2011 Air Quality Progress Report for City of Edinburgh Council

In fulfillment of Part IV of the Environment Act 1995
Local Air Quality Management

October 2011

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Executive Summary

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in Part IV of the Environment Act 1995 and the National Air Quality Strategy 2007. The report has been completed in accordance with Technical Guidance LAQM.TG (09) document, produced by DEFRA and the Devolved Administrations.

The report concludes the following:

Monitoring data (2010)

Nitrogen dioxide

Nitrogen dioxide concentrations for 2010 within the three Air Quality Management Areas (AQMAs) continue to exceed targets at the majority of monitoring locations and therefore the AQMAs remain valid.

The following locations outwith the AQMAs also show exceedences of the annual mean nitrogen dioxide objective, London Road, Easter Road, Grassmarket, Cowgate, Bernard Street, Hope Park Terrace, Queensferry Road, Glasgow Road, Inverleith Row, Hillhouse Road Angle Park Terrace, Slateford Road, Fountainbridge/Tollcross and Gorgie Road /Delhaig.

It will be necessary to extend the central AQMA to include exceedences at Easter Road, London Road, Gorgie Road/Delhaig and Grassmarket/Cowgate. It will also be necessary to extend Great Junction Street AQMA boundaries to include Bernard Street (Leith).

Potential exceedences of the pollutant nitrogen dioxide have been identified at the following locations, Broughton Road, Ferry Road, Commercial Street, Salamander Street/Bath Street and Portobello High Street.

Additional monitoring for Detailed Assessment relating to Glasgow Road and Queensferry Road indicate that the exceedences are localised. An AQMA will be required for the Glasgow Road/Newbridge area. However, further investigation will be required at Queensferry Road in order to ascertain exceedence of the annual mean nitrogen dioxide objective.

Detailed Assessment is required for Hope Park Terrace/Clerk Street junction, Hillhouse Road, Slateford Road, Fountainbridge/Tollcross and Angle Park Terrace. Additional monitoring will commence 2012.

Detailed Assessment is currently being progressed at Portobello and Inverleith Row.

Particles (PM_{10})

The PM_{10} EU limit values were achieved at all monitoring locations. However, from historical and current monitoring data it is anticipated that the majority of heavily trafficked roads within the city centre and beyond may exceed or are close to exceeding the Scottish Government Annual Objective for particles (PM_{10}). PM_{10} concentrations at Salamander Street fail both the daily and annual Scottish Objectives. It is likely that fugitive emission sources, from an adjacent scrap yard and cement batching process contribute to this exceedence as well as local traffic. Fugitive emissions will be investigated in conjunction with SEPA and be included in the city-wide Detailed Assessment study.

Data Trends

It has proved difficult to formulate reliable assumptions on data trends for both NO_2 and PM_{10}, due to disruptions to normal traffic flows, arising from construction works associated with the Edinburgh Tram project. However, there has been a significant decrease in the hourly exceedences of nitrogen dioxide at St Johns Road from 166 in 2008 to 60 in 2010. Initial analysis suggests that this could be attributable to improvements in the emission standards of the bus fleet operating in the St Johns Road corridor.

Local Developments:

Industrial - Biomass Plant

Air quality concerns have been raised by the Council regarding the proposal to build a 200(MWe) biomass power station (mainly combusting wood) at Leith Docks. The concerns relate to emissions arising from the combustion process, transportation of fuel and waste and fugitive emissions associated with open-air wood storage. The installation will be in close proximity to an existing high-density residential area and adjacent to land which has been allocated for future residential development. The site is also close to an area of poor air quality. Emissions from a biomass fuelled a power station of this scale at this location could seriously undermine other Actions currently being pursued to achieve Scottish Government Air Quality Objectives.

Roads with a high flow of buses or HGVs

Edinburgh Tram network is not as extensive as was initially proposed with Phase 1 funded to operate between Edinburgh Airport and St Andrew Square in the city centre. It is unlikely that the route will be extended to Leith/Ocean Terminal in the foreseeable future. As a consequence it is possible that the current level of bus services will be retained and a proportion may be rerouted (especially from Princes Street) for Tram operations. Therefore, the potential air quality impact on the adjacent road network arising from bus displacement requires to be assessed and evaluated.

Progress on Actions

Bus improvements

The bus emission analysis study undertaken by Transport and Travel Research (TTR 2011) concluded that implementation of the Council's Voluntary Emission Reduction Partnership (VERP) proposal, of Euro 5 (or higher standard of vehicle) by 2015 in all three AQMAs would provide a significant reduction in emissions of nitrogen oxides (NO_x) and PM_{10} compared with the base case (no intervention) scenario.

The greatest potential emission reductions in NO_X with VERP proposal (2010 to 2015) is observed at Great Junction Street (61%), followed by Central (59%) and St Johns Road (48%).

With respect to PM_{10}, the greatest potential emission reduction was observed within the central AQMA (94%), followed by St Johns Road (77%) and Great Junction Street (74%).

Lothian Buses have achieved significant improvements in the emission standard of their main service fleet with substantial financial support from the Scottish Government. In the absence of further financial incentives it is unlikely that either of the two main bus operators (Lothian Buses and First Scotland (East) will attain a 100% Euro 5 fleet by 2015.

Freight Improvement

ECOSTARS

In November 2010, funding from 'European Intelligent Energy Europe' was approved for the ECOSTARS project. The project will run from 2011 to 2014 and will provide a relatively low-cost, 'partnership' mechanism to assist the Council encourage and facilitate emissions improvements from the road freight sector operating in the city.

Challenging targets have been set for the number of vehicles required to become part of the scheme:

Year 1: 3000 vehicles
Year 2: 4000 vehicles
Year 3: 4000 vehicles

These targets are for vehicles operating in and through the city of Edinburgh Council's area; they are not limited to those which are based within the city.

Low Emission Zone Consultation

Due to the general lack of funding available to all sectors (and especially for non-local authority owned vehicles) it is recognised that voluntary emission reduction partnerships are unlikely to provide the level of improvement required.

Following an update report to the Council's Transport, Infrastructure & Environment Committee (September 2009) on progress with the Air Quality Action Plan, Members instructed officers to initiate consultation with stake-holders on the feasibility of establishing a Low Emission Zone (LEZ) for the city. This will be progressed once Vehicle Emission Factors have been re evaluated and guidance for LEZ implementation has been issued by DEFRA and the Devolved Administrations.

Given the general desire for continuing economic growth in the city and wider region, and the inevitable additional demand for all modes of transport that this will bring, a reversal of the continuing deteriorating trend in local air quality will require the adoption of radical city-wide initiatives and interventions.

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1 Introduction

1.1 Description of Local Authority Area

Edinburgh is located in the South East of Scotland's Central Belt area and is the second largest city in Scotland. It is bounded by the Firth of Forth, which lies, to the North and the Pentland Hills to the South. The latter comprises of 20 miles of farming and recreational land. The peripheral areas of the city to the West and South West are predominately semi-rural. The city is described as a financial, commercial and tourist centre.

The residential population is estimated to be 486,120 (2010) with an overall population density of 1,853 persons per square kilometre. Edinburgh is a unique city in that a large number of people live within the core of the city centre. The city is a popular tourist destination and attracts 1 million overseas visitors annually. During the summer months, the number of visitors can be equal to the population.

55% of Edinburgh's population live in tenements or high-rise flats compared to the Scottish average of 33%. The majority of tenement properties are located in the central and northern areas of Edinburgh. There has been a substantial growth of residential flats within these locations of the city due to the development of former industrial sites. The southern and western peripheral areas of the city have predominantly detached and semi detached housing.

Many of Edinburgh's main streets and major radial routes into the city are narrow with tenement buildings four to five stories high on either side of the road carriageway, which form street canyons. In many instances, the distances from the edge of the road to the façade of residential properties can be 2m.

The main means of transport within Edinburgh is via the road network. Currently, 29% of the population use the bus to get to work and 26% walk or cycle. The main East Coast rail line is routed through the city centre and there are further rail links to Glasgow and Fife.

As a major employment centre, Edinburgh attracts a substantial amount of commuter road and rail traffic.

Smoke Control Orders cover the entire Edinburgh area and significant improvements in air quality have been achieved since their introduction due to use of natural gas in the domestic and commercial sectors.

The major cause of poor air quality in Edinburgh as in many urban environments is related to traffic.

1.2 Purpose of Progress Report

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in Scotland are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 97), the Air Quality (Scotland) (Amendment) Regulations 2002 (Scottish SI 2002 No 297), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre, $\mu g/m^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in Scotland

Pollutant	Concentration	Measured as	Date to be achieved by
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	3.25 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	50 $\mu g/m^3$, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	40 $\mu g/m^3$	Annual mean	31.12.2004
	18 $\mu g/m^3$	Annual mean	31.12.2010
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

The Environment Act 1995 requires local authorities to periodically review and assess air quality within their boundaries. A number of pollutants require to be assessed against air quality objectives which are prescribed in regulations. Table 1.1.

If an air quality objective is not going to be achieved at a relevant location then the local authority must designate an Air Quality Management Area (AQMA) and produce a written Air Quality Action Plan (AQAP). The Action Plan requires to demonstrate how a local authority will work towards achieving the air quality objectives within an AQMA.

The review and assessment process of Local Air Quality Management (LAQM) commenced in 1997. A summary of Edinburgh's findings and description of the three AQMAs are detailed in Tables 1.2 and 1.3.

Table 1.2 Summary of previous Review and Assessments

Round	Report	Date	Outcome
1	Review and Assessment of Air Quality in the City of Edinburgh Stage 1 and 2	1998	Potential exceedences of NO_2 and PM_{10}
1	City of Edinburgh Council Review Stage 3	2000	Exceedences of NO_2 annual mean objective Attributed to traffic emissions AQMA declared for City Centre 31.12.2000
1	City of Edinburgh Review and Assessment of Air Quality Stage 4	2002	Source apportionment identified that buses were the major contributors of NO_2
2	Updating and Screening Assessment Local Air Quality Management Phase 2	2003	Detailed Assessment required city-wide for PM_{10} due to high background concentrations and tightening of air quality objectives for Scotland Detailed Assessment for NO_2 St Johns Rd
2	Detailed Assessment Report	2004	Partisol co-location study with TEOM gave local gravimetric conversion factor of 1.14 AQMA not required for PM_{10} using 1.14 AQMA required for NO_2 at St Johns Rd.
2	Air Quality Progress Report	2005	Potential exceedences of NO_2 at West Port and Gt Junction St 4 Locations in Central AQMA likely to fail EU limit value – West Maitland St, Torphichen Pl, Princes St and Roseburn Terrace. Concerns raised with respect to density of development in city centre and North Edinburgh Waterfront
3	Updating and Screening Assessment Report	2006	Exceedences of NO_2 within: Central AQMA St Johns Rd AQMA declared for St Johns Rd 31.12.2006
3	Detailed Assessment for Nitrogen Dioxide at Gt Junction St and West Port	2007	AQMA required for NO_2 at Gt Junction St and West Port. West Port likely to also fail hourly nitrogen dioxide objective. Council to explore various options extend existing central AQMA to cover both areas or West Port. Declare two separate AQMAs. Prefered option to extend Central AQMA.

Table 1.2 Summary of previous Review and Assessments

Round	Report	Date	Outcome
3	Air Quality Progress Report. Round 3 of Local Air quality Management	2008	Nitrogen dioxide objectives continue to be exceeded within AQMAs.Number of locations also fail hourly mean objective. Based on 2007 data predictions EU limit values are likely to be exceeded within AQMAs Exceedences of NO_2 at Bernard St, Commercial St, Ferry Rd, Easter Rd, London Rd, Hope Park Terrace, Glasgow Rd Detailed Assessment required. City-wide Detailed Assessment required for PM_{10} due to exceedences of Scottish Air Quality Objectives (using 1.14 local gravimetric factor). AQMA declared for Gt Junction St 09.03.2009 included area of exceedence on Ferry Road. Central AQMA amended to include West Port and exceedences of hourly mean nitrogen dioxide objective. St Johns Rd AQMA amended to include exceedence of hourly mean nitrogen dioxide objective.
4	Updating and Screening Assessment	2009	Nitrogen dioxide objectives continue to be exceeded within AQMAs. Existing AQMAs remain valid. City-wide Detailed Assessment for PM_{10} required, which will address the four biomass installations and poultry farm complex at Gogarburn. Most congested main roads in city centre are likely to exceed Scottish annual objective for PM_{10} based on monitoring at Queen Street, Haymarket and DMRB modelling NO_2 annual exceedences noted at Glasgow Rd, Easter Rd, London Rd, Bernard St, Grassmarket, Cowgate, Queensferry Rd/ Barnton and Hillhouse Rd. Potential exceedences of NO_2 at Hope Park Terrace, Broughton Rd and Commercial St

Table 1.2 Summary of previous Review and Assessments

Round	Report	Date	Outcome
4	Air Quality Progress Report	2010	NO_2 exceedences within all 3 AQMAs AQMAs remain valid. Exceedences of NO_2 at, Portobello High St Inverleith Row, Bernard Street, Glasgow Road, Easter Road, London Road, Queensferry Road, Grassmarket Potential exceedences at, Broughton Rd, Commercial St, Hope Park Terrace, Cowgate, Hillhouse Road.
4	Further Assessment St Johns Road West Port (extension of Central AQMA) Great Junction Street	2011	NO_2 exceedences within 3 AQMAs . AQMAs remain valid Source apportionment : Within local vehicle fleet, buses contribute the greatest percentage of the measured NO_2 at St Johns Rd and Gt Junction St, whilst at West Port the greatest contribution is attributed to cars. % Range of roadside NO_X reduction required to meet NO_2 Annual Mean Objective (40µg/m^3). Using both UK and Scottish background maps. (UK) (SG) Gt Junction St 40.7% - 49.9% St Johns Rd 70.6% - 76.8% West Port 74.9% - 86.4%

Table 1.3 Description of AQMAs

Description AQMA / Declaration	Pollutant/ Source	Amendments
Central AQMA 31/12/2000 Includes area of City Centre and main arterial routes leading into the city centre. Exceedences mostly in locations where there are street canyons, high percentage of bus movements and congested traffic. Locations include Princes St, Leith Walk, Gorgie Rd, Queen St, Roseburn St, North Bridge. Residential properties at ground, first, second, third, fourth and basement level. Receptors close to road edge. Busy shopping areas include Princes Street, George Street, Dalry/Gorgie Road, Roseburn Terrace. Leith Walk. North Bridge.	**NO_2** **Traffic**	**09/03/2009** Extended to include West Port Amended to cover hourly breach as well as annual breach of NO_2 air quality objective
St Johns Road 31/12/2006 Part of the A8 route at Corstorphine area includes length of road up to building facades. Residential properties at ground, first, second, third and fourth floor level. Canyon effect. Busy shopping area. Receptors close to road edge. High percentage of bus movements.	**NO_2** **Traffic**	**09/03/2009** Amended to cover hourly breach as well as annual breach of NO_2
Great Junction Street 09/03/2009 The length of road to building façades covering the junction area of Ferry Road. Residential properties at first, second,third and fourth floor level. Street canyon, congested traffic and busy shopping area. Receptors close to road edge. High percentage of bus movements.	**NO_2** **Traffic**	**N/A**

Maps of each of the three AQMAs are shown in Figures 1 to 3.

Figure 1.1 Central AQMA (amended to include West Port).

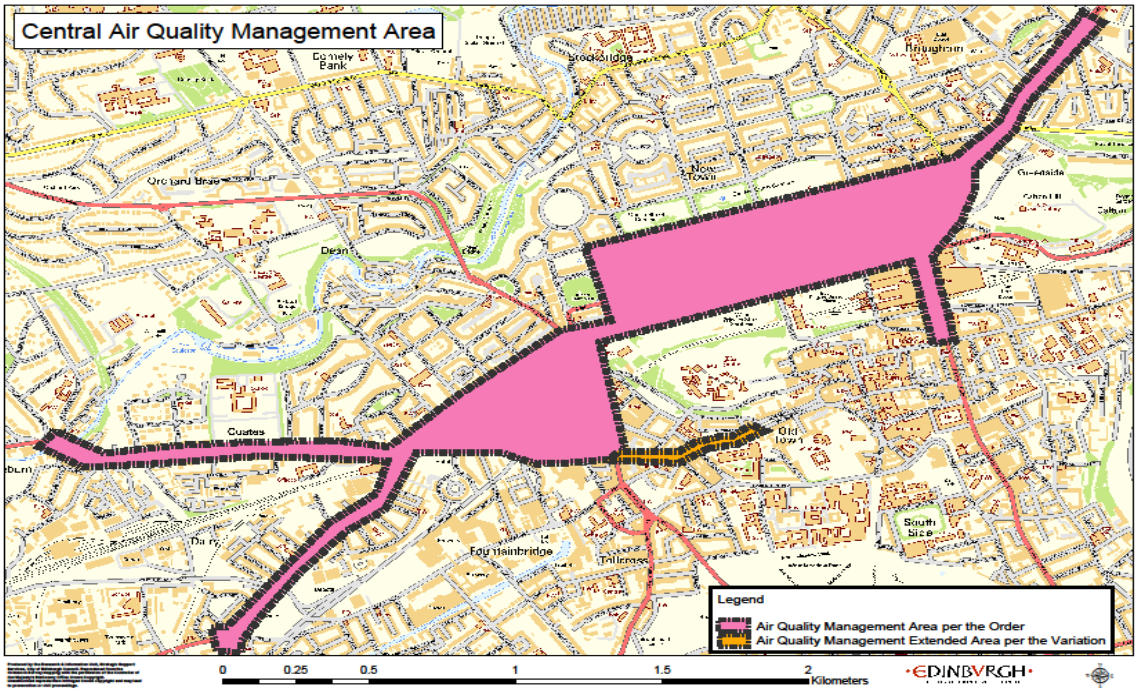


Figure 1. 2 St Johns Road AQMA

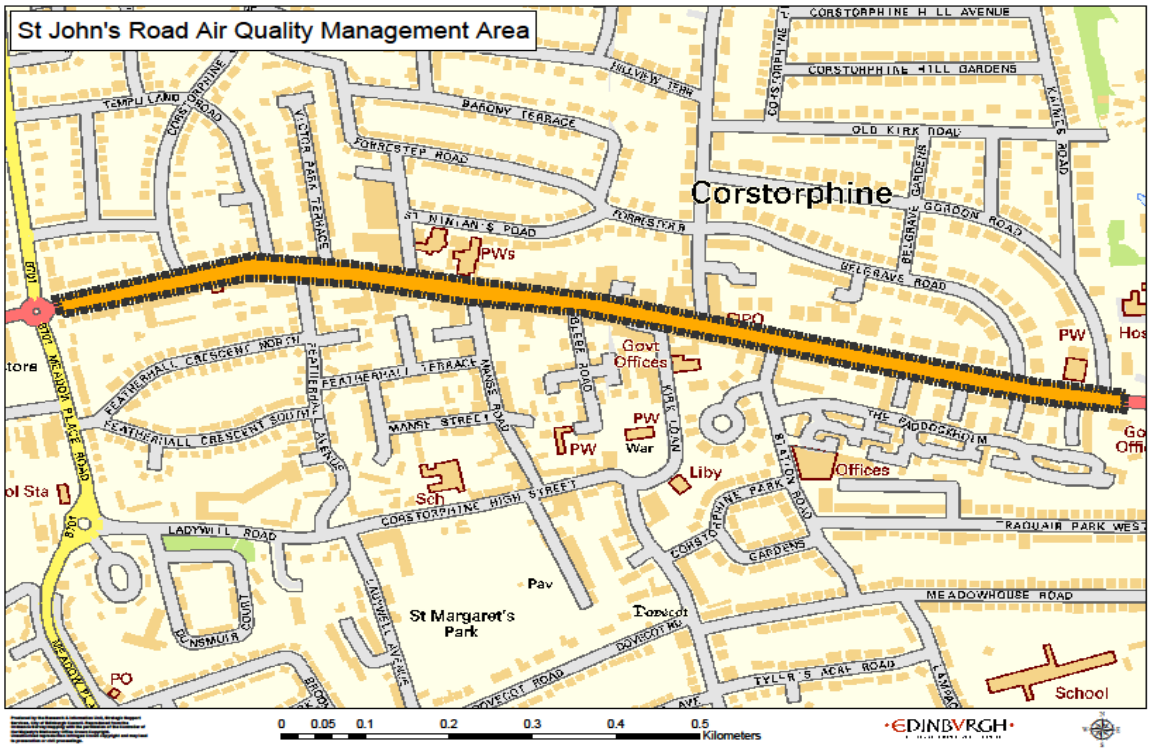
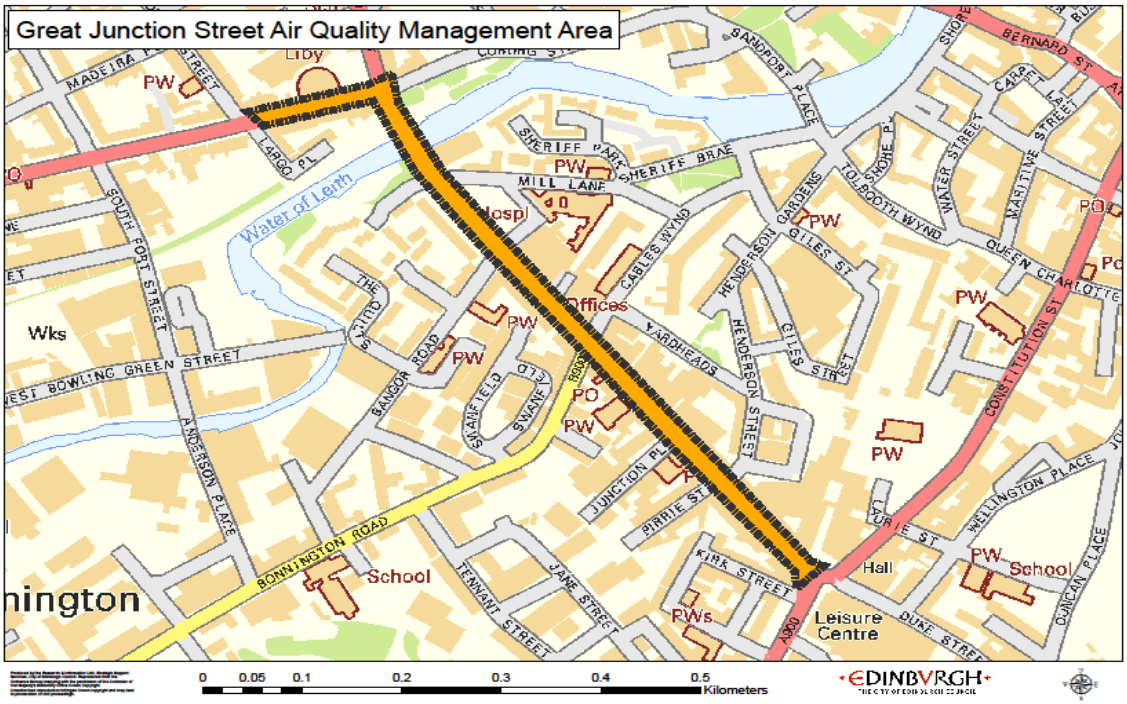


Figure 1. 3 Great Junction Street AQMA



LAQM (Review and Assessment) progress to date.

