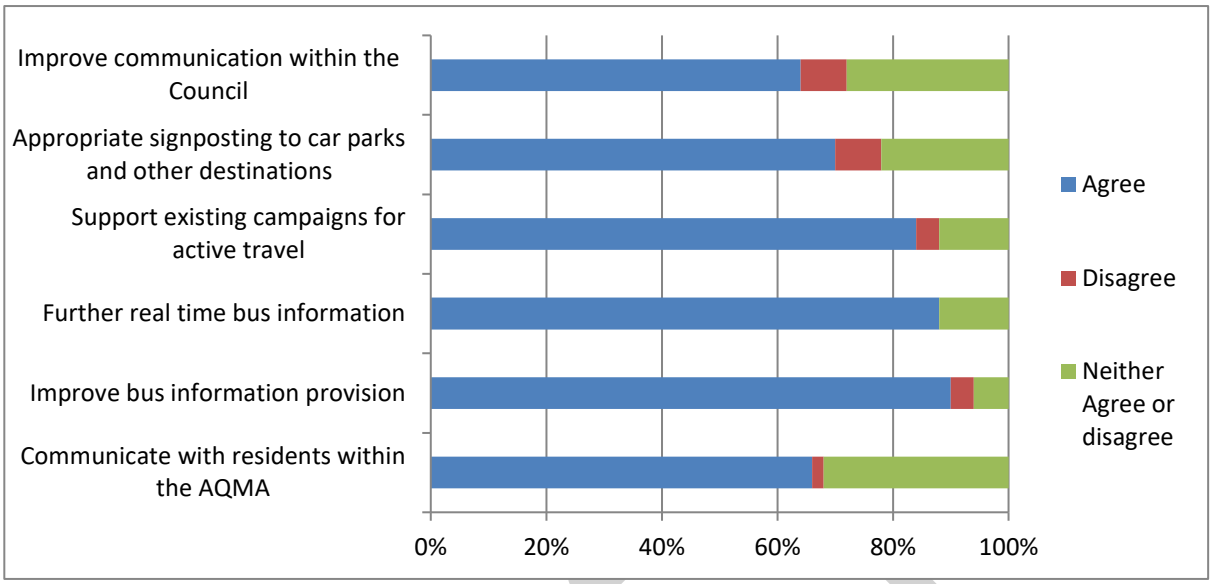

Figure 8: Responses to Consultation Questions relating to Communication

Table 13: Comments on Communication Measures

Individual Comments
Signage ref car parks to me fits hand in hand with a park and ride site - Inverness car parks at east gate are over capacity continually - Rose St not far off but poorly designed . Signage advising of difficulties of parking should be placed near park and ride sites to influence smarter greener travel choices into Inverness
Improving the cycle path along Millburn Road would help. We cycle to Cradle Hall from Innes Street to take our toddler to nursery. Going over the golden bridge and via the UHI campus has made this possible. However, Millburn is complicated as vehicles always have the right of way. Giving more priority to cyclists (like they do in the Netherlands) would be good. Some junctions like those near Millburn Academy are very dangerous, also around and opposite Morrison's is a faff and slow.
I have indicated that I disagree with appropriate sign posting to car parks and other destinations. This is not because I think we should be bewildering drivers by having poor signage but because I think we should be thinking very hard about how we 'invite' vehicles into the City Centre. There should be proper park and ride facilities and a positive discrimination for those who enter the City Centre by public transport, on bikes or on foot.
Many of the real time systems at bus stops simply go by some automated timeframe as they rarely reflect actual timings at peak times. This leads to some buses running almost empty as folk just the first one that gets them close to home. Not efficient.
Bus real time signs are working properly
Use nhs surgeries too. The health impacts are significant so get them onboard.

Individual Comments
THC need to lead the bus companies, not as at present, where the bus companies lead the Council. People will not change unless there is a clear benefit, and while Council staff and Members enjoy free car parking, staff take Council vehicles home, staff are provided with leased/company vehicles, then the public will, quite rightly, ignore the Council - need to lead by example, wake up and accept that in the Highlands, people need cars. The horse must lead the cart -until there are alternatives available, and that work, then the public will not, indeed cannot, change to public transport
The bus service within Inverness is pretty bad, often late, if they turn up at all. What you want is a regular reliable service, maybe that would encourage more people to use it?
Educating the public about how carcinogenic emissions from vehicles are would help, council employees should also have to attend training as I often see council maintenance vans with engines idling for entire lunch breaks so that staff can charge their phones and benefit from the vans heating. Alba traffic management seem to be employed for many council projects and they also have leave vehicles with idling engines for hours at a time, the council should highlight air pollution to them as an important issue and threaten to reduce their contracts if they don't take steps to reduce their emissions. Their staff would benefit from some training on the subject.
Make the main multistory carpark free and encourage drivers to use dual carriageway to get to carpark improve the flow of traffic to the carpark and drivers will not need to drive through the town centre as often consider a full 1 way system through the town centre
Town centre for tourists driving, especially in the peak months must be a nightmare
You should communicate with all stakeholders and not just residents in the local area. Otherwise you will move the problem rather than solve it.