Nitrogen dioxide Further Assessment (Completed 2011)

Further Assessment (source apportionment work) at St Johns Road, West Port and Great Junction Street has been completed. The report has been approved by DEFRA, Scottish Government and Scottish Environment Protection Agency (SEPA). [6]

Detailed Assessment work completed for the following areas:

London Road
Easter Road
Bernard Street

Exceedences of nitrogen dioxide are apparent at the above locations based on current and historical monitoring data. Therefore, it will be necessary to extend the existing Central and Great Junction Street AQMAs.

In 2009 additional nitrogen dioxide monitoring commenced at Glasgow Road, London Road and Queensferry Road using passive diffusion tubes to support Detailed Assessment work.

Monitoring on Glasgow Road has shown that the exceedences are likely to be localised close to Newbridge junction. Other monitoring sites established along the A8 corridor (Glasgow Road) met the objectives.

Passive diffusion tube sites established on Queensferry Road and Maybury Road/ Barnton junction for Detailed Assessment met the objectives, except for two roadside locations (ID 62 and ID63) which were distance corrected for relevant exposure. However, one of the adjacently located tubes positioned at the actual façade met the objective.

Queensferry Road monitoring station was commissioned towards the end of 2010. Provisional mean hourly data gathered from January 2011 to September 2011 at the roadside is showing a mean value of 43 µg/m^3. Therefore it is likely that the objectives will be met where there is relevant exposure and that an AQMA will not be required for this location. However, due to the discrepancy between the measured and calculated façade measurements further investigation of the two roadside sites described above will be pursued.

Additional monitoring commenced January 2011 at the following locations to support Detailed Assessment work:

Inverleith Row
Portobello High Street
Grassmarket

Particles (PM_{10})

Detailed Assessment for PM_{10} will be delayed for a further year due to numerous technical faults with the FDMS analyser at Queensferry Road, which has resulted in poor data capture during 2011.

The Roseburn Air Quality Automatic Monitoring Station has been relocated to Glasgow Road. Proposed commissioning of this site is scheduled for December 2011. Data obtained from this site will support Detailed Assessment for PM_{10} study and Further Assessment work for NO_2.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Edinburgh has eight automatic (real-time) monitoring stations. One of the stations (St Leonards) is part of the UK Automated Urban and Rural National Network (AURN). Seven sites were operational throughout 2010.

The suburban background monitoring location at Currie High School was decommissioned in 2006 due to major construction work at the school. The unit was reinstated at the end of 2009 and a full year of annual data for 2010 is reported.

A new air quality monitoring station was located on Queensferry Road/Barton October 2010. Site details and annual data gathered in 2011 will be reported in the next round of review and assessment (2012).

The automatic monitoring station at Haymarket was decommissioned in January 2009 (due to tram works) and was relocated to Salamander Street (North Leith). The station has been operational at this location since September 2009. A full year of data for 2010 has now been gathered. Previous nitrogen dioxide annual data for 2009 was estimated in accordance with technical guidance Box 3.2 LAQM TG09.

The automatic monitoring stations are located to represent relevant exposure. However, not all stations represent worst-case. This is due to the difficulties of locating the monitoring stations on pavements, which are often narrow and the requirement to have ready access to an electrical supply.

Both Haymarket and Roseburn automatic monitoring stations are set back from the relevant receptor locations. The concentrations are likely to be lower here than at the facades of the adjacent tenement block. At these monitoring sites, the government receptor distance calculator tool has been used to estimate the likely concentrations at the building façade.

Details and description of automatic monitoring sites for 2010 are shown in Tables 2.1a and 2.1b.

QC/QA procedures on the automated monitoring sites are shown in Appendix A6.

Table 2.1a Description of Automatic Monitoring Locations

Location	Description of automatic monitoring location
St Johns Road ID 5	Pavement (kerbside) of busy shopping street . Residential properties within 2.1 m of kerb edge. Takes account of junction and street canyon. Relevant exposure and worst-case location.
Queen Street/Wemyss Pl ID 1	Pavement in line with residential property located 5.2m from road edge. No buildings at rear of monitoring unit. Relevant exposure.
Roseburn ID 3	Located on footbridge over the water of Leith 7.6m from kerb edge. Set back from line of residential property. Does not take account of canyon at Roseburn Terrace.
Gorgie Road/White Park ID 4	Located in line with façade of adjacent residential flats on edge of children's play park. Within 2.5m of kerb edge. Not located in canyon area of street. Relevant exposure, but not worst- case location.
Salamander Street ID 8	Located on pavement 2.13m from road edge, 5.4 m in front of residential property.
St Leonards ID 7	Located in small park area adjacent to Medical centre 45.0m from main road. Representative of urban exposure.
Currie High School ID 6	Located adjacent to school building at rear of school. Representative of suburban/ semi-rural exposure.
Haymarket Decommissioned (2009) ID 2	Located in a car parking bay at Haymarket Station distance from the main road is 9.2m The location is set back from the façade of residential property. Not in street canyon.

Map showing automatic monitoring locations is shown in Figure 2.1.

Figure 2.1 Map of Automatic Monitoring Sites

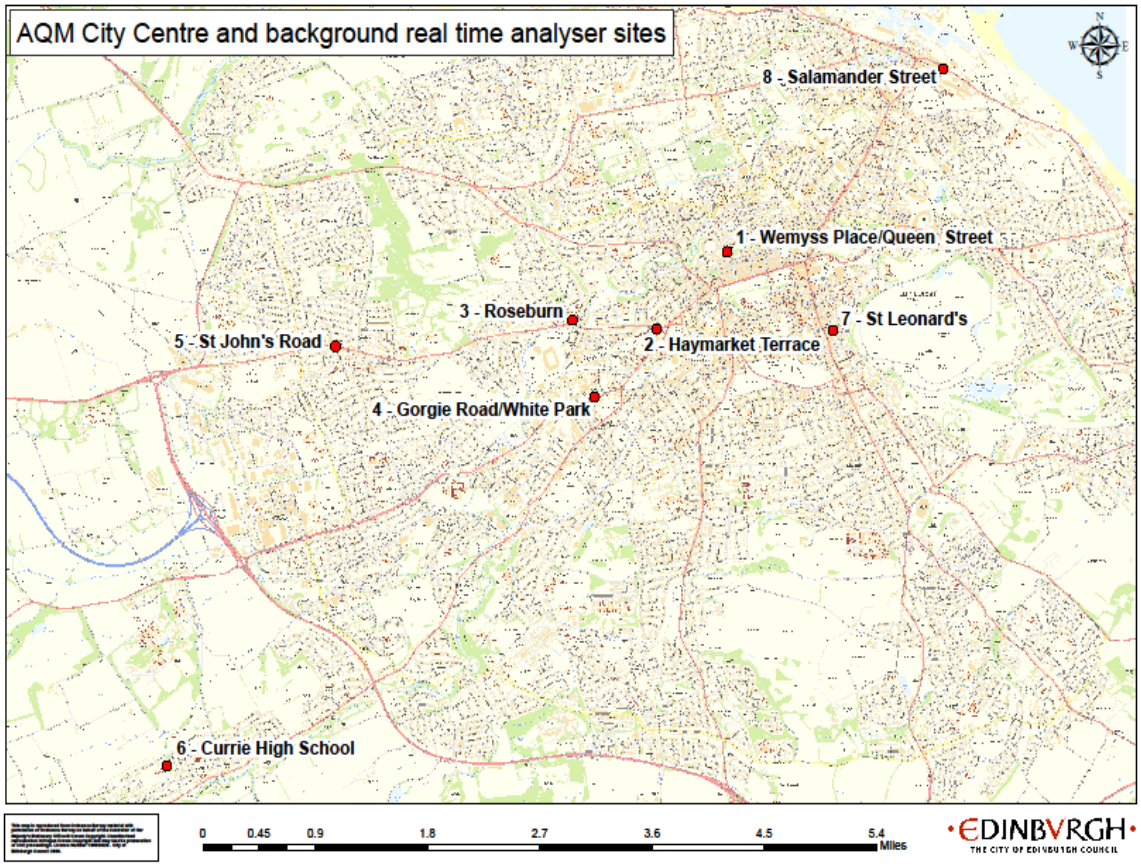


Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
St Leonards	Urban background AURN	X326265	Y673129	NO_2 PM_{10} $PM_{2.5}$ O_3 CO SO_2 PAH	Chemilum FDMS FDMS UV absorp IR absorp UV absorp Digitalsamp	N	Y 29.0m	45.0m	N/A
Queen St/Wemyss Pl	Roadside	X324826	Y674078	NO_2 PM_{10}	Chemilum TEOM	Y	Y façade	5.2m	Y
Gorgie Road	Roadside	X323121	Y672314	NO_2	Chemilum	Y	Y façade	2.5m	Y (not in canyon)
Roseburn	Roadside	X322939	Y673233	NO_2 PM_{10}	Chemilum TEOM	Y	Y 4.9m	7.6m	N
St Johns Road	Kerbside	X320101	Y672907	NO_2	Chemilum	Y	Y 1.35m	0.5m	Y
Salamander Street Formally Haymarket	Roadside	X327615	Y676333	NO_2 PM_{10}	Chemilum TEOM	N	Y 5.4m	2.13m	Y
Currie High School	Suburban background	X317595	Y667909	NO_2 PM_{10}	Chemilum TEOM	N	N/A	N/A	N/A

2.1.2 Non-Automatic Monitoring Sites

Edinburgh has an extensive network of passive diffusion tube samplers throughout the city, which monitor nitrogen dioxide. The samplers are located both within and outwith the AQMAs. The majority of the locations are in street canyons where tenement-style residential property is within 2 to 3 metres of the road edge. Most of the passive diffusion tubes are sited at the building facades of residential property. Table 2.2.

The following locations were identified as areas of concern and monitoring was established in January 2010, Commercial Street/Portland Place, Ocean Drive, Angle Park Terrace, Slateford Road/Maltings, Fountainbridge (Tollcross) and Gorgie Road/Delhaig.

New monitoring locations were established in George Street, Great Stuart Street and St Colme Street, following air quality concerns raised by local residents and Councillors due to traffic diversions associated with Edinburgh Tram. George Street is within the Central AQMA area and Great Stuart Street and St Colme Street are adjacent.

Kerbside and roadside monitoring data has been corrected to represent relevant public exposure using the DEFRA nitrogen dioxide distance calculator tool.

An addendum to LAQM TG09 was produced in 2010 by DEFRA which specifically addressed, 'distance correction' for concentrations of nitrogen dioxide in circumstances where a monitoring location is adjacent to a parking bay. The following locations were identified as having parking bays, Grassmarket (ID37), Deanhaugh Street (ID13), Dundas Street (ID35), Niddrie Mains Road (ID32), Baileyfield Road (ID19), India Street (ID34) Bowhill Terrace (ID53) and Great Stuart Street (ID75b). Data (2010) for the aforementioned sites was calculated in accordance with the addendum. These locations have been highlighted in the monitoring tables with an asterisk.

Subsequent to a review of the passive diffusion tube network the following listed sites were discontinued at the end of 2009, Hope Park Terrace (ID17), Roseburn Street/Terrace junction (ID22), North Bridge (ID26), Ardmillan Terrace (ID6), Easter Road (ID25h), London Road ID(46a) Whitehouse Road (ID50b), Ferry Road (ID45c) and Distillery Lane (ID65).

QC/QA work associated with passive diffusion tube method of monitoring is contained in the following appendices:

A1 Diffusion tube bias adjustment factors
A2 Factor from local co-location studies
A3 Discussion of factor of choice
A7 QA/QC of diffusion tube monitoring.

A map illustrating the network of nitrogen dioxide non-automatic monitoring locations across the city is shown in Figure 2.2. Individual maps are too detailed to be included in this report and can be provided as attached documents on request.

Figure 2.2 Map of Non-Automatic Nitrogen Dioxide Monitoring Sites

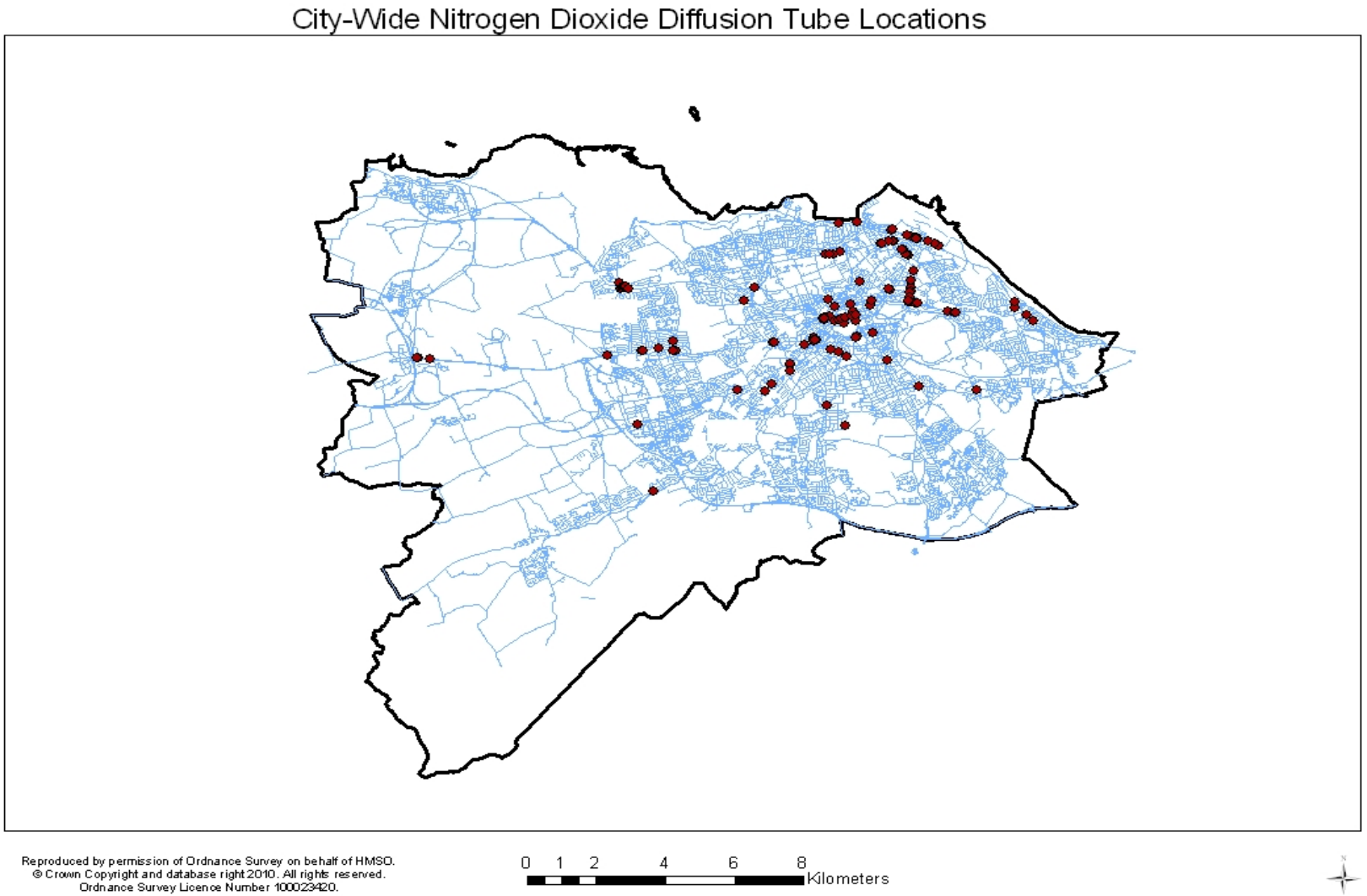


Table 2.2 Details of Nitrogen Dioxide Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Site ID	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
St Johns Rd	Kerbside	X 320122	Y 672917	1	Y	Y (1.8)	0.54	Y
St Johns Rd	Roadside	X 320154	Y 672911	1b	Y	Y facade	2.0	Y
St Johns Rd	Roadside	X 320084	Y 672910	1c	Y	Y facade	2.1	Y
St Johns Rd	Roadside	X 320096	Y 672907	1d	Y	Y facade	2.1	Y
St Johns Rd	Roadside	X 320070	Y 672912	1e	Y	Y facade	2.1	Y
St Johns Rd	Kerbside	X 320099	Y 672907	1f	Y	Y (1.9)	0.2	Y
St Johns Rd	Roadside	X 319677	Y 672991	39	Y	Y (9.0)	1.7	Y
West Maitland St	Kerbside	X 324192	Y 673332	2	Y	N (4.2)	0.65	Y
Torphichen Pl	Roadside	X 324260	Y 673270	3	Y	N (1.55)	0.73	Y
Princes St Mound	Kerbside	X 325397	Y 673869	24	Y	N (10.2)	1.0	Y
Princes St	Roadside	X 325049	Y 673791	47	Y	Y facade	9.0	Y
RoseburnSt/Terr	Kerbside	X 323040	Y 673174	22	Y	N (1.6)	0.55	Y
Roseburn St	Kerbside	X 323007	Y 673198	23	Y	N (2.3)	0.23	Y
North Bridge N	Roadside	X 325918	Y 673687	26	Y	Y facade	5.1	Y
North Bridge S	Roadside	X 325944	Y 673670	27	Y	Y facade	3.5	Y
Gorgie Rd	Kerbside	X 323484	Y 672478	5	Y	N (4.9)	0.3	Y
Gorgie Rd	Roadside	X 323477	Y 672476	18	Y	Y facade	2.4	Y
Queen St/Hanover St	Roadside	X 325310	Y 674186	33	Y	Y facade	6.0	Y
York Pl	Kerbside	X 325828	Y 674362	36	Y	Y (2.7)	5.5	Y
Leith Wlk/Brun	Roadside	X 326366	Y 674872	21	Y	Y (3.4)	1.16	Y
Leith Wlk/ Mac	Kerbside	X 326365	Y 674878	20	Y	Y (4.6)	1.0	Y
Ardmillian Terr	Kerbside	X 323498	Y 672457	6	Y	N (3.8)	0.6	Y
West Port	Roadside	X 325192	Y 673261	28	Y	Y facade	1.7	Y
West Port	Roadside	X 325166	Y 673242	28b	Y	Y facade	1.4	Y
West Port	Roadside	X 325184	Y 673261	28c	Y	Y facade	3.0	Y
West Port	Roadside	X 325203	Y 673250	28d	Y	Y facade	2.7	Y

Table 2.2 Details of Nitrogen Dioxide Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Site ID	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Gt Junction St	Roadside	X 326884	Y 675997	30	Y	Y facade	2.8	Y
Gt Junction St	Roadside	X 326740	Y 676138	30b	Y	Y facade	2.9	Y
Gt Junction St	Roadside	X 326925	Y 675949	30c	Y	Y facade	2.8	Y
Gt Junction St	Roadside	X 326757	Y 676144	30d	Y	Y facade	2.8	Y
Gt Junction St	Roadside	X 326845	Y 676015	30e	Y	Y facade	2.7	Y
Morrison St	Roadside	X 324167	Y 673249	49	Y	Y (2.4)	2.2	Y
Morrison St	Roadside	X 324202	Y 673247	49a	Y	Y facade	2.2	Y
Morrison St	Roadside	X 324183	Y 673231	49b	Y	N facade	2.1	Y
Easter Rd	Roadside	X 326934	Y 674503	25	N	Y facade	2.3	Y
Easter Rd	Roadside	X 326950	Y 674624	25b	N	Y facade	3.3	Y
Easter Rd	Roadside	X 326958	Y 674770	25c	N	Y facade	3.25	Y
Easter Rd	Roadside	X 326978	Y 674809	25d	N	Y facade	3.8	Y
Easter Rd	Roadside	X 326999	Y 674940	25e	N	Y facade	3.95	Y
Easter Rd	Roadside	X 327010	Y 675149	25f	N	Y facade	2.8	Y
Easter Rd	Roadside	X 327071	Y 675467	25g	N	Y facade	3.0	Y
Easter Rd	Roadside	X 326917	Y 674483	25h	N	Y facade	2.1	Y
London Rd	Roadside	X 326944	Y 674472	46	N	Y facade	5.6	Y
London Rd	Roadside	X 326939	Y 674469	46a	N	Y (3.46)	2.2	Y
Ferry Rd	Roadside	X 326136	Y 676361	45	N	Y facade	3.7	Y
Ferry Rd	Roadside	X 326150	Y 676341	45a	N	Y facade	3.5	Y
Ferry Rd	Roadside	X 326359	Y 676420	45b	N	Y façade	7.5	Y
Ferry Rd	Roadside	X 326461	Y 676426	45c	Y	Y façade	3.1	Y
Ferry Rd	Roadside	X 326503	Y 674436	45d	Y	Y facade	3.1	Y
Queensferry Rd/Barn	Roadside	X 318662	Y 674960	50	N	N (8.7)	1.3	Y
Whitehouse Rd/Barn	Roadside	X 318571	Y 675028	50a	N	N (1.57)	3.5	Y

Table 2.2 Details of Nitrogen Dioxide Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Site ID	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Whitehouse Rd	Roadside	X 318536	Y 675069	50b	N	N (8.5)	1.8	Y
Bernard St Leith	Roadside	X 327148	Y 676507	29	N	Y facade	2.2	Y
Bernard St Leith	Roadside	X 327137	Y 676529	29a	N	Y facade	2.1	Y
Bernard St Leith	Roadside	X 327192	Y 676513	29b	N	Y facade	2.2	Y
Bernard St Leith	Roadside	X 327135	Y 676515	29c	N	Y facade	2.1	Y
Broughton Rd	Roadside	X 325513	Y 675134	43	N	Y facade	2.0	Y
Broughton St	Roadside	X 325855	Y 674527	44	N	Y facade	4.5	Y
Pier Pl	Roadside	X 325424	Y 677048	12	N	N (2.7)	2.2	Y
Trinity Cres	Roadside	X 324896	Y 676991	14	N	N (4.0)	2.0	Y
Commercial St	Roadside	X 327009	Y 676565	7	N	Y façade	2.47	Y
Commercial St	Roadside	X 326879	Y 676626	9	N	Y façade	2.6	Y
Glasgow Rd	Roadside	X 312664	Y 672672	15	N	N (4.5)	1.6	Y
Glasgow Rd	Roadside	X 313028	Y 672633	16	N	N (4.4)	1.8	Y
Grassmarket*	Roadside	X 325436	Y 673374	37	N	Y (5.0)	2.0 + 2.1	Y
Grassmarket	Roadside	X 325401	Y 673340	37a	N	Y facade	3.4	Y
Cowgate	Roadside	X 325881	Y 673471	48	N	Y façade	4.5	Y
Morningside Rd	Kerbside	X 324538	Y 671166	8	N	Y (2.8m)	0.7	Y
Home St	Roadside	X 324905	Y 672893	10	N	Y façade	2.8	Y
Deanhaugh St*	Kerbside	X 324603	Y 674555	13	N	N (5.1)	0.6 + 2.1	Y
Calder Rd	Roadside	X 319062	Y 670543	4	N	Y (25)	1.6	Y
Hope Park Terr	Kerbside	X 326308	Y 672607	17	N	N (4.5)	0.6	Y
Dalkeith Rd	Roadside	X 327231	Y 671782	31	N	N (4.9)	1.8	Y
Dundas St*	Kerbside	X 325243	Y 674400	35	N	N (7.3)	0.3 + 2.1	Y

Table 2.2 Details of Nitrogen Dioxide Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Site ID	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Niddrie Main Rd*	Roadside	X 328889	Y 671649	32	N	N (4.7)	0.2 + 2.4	Y
Lanark Rd	Roadside	X 319527	Y 668420	11	N	N (3.7)	1.5	Y
Baileyfield Rd*	Roadside	X 329997	Y 674274	19	N	N (3.5)	2.0 + 2.1	Y
Melville Dr	Roadside	X 325141	Y 672733	38	N	N (10.0)	2.8	Y
India St *	Kerbside	X 324790	Y 674341	34	N	N (6.6)	0.4 + 2.1	Y
Hillhouse Rd	Roadside	X 322144	Y 674497	40	N	Y facade	2.0	Y
Hillview Terr	Backgrnd	X 320081	Y 673232	41	N	N (9.0)	1.0	N/A
Midmar Drive	Roadside	X 325105	Y 670511	42	N	N (9.0)	1.4	Y
Salamander St/Pl	Roadside	X 327780	Y 676251	51a	N	N (0.85)	1.2	Y
Salamander St/BathSt	Roadside	X 327665	Y 676331	51b	N	Y facade	1.8	Y
Salamander St/Baltic	Roadside	X 327476	Y 676418	51c	N	Y facade	2.25	Y
268 Ferry Rd	Roadside	X 324946	Y 676070	52	N	N (4.6)	1.65	Y
6 Bowhill Terr*	Roadside	X 324726	Y 676004	53	N	N (1.57)	1.75 + 2.85	Y
FerryRd/Inverleith Gdn	Roadside	X 324527	Y 675999	54	N	N (8.7)	1.3	Y
FerryRd/Inverleith Row	Roadside	X 324638	Y 675993	55	N	Y facade	4.65	Y
Glasgow Rd 18-20	Kerbside	X 319212	Y 672921	56	N	N (4.6)	0.57	Y
Glasgow RD GFC 11	Kerbside	X 319191	Y 672914	56a	N	N (6.0)	0.57	Y
Glasgow Rd 158	Roadside	X 318185	Y 672756	57	N	N (8.5)	3.6	Y
Glasgow Rd GFC 319	Roadside	X 312693	Y 672670	58	N	N (4.9)	2.8	Y
Telford Rd	Roadside	X 322463	Y 674942	59	N	N (10.0)	2.6	Y
Maybury Rd/Barnton	Roadside	X 318551	Y 674902	60	N	N (17.0)	3.0	Y
Maybury Rd/Barnton	Roadside	X 318612	Y 674924	61	N	N (12.5)	2.8	Y
561 Queensferry Rd	Roadside	X 318810	Y 674903	62	N	Y facade	16.9	Y
544 Queensferry Rd	Roadside	X 318723	Y 674963	63	N	Y facade	13.6	Y

Table 2.2 Details of Nitrogen Dioxide Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Site ID	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
550 Queensferry Rd	Roadside	X 318698	Y 674955	64	N	N (9.2)	1.49	Y
Distillery Lane	Roadside	X 323926	Y 673103	65	N	Y (5.0)	8.0	Y
Hope Park Terrace	Roadside	X 326312	Y 672614	17a	N	Y facade	5.0	Y
London Rd/Cadzow Pl	Roadside	X 327112	Y 674442	66	N	Y facade	2.7	Y
London Rd/Earlston Pl	Roadside	X 327190	Y 674433	67	N	Y facade	2.7	Y
Parsons Green Terr	Roadside	X 328049	Y 674174	68	N	Y facade	2.7	Y
London Rd/Wolsley Pl	Roadside	X 328272	Y 674143	69	N	Y facade	2.62	Y
London Rd/Wolsley Terr	Roadside	X 328293	Y 674138	70	N	Y facade	3.3	Y
Portobello High St W	Roadside	X 330533	Y 673850	71	N	Y facade	3.0	Y
Seafield Rd East	Roadside	X 329993	Y 674457	72	N	Y facade	4.5	Y
Portobello High St E	Roadside	X 330366	Y 674057	73	N	Y facade	3.1	Y

Table 2.2a Details of Nitrogen Dioxide (New) Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Site ID	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Commercial St/Port Pl	Roadside	326430	676754	9a	N	Y 3.90	1.47	Y
Ocean Drive	Roadside	326455	676805	9b	N	Y facade	4.2	Y
Cowgate	Roadside	325929	673490	48a	N	Y facade	3.2	Y
75 George St	Roadside	325103	673981	74a	N	Y 6.4	0.5	Y
107 George St	Roadside	324966	673947	74b	N	Y facade	3.55	Y
41 George St	Roadside	325273	674030	74c	N	Y (4.3)	0.54	Y
20 George St	Roadside	325383	674038	74d	N	Y (4.1)	0.53	Y
George St/Charlotte Sq	Roadside	324783	673868	74e	N	Y (5.2)	0.3	Y
112 George St	Roadside	324880	673891	74f	N	Y facade	6.8	Y
St Colme St	Roadside	324624	674012	75a	N	N (5.1)	0. 6	Y
Gt Stuart St*	Roadside	324488	673978	75b	N	N (6.14)	0.4 + (2.1)	Y
Angle Park Terrace	Roadside	323498	672263	76	N	Y facade	2.20	Y
Slateford Rd	Roadside	322960	671846	77	N	Y facade	2.67	Y
Slateford Rd/ Maltings	Roadside	322772	671606	78	N	Y facade	2.2	Y
Fountainbridge/Tollcross	Roadside	324682	672939	79	N	Y facade	3.3	Y
Gorgie Rd /Delhaig	Roadside	321967	671666	80	N	Y facade	2.6	Y

NOTES

* Nominal kerb change due to parking bay in front of monitoring location.

Discontinued locations are highlighted in red.

New monitoring locations (2010) are highlighted in blue.

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

New automatic monitoring data (2010) shows that the following roadside locations met both nitrogen dioxide objectives, Queen Street/Wemyss Place, Salamander Street and Roseburn. The background site at St Leonards also met with the targets. However, the annual mean is exceeded at Gorgie Road and both the annual mean and 1- hour mean air quality objectives are exceeded at St Johns Road. Automatic data is shown in Tables 2.3a and 2.3b.

Table 2.3a Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Relevant public exposure? Y/N	Data Capture for full calendar year 2010 %	Annual mean concentrations (μg/m^3)		
					2008	2009	2010
1	Queen St/Wym Pl	Y	Y	98.2	32	33	37
2	Haymarket	Y	Y	N/A	41 (49)	-	-
3	Roseburn	Y	Y	98.0	28 (31)	26 (28)	30 (33)
4	Gorgie Rd	Y	Y	76.3	42	38	41
5	St Johns Rd	Y	Y	93.7	75	70	71
6*	Currie	N	N/A	96.0	-	-	10
7	St Leonards	N	N/A	98.4	31	24	31
8	Salamander St	N	Y	97.1	-	30 (27)	30 (28)

NOTE

Annual mean exceedences are highlighted in red

Where data capture is less than 90% for a full year this is highlighted in blue

Data in brackets represents the estimated annual concentration at the receptor using the NO_2 reduction with distance calculator LAQM Defra site under 'Tools'.

***** Currie air quality monitoring station is not supported by the Scottish Government's data ratification programme undertaken by AEA Technology. The NO_2 data in this report is therefore provisional.

Table 2.3b Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

Site ID	Location	Within AQMA?	Relevant public exposure? Y/N	Data Capture for full calendar year 2010 %	Number of Exceedences of hourly mean (200 µg/m^3) If the period of valid data is less than 90% of a full year, include the 99.8th percentile of hourly means in brackets.		
					2008	2009	2010
1	Queen St/W Pl	Y	Y	98.2	0	0	0
2	Haymarket	Y	Y	N/A	1	-	-
3	Roseburn	Y	Y	98.0	0	0	1
4	Gorgie Rd	Y	Y	76.3	0	0 (130)	0 (122)
5	St Johns Rd	Y	Y	93.7	**166**	**114**	**60**
6	Currie	N	N/A	96.0	-	-	0
7	St Leonards	N	N/A	98.4	0	0	0
8	Salamander St	N	Y	97.1	0	0 (141)	0

NOTE

1- hourly exceedences are highlighted in red (number permitted 18).
Where data capture is less than 90% for a full year this is highlighted in blue

Trends in annual mean nitrogen dioxide concentrations measured at Automatic Monitoring Sites

Trend analysis has been undertaken at monitoring locations with five or more years of valid data. Annual mean nitrogen dioxide concentrations have been plotted for successive years at Gorgie, Roseburn, Queen Street/Wemyss Place and trend lines have been drawn using an Excel simple regression statistical program.

Monitoring stations at St Johns Road, Salamander Street and Currie have not been operational for the required number of years to assess data trends.

Data trends are shown in Figures 2.31, 2.32, 2.33 and 2.34 and are summarised in Table 2.3c.

Table 2.3c Summary of Annual Mean Nitrogen Dioxide trends measured at Automatic Monitoring Sites

Monitoring Location	Trend in annual mean NO_2 (years included)	Concentrations of NO_2
Gorgie (Roadside)	↑ (1999 to 2010)	Increasing (slight)
Roseburn (Roadside)	↓ (2003 to 2010)	Decreasing (marked)
Queen St (Roadside)	↑ (2006 to 2010)	Increasing (slight)
St Leonards (Urban background)	↑ (2004 to 2010)	Increasing (marked)

The hourly exceedences of nitrogen dioxide have significantly reduced at St Johns Road from 166 in 2008 to 60 in 2010. Initial analysis suggests that this may be attributable to improvements in the emission standards of the bus fleet operating along St Johns Road corridor.

Figure 2.31 Nitrogen Dioxide (µg/m^3) Trend: St Leonards AURN (Urban Background)

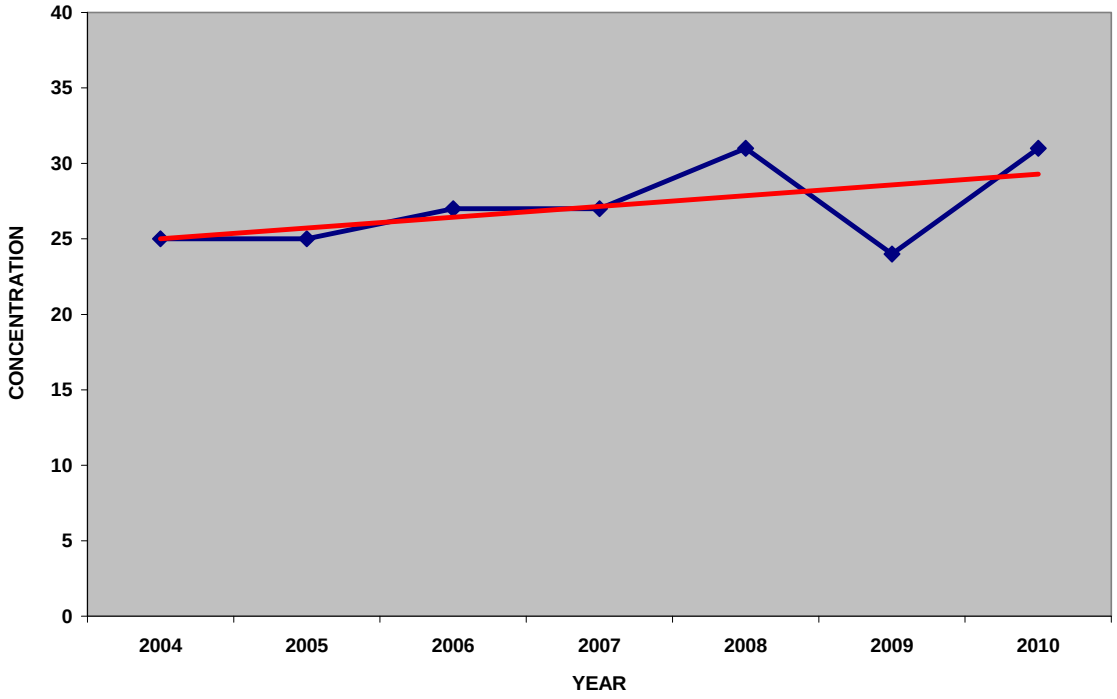


Figure 2.32 Nitrogen Dioxide (µg/m^3) Trend: Gorgie (Roadside)

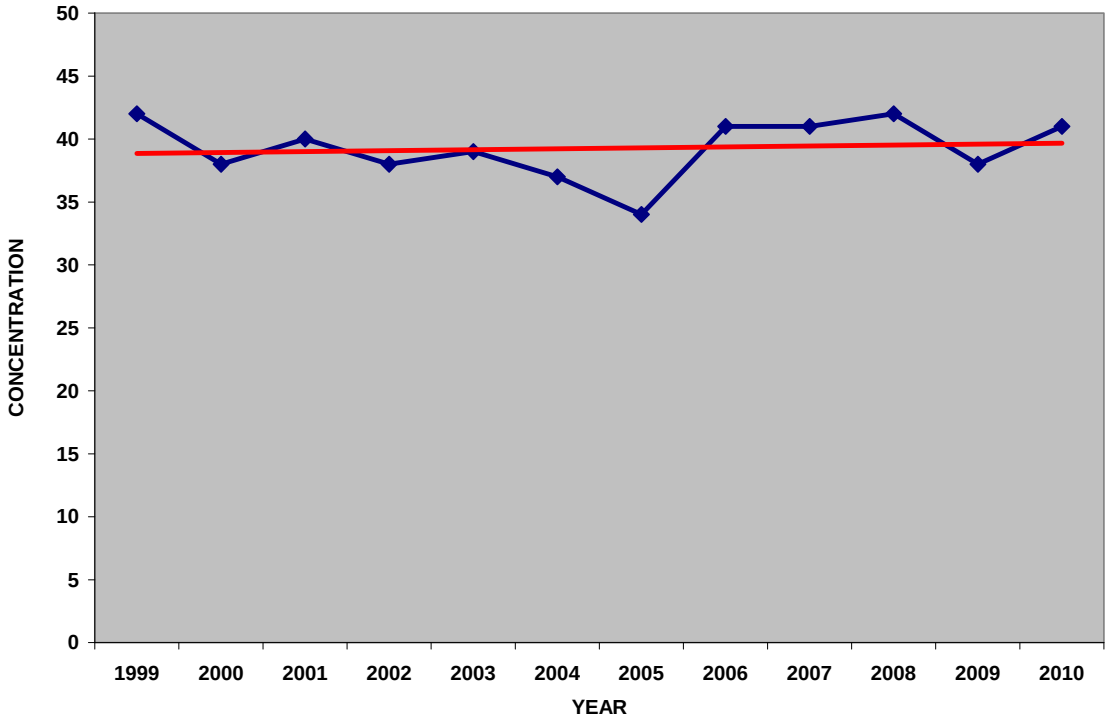


Figure 2.33 Nitrogen Dioxide (µg/m^3) Trend: Roseburn (Roadside)

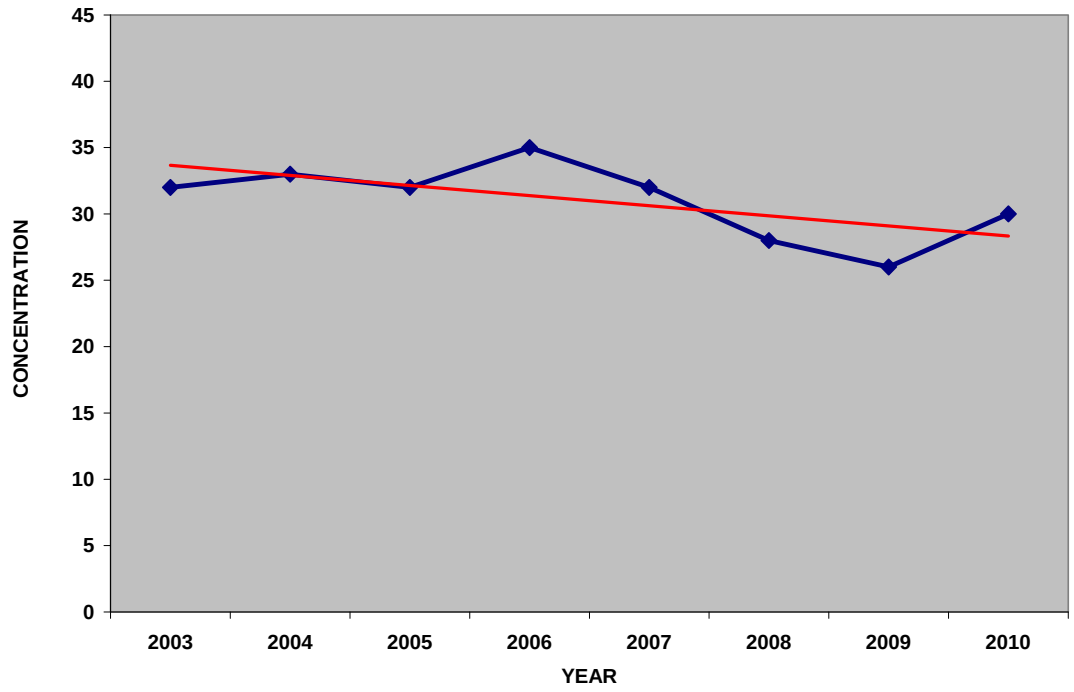
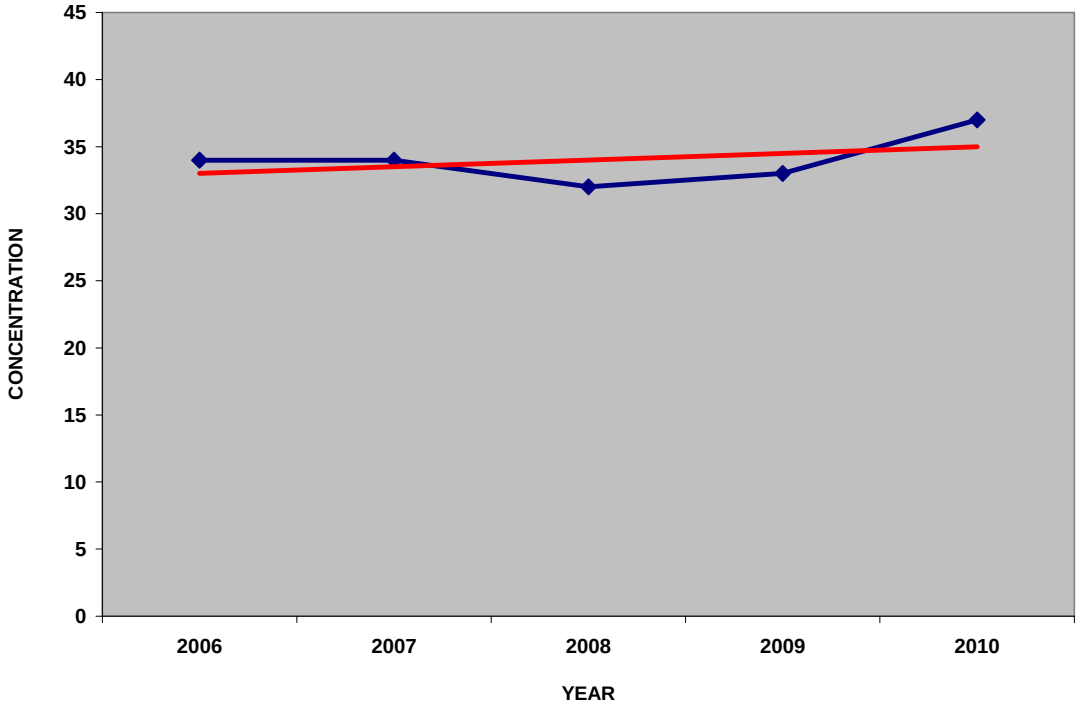


Figure 2.34 Nitrogen Dioxide (µg/m^3) Trend: Queen St / Wemyss Pl (Roadside)



Diffusion Tube Monitoring Data

The passive monitoring tube data for 2010 show exceedences of the annual mean nitrogen dioxide objective within each of the three AQMAs and therefore they remain valid. Table 2.4.