Monitoring and Assessment

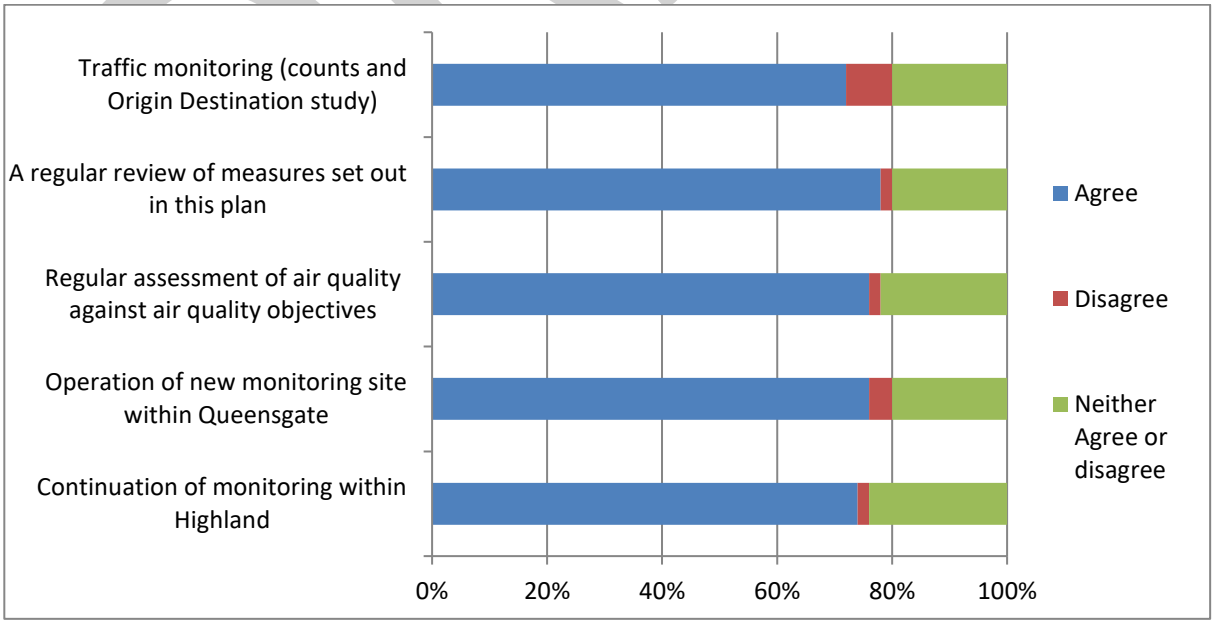

Figure 9: Responses to Consultation Questions relating to Monitoring and Assessment

Table 14: Comments on Monitoring and Assessment

Individual Comments
Church street badly needs parking enforcement consistently - major pinch point for buses
This is important especially when the weather is still as feels as the air quality on Innes Street can become very unpleasant with all the traffic queuing on A82. I would take away lights so traffic can move more freely, but gains priority to pedestrians so traffic also hasn't to drive more carefully. Take lights away at bridge too. Encourage more people to exit A9 south via the stadium and slip road.
Air quality should be measured in all Highland pollution pressure points - Dingwall, Fort William among others. The monitoring in Inverness should prioritise the area around Council HQ and adjoining streets as well as Queensgate/ Academy St. Highland Council should set a more ambitious pollution target. Arguably the West Link provides a unique opportunity to reduce pollution in around the City Centre.
It's fine to monitor the traffic, but what will be done to mitigate any identified problems....
I'm not sure the count is necessary until the other measures have failed.
Exactly - work out the routes that are required, and then provide/improve them, and stop controlling, or reducing access as at present, and start promoting access routes that work
Steps should be taken to change traffic flows in area where's there is poor air quality. I would suggest that castle street suffers from poor air quality particularly from the castle tavern heading towards Culduthel road. The traffic lights their force cars to stop frequently and then produce increased emissions to set off and drive up the hill. Removing these traffic lights or only having them on a certain period would reduce queuing traffic and air pollution.
"Operation of new real time monitoring site in Queensgate" should include Public Accessible real time statistics and archived graphs on the Highland Council Website Portal (similar to Scottish Government A9 Camera website).
Others areas should also be considered not just AQMA the plan should be to actively reduce congestion throughout the city
Publish the results so that there widely available to access to show, how damaging they are to people and animals health.
Waste of money
Publish real time data on line, including Traffic volume data with pollution data.

General Comments

Table 15: General Comments

Individual Comments
To produce a long term plan for city development that see the decrease of traffic and increase of public transport, walking and cycling within the city centre.
Very badly needed. Glad it is here.