Exceedences at monitoring locations outwith the AQMAs have been identified, and are shown in Table 2.4a.

Although the monitoring locations, Cowgate (ID 48) and Grassmarket (ID 37a) exceed the objective, only 50% and 41% of data was gathered at each respective site during the calendar year 2010. The majority of the data was collected over the 'winter' months when concentrations of nitrogen dioxide are generally higher.

Fountainbridge/Tollcross also showed an exceedence. However, only 50% of data was gathered during 2010.

Locations which are considered borderline with respect to exceeding the annual mean nitrogen dioxide air quality objective are, Broughton Road, Commercial Street, Ferry Road, Salamander/Bath Street and Portobello High Street. Table 2.4b.

Monitoring locations outwith Great Junction Street AQMA on Ferry Road previously have met the air quality objectives. However, the site which now marginally fails the annual mean is not regarded as being the worst-case location. Further investigation of this site will be undertaken.

Although 2010 data at Portobello High Street (ID71) met the annual mean objective additional monitoring sites were established in 2011 for Detailed Assessment work based on 2009 data. This study will determine if an additional AQMA is required.

Monitoring data for Glasgow Road has shown that the exceedences are likely to be localised towards the Newbridge junction. Other monitoring sites established along the A8 corridor (Glasgow Road) met the objectives. All monitoring data has been corrected to the façade of residential property using the distance correction calculator.

Passive diffusion tube sites established on Queensferry Road and Maybury Road/ Barnton junction for Detailed Assessment met the objectives, except for two roadside locations (ID 62 and ID63) which were distance-corrected for relevant exposure. However, one of the adjacently located tubes positioned at the actual façade met the objective.

Queensferry Road monitoring station was commissioned towards the end of 2010. Provisional mean hourly data gathered from January 2011 to September 2011 at the roadside is showing a mean value of 43 $\mu g/m^3$. Therefore it is likely that the objectives will be met where there is relevant exposure and that an AQMA will not be required for this location. However, due to the discrepancy between the measured and calculated façade measurements further investigation of the two roadside sites described above will be pursued.

Raw monthly passive diffusion tube data is shown in Appendix B.

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA	Relevant public exposure Y/N	Data Capture for full calendar year 2010 %	Annual mean concentrations (μg/m^3)		
					2008	2009	2010
1	St Johns Rd	Y	Y	75	41.2	36.7	38.6
1b	St Johns Rd	Y	Y	91.6	48.8	44.2	43.5
1c	St Johns Rd	Y	Y	-	**74.4**	-	-
1d	St Johns Rd	Y	Y	83.3	**84.9**	57.8	58.8
1e	St Johns Rd	Y	Y	-	**77.1**	-	-
1f	St Johns Rd	Y	Y	-	**77.2**	-	-
39	St Johns Rd	Y	Y	91.6	31.7	28.2	31.1
2	West Maitland St	Y	Y	100	**70.1**	45.6	55.4
3	Torphichen Pl	Y	Y	91.6	58.2	56.3	55.6
24	Princes St Mound	Y	Y	100	51.5	36.2	49.3
47	Princes St	Y	Y	100	51.7 (64)	31.6 (34)	47.5 (58)
22	RoseburnSt/Terr	Y	Y	-	**63.6**	49.3	-
23	Roseburn Terr	Y	Y	91.6	49.5	37.2	43.2
26	North Bridge N	Y	Y	-	51.7	48.5	-
27	North Bridge S	Y	Y	83.3	52.3	48.4	49.4
5	Gorgie Rd	Y	Y	91.6	44.3	42.6	42.9
18	Gorgie Rd	Y	Y	100	51.5	45.0	54.5
33	Queen St/Hanover	Y	Y	83.3	43.7	50.8	56.3
36	York Pl	Y	Y	75.0	40.5	37.5	39.0
21	Leith Wlk/Brun	Y	Y	58.3	37.3	35.3	35.4
20	Leith Wlk/ Mac	Y	Y	75.0	53.1	36.8	38.1
6	Ardmillian Terr	Y	Y	-	35.5	31.2	-
28	West Port	Y	Y	25.0	53.3	47.7	51.0
28b	West Port	Y	Y	75.0	**72.5**	**66.7**	**62.4**
28c	West Port	Y	Y	83.3	51.5	43.5	41.5
28d	West Port	Y	Y	58.3	**66.6**	**60.2**	54.9
30	Gt Junction St	Y	Y	91.6	44.6	44.1	41.8
30b	Gt Junction St	Y	Y	91.6	38.4	38.5	39.9
30c	Gt Junction St	Y	Y	91.6	50.2	42.6	44.1
30d	Gt Junction St	Y	Y	91.6	39.0	37.1	39.9
30e	Gt Junction St	Y	Y	91.6	43.1	41.9	38.7
49	Morrison St	Y	Y	100	**61.4**	44.6	49.3
49a	Morrison St	Y	Y	-	**71.9**	-	-
49b	Morrison St	Y	Y	-	**76.2**	-	-
25	Easter Rd	N	Y	100	58.2	50.8	49.7
25b	Easter Rd	N	Y	91.6	44.9	38.8	39.1
25c	Easter Rd	N	Y	100	43.8	38.0	37.7
25d	Easter Rd	N	Y	91.6	40.8	37.3	37.1
25e	Easter Rd	N	Y	100	37.3	34.1	34.2
25f	Easter Rd	N	Y	75	35.0	30.1	32.5
25g	Easter Rd	N	Y	83.3	33.4	27.9	30.3
25h	Easter Rd	N	Y	-	49.3	38.0	-

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA	Relevant public exposure Y/N	Data Capture for full calendar year 2010 %	Annual mean concentrations (μg/m^3)		
					2008	2009	2010
46	London Rd	N	Y	100	52.3	43.4	46.2
46a	London Rd	N	Y	-	50.8	43.1	-
66	London Rd/Regent	N	Y	83.3	-	43.0	40.5
67	London Rd/Earl Pl	N	Y	75	-	47.9	51.3
68	London Rd /Parsons	N	Y	91.6	-	30.4	36.6
69	London Rd/Wols Pl	N	Y	83.3	-	56.2	50.6
70	London Rd/Wols Tr	N	Y	66.6	-	43.7	46.1
50	Queensferry Rd	N	Y	83.3	52.6	46.4	50.5
50a	Whitehouse Rd	N	Y	91.6	31.4	29.8	32.1
50b	Whitehouse Rd	N	Y	-	21.2	20.6	-
60	Maybury Rd/Barn	N	Y	41.6	-	22.1	28.2
61	Maybury Rd/QSF	N	Y	100	-	24.2	27.0
62	561 QSFerry Rd	N	Y	100	-	22.0	25.6
63	544 QSFerry Rd	N	Y	100	-	27.6	29.4
64	550 QSFerry Rd	N	Y	91.6	-	46.8	47.5
43	Broughton Rd	N	Y	100	40.4	38.1	39.8
44	Broughton St	N	Y	83.3	37.7	35.1	35.3
12	Pier Pl	N	Y	83.3	29.7	27.0	27.8
14	Trinity Cres	N	Y	91.6	28.3	28.6	27.5
7	Commercial St	N	Y	91.6	38.6	34.8	34.2
9	Commercial St	N	Y	66.6	40.4	31.6	36.7
15	Glasgow Rd	N	Y	83.3	35.7	42.0	37.6
16	Glasgow Rd	N	Y	91.6	42.4	46.8	44.5
56	Glasgow Rd 18/20	N	Y	91.6	-	28.6	30.7
56a	Glasgow Rd gfc11	N	Y	100	-	27.9	29.4
57	Glasgow Rd 158	N	Y	100	-	34.9	36.3
58	Glasgow Rd gfc 319	N	Y	83.3	-	51.1	51.3
8	Morningside Rd	N	Y	83.3	30.0	27.1	28.8
10	Home St	N	Y	100	37.4	32.3	36.5
13	Deanhaugh St*	N	Y	83.3	32.3	30.1	33.0
4	Calder Rd	N	Y	100	29.5	26.3	25.9
17	Hope Park Terr	N	Y	-	36.4	34.7	-
17a	Hope Park Terr	N	Y	100	-	38.8	43.4
31	Dalkeith Rd	N	Y	91.6	31.8	28.1	27.8
35	Dundas St*	N	Y	91.6	28.9	27.2	31.6
32	Niddrie Mains Rd*	N	Y	75.0	26.9	30.7	32.5
11	Lanark Rd	N	Y	100	24.8	22.3	23.5
19	Baileyfield Rd*	N	Y	66.6	24.6	22.5	27.5
38	Melville Dr	N	Y	83.3	26.2	25.3	27.6
34	India St*	N	Y	100	22.7	22.6	22.7
40	Hillhouse Rd	N	Y	91.6	44.4	37.4	42.4
41	Hillview Terr	N	Y	100	19.6	21.2	22.4
42	Midmar Dr	N	Y	100	17.4	15.2	18.4

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA	Relevant public exposure Y/N	Data Capture for full calendar year 2010 %	Annual mean concentrations (μg/m^3)		
					2008	2009	2010
45c	Ferry Rd	Y	Y	-	38.6	38.4	-
45d	Ferry Rd	Y	Y	66.6	42.4	40.9	38.3
45	Ferry Rd	N	Y	83.3	39.6	35.4	41.5
45a	Ferry Rd	N	Y	75.0	40.2	32.1	36.5
45b	Ferry Rd	N	Y	100	35.3	30.9	33.5
52	268 Ferry Rd	N	Y	75.0	-	32.1	32.4
53	6 Bowhill Terr	N	Y	100	-	36.4	34.8
54	Inverleith Gnds	N	Y	83.3	-	32.1	31.8
55	Inverleith Row	N	Y	100	-	42.6	44.0
59	Telford Road	N	Y	83.3	-	30.5	34.3
29	Bernard St (Leith)	N	Y	100	45.3	45.1	43.7
29a	Bernard St (Leith)	N	Y	100	48.0	42.0	44.6
29b	Bernard St (Leith)	N	Y	100	41.3	32.9	36.9
29c	Bernard St (Leith)	N	Y	83.3	53.4	48.2	49.4
51a	Salamander St/Pl	N	Y	83.3	-	23.6	26.0
51b	Salamander St/Bath St	N	Y	100	-	37.4	40.3
51c	Salamander St/Baltic St	N	Y	100	-	37.1	36.2
37	Grassmarket *	N	Y	58.3	35.1	35.4	38.4
37a	Grassmarket	N	Y	41.6	42.3	40.5	60.0
48	Cowgate	N	Y	50.0	46.6	39.8	46.2
65	Distillery Lane	N	Y	-	-	32.7	-
71	Portobello High St W	N	Y	83.3	-	43.0	39.2
72	Seafield Rd East	N	Y	91.6	-	35.0	38.4
73	Portobello High St E	N	Y	75.0	-	26.3	25.5

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes (New Sites)

Site ID	Location	Within AQMA	Relevant public exposure Y/N	Data Capture for full calendar year 2010 %	Annual mean concentration (μg/m^3)
9a	Commercial St/Port Pl	N	Y	91.6	38.1
9b	Ocean Drive	N	Y	75	33.0
48a	Cowgate	N	Y	83.3	37.7
74a	75 George St	Y	Y	75	37.3
74b	107 George St	Y	Y	83.3	42.7
74c	41 George St	Y	Y	91.6	39.5
74d	20 George St	Y	Y	83.3	39.4
74e	George St/Charlotte Sq	Y	Y	100	42.6
74f	112 George St	Y	Y	100	43.4
75a	St Colme St	N	Y	91.6	38.5
75b	Gt Stuart St	N	Y	100	36.2
76	Angle Park Terrace	N	Y	100	52.9
77	Slateford Rd	N	Y	91.6	47.6
78	Slateford Rd/ Maltings	N	Y	75.0	35.9
79	Fountainbridge/Tollcross	N	Y	50.0	42.0
80	Gorgie Rd /Delhaig	N	Y	100	47.4

NOTES

All passive diffusion tube data shown in the tables has been adjusted for bias, and where necessary to the nearest relevant exposure receptor using the NO_2 concentration reduction with distance calculator based on the specified procedure in Box 2.3 TG (09) and addendum note provided by Defra 2010.

Bias factors used for each year:

2008 = 0.88
2009 = 0.86
2010 = 0.85

Annual mean concentrations which exceed the annual mean objectives are highlighted in red; those that are likely to exceed the 1-hour objective are highlighted in bold red. (60μg/m^3 or above as an annual mean).

Where data capture is less than 90% for a full year this is highlighted in blue.

Princes Street data (ID47) in brackets represents pavement exposure 2.5m from the kerb, data without brackets represents concentrations at the façade.

Discontinued locations are highlighted in red.

New monitoring locations (2010) are highlighted in blue.

Table 2.4a Locations outwith AQMAs where monitoring results (2010) show exceedence of the Annual Mean Nitrogen Dioxide Objective

Location	2010 annual mean NO_2 concentration	Data Capture %
Easter Road ID 25	49.7	100%
London Road ID 46 ID 66 (London Road Regent Terrace) ID 67 (London Road Earlston Road) ID 69 (London Road Wolseley Pl) ID 70 (London Road Wolseley Terr)	46.2 40.5 51.3 50.6 46.1	100% 83.3% 75% 83.3% 66.6%
Queensferry Road ID 50 ID 64	50.5 47.5	83.3% 91.6%
Bernard Street Leith ID 29 ID 29a ID 29c	43.7 44.6 49.4	100% 100% 100%
Glasgow Road ID16 ID 58	44.5 51.3	91.6% 83.3%
Grassmarket ID 37a	**60.0**	41.6%
Cowgate ID 48	46.2	50.0%
Hillhouse Road ID 40	42.4	91.6%
Inverleith Row ID 55	44.0	100%
Angle Park Terrace ID 76	52.9	100%
Slateford Road ID 77	47.6	91.6%
Fountainbridge/Tollcross ID 79	42.0	50.0%
Hope Park Terrace ID15a	43.4	100%
Gorgie Road/Delhaig ID 80	47.4	100%

NOTE

New monitoring locations not previously reported are highlighted in blue.

Locations that are likely to exceed the 1-hour objective are highlighted in bold red. (60µg/m^3 or above as an annual mean)

Where data capture is less than 90% for a full year this is highlighted in blue.

Table 2.4b Locations where monitoring results (2010) indicate potential exceedences of the Annual Mean Nitrogen Dioxide Objective

Location	Annual mean nitrogen dioxide concentration (μg/m^3) (Data capture %)			
	2007	2008	2009	2010
Broughton Road ID 43	38.9 (100%)	40.4 (100%)	38.1 (100%)	39.8 (100%)
Commercial Street ID 9	42.0 (100%)	40.4 (100%)	31.6 (100%)	36.7 (66.7%)
Commercial St/ Port ID 7A	-	-	-	38.1 (91.6%)
Portobello High St ID 71	-	-	43.0 (75%)	39.2 (83.3%)
Salamander St /Bath ID 51B	-	-	37.4 (100%)	40.3 (100%)
Ferry Road ID 45	38.2 (100%)	39.6 (91.7%)	35.4 (83.3%)	41.5 (83.3%)

NOTE

All passive diffusion tube data shown in the tables has been adjusted for bias, and where necessary to the nearest relevant exposure receptor using the NO_2 concentration reduction with distance calculator based on the specified procedure in Box 2.3 TG (09) and addendum note provided by Defra 2010.

Bias factors used for the indicated years:
2007 = 0.90
2008 = 0.88
2009 = 0.86
2010 = 0.85

Annual mean concentrations which exceed the annual objective are highlighted in red.

Where data capture is less than 90% for a full year this is highlighted in blue.

Trend data from nitrogen dioxide passive diffusion tubes within the AQMAs

The passive diffusion tube data, which has been used in the trend assessment, has been corrected for diffusion tube bias, and taken from the point of measurement. This is to ensure consistency due to the change in methodology for calculating NO_2 fall off with increasing distance from source. Many of Edinburgh's historic monitoring sites within the central AQMA were positioned at the kerbside/roadside and these locations have been retained for continuity. Trend lines have been drawn using the same method as previously described on page 35.

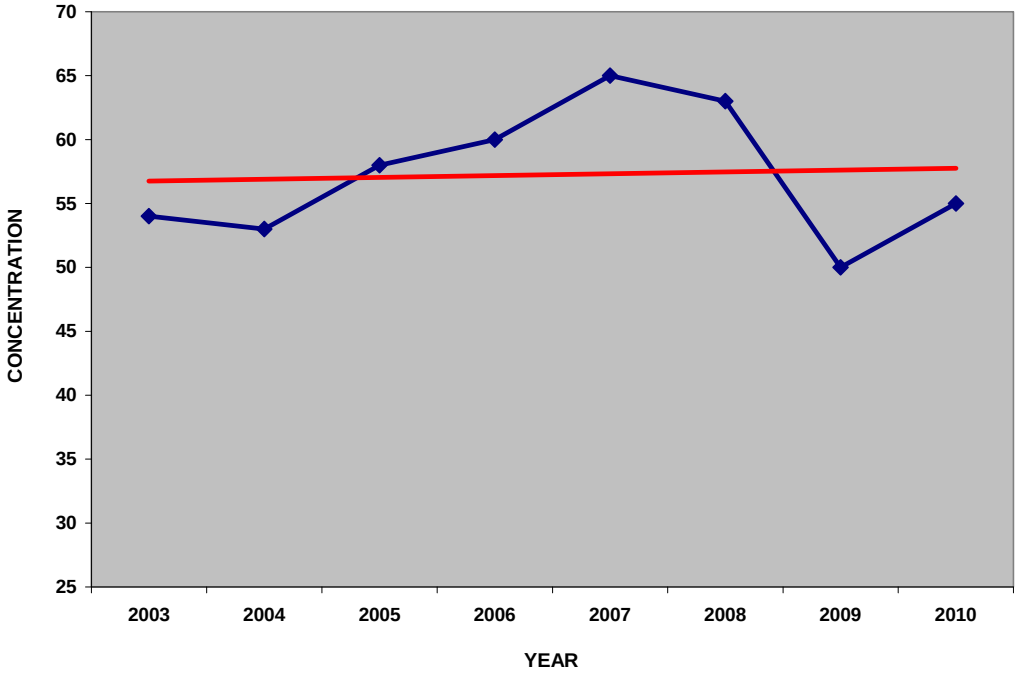
The trend data is based on the average mean concentrations obtained from passive diffusion tube monitoring at the following locations each year, St Johns Road (ID 1,ID1b and ID1c), West Maitland Street (ID 2), Torphichen Place (ID 3), Gorgie Road (1D18), MacDonald Road (ID 20), Roseburn Terrace (ID 23), Princes Street (ID 24), North Bridge (ID 27), Queen Street (ID 33), York Place (ID 36), Great Junction Street (ID 30) and West Port (ID 55). Data which has been used to establish the average trend is shown in Appendix C.

The average roadside trend within the AQMAs from 2003 to 2010 is beginning to flatten thus showing no significant increase of the annual mean nitrogen dioxide concentrations. However, this should be viewed with caution due to major disruption to traffic in the city centre throughout 2009. Figure 2.4.

As previously described in 2010 Air Quality Progress Report annual data gathered during 2009 at specific locations in the Central AQMA shows a significant decrease compared with data for 2008. For example, Princes Street (at the relevant receptor) was 36 μgm^{-3} in 2009 compared to 51 μgm^{-3} in 2008 and West Maitland Street 46 μgm^{-3} in 2009 compared to 70 μgm^{-3} in 2008.

Both these changes can be attributed to the closure of Princes Street to traffic for most of 2009, due to tram construction work. At West Maitland Street a 4 - metre 'buffer zone' was created during tram works. This moved vehicles away from the kerbside into the centre of the carriageway, therefore the tail pipe emissions would have moved further from the monitoring site. The mean average value of the aforementioned site at point of relevant exposure decreased significantly in 2009 from 63 $\mu g/m^3$ in 2008 to 50 $\mu g/m^3$ in 2009.

Figure 2.4 Nitrogen Dioxide (µg/m^3) Trend measured at Diffusion Tube Monitoring Sites within AQMAs



2.2.2 Particles (PM_{10})

PM_{10} monitoring is undertaken using Tapered Element Oscillating Microbalance (TEOM) instruments, apart from the AURN site at St Leonards, which operates a Filter Dynamics Measurement System (FDMS) unit.

The PM_{10}TEOM monitoring data at Queen Street, Roseburn, Salamander Street and Currie has been corrected to provide a gravimetric equivalent using the Kings College Volatile Correction Model (VCM). This is discussed in Appendix A4.

The data has also been gravimetrically corrected using Edinburgh's local derived gravimetric factor (1.14) for comparison and continuity with historical data.[1] The data shows that the two correction methodologies are comparable. Data is shown in Table 2.5a and Table 2.5b.

All monitoring locations are representative of relevant public exposure.

Table 2.5a Results of PM_{10} Automatic Monitoring: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for full calendar year 2010 %	Annual mean concentrations (µg/m^3)		
				2008	2009	2010
1	Queen St TEOM	Y (NO_2)	96.4 %	(vcm) 19 (1.14) 19	(vcm) 18 (1.14) 18	(vcm) 18 (1.14) 19
3	Roseburn TEOM	Y (NO_2)	98.9%	(vcm) 16 (1.14) 16	(vcm) 15 (1.14) 15	(vcm) 15 1.14 15
2	Haymarket TEOM	Y (NO_2)	-	(vcm) 20 (1.14) 20	-	-
8	Salamander St TEOM	N	97.0%	-	(vcm) 22 (1.14) 23	(vcm) 26 (1.14) 27
7	St Leonards FDMS	N	94.8%	15	17	14
6	Currie TEOM	N	98.0%	-	-	(vcm) 11 (1.14) 11

NOTE

Annual exceedences are highlighted in red

Monitoring commenced at Salamander Street in mid September 2009. This short-term data could not be corrected to provide an estimated annual mean due to insufficient data available from the FDMS unit at the local background site at St Leonards. The FDMS instrument developed a fault during July, which continued until January 2010.

Monitoring data from automatic station at Currie has been ratified by the local authority.

Table 2.5b Results of PM_{10} Automatic Monitoring: Comparison with 24-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture 2010 %	Number of Exceedences of daily mean objective (50 μg/m^3) If data capture < 90%, include the 98th percentile (in Scotland) of daily means in brackets.		
				2008	2009	2010
1	Queen St TEOM	Y (NO_2)	96.4 %	0	1	1
3	Roseburn TEOM	Y (NO_2)	98.9%	0	0	0
2	Haymarket TEOM	Y (NO_2)	-	2	-	-
8	Salamander St TEOM	N	97.0%	-	2 (44)	19
7	St Leonards FDMS	N	94.8%	0	2	1
6	Currie TEOM	N	98.0%	-	-	0

Note

Exceedence of the daily mean objective is highlighted in red (In Scotland permitted number is 7)

2010 data from all monitoring locations met with the PM_{10} EU limit values and the UK National Objectives. The background site at St Leonards and roadside location at Roseburn met with the Scottish Air Quality Objectives. However, Queen Street is borderline for achieving the annual mean objective (18μg/m3) and Salamander Street fails both the annual mean and permitted number of daily exceedences.

Based on new and historical monitoring data the requirement to progress the city-wide Detailed Assessment remains valid.

Trends in Annual Mean PM_{10}.

Uncorrected TEOM data (non-volatile fraction) has been used to assess PM_{10} trends due to government changes associated with gravimetric correction methodology. The non-volatile fraction of the FDMS data from years 2008, 2009 and 2010 at St Leonards has also been used to ensure a consistent approach. Although non-volatile data was used for the trend assessment at St Leonards, this has to be viewed with caution as the TEOM instrument was replaced with a FDMS system 2008. Trend lines have been drawn using the same method as previously described on page 35.

Data trends are shown in Figures 2.5a to 2.5c and the findings are summarised in Table 2.5c.

Figure 2.5a PM_{10} (µg/m^3) Trend: St Leonards (Urban Background)

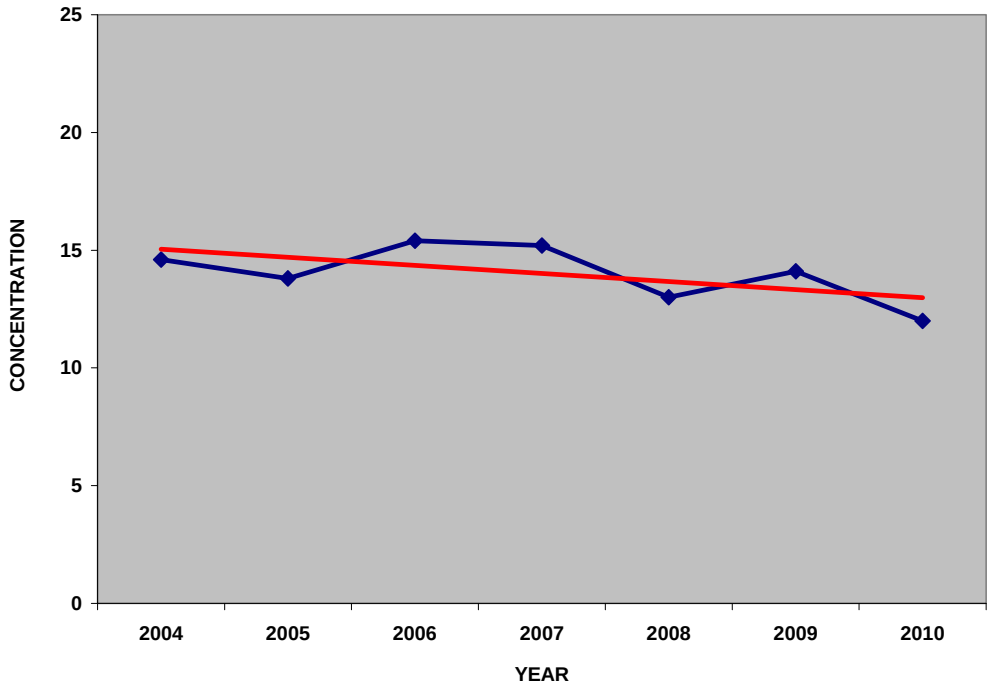


Figure 2.5b PM_{10} (µg/m^3) Trend: Queen Street (Roadside)

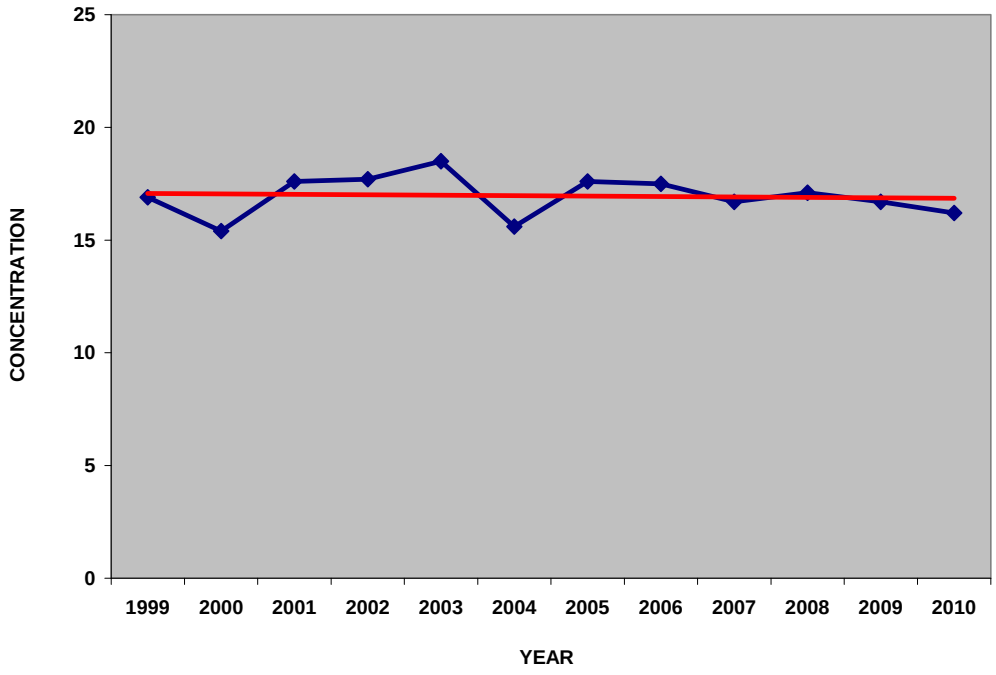


Figure 2.5c PM_{10} ($\mu g/m^3$) Trend : Roseburn (Roadside)

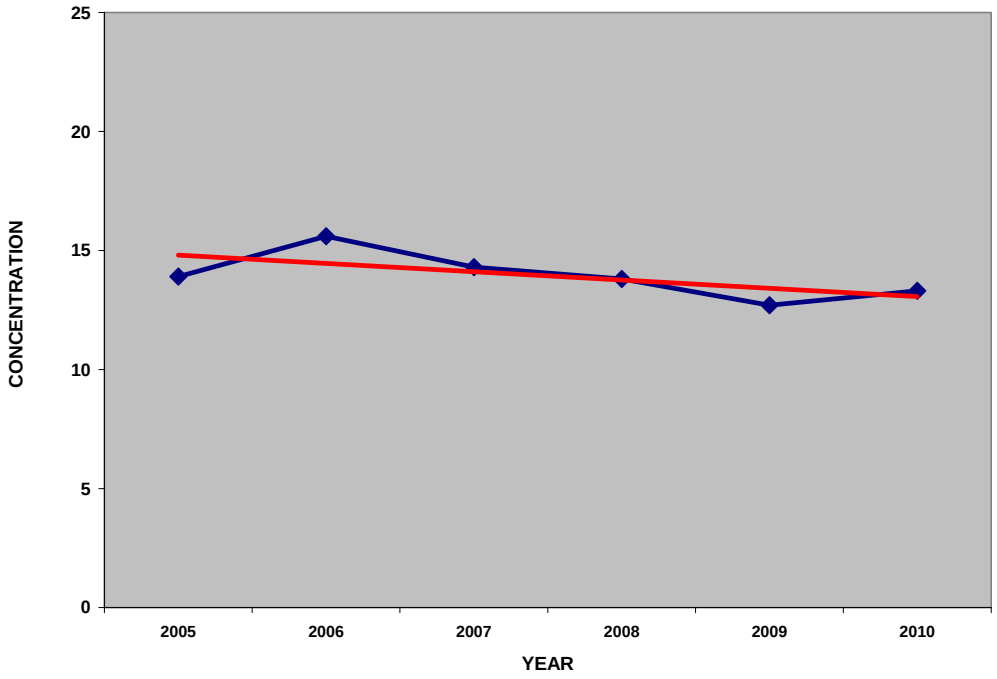


Table 2.5c Summary of PM_{10} Annual Mean Trend Data

Monitoring Location	Trend in annual mean PM_{10} (years)	Concentrations of PM_{10}
Roseburn (Roadside)	↓ (2005 to 2010)	Decreasing
Queen St * (Roadside)	flat (1999 to 2010)	No change
St Leonards (Urban background)	↓ (2004 to 2010)	Decreasing (marked)

* Queen Street monitoring location moved from North Castle Street to Wemyss Place in 2005

Whilst downward trends (decrease in PM_{10} concentrations) are noted at Roseburn and St Leonards, Queen Street shows no change.

2.2.2 Sulphur Dioxide

Sulphur dioxide is monitored at the AURN urban background site at St Leonards. This location continues to comply with the objectives. Table 2.6.

Table 2.6 SO_2 Automatic Monitoring: Comparison with Objectives

Site ID	Location	Within AQMA	Data Capture 2010 %	Number of Exceedences of: (μg/m^3)		
				15-minute Objective (266 μg/m^3)	1-hour Objective (350 μg/m^3)	24-hour Objective (125 μg/m^3)
7	St Leonards	N	91.8	0	0	0
Maximum concentrations for averaging period				218	149	54

2.2.3 Benzene

Monitoring data using the pumped tube methodology obtained from the urban background (AURN) site at St Leonards has not identified any running annual means greater than 3.25μg/m^3. Monitoring ceased at this site on 27.11.2007. Data is reported in the Air Quality Progress Report 2008.

2.2.4 Other pollutants monitored

The UK Government and Devolved Administrations are responsible for monitoring Ozone, Polycyclic Aromatic Hydrocarbons (PAHs) and $PM_{2.5}$. The AURN urban background site at St Leonards monitors the aforementioned pollutants.

Ozone

Ozone concentrations measured at the above location in Edinburgh failed to comply with the UK objective in years 2007, 2008 and 2009, but have met in 2010. Table 2.7

Table 2.7 Ozone Automatic Monitoring: Comparison with Objectives

St Leonards Urban background	2007	2008	2009	2010
Number of exceedences	11	14	12	0
Ozone Obective 100μgm^{-3} not to be exceeded more than 10 times a year as an 8 - hour running mean by 31 December 2005				

Polycyclic Aromatic Hydrocarbons (PAHs)

There are many different PAHs; however, the component, used as a marker, is benzo (a) pyrene (B(a)P). The concentrations monitored at St Leonards comply with the UK objective. Monitoring is undertaken using a digital sampler. Concentrations are shown in Table 2.8.

Table 2.8 PAH (B(a)P) Monitoring: Comparison with objectives

St Leonards	**2008**	**2009**	**2010**
Annual Concentration (ngm^{-3})	0.124	0.115	0.129
B(a)P Objective 0.25ngm^{-3} as an annual average by 31 December 2010			

$PM_{2.5}$

$PM_{2.5}$ monitoring commenced in November 2008 at St Leonards urban background location. The annual 2010 data met the Scottish Government proposed target of 12μgm^{-3} as shown in Table 2.9.

Table 2.9 $PM_{2.5}$ Automatic Monitoring: Comparison with proposed Scottish Objective

St Leonards	**2009**	**2010**
Annual Concentration (μgm^{-3})	8	9
$PM_{2.5}$ Scottish Objective 12μgm^{-3} annual average (limit) 2010 This target is not in Air Quality Regulations.		

Carbon Monoxide (CO)

Carbon monoxide is also monitored at St Leonards. Data from this site continues to comply with the objectives as described in previous reports. This pollutant is considered not to be an issue UK wide.

2.2.5 Summary of Compliance with AQS Objectives

Edinburgh has measured concentrations of **nitrogen dioxide** and **PM_{10}** above the annual mean and 24-hour mean (PM_{10}) at relevant locations outside of the AQMAs, and **will need to proceed to a Detailed Assessment**, at the following locations:

Nitrogen dioxide

Angle Park Terrace
Slateford Road
Fountainbridge/Tollcross
Hillhouse Road
Hope Park Terrace
Cowgate

Detailed Assessments are being progressed currently at the following locations, additional monitoring commenced 2011:

Portobello High Street (2010 annual mean value met where previously it exceeded)
Inverleith Row
Grassmarket

PM_{10}

City-wide for exceedences of Scottish Objectives as identified in Progress Report 2010 and previous Review and Assessment Reports.

3 New Local Developments

3.1 Road Traffic Sources

Roads with a high flow of buses or HGVs

Edinburgh Tram network is not as extensive as initially proposed. Funding has been secured for Phase 1 to operate between Edinburgh Airport and St Andrews Square. It is unlikely that the route will be extended to Leith/Ocean Terminal in the foreseeable future. As a consequence, it is possible that the current level of bus services will be retained and a proportion may be rerouted (especially from Princes Street) for Tram operations. Therefore, air quality impacts on the adjacent road network arising from bus displacement will require to be assessed and evaluated. There is also a potential for greater congestion where tram and bus routes coincide.

The Forth Replacement Crossing has been considered in detail and the Environmental Assessment report concluded that there was no relevant exposure on the small stretch of the M8 where exceedences of nitrogen dioxide occurred. The modelled PM_{10} data for the base case year (2005) failed to meet the Scottish Objectives. However, based on national projection factors estimated concentrations are predicted to meet by 2017 and 2032.[7] Monitoring PM_{10} during the construction phase is still under consideration.

3.2 Other Transport Sources

There are no new/newly identified non- road traffic sources since the last Updating and Screening Assessment that require assessment. Diesel train movements at Haymarket were assessed during 2010 and data showed that this transport source would not result in exceedence of nitrogen dioxide.[7]

3.3 Industrial Sources

A biomass power station (200MWe) combusting mainly wood fuel has recently been proposed at Leith Docks. The site will be in close proximity to an existing high-density residential area and adjacent to land which has been allocated for future residential development. It is also close to an area of poor air quality. A full Environmental Impact Assessment has been carried out. The Council has sought further clarification on a number of air quality issues, and is currently awaiting a response. However, consideration of the proposal has been delayed until further notice. The planning decision will lie with the Scottish Ministers.

Concerns which have been raised by the Council relate to the impact that this large installation may have on local air quality in terms of the emissions arising from, the combustion process; transportation of fuel and waste; and fugitive emissions associated with open-air storage of wood material.

3.4 Commercial and Domestic Sources

There have been no new biomass combustion installations nor areas identified where the combined impact of several biomass sources may be relevant, since the last Progress

Report (2010). The Council issued Interim Planning Policy (2010) that discourages the installation of commercial biomass combustion installations in the city.

Smoke Control Orders cover the entire local authority area. There are currently no areas where significant coal burning takes place.

3.5 New Developments with Fugitive or Uncontrolled Sources

Open storage of woody biomass material for the biomass power station proposal in Leith may give rise to additional emissions of fugitive sources of PM_{10}. However, the Environmental Impact Assessment considered covered storage. Clarification is still required on this issue.

There are potential fugitive sources from a scrap yard and a cement batching process at Bath Street, which may be contributing towards the PM_{10} concentrations monitored at Salamander Street. Both these installations are regulated by SEPA. City of Edinburgh Council has already been in discussion with SEPA to discuss selective speciation measurement. This work will be funded by SEPA and the findings will be included in the city-wide Detailed Assessment Study.

Edinburgh has identified the following which may impact on air quality in the Local Authority area.

Biomass (wood fuelled) power station (200 MWe) at Leith Docks.
Direct emissions of NOx and fine particles from the combustion process, transport emissions associated with fuel delivery and removal of waste and fugitive sources arising from the open storage of wood.

Possible fugitive emissions from a scrap yard and a cement batching plant in Leith contributing to exceedences of PM_{10} at Salamander Street. Will be investigated as part of city-wide Detailed Assessment

Roads with a high flow of buses or HGVs
Potential re- routing of buses on to the adjacent road network due to tram operations .
Potential for greater congestion levels where tram and bus routes coincide.

4 Planning Applications

Many areas within Edinburgh are subject to major regeneration proposals in locations where there are current air quality concerns. According to the Council's State of the Environment Report 2008, the city-region of Edinburgh has the fastest growing population in Scotland and one of the fastest in the UK, (9% growth is projected from 2005 to 2024). There is strong political desire for economic growth in the city region. However, due to the current economic downturn the projected rate of growth may now be slower.

The Edinburgh City Local Plan (approved January 2010) outlines areas for residential use and commercial development. Tables 4.1 and 4.2.

Table 4.1 Proposed areas of residential development as detailed in Edinburgh City Local Plan

Local Plan Ref Number	Site location	Area of Edinburgh	Estimated Capacity Units
WAC 1a	Leith Waterfront (Western Harbour)	North	2400
WAC 2	Granton Waterfront	North	6000
CA 4*	Quartermile	Central	1000
HSG 1	Craigs Road (SASA)	West	280
HSG 2	Chesser Avenue	South	500
HSG 3	Hyvots	South	310
HSG 4	Lochend Butterfly	South	356
HSG 5	New Greendykes	South	810
HSG 6	Greendykes	South	990
HSG 7	Niddrie Mains	South	600
HSG 8	Castlebrae High School	South	145
HSG 9	Thistle Foundation	South	170
WAC 1b	Leith Waterfront (Leith Docks)	North	18000
WAC 1c	Leith Waterfront (Salamander Pl)	North	800
CA 2	Calton Gate	Central	250
CA 3	Fountainbridge	Central	1200
HSG 10	Clermiston Campus	West	295
HSG 11	Telford College (North Campus)	North	300
HSG 12	Telford College (South Campus)	North	350
HSG 13	Eastern General Hospital	North	274
HSG 14	Newcraighall North	South East	200
HSG 15	Newcraighall East	South East	200
HSG 16	Edinburgh Zoo	West	80
HSG 17	South Gyle Wynd	West	180
HSG 18	Shrub Place	Central	400
HSG 19	City Park	North	200
HSG 20	Fairmilehead Water Treatment Wks	South	300

Note

WAC 1a to HSG 9 are sites identified in the Structure Plan base supply and previous local plans
WAC 1b to HSG 15 are sites to meet Strategic Housing land Requirements
HSG 16 to HSG 20 are sites that have been identified to make a useful contribution

Locations that are in AQMAs and areas of air quality concern are highlighted in red.

Table 4.2. Proposed commercial development described in Edinburgh City Local Plan

Local Plan Ref Number	Site location	Area of Edinburgh	Site Hectares
BUS 1	Centre for biomedical research	South East	40
BUS 2	Edinburgh Park	West	16
BUS 3	Leith Eastern Industrial Area	North	20
S1	Westerhailes Centre	West	
S2	Harvesterway Westerhailes	West	4.3
S3	Hermiston Gate Centre	West	3.4
S4	Niddrie Main Road	South East	
S5	Granton Waterfront	North	
S6	Leith Waterfront	North	
S7	Fountainbridge	Central	
CA 1	St James Centre (expansion of existing)	Central	
CA 2	Caltongate	Central	
CA 4	Quartermile	Central	

Locations that are in AQMA and areas of air quality concern are highlighted in red.
St James Centre is within the Central AQMA. The expansion of this retail centre will result in additional car parking spaces from aproximately 600 to 1800.

Table 4.3 Leith Docks development proposals as detailed in Outlne Application

Land use	Phase 1 (2015)	Phase 2 (2025+)	Total
Residential (units)	2,935	13,079	16,014
Office (m^2)	4,740	87,328	92,068
Port activities (m^2)	0	12,120	12,120
Ocean Terminal Extention (m^2)	64,900	0	64,900
Retail- local shops (m^2)	5,428	13,416	18,844
Bar/Restaurant (m^2)	2,250	4,500	6,750
Leisure (m^2)	576	9,337	9,913
Education (m^2)	0	5,620	5,620
Cultural/public/ performance arena /car parking for above land uses	0	14,014	14,014

In addition to the Edinburgh City Local Plan, there is also the Rural West Edinburgh Local Plan (RWELP) and the West Edinburgh Framework Area. The WEFA incorporates a range of major development proposals e.g. expansion of Edinburgh Airport, redevelopment and expansion of the Royal Highland Showground and adjacent land at Ingliston - including new hotels and office accommodation, the creation of an International Business Gateway at land to the east of the airport, the Edinburgh Tram terminus and link to the city. Major housing developments are also being advanced at Kirkliston, Newbridge and Ratho Station.Table 4.4.

The annual mean nitrogen dioxide objective was exceeded on the A8, Glasgow Road, close to the Newbridge roundabout. This road is a main arterial route into the Edinburgh from the west.

Although, AQMAs have not been declared in the Rural West, traffic generated from residential and commercial development has the potential to impact on the existing poor air quality on the A8.

Table 4.4 Strategic Housing Allocation proposals contained in RWELP

Ref RWELP	Site Location	Estimated Capacity Units
HSP1	North Kirkliston	610*
HSP2	Main Street West, Kirkliston	90
HSP3	Kirkliston Distillery, Kirkliston	103
HSP4	Newbridge Nursery Newbridge	25
HSP5	Hillwood Road, Ratho Station	50*
HSP6	Craigpark Quarry Ratho	80
HSP7	Freelands Road Ratho	100

* Both these areas are green field sites and '*housing should not be occupied before the West Edinburgh tram to Newbridge is operational or it's funding has been committed to, or in the event of this not being delivered after strategic (or strategically significant) improvement in public transport accessibility to the area have been secured'.*

In addition there are further areas for residential development which are not detailed in Rural West Local Plan which have planning approval. Table 4.5.

Table 4.5 Residential development proposals not identified in the RWELP

Location	Estimated Capacity Units
Newbridge Continental Tyre factory	490
North Kirkliston	176
East Kirkliston	62

The Local Plan is currently being aligned with the Regional Structure Plan (SESplan). The main issues report is due to be approved for consideration at the end of October 2011. This will bring together RWELP and the Local City Plan. The Environmental Report will be released for consultation in November 2011.

5 Air Quality Planning Policies

The City of Edinburgh Council's Planning Committee recently approved a report calling for the introduction of interim Planning Policy to limit the introduction of unabated biomass combustion in the city.

The report, entitled 'Use of Biomass of 50 MW(e) or less in Edinburgh highlights increasing concerns about the potential cumulative impacts on local air quality and health of unabated emissions - especially of fine particles PM_{10} / $PM_{2.5}$ from a potential proliferation in biomass uptake.[8] The approved report effectively provides the Planning Authority with policy support to assist the Council manage and control the introduction of biomass combustion installations in development proposals in the current absence of proven, cost-effective abatement technologies.

The approved Planning report's key recommendations are that:

(a) Proposals for biomass installations of 50MW (e) or less will only be considered acceptable where it is demonstrated that the following conditions can be met.

- an appropriate and effective abatement system to control emissions of concern can be applied to the plant, and maintained.
- contributions to levels of pollutants of concern in Edinburgh do not conflict with the requirements of the UK National Air Quality Strategy and / or the Council's statutory obligations in Local Air Quality Management per the Environment Act 1995 (Part 4), and

(b) This position will be reviewed once the city-wide study of fine particles has reported in 2011.

This is the first time an administration in Edinburgh has introduced an Interim Planning Policy directly aimed at influencing levels of specific air pollutants in the city. Due to the financial attractiveness to developers of biomass over alternative methods of potentially carbon-neutral technologies, it is likely that levels of combustion-derived PM_{10} and $PM_{2.5}$ in the city would increase in its absence, potentially compromising the Council's ability to meet the Scottish Government's air quality targets for PM_{10} and nitrogen dioxide.

6 Local Transport Plans and Strategies

Local authorities are advised in Technical Guidance document LAQM TG (09) to refer to measures which are outlined in the Local Transport Strategy that specifically relate to bringing about improvements in air quality.

Edinburgh's current Local Transport Strategy (LTS) covers the period 2007-2012. The LTS contains a number of policy measures which are mirrored in the Air Quality Action Plan 2008-2010. In essence, the LTS provides a framework of policies and measures to support the Action Plan. It is anticipated that collectively they will assist in delivering the air quality improvements required.

The key policies in the LTS which are associated with air quality are listed in Table 6.1 below.

Table 6.1 Key Air Quality Improvement Policies in Edinburgh's LTS 2007 to 2012

Policy	Statement
Env1	The Council will continue to review transport measures that can contribute to achieving air quality objectives.
Env2	The Council will continue to implement the transport –related measures in the Air Quality Action Plan (AQAP) within available budgets.
Cars3	The Council will consider supporting congestion charging only at a national level for Scotland or the whole UK. The Council will develop a congestion indicator that can be monitored and will set targets in the context of the Regional Transport Strategy.
Cars4	The Council will promote the expansion of the City Car Clubs
Park19	The Council will keep under reveiew the need for new Controlled Parking Zones (CPZs) and /or further extensions to the existing CPZ.
P+R1 Park and Ride	The Council will provide, promote and enlarge Park and Ride (P+R) sites at the edge of urban areas on main radial routes and will work with operators to ensure that the most attractive ticket packages are available to users.
P+R2. Park and ride	The Council will promote access to P+R sites by bus, cycle, and on foot and will seek the provision of high quality public transport services to link P+R sites to major destinations outside the city centre.
PT22	The Council will work in partnership with the rail industry, South East of Scotland Regional Transport Partnership (SEStran), other Councils, the Scottish Executive, Transport Scotland, developers and others to improve services and promote new rail schemes where appropriate including: Edinburgh Airport link Borders rail link Bathgate to Airdrie link Edinburgh South Suburban line reopening to passengers

PT20	The Council will promote further bus priorities within the city where needed to maintain and improve public transport service quality and realiability and will work with SEStran to develop bus priority schemes that will support orbital bus services linking key growth areas in and around the city, including considerations of priorities on trunk roads and motorways.
Goods 3	The Council will work with the industry, SEStran and other partners to evaluate the benefits of a Freight Quality Partnership at the regional level.
Goods 4	The Council will support the use of rail and sea freight, in particular through the planning process by: Safeguarding rail access to key industrial sites Ensuring that major new freight generating developments are acessible to the rail network where possible. Encouraging developments which are likely to benefit from sea freight to be located so that they are easily accessible to the freight handling ports in the Forth and; working to ensure muliti-modal freight operations where possible.
Goods 5	The Council will make every effort to ensure that Edinburgh's domestic waste continues to be moved out of Edinburgh by rail and will examine other ways in which the council can lead by example.
EX2	The Council will work with BAA and other partners to increase significantly the use of sustainable travel modes for access to Edinburgh Airport, including the provision of rail and tram links.

Road Traffic Reduction

The current LTS set a target of no more than 10% traffic growth between 2001 and 2010 and states, '*that longer term traffic targets can be considered only after the context of National and Regional Transport strategies become clearer and decisions on some of the major transport projects affecting the city are made.'*

Promotion of Walking, Cycling and Safe routes to school

The LTS contains numerous cycling and walking policies which encourage these modes of travel.

Tram

Edinburgh Tram proposals are seen as a positive measure for air quality as emissions to air at point of use are zero. However, the original route has now been shortened to operate between Edinburgh Airport and St Andrews Square. It is unlikely that the route will be extended to Leith/Ocean Terminal in the foreseeable future.

Transport 2030 Vision

In addition to the LTS, City of Edinburgh Council's recently approved Transport 2030 Vision provides an overarching strategy for the development of transport in Edinburgh over the next 20 years.

The Transport 2030 Vision will compliment and inform the regularly updated LTS. The document has a number of outcomes and indicators which include, reductions in traffic volumes, nitrogen dioxide and carbon dioxide. City of Edinburgh Council will monitor, review and report upon progress against the vision outcomes.

The measures would assist in delivering the outcomes associated with improving air quality are:

- Low emission zones if other measures do not make the necessary progress towards improved air quality.
- Working with operators towards an emission free public transport fleet and supporting initiatives for electric and hybrid vehicles.
- Air quality improvements in partnerships with the public transport and freight industries.
- Active traffic management to mitigate pollution hot spots.
- Working through planning and economic development initiatives to foster low impact development that reduces the need to travel by car.
- Engaging with the Scottish Government and other partners to encourage a shift to low carbon transport including supporting use of electric vehicles.
- Parking permit charges based on vehicle emissions.
- Green procurement when purchasing new Council fleet vehicles.
- Promotion of eclogical driving and slower speeds.
- Creating walkable and cyclable neighbourhoods through 20mph speed limits.
- Promote smarter travel through support for behaviour change programmes including travel plans.
- Targeting the school run, school travel plans and safe routes to school.
- Improved crossings – Forth services to Fife.
- Expansion of Park and Ride facilities.
- Supporting growth of City Car Club.

City of Edinburgh Council's LTS is currently being revised.

7 Climate Change Strategies

The Council is working with the Carbon Trust and Entec (an Environmental Consultancy) as part of the Carbon Trust's *Revisited* Programme to assess the progress of the Council's current carbon management work and to identify projects which will help the Council achieve its targets on carbon reduction. The effective rolling-out of the revised Carbon Management Plan (CMP) will be part of the Council's response to its commitment under the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme.

The specific objectives of this programme are:

- to review the current status of the Council's CMP
- to quantify the potential carbon savings from the Council's project register;
- to carry out a gap analysis to determine the remaining carbon savings required to meet the Council's carbon reduction target; and
- to develop an Action Plan leading to a revised exemplar CMP by June 2011.

In January 2007 the Council signed Scotland's Climate Change Declaration**.** The Declaration includes commitments both to mitigate the Council's impact on climate change through reducing greenhouse gas emissions and to adapt to predicted climate change impacts. A comprehensive annual report on the Council's progress against these commitments is prepared each September and is available from the Scotland's Climate Change Declaration website. Further targets to achieve a 'climate responsive city' by 2020 are expected to be approved in June 2011 as part of the Council's new Sustainable Development Framework.

On 7th April 2011 the Edinburgh Partnership approved the formation of a Climate Change Strategic Partnership (CCSP). The CCSP will address a number of issues on the climate change agenda and develop if required other strategic partnerships to ensure compliance with relevant legislation. A scoping report/framework document will be published towards the end of 2011 setting out the partnership's initial priorities for action.

Although, climate change initiatives can be benefical with respect to improving air quality, there is potential for conflict between the two statutory obligations. It is essential that measures proposed to improve air quality and those relating to Climate Change are assessed for possible adverse impacts. The Council will work to avoid such conflicts.

8 Implementation of Action Plans

Action Plan (2003)

The measures in the City of Edinburgh's Air Quality Action Plan (AQAP) 2003 if fully implemented were estimated to reduce nitrogen oxides (NOx) by approximately 40%. Table 8.1.

Table 8.1 Estimated NO_x Reduction from Transport Measures (Action Plan 2003)

Action	**NO_X Emission reduction**
Integrated Transport Initiative including Congestion charging and tram network	20%
Traffic Management Enhanced signals Controlled Parking Zones	5%
Cleaner Vehicles Buses & Coaches (Euro IV by 2010) Council Fleet/ Taxis	 14% 7%
Total	**46%**

An additional 40% reduction was expected to occur without intervention, due to improvements in vehicle technology and subsequent fleet replacement. Reduction in overall NOx emissions was estimated as approximately 80%.

The roadside NO_x concentration reductions required to meet the 2005 annual mean air quality objective in the Central AQMA were calculated to be between 33% and 68%.[4]

Source apportionment work undertaken in 2002 within the Central AQMA identified that the bus fleet contributed to largest percentage of NO_X emitted at Leith Walk (56%), Gorgie Road (55%) and West Maitland Street (63%).[5] Therefore, the main challenge for Edinburgh was to stimulate a vehicle clean up programme, targeting bus and freight operators in the city.

A key element of the Action Plan was the introduction of congestion charging. In addition, to reducing traffic and congestion levels in the city centre, the scheme would have generated revenue to provide grants for the clean-up of older 'more' polluting vehicles.

Action Plan 2008 (revised)

The AQAP 2003 was revised in 2008 to take account of proposals for congestion charging not being implemented and to include St Johns Road AQMA.

The focus of the current AQAP 2008 (revised) is a reduction in exhaust emissions from bus and road freight vehicles operating in the city. A Low Emission Strategy Feasibility study was commissioned by the Council and undertaken by Transport and Travel Research 2007 (TTR).[3] The study concluded that, the greatest reductions in NO_X and PM_{10} emissions for the

Council's administrative area would be achieved by implementing a mandatory emission reduction scheme for bus and road freight operators. Voluntary Partnership Agreements were deemed the next best option, depending on the percentage of fleet improvement that could be achieved.

The current AQAP incorporates a number of transport and traffic management initiatives as identified in the Local Transport Strategy (LTS) as well as to ensure that the Council's own vehicle fleet is as 'clean' as practical.

The AQAP also highlighted the issue of cumulative impacts associated with development and the short comings of Air Quality Impact Assessments undertaken on behalf of developers to support their proposals. This issue was put forward as a Policy Initiative in the AQAP. Three key actions were described, viz a series of internal seminars on Air Quality, establish a city-wide inventory of development sites and develop Land Use and Traffic modelling capability to assess air quality impacts of development. However, little progress has been achieved in developing a city-wide Land Use and Transport Model, primarily because of the high capital and revenue costs involved for establishing and maintaining such a system. It is unlikely that such a model will be forthcoming in the foreseeable future due to current financial constraints.

Progress made with Actions

Managing emissions from buses.

Following a number of meetings and discussions in 2009, all bus companies operating services in the city were invited to enter into a Voluntary Emissions Reduction Partnership (VERP) with the Council. The key elements of the draft proposal were:

- Eliminate vehicles below Euro IV standard from the AQMAs by October 2012
- Increase the number of Euro V standard buses incrementally throughout the period of this agreement, with the aim of achieving 100% Euro V standard operating in the AQMAs by October 2015.
- Organise the use of vehicles in the AQMAs to minimise emissions maximising the use of the least polluting vehicles
- Provide the Council with data on the bus entries to each of the AQMAs, and of total fleet composition operating in Edinburgh, by engine Euro standard on a 6-monthly basis.

The two main bus companies operating in the city Lothian Buses and First Scotland(East) considered the proposal too onerous in the absence of substantial financial support, consequently no formal agreement has been reached.

Bus Improvements 2010/2011

Transport (Scotland) has provided part funding to support the retrofit conversion of 34 'mid-life' Lothian single–deck buses from Euro 3 emission standard to beyond Euro 5. The installation programme was completed in September 2011 and vehicles are now in service. The total cost of the retrofit work was approximately £500,000, of which Lothian Buses contributed £243,000 and the City of Edinburgh Council £50,000, the Scottish Government provided the remainder. These buses are operating on service routes which go through Central and Great Junction Street (Leith) AQMAs.

In addition, support funding of £1M was obtained this year by Lothian Buses from the Scottish Government towards the £3.7M acquisition of 15 new hybrid diesel-electric double-

deck buses. The vehicles entered service in September 2011 and are operated on the Number 10 route, which is a high frequency service through the Central AQMA.

Lothian Buses are continuing to use Euro 5 standard buses on high frequency services (Airlink 100 and the Number 26) which go through the Central and St Johns Road AQMAs. Service 22 is also a high frequency service and buses are either Euro 4 or Euro 5 standard. This route passes through both the Central and Great Junction Street AQMAs.

Lothian Buses have recently installed a 4 minute idling engine cut out system across the entire fleet.

Lothian Buses is the main bus service operator in the city area of Edinburgh. More than half of Lothian Service bus fleet is now Euro 4 or higher. The degree of improvement of Lothian Service and Tour fleets are shown in Tables 8.2a and 8.2b.

Table 8.2a Euro Standard of Service Bus Fleet (Lothian Buses 2006 to 2011)

Bus Standard	**Lothian Bus base line LTS (2006)**	**Lothian bus Sept 2010**	**Lothian bus Oct 2011**
Pre Euro	63 (10%)	0	0
Euro 1	33 (5%)	0	0
Euro 2	202 (32%)	64 (10%)	7 (1%)
Euro 3	317 (52%)	307 (52%)	257 (43%)
Euro 4	0	79 (13%)	79 (13%)
Euro 5	0	136 (23%)	141 (23%)
EEV (5/6)		1 (0.1%)	117 (20%)
Total	**615**	**587**	**601**

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Table 8.2b Euro Standard of City Tour Bus Fleet (Lothian Bus 2010 to 2011)

Bus Standard	**Lothian bus Sept 2010 City Tour Fleet**	**Lothian Bus May 2011 City Tour Fleet**
Pre Euro	9	0
Euro 1	0	0
Euro 2	37	45
Euro 3	0	0
Euro 4	0	0
Euro 5	0	1
Total	**46**	**46**

Data provided by Lothian Bus October 2011

It is recognised that the City Tour Fleet are all Euro 2 buses apart from one, this issue is currently being reviewed by Lothian Buses.

First Scotland(East) is the second major operator in Edinburgh, the current fleet and projected fleet at 2015 is shown in Table 8.3.

Table 8.3 First Scotland(East) Fleet operating in Edinburgh: Current and projected improvement at 2015.

Euro Standard	2011 (Current)	2015 projected
Euro I	7%	0
Euro 2	45%	5%
Euro 3	35%	35%
Euro 4	10%	35%
Euro 5	3%	25%

Data provided by First Scotland(East) 2011

Bus emission analysis within AQMAs (Scottish Government funded project)

The Low Emissions Strategy Feasibility study 2007 undertaken by Transport and Travel Research (TTR) on behalf of City Edinburgh Council was based on the bus fleet profile in 2005/2006. Due to a significant improvement in parts of the bus fleet operating in Edinburgh, introduction and expansion of Park and Ride services and an increase of bus frequency on some routes, it was necessary to revisit the study to take account of these changes.

The revised study has taken a slightly different approach, focusing on the distance travelled and the bi-directional flow of the current bus fleet through each of the AQMAs rather than the previous city-wide study. 2010 emission baselines for NO_X and PM_{10} were established for each AQMA using data provided by bus companies. Two projection scenarios to 2015 were developed comprising of a base case (operators planned fleet replacement programme) and the Council's, Voluntary Emission Reduction proposal (accelerated uptake of Euro 5 standard vehicles).[2]

As expected the results from the study identified that the implementation of the proposed Voluntary Partnership scenario gave a significant potential reduction in emissions of both NO_x and PM_{10} in all three AQMAs over and above the reduction that would occur in the base case (no intervention) scenario.

The study showed that the greatest potential NO_X emission reductions with the proposed voluntary partnership from 2010 to 2015 would be at Great Junction Street (61%), followed by Central (59%) and St Johns Road (48%). Table 8.4.

Table 8.4 Percentage of NO_X Reductions in each of the AQMAs

AQMA	NO_X emission reduction voluntary partnership agreement	NO_X base case (no intervention)
Great Junction Street	61%	9%
Central	59%	12%
St Johns Road	48%	14%

With respect to PM_{10}, the greatest potential emission reduction was observed within the central AQMA 94%, followed by St Johns Road (77%) and Great Junction Street (74%). Table 8.5.

Table 8.5 Percentage of PM_{10} Reductions in each of the AQMAs

AQMA	PM_{10} emission reduction voluntary partnership agreement	PM_{10} base case (no intervention)
Great Junction Street	74%	12%
Central	94%	50%
St Johns Road	77%	52%

Graphical representations (detailed in the TTR (2011) report); of NO_x and PM_{10} emission reductions (tonnes per year) within the AQMAs are shown in Appendix D.

Future Bus fleet projections

The projected improvement of First Scotland(East) fleet to 2015 shows a large percentage of Euro 3 vehicles and only 25% attaining Euro 5 status. Lothian Buses at this current time are uncertain about future investment of their fleet.

However, without additional financial incentives it is unlikely that further accleration of the bus fleet from the two main operators in Edinburgh will occur in order to attain 100% Euro V by 2015 as required by the Council's draft Voluntary Emissions Reduction Partnership Scheme.

Consultation on a Low Emission Zone

The Council's Transport Infrastructure and Environment Committee instructed officers to consult with stakeholders on the feasibility of a Low Emission Zone for the City in 2009. This work has been delayed due to emerging concerns regarding vehicle emission factors.

The UK has relied on 'expected' improvement from the more modern vehicle engines to provide the required reduction in emissions. It is well established that the anticipated outcomes have not been delivered in 'real life' driving situations and consequently the current 'emission factors' for Euro Standards of vehicles are optimistic. These factors form a significant part of assessing varying scenarios when developing Low Emission Zones. The factors are currently being re-evaluated by DEFRA.

Therefore, it would be prudent for the Council to wait until this work had been completed to attain a more reliable understanding of the improvements likely to be achieved, prior to embarking on a LEZ consultation exercise with stakeholders.

Work is also in progress regarding production of government guidance on the implementation of LEZs in the UK. This guidance will be crucial to assist those Local Authorities who are considering the introduction of LEZs.

Managing emissions from freight

The road freight sector is historically more fragmented and disparate than the bus sector. Many companies are sizeable private commercial concerns, with complex logistical and routing operations serving large geographic areas, often UK-wide. The two largest national representative organisations are the Road Haulage Association (RHA) and the Freight Transport Association (FTA) which combined only account for 50% of operators. The majority of the operators have company headquarters outwith the City of Edinburgh's administrative area, which generally makes them more difficult to contact.

Therefore, the most feasible option to achieve a reduction in emissions from road freight vehicles was via the Regional Freight Quality Partnership established by the South East of Scotland Regional Transport Partnership (SEStran). The Council has met with representatives of the Road Haulage Association and Freight Transport Association. A sub group has been established to facilitate closer working with the aforementioned Partnership.

In an attempt to encourage road freight operators to voluntarily reduce their emissions, the Council became a partner in an EU project-funding bid. The project, ECOSTARS Europe, involves operators voluntarily joining a self-assessment quality grading scheme, that awards them a 'star rating', depending on how well they perform across a range of indicators, which include emissions standards, types of fuel, scheduling techniques, driver training and fuel efficiency. The project is an extension of a similar scheme, which has been trialled successfully by a consortium of South Yorkshire local authorities in partnership with TTR.

In November 2010 funding from 'European Intelligent Energy Europe' was approved for the ECOSTARS project. The project will run from 2011 to 2014 and will provide a relatively low-cost, 'partnership' mechanism to assist the Council encourage and facilitate emissions improvements from the road freight sector operating in the city.

The project's inception meeting took place in Edinburgh in June 2011 and ambitious targets have been set for the number of vehicles required to become part of the scheme:

Year 1: 3000 vehicles
Year 2: 4000 vehicles
Year 3: 4000 vehicles

These targets are for vehicles operating in and through the City of Edinburgh Council's area; they are not limited to those which are based within the city.

The ECOSTARS concept can also be extended to other commercial road vehicle sectors e.g. Public service buses, coaches and Light Goods Vehicles (LGVs).

Formal launch of the project with vehicle operators is scheduled for January 2012. Contact is now being made with key freight operators and their representatives including FTA and RHA. Members are already being recruited.

Council's own fleet

It is the Council's intention to ensure that its fleet is as 'clean' as possible. All Pre- Euro 1, Euro 1 and Euro 2 vehicles have now been removed from the Council's fleet and Euro 3 forms a very small percentage (8%). Tables 8.6a and 8.6b.

Table 8.6a City of Edinburgh Council Fleet (2003)

Euro	Council Fleet	%
Pre Euro I	12	1
Euro I	96	12
Euro 2	374	45
Euro 3	338	41
Euro 4	12	2
Total	**892**	**100**

Table 8.6b City of Edinburgh Council Fleet (2011)

Euro	Council Fleet	Hire	Total	%
Euro 3	78		78	8.4
Euro 4	503	124	627	67.2
Euro 5	101	126	227	24.3
Electric	1		1	0.1
Grand Total	**683**	**250**	**933**	**100**

The Council has been successful in obtaining funding from the Scottish Government with respect to the Low Carbon Vehicle Procurement Support Scheme. This was a joint venture with NHS Lothian, Fire and Rescue Service and Lothian and Borders Police and has provided support towards the purchase of 2 hybrid vans, a hybrid mini bus and 4 electric cars, as well as the installation of 6 electric vehicle charging points.

Under phase 2 of this scheme the Council has applied for the following electric vehicles I2 cars, 10 vans and 2 small road sweepers, plus 8 electric vehicle charging points.

Traffic Management /Scoot

Spilt Cycle Offset Optimisation Technique (SCOOT) Systems are automatically responsive to traffic flow and demand, and therefore help to ease congestion by effective control over traffic signals. SCOOT is in place on a number of road networks in the city. Unfortunately, a backlog of loop repairs and validation requirements has prevented the full operational benefits in some areas of the City. Also, construction work associated with the Tram project has meant that a number of areas are no longer running SCOOT, and these may be controlled differently once Edinburgh Tram is running.

Loop repairs have been carried out on the Bridges, Causewayside/ Dalkeith Road and St Johns Road (AQMA).

Current status of SCOOT Systems for Edinburgh is shown in Table 8.7.

The Council is now formalising a loop cutting contract to make it more straightforward and cost effective to arrange repairs and installation in the future.

It is anticipated that SCOOT will be fully operational by March 2012 at St Johns Road and that priority will be given to loops being repaired on Gorgie Road (from Robertson Avenue to Chesser Avenue). SCOOT deployment as detailed in Table 8.7 will be subject to funding availability.

Scottish Funding was previously provided to trial 'Motes' deployment at St Johns Road. The system provides instant qualitative real-time NO_2 data, which can be linked to SCOOT and therefore will enable traffic signalling to be governed with respect to ambient concentrations of NO_2.

This trial will involve the co- location of a Motes system with the automatic monitoring unit at St Johns Road, to determine agreement with ambient air quality data and set a base concentration to initiate signalling changes.

The project has now been delayed until a study currently being undertaken in Medway Kent has been completed and evaluated.

Table 8.7 Current status of SCOOT Systems within Edinburgh

SCOOT Status CEC	Areas	In AQMA or area of current concern
Fully operational (loops all functional)	Causewayside, Dalkeith Road	N
Running in part, loops functional but revalidation needed	Bridges, St John's Road	Y
Loops needing to be repaired, validation not required	Lothian Road, Gorgie Road, Slateford/ Shandon, Ardmillan, Queensferry Road, New Town, Ferry Road, London Road	Y
Loops and validation needed	Roseburn, Slateford near Union Canal, Bristo Triangle	Y
Never been installed	High St and Mound, Telford Rd, Queensferry St, Morningside, St Mary's St, Stockbridge, Polwarth	N
Unlikely to be installed due to tram receiving priority	Queen Street, Princes Street, Haymarket, Leith Walk, Leith, St Andrew Square	Y

Park and Ride

Edinburgh is served by a number of Park and Ride Sites. The current status is shown in Table 8.8.

Table 8.8 Park and Ride Sites serving Edinburgh and Number of Car Parking Spaces

Park and Ride Site.	Number of Car Parking Spaces.
Wallyford, East Lothian.	321
Hermiston	470
Sheriffhall, Midlothian.	561
Newcraighall	565
Straiton	600
Ingliston	1030
Ferrytoll, Fife.	1040
Total:	**4587**

The number of car parking spaces provided has the potential to reduce the 'daily work commuter' car vehicle journeys into the city by 9174 vehicles if operated at maximum capacity.

The usage of each Park and Ride site is variable. Figures obtained from Ferrytoll have shown steady increases in daily occupancy from 530 spaces in 2007 to 730 in 2010. Recent figures for 2011 show that the site is approaching capacity. Hermiston is also close to reaching capacity. The usage at Ingliston is currently approximately 56%, but this is after expansion and there is evidence that the additional spaces will be required in the future.

In September 2009, the Transport, Infrastructure and Environment Committee approved a report recommending further capacity for Park and Ride sites at Hermiston (400 spaces) and Sheriffhall (600 spaces).

Promotion of Walking, Cycling and Safe Routes to School

The LTS contains numerous cycling and walking policies to encourage these modes of travel.

The Council is in the process of implementing an Active Travel Action Plan (ATAP), which aims to deliver significant increases in the numbers of pedestrians and cyclists travelling within Edinburgh. The ATAP sets targets of 35% for walking and 10% for cycling for all trips by 2020. A core element of the plan is the development of a 'Family Network' of cycle routes that will enable people to travel around the city on safe routes away from the busier roads.

The Council has also secured European funding for a project, 'Managing Energy Reduction through Cycling e**X**cellence (MERCX). This project will help fund cycling promotion through marketing and promotional activities which will include development and distribution of publicity materials, planning and delivery of work place initiatives. This project commenced on 1 October 2011 and will run for three years. The lead partner is Traject Mobility Management, Ghent, Belgium.

Electric vehicle / Plugged in places

The United Kingdom Office for Low Emission Vehicles (OLEV) has funding available for the second wave of its 'Plugged in Places' programme, which part funds electric vehicle infra structure. The Council is a member of the Central Scotland Plugged in Places Project consortium, led by Transport Scotland. Together with OLEV, Transport Scotland will fund the majority of the cost of acquiring and installing up to 375 electric vehicle charging points across Central Scotland during 2011/12 and 2012/13 financial years. Transport Scotland anticipates that funding will be available to provide up to 50 charging points in Edinburgh. This is additional to the bid for 10 publicly accessible charging facilities in 2010/11.

City of Edinburgh Council has recently reviewed its policy on Parking Standards. The Policy now states, that developers should consider provisions to encourage electric vehicle charging infrastructure throughout all types of development.

The installation of infrastructure for charging electric vehicles is currently being encouraged via the inclusion of an informative on planning consents, rather than use of Section 75 Legal Agreements or use of planning conditions. It is recognised that this position is weak and it is the Council's intention to review the current approach.

Telematic Trial

Scottish Government funding was provided during 2010/2011 for the Council to undertake a Telematics Trial. The trial will be managed by the company Cybit on behalf of the Council.

The aim of Telematics is to reduce fuel consumption through more efficient driving, better route planning and improved utilisation of vehicles.

Fifteen vehicles from the Council fleet which operate within the AQMAs of the city have been selected for this trial. The system will run for three months with little intervention to provide a base case. Eco driving instruction will then be given to the vehicle drivers.

All the data will be recorded from the vehicle as it moves, giving live feedback to a web based system. The Council will receive weekly reports on drivers/teams performance.

A report will be submitted to the Scottish Government following completion of the study.

Differential Residential Car Parking Permits

In October 2010, the Council implemented the 'Park Green' scheme; this is a banding system for residential parking permits with fees based on CO_2 emissions of a resident's vehicle (or engine size for vehicles registered prior to March 2001). The scheme aims to encourage those living in residential parking zones to buy and run lower emission vehicles.

Controlled Parking Zones

The boundary of the city centre Controlled Parking Zone (CPZ) was extended in 2006-2007. By allocating a proportion of on-road parking to residents, CPZ's effectively discourage car commuting into the city centre and neighbouring areas. An alternative form of CPZ, a Priority Parking Zone (PPZ) is being trialled in the south central area of the city. This is expected to have a positive influence on the number of commuters travelling in by car as operational times of PPZs will be set during peak travel periods. This trial will be reviewed after a year when outcomes will be assessed and reported. Introduction of new CPZs or PPZs and extensions will be kept under review by City Development (Transport).

Biomass interim Planning Policy

The Council's Interim Planning Policy on Biomass has discouraged the installation of many commercial units within the city. The current continuation of this policy is crucial in the absence of appropriate abatement technology and failure to comply with Air Quality Objectives in the city.

Smoke Control Areas

Although Smoke Control Orders cover the entire Edinburgh city area, it has become apparent that more residents are burning coal and wood in open fires. The Council has adopted a pro-active approach to address this issue and each year at the end of the summer Edinburgh runs a campaign to draw attention to the air quality impacts and legal requirements under the Clean Air Act.

A summary of measures and Action Plan progress is shown in Table 8.9.

Table 8.9 Action Plan Progress

No.	Measure	Focus	Lead authority	Planning phase	Implemen-tation phase	Indicator	Target annual emission reduction in the AQMA	Progress to date	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
1	Manage bus emissions	Reduce Emissions by a Voluntary Partnership	CEC/ SFC	2009 2011	2011 to 2014	Euro 4 by 2012 Euro 5 by 2015 No formal agreement has been reached Bus Companies considered it too onerous in the absence of financial support	**Central** 59% NOx **St Johns** 48% NOx **Gt Junct** 61% NOx Target year **2015** (TTR study**)**	TTR study completed	Lothian bus Euro 2 (1%) Euro 3 (43%) Euro 4 (13%) Euro 5 (23%) Euro 5/6(20%) First Scotland (East) Euro 1 (7%) Euro 2 (45%) Euro 3 (35%) Euro 4 (10%) Euro 5 (3%)		Further improvement will require additional financial funding
1a	Manage bus emissions and potentially emissions from other vehicle classes	Reduce emissions via implementation of a LEZ	CEC SFC/ transport	2010 - 2011	Will depend on outcome from consultation & political will of CEC	Euro 5 by 2015	Not calculated Work will be included as part of consultation exercise. **Note** Largest reduction in bus NOx emissions as indentified in LES city-wide study would be via mandatory scheme.	Instruction from Committee members for CEC to consult with stake holders on the feasibilty of a LEZ. Funding secured for Consultation	Delayed due to re-evaluation of vehicle emission factors and publication of Defras Guidance advising LAs on implementation of LEZs .Agreed with Scottish Government		Revised study on buses within AQMAs showed that significant NOx reductions could be achieved with buses operating at Euro 5. The LEZ will look at other vehicles in fleet

No.	Measure	Focus	Lead authority	Planning phase	Implemen-tation phase	Indicator	Target annual emission reduction in the AQMA	Progress to date	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
2a	Manage Road freight emissions	Reduce emissions via Establishing a Freight Quality Partnership in the city.	SEStran	On going	On going	Euro 5	Not calculated		Air Quality Freight Sub group has been formed.	On going	A regional Freight Quality Partnership has been established by the South East of Scotland Regional Transport Partnership (SEStran) actions and progress will be monitored and reported on via CAQWG
2a	Manage Road Freight Emissions	ECOSTARS Europe Project Grading star rating scheme: Includes Emission Std Types of Fuel Driver training Fuel efficiency Scheduling techniques	CEC In conjunctio n with ttr	2011-2012	2011 on going	Number of Vehicles: Yr 1 3000 Yr 2 4000 Yr 3 4000	Not calculated	Contact made with FTA and RHA	EU Funding approved Nov 2010 for Ecostars project Which will run from 2011 to 2014. This will provide a low cost 'partnership' to assist the CEC encourage and facilitate emission improvements from road freight	2014 (end)	
3	Council Fleet Cleaner Vehicles	Reduce emissions By ensuring high Euro vehicle Std replacement		2003	On going		Not calculated	Since 2003 all Pre-Euro1,Euro 1 and Euro2 removed from fleet Euro 3 small percentage	Current fleet Euro 3 8% Euro 4 67% Euro 5 24% Under low carbon vehicle procurement support	Ongoing	

No.	Measure	Focus	Lead authority	Planning phase	Implemen-tation phase	Indicator	Target annual emission reduction in the AQMA	Progress to date	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
									scheme Council has applied for 12 electric cars 10 vans 2 small road sweepers plus 8 electric charging points		
3a	Council Fleet Develop driver eco training/ Telematics Trial	Reduction in fuel usage seen as being beneficial to air quality	CEC/ SFC Corporate			Fuel reduction		Difficulties due to Alternative Business Model ABM process However, funding secured to trial telematics which will incorporate Eco Driving instruction	15 vehicles selected which operate through all AQMAs Base 3 months established without Intervention for 10 vehicles Eco driving instruction will proceed	2013	If successful may be installed on other vehicles Report to Scottish Government
4	LTS Park and Ride Sites Establishe d	Reduce emissions By easing congestion at peak times			Complet ed	Patronage rates	Not quantified NOTE Older buses were serving P&R now using Euro 3	Ferrytoll 1040 Ingliston 1030 Straiton 600 NewcraigHa 565 Sheriffhall 561	Hermiston and Ferrytoll approaching capacity TIE Committee Approved a report rec additional spaces for Hermiston 400 Sheriffhall 600	Further capacity for Hermiston & Sheriffhall Proposed Total 1000 new spaces	Using Euro 3 buses However, further improvement required

No.	Measure	Focus	Lead authority	Planning phase	Implemen-tation phase	Indicator	Target annual emission reduction in the AQMA	Progress to date	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
								Hermiston 470 Wallyford 321			
5	LTS Differential Parking	Carbon and LAQM pollutant	CEC Transport	2008	Oct 2010	Number of low carbon vehicles registered	Not quantified			ongoing	
6	LTS Tram	Reduce Emissions Zero at Source	CEC Transport	2008- 11	Issues with funding	Patronage	Not quantified		Line will now run from Edinburgh Airport to St Andrews Sq	2012	Not quantified Potential issues with bus displacement and congestion where tram and bus routes coincide
7	LTS New rail Line/stations	One of a package of measures to reduce traffic entering Edin Ardrie/ Bathgate Newcraighall	CEC Transport			Passenger numbers	Not quantified	Bathgate /Ardrie Newcraighall		Lines completed	Passenger growth recorded for all stations
8	LTS Cycle Initiatives	Model shift Reduce emissions via Active Travel plan and MERCX cycling promotion project	CEC Transport			Model shift All trips by 2020 35% walking 10% cycling	Not quantified	Development of cycle routes enable people to travel around the city on safe routes CEC secured EU funding for project MERCX		2014	

No.	Measure	Focus	Lead authority	Planning phase	Implemen-tation phase	Indicator	Target annual emission reduction in the AQMA	Progress to date	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
9	Traffic Management SCOOT MOTES					Reduce congestion	Not calculated				SCOOT systems to be repaired Further installation subject to funding MOTES trial on hold Until London trial has been evaluated
10	Develop City Centre traffic/land use model	This measure was pro active approach to address impact of cumulative development	CEC SFC			Control density of development/ and locate where impact of emissions minimum		Limited due to high capital & revenue cost in establishing city- wide land use and transport model with sufficient output resolution to enable meaningful AQ dispersion modelling.	None		Will continue to be considered

9 Conclusions and Proposed Actions

9.1 Conclusions from New Monitoring Data

Nitrogen dioxide

Nitrogen dioxide data for the year 2010 shows that the majority of monitoring locations within each of the AQMAs continue to exceed the air quality objectives. Therefore, the AQMAs remain valid.

A number of monitoring locations in 2010 which are outwith the current AQMAs also exceed the air quality objectives. These locations are, London Road, Easter Road, Queensferry Road, Bernard Street (Leith), Glasgow Road, Grassmarket, Cowgate, Hillhouse Road, Inverleith Row, Hope Park Terrace, Angle Park Terrace Slateford Road, Fountainbridge /Tollcross, Gorgie Road/Delhaig (Chesser).

Current (2010) data from all monitoring locations which fail to meet nitrogen dioxide objectives is summarised in Table 9.1

Potential exceedences of the pollutant nitrogen dioxide have been identified at Broughton Road, Ferry Road, Commercial Street, Salamander Street/Bath Street and Portobello High Street.

Passive diffusion tube monitoring locations established along Glasgow Road (A8) to fulfil Detailed Assessment work has shown that the exceedence is likely to be localised close to Newbridge/Ratho junction. An AQMA will be required for this area. The air quality monitoring station previously sited at Roseburn has been relocated close to Ratho on the Glasgow Road. It is anticipated that this station will be commissioned by December 2011.

Passive diffusion tube sites established on Queensferry Road and Maybury Road/ Barnton junction for Detailed Assessment met the objectives, except for two roadside locations (ID 62 and ID63) which were distance-corrected for relevant exposure. However, one of the adjacently located tubes positioned at the actual façade met the objective.

Queensferry Road monitoring station was commissioned towards the end of 2010. Provisional mean hourly data gathered from January 2011 to September 2011 at the roadside is showing a mean value of 43 $\mu g/m^3$. Therefore it is likely that the objectives will be met where there is relevant exposure and that an AQMA will not be required for this location. However, due to the discrepancy between the measured and calculated façade measurements further investigation of the two roadside sites described above will be pursued.

Table 9.1 Summary of locations where monitoring results (2010) exceed Nitrogen Dioxide Objectives

Site ID	Location	Within AQMA?	2010 (Data capture)
1b (pdt)	St Johns Rd	Y (St Johns Rd)	43.5 (92%)
1d (pdt)	St Johns Rd	Y (St Johns Rd)	58.8 (83%)
5 (automatic)	St Johns Rd	Y (St Johns Rd)	**71.0** (94%)
2 (pdt)	West Maitland St	Y (Central)	55.4 (100%)
3 (pdt)	Torphichen Pl	Y (Central)	55.6 (92%)
22 (pdt)	RoseburnSt/Terr	Y (Central)	43.2 (92%)
27 (pdt)	North Bridge S	Y (Central)	49.4 (83%)
5 (pdt)	Gorgie Rd	Y (Central)	42.9 (92%)
18 (pdt)	Gorgie Rd	Y (Central)	54.5 (100%)
4 (automatic)	Gorgie Rd	Y (Central)	41.0 (76%)
33 (pdt)	Queen St/Hanover	Y (Central)	56.3 (83%)
28 (pdt)	West Port	Y (Central)	51.0 (25%)
28b (pdt)	West Port	Y (Central)	**62.4** (75%)
28c (pdt)	West Port	Y (Central)	41.5 (83%)
28d (pdt)	West Port	Y (Central)	54.9 (58%)
49 (pdt)	Morrison St	Y (Central)	49.3 (100%)
74b (pdt)	George Street	Y (Central)	42.7 (83%)
74e (pdt)	George Street/Charlotte Sq	Y (Central)	42.6 (100%)
74f (pdt)	112 George St	Y (Central)	43.4 (100%)
30 (pdt)	Gt Junction St	Y (Gt Junction St)	41.8 (92%)
30c (pdt)	Gt Junction St	Y (Gt Junction St)	44.1 (92%)
45 (pdt)	Ferry Road	N	41.5 (83%)
25 (pdt)	Easter Rd	N	49.7 (100%)
46 (pdt)	London Rd	N	46.2 (100%)
66 (pdt)	London Rd /Regent Terr	N	40.5 (83%)
67 (pdt)	London Rd/Earlston Pl	N	51.3 (75%)
69 (pdt)	London Rd/Wolseley Pl	N	50.6 (83%)
70 (pdt)	London Rd/Wolseley Terr	N	46.1 (67%)
50 (pdt)	Queensferry Rd	N	50.5 (83%)
64 (pdt)	Queensferry Rd	N	47.5 (92%)
16 (pdt)	Glasgow Rd/Ratho	N	44.5 (92%)
58 (pdt)	Glasgow Rd/Newbridge	N	51.3 (83%)
29 (pdt)	Bernard Street (Leith)	N	43.7 (100%)
29a (pdt)	Bernard Street (Leith	N	44.6 (100%)
29c (pdt)	Bernard Street (Leith)	N	49.4 (100%)
37a (pdt)	Grassmarket	N	**60.0** (42%)
48 (pdt)	Cowgate	N	46.2 (50%)
40 (pdt)	Hillhouse Road	N	42.4 (92%)
76 (pdt)	Angle Park Terrace	N	52.9 (100%)
77 (pdt)	Slateford Rd	N	47.6 (92%)
79 (pdt)	Fountainbridge /Tollcross	N	42.0 (50%)
80 (pdt)	Gorgie Rd/Delhaig	N	47.4 (100%)

NOTE
Locations highlighted in blue are new sites
Less than 90% data capture is highlighted in blue
Concentrations highlighted in bold likely to fail 1- hour objective.(60µg/m^3 or greater)

Particles (PM_{10})

PM_{10} data for 2010 from all monitoring locations met the EU limit values and UK Air Quality Objectives. The background site at St Leonards and roadside location at Roseburn met the tighter Scottish Air Quality Objectives. However, Queen Street is borderline for achieving the annual mean objective (18µg/m3) and Salamander Street fails both the annual mean and permitted number of daily exceedences. It is likely that fugitive emission sources from installations in the vicinity which are regulated by SEPA contribute to the exceedences as well as local traffic. Discussions with SEPA regarding PM_{10} speciation analysis have commenced.

Based on new and historical monitoring data the requirement to progress the city-wide Detailed Assessment remains valid.

Trend Data

NO_2

The average roadside trend of nitrogen dioxide within the AQMAs (2003 to 2010) using passive diffusion tubes is beginning to flatten thus showing no significant increase of the annual mean nitrogen dioxide concentrations. However, this has to be viewed with caution due to major disruption of traffic in the city centre throughout 2009.

NO_2 concentrations are increasing at the AURN (background site) St Leonards since the site was established in 2004. Data from the automatic monitoring sites at Queen Street and Gorgie Road also show a slight increase in concentrations, whilst Roseburn shows a marked decrease.

A significant improvement has been in the reduction in the number of hourly exceedences at St Johns Road from 166 in 2008 to 60 in 2010. This may be attributable to improvements in the emission standards of the bus fleet operating on St Johns Road. However, further analysis of local traffic flows is required to confirm the reasons.

PM_{10}

PM_{10} trends show decreasing concentrations at Roseburn (roadside) and the AURN (background) St Leonards and no change at Queen Street. However, trend assessment should be viewed with caution due to traffic disruption in the city centre and changes in the methodology for calculating PM_{10} gravimetric equivalence.

General Trends

It has proved difficult to formulate reliable assumptions on data trends for both NO_2 and PM_{10} due to disruptions to normal traffic flows, arising from construction works associated with Edinburgh Tram project. This will impact on normal traffic routes well beyond the city centre. It is anticipated further closure of Princes Street (September 2011 to February 2012) will effect 2011 annual data.

9.2 Conclusions relating to New Local Developments

The Council has raised a number of concerns regarding the proposal to build a 200(MWe) biomass power station (mainly combusting wood) at Leith Docks. The site will be in close proximity to a high-density residential area and adjacent to land which has been allocated for future residential development. It is also close to an existing area of poor air quality. Emissions of pollutants will arise from the combustion process, open storage of wood fuel and traffic movements associated with fuel deliveries and removal of waste.

A power plant of this scale, at this location, could present serious challenges for the regulation and control of emissions in order that Scottish Government air quality objectives are met. The planning decision regarding this installation will lie with the Scottish Government Ministers.

9.3 Other Conclusions

Air Quality Action Plan

Cleaner vehicles

Buses

Lothian Buses (main operator in Edinburgh) has improved the standard of their fleet this year with assisted funding provided by the Scottish Government. In total 54 vehicles which were previously Euro 2/3 standard have been retrofitted with SCRT technology to a Euro 5 standard. In addition 15 new hybrid diesel-electric double deck buses have been purchased with the help of £1 million support funding from the Scottish Government.

More than half of the main Lothian Bus fleet is now Euro 4 standard or higher.

Bus Emission Analysis Study in each AQMA

As expected the study concluded that implementation of the proposed Voluntary Partnership scenario gave a significant potential reduction in emissions of both NO_x and PM_{10} in all three AQMAs over and above the reduction that would occur in the base case (no intervention) scenario.

The greatest potential NO_X emission reductions with the proposed voluntary partnership from 2010 to 2015 would be at Great Junction Street (61%), followed by Central (59%) and St Johns Road (48%).

With respect to PM_{10}, the greatest potential emission reduction was observed within the central AQMA (94%), followed by St Johns Road (77%) and Great Junction Street (74%).

Freight

In November 2010 funding from ‘European Intelligent Energy Europe’ was approved for the ECOSTARS Europe project (Freight Recognition Scheme). The project will run from 2011 to 2014 and will provide a relatively low-cost, ‘partnership’ mechanism to assist the Council encourage and facilitate emissions improvements from the road freight sector operating in the city.

Challenging targets have been set for the number of vehicles required to become part of the scheme:

Year 1: 3000 vehicles
Year 2: 4000 vehicles
Year 3: 4000 vehicles

These targets are for vehicles operating in and through the city of Edinburgh Council‘s area; they are not limited to those which are based within the city.

Formal launch of the project with vehicle operators is scheduled for January 2012.

Due to the general lack of funding available to all sectors (and especially for non local authority owned vehicles), it is acknowledged that voluntary emission partnerships are not likely to deliver the level of improvement required.

Following an update report to the Council’s Transport Infrastructure and Environment Committee (September 2009) on progress with the Air Quality Action Plan, Members instructed Council staff to initiate consultation with Stake- Holders on the feasibility of a Low Emission Zone for the city. Although funding was secured for this work during 2010/2011 the consultation has been delayed until DEFRA has re evaluated the current Vehicle Emission Factors and the government guidance document for local authorities considering implementing LEZs has been completed.

Council Fleet

It is the Council’s intention to ensure that the average age of its fleet is as ‘clean’ as practicable. All Pre-Euro 1, Euro 1, Euro 2 have now been removed from the Council’s fleet and Euro 3 forms a very small percentage (8%). Most vehicles are Euro 4 or 5 standard.

Under the Low Carbon Vehicle Procurement Support Scheme 2010/11 the Council, NHS Lothian, Fire and Rescue Service and Lothian and Borders Police purchased, 2 hybrid vans, a hybrid mini bus and 4 electric cars and the installation of 6 electric charging points.

Under phase two of the scheme the Council has applied for I2 cars, 10 vans and 2 small road sweepers, plus 8 electric vehicle charging points.

Scottish Government funding was provided during 2010/2011 for the Council to undertake a telematics trail. Fifteen vehicles from the Council fleet which operate within the AQMAs have been selected to participate in this trial. A report will be submitted to the Scottish Government following completion of the study.

Planning applications

The majority of applications shown in Tables 4.1 to 4.5 have full or outline planning consent.

Given the general desire for continuing economic growth in the city and the wider region and the inevitable additional demand for all modes of transport that this will bring, a reversal of the currently deteriorating trend in local air quality will require the adoption of radical city-wide initiatives and interventions.

Local Transport Strategies

The current LTS has a number of policies which will help towards improving the city’s air quality. This strategy will be revised in keeping with the Transport (2030) Vision document. It is important that there is full Council consultation on each of the ‘vision outcomes’ to ensure that air quality from traffic sources will be adequately addressed.

In order to progress certain aspects of the Transport (2030) Vision document relating to traffic volume reductions, comprehensive counting and monitoring of traffic volumes will be essential.

Additional Monitoring not covered by LAQM

Monitoring data for pollutants that are not directly the responsibility of the Council under the LAQM regime have also been included in this report for completeness. These pollutants are measured at the AURN background site at St Leonards.

The 2010 monitoring results show that Ozone, PAH and $PM_{2.5}$ comply with their specified objectives.

9.4 Proposed Actions

Nitrogen dioxide Detailed Assessments

Detailed Assessments Work in progress;: Expected completion April 2012.

Additional monitoring commenced January 2011 at the following locations to support Detailed Assessment:

Inverleith Row.
Portobello High Street
Grassmarket (Will be included in Central AQMA extension)

New areas of nitrogen dioxide exceedences: Expected Detailed Assessment completion April 2013

Additional passive diffusion tube monitoring will be required to progress Detailed Assessment at the following locations:

Angle Park Terrace
Slateford Road
Fountainbridge/Tollcross
Hillhouse Road
Hope Park Terrace
Cowgate (Will be included in Central AQMA extension)

Sites will be selected and monitoring will commence at the start of January 2012.

Outstanding LAQM tasks:

Extension of boundaries for existing AQMAs : **Expected completion February 2012**

It will be necessary to extend the existing AQMAs (based on historical and current data) as detailed below:

Central AQMA
To include Easter Road to Albion Place,
London Road to Willowbrae Road,
Grassmarket/Cowgate
Gorgie Road/Delhaig/Chesser.

Great Junction Street (Leith) AQMA

To include Bernard Street.

The boundaries of the AQMA extensions will be subject to internal consultation.

The above extensions to the existing AQMAs can be undertaken without submitting a formal Detailed Assessment Report (personal communication Scottish Government).

New AQMA

A new AQMA will be required for the localised exceedences at the western end of Glasgow Road (A8) towards Newbridge and Ratho. It may be prudent to assess real time data gathered from the automatic monitoring station at Ratho (located to represent relevant exposure) prior to declaration. This will require further discussion with the Scottish Government.

Further Assessment; Expected completion 2012

Source Apportionment work for Easter Road, London Road, Gorgie Road and Bernard Street will commence during 2012 for the Further Assessment Report, following extension of the AQMA boundaries.

Source Apportionment will also be required for Glasgow Road in anticipation of declaration of a new AQMA.

Detailed Assessments requiring further investigation:

Queensferry Road: Expected completion March 2012

Investigation of passive diffusion tube roadside locations and assessment of NO_2 ratified real-time data (2011) from the automatic air quality station at Queensferry Road will be required in order to ascertain exceedence.

PM_{10} city-wide Detailed Assessment: Expected completion 2013

Unfortunately, this assessment has been delayed due to numerous faults with the FDMS instrument at the monitoring station located on Queensferry Road.

Submit Updating and Screening Assessment report 2012.

Revision of existing Action Plan

The Council's current Air Quality Action Plan will be revised and updated during 2012 to address:

Conclusions of recent source apportionment undertaken for Great Junction Street, St Johns Road. West Port; and the findings of future source apportionment work for London Road, Easter Road, Gorgie Road/Chesser, Bernard Street and Glasgow Road.

Extension of Central and Great Junction Street AQMA boundaries.

New AQMA at Glasgow Road/ Newbridge.

The Action Plan will also include the following:

Review of the licensed taxi fleet

LEZ development work.

Conclusions from TTR Bus Emission Study (2011)

10 References

1 City of Edinburgh Council: Detailed Assessment Report (Local Air Quality Management . Round 2 (2004).

2 Edinburgh Low Emissions Strategy – bus emissions analysis. Transport and Travel Research. March 2011.

3 Edinburgh Low Emission Strategy Feasibility Study. Transport and Travel Research. May 2007.

4 Air Quality Action Plan 2003.

5 City of Edinburgh Council: Review and Assessment of Air Quality Stage 4

6 City of Edinburgh Council: 2011 Further Assessment Report for the following AQMA declarations Great Junction Street ,St Johns Road and West Port (extension of Central AQMA).

7 2010 Air Quality Progress Report for City of Edinburgh Council.

8 Use of Biomass of 50MW(e) or less in Edinburgh: Planning Committee 30th September 2010.

Appendices

Appendix A: QA/QC Data

A1 Diffusion tube Bias adjustment factors

A2 Factor from local Co- location Studies.

A3 Discussion of Choice of Factor to Use.

A4 PM Monitoring Adjustment

A5 Short-term to long-term data adjustment (nitrogen dioxide)

A6 QA/QC of automatic monitoring

A7 QA/QC of diffusion tube monitoring.

Appendix B:

Raw Monthly passive diffusion tube data 2010

Appendix C:
Data used for trend analysis within AQMAs

Appendix D:
Reductions in NO_x and PM_{10} emissions (tonnes per year) in Edinburgh's AQMAs. (Travel and Transport Research Report 2011)

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

A1 Diffusion Tube Bias Adjustment Factors

Edinburgh Scientific Services supply and analyse the passive diffusion tubes. The tubes are made of acrylic and the laboratory uses 50% v/v Triethanolanine (TEA) in acetone for the adsorbent; the grids are dipped into this solution and allowed to dry before insertion into the tube. The tubes are exposed for 4 or 5 week periods in accordance with the recommended calander supplied by DEFRA. The method has remained unchanged during the monitoring periods.

The annual mean data from the co-location studies always show that passive diffusion samplers over read the real time analysers by average factors from 0.85 to 0.91. Table A1.

Table A1 Historical bias data used in previous reports

Site		2001	2002	2003	2004	2005	2006	2007	2008	2009
Queen St	R	0.91	0.91	0.91	0.90	0.84	0.83	0.85	0.81	0.83
Haymarket	R	0.93			0.88	0.93	0.91	0.92	0.87	
Leith Walk	R	0.89								
Currie	SB				0.91					
Gorgie	R					0.86		0.91	0.94	
Roseburn	R					0.92			0.91	0.82
St Johns Rd	K							0.93	0.86	0.92
MEAN		**0.91**	**0.91**	**0.91**	**0.89**	**0.89**	**0.87**	**0.90**	**0.88**	**0.86**

A2 Factors from Local Co-location Studies

The automatic monitoring stations which were considered for the co-location study during 2010 are shown in Table A2.

Gorgie Road had poor data capture for February and September and data was not gathered for the month of January.Therefore this automatic monitoring station was not used for the co-location study.

Table A2 Bias factors used for 2010 data

Site	Type	Analyser	Pdt mean	Pdt precision	DC Analyser	Period	Bias Adjust Factors
Queen St	Roadside	37	44	good	good	12	0.84
Roseburn	Roadside	30	35	good	good	12	0.85
Salamander St	Roadside	30	38	good	good	12	0.79
St Johns Rd	Kerbside	71	77	good	good	12	0.92
MEAN							**0.85**

A3 Discussion of Choice of Factor to Use

Edinburgh co-locates triplicate passive diffusion tubes on the sampler head cages of each air quality monitoring station. The analysis has been undertaken for a number of years using Edinburgh Scientific Services Laboratory and the preparation of tubes during this time has remained the same. Historical data shows that the annual mean bias factors range from 0.86 to 0.91. The passive diffusion tubes have always given higher concentrations than the real time analysers over an annual period. The mean national factor for 2009 which included Edinburgh's submitted data was 0.85, compared with Edinburgh's 0.86. The mean national factor for 2010 was 1.02. This was based on two co-location studies, one of which was for a period of 9 months. City of Edinburgh Council's Study is based on 4 co-location studies each was for the full 12 months and all studies showed overall good precision and good data capture for the analyser. Therefore the local study (City of Edinburgh Council) was considered to be more reliable.

A4 PM Monitoring Adjustment

The unadjusted 2010 TEOM data for Queen Street, Roseburn, Salamander Street and Currie was used in the VCM correction spread sheet provided by Kings College to provide a gravimetric equivalent concentration. The FDMS purge data over the same period was obtained from the following two AURN sites, St Leonards Edinburgh and Grangemouth . The latter location is approximately 25 miles from Edinburgh centre. Temperatures and pressures were obtained from the AURN at St Leonards.

TEOM data was also corrected to provide a gravimetric equivalent using Edinburgh's local gravimetric factor 1.14, which was derived from undertaking a co-location study with a partisol unit and TEOM instrument during 2004.[1]

A5 Short-term to Long-term Data adjustment (Nitrogen dioxide)

The monitoring location at Salamander Street was established in September 2009. This monitoring station was previously located at Haymarket Terrace. Data collection started on the 19 September 2009. The long-term sites selected for this calculation are within 50 miles of Edinburgh and classed as urban background and rural locations. The annual mean and period means have been calculated for 2009. The mean ratio which was used to calculate the estimated annual mean for Salamander Street was 0.761. The period means were calculated from 19.09.2009 to 31.12.2009. The annual means were for a full calander year January to December 2009. Data capture (DC) was considered to be within acceptable limits for both annual means and period means for each of the selected sites.

Site	Site Type	Annual Mean μgm^{-3}	Period Mean μgm^{-3}	Ratio
St Leonards	Urban backgrnd	24 (DC = 98%)	31.66 (DC = 99.2%)	0.758
Bush	Rural	7.2 (DC = 85%)	9.43 (DC = 99.4%)	0.763
			Average	0.761

Salamander Street monitoring data for the period 19.09.2009 to 31.12.2009 = 39 μgm^{-3}
Annual estimated mean 39 x 0.761 = 29.67 (30 μgm^{-3})

A6 QA/QC of Automatic Monitoring

Staff competence

Three officers are trained as local site operators in relation to the management of the DEFRA AURN National Network site and undertake the necessary calibrations and basic maintenance at all the Edinburgh automated sites.

Calibration procedures

The four ML 9841 B NO_x analysers perform an autocalibration each day with zero air and NO gas. Warning limits are set at +/- 5 % on the software program. (Queen Street, Roseburn, Salamander Street and St Johns Road).

All other sites including those listed above sites are visited fortnightly, apart from the National Network site AURN, which is visited monthly and manual calibration checks are carried out using certified NO gas at approximately 500ppb plus a zero check. All cylinders are replaced at 12 - 18 month intervals. NO cylinders are supplied by Air Liquide UK.

Servicing

All instruments are serviced and recalibrated every six months by the appropriate supplier
The service contracts include a support package for software and replacement parts, plus any necessary call outs to the sites.

The TEOM heads on the automatic PM_{10} units are cleaned monthly and filters are changed regularly (approximately every 2 weeks).
All visits to the monitoring stations, actions which are taken and activities adjacent to the site are recorded in the site log book.

Data validation and ratification

All data, including calibration data is scrutinised on a daily basis (Monday to Friday) by visual