Individual Comments
as a Queensgate resident can i take legal action against the council if it is found that it has constantly failed to ensure clean air levels and my health has suffered due to it.my newly painted white windows have soot particles clearly visible, the invisible ones i cant see are more dangerous to my health. 11 years in a highly polluted location is sure to cause breathing problems in later life so if you know and have known the pollution levels are a hazard and you dont do anything to reduce it you could be liable !
Ambition, ambition, ambition - PLEASE!
Actions 2 and 4 would seem to provide the quickest improvements and would appear readable and not costly to the council.
The uncontrolled sprawl of Inverness suburbs has to be stopped. Endless little boxes on the hillside and poor public transport provision to these peripheral areas. Provision of more bike lanes necessary. Better park and ride facilities for people living in rurall areas also necessary.
Being a resident of Strothers lane I have a couple of concerns. 1. Noise level and times of works. We have just had to endure the past months of constant noise pollution from the rebuilding of the M and Co next door. This was a constant source of noise some times up until the small hours of the morning. Or noise starting from 5am. This should not be allowed for the proposed works! 2. A big problem on these streets especially on a Friday and Saturday night are people with loud exhausts sitting and the queens gate lights and constantly revving their engines, using Strothers Lane as a drag strip and senseless showing off. My suggestion for this would be to make the following streets for bus, taxi and loading ONLY, Strothers lane, queens gate, union street and church street. There is absolutely no reason people need to drive on those streets unless they live on them. This would not only cut down on pollution on the streets through out the day, but also keep antisocial behaviour to a minimum and prevent the building up of traffic on these silly little lanes.
This has been an eu obligation that everyone from central government down has dodged. Shame on you for allowing this to cone to a court action by client earth to force your hand.
Reason for poor air quality in city centre - the road network makes all buses run around the Union Street/Queensgate square, so we have anything up to 6 or 8 stationary buses in a small area. THC permitted a stifling of Farraline Park by permitting it to be landlocked by recent development - time for THC to actually begin planning for the future
Plant trees throughout the center of Inverness ....Simple solution
I hope there are some real changes and not just piecemeal policy and strategic changes. It's commendable for THC to consult on this and I praise the use of digital media as a communication pathway. It's the cheapest and easiest way to connect with the young of the city.
Make church Street, Queensgate and union Street areas, no entry for cars other than access and taxis
Concentrate on public transport because electric cars for remoter rural drivers are a red herring. The buses need a structured joined up timetable and more minibuses need to serve smaller residential areas a few times a day (eg. Bunloit and Balnain and Abriachan etc.) Finally, why is there nothing in the plan for using the Canal System as part of a low emissions transport network? Heavy lift materials like coal, wood, cement, steel, road salt etc etc. could all come on a continuous barge system. It does not matter if it takes a barge 3 weeks to get from the south to Inverness if it is part of a continuous rolling service for the same materials that are required continuously.
Have busses shutdown engines at stops

Individual Comments
I think this is an excellent idea, hope to see this in the near future.
Too many buses and cars sit in traffic with their engines on. This is extremely polluting and should be looked at.
Put other forms of transport before the motor car. This needs to include the right of way, otherwise the car will always be king. Look at park and walk/cycle/ ride again.

A2 Professional Experience

Prof. Duncan Laxen, BSc (Hons) MSc PhD MIEnvSc FIAQM

Prof Laxen is the Managing Director of Air Quality Consultants, a company which he founded in 1993. He has over forty years' experience in environmental sciences and has been a member of Defra's Air Quality Expert Group and the Department of Health's Committee on the Medical Effects of Air Pollution. He has been involved in major studies of air quality, including NO_2, lead, dust, acid rain, PM_{10}, $PM_{2.5}$ and ozone and was responsible for setting up the UK's urban air quality monitoring network. Prof Laxen has been responsible for appraisals of all local authorities' air quality Review & Assessment reports and for providing guidance and support to local authorities carrying out their local air quality management duties. He has carried out air quality assessments for power stations; road schemes; ports; airports; railways; mineral and landfill sites; and residential/commercial developments. He has also been involved in numerous investigations into industrial emissions; ambient air quality; indoor air quality; nuisance dust and transport emissions. Prof Laxen has prepared specialist reviews on air quality topics and contributed to the development of air quality management in the UK. He has been an expert witness at numerous Public Inquiries, published over 70 scientific papers and given numerous presentations at conferences. He is a Fellow of the Institute of Air Quality Management.

Dr Clare Beattie, BSc (Hons) MSc PhD CSci MIEnvSc MIAQM

Dr Beattie is a Principal Consultant with AQC, with more than fourteen years' relevant experience. She has been involved in air quality management and assessment, and policy formulation in both an academic and consultancy environment. She has prepared air quality review and assessment reports, strategies and action plans for local authorities and has developed guidance documents on air quality management on behalf of central government, local government and NGOs. Dr Beattie has appraised local authority air quality assessments on behalf of the UK governments, and provided support to the Review and Assessment helpdesk. She has also provided support to the integration of air quality considerations into Local Transport Plans and planning policy processes. She has carried out numerous assessments for new residential and commercial developments, including the negotiation of mitigation measures where relevant. Clare also works closely with Defra and has managed the Defra Air Quality Grant Appraisal contract. She is the Secretary of the Institute of Air Quality Management.

Full CVs are available at www.aqconsultants.co.uk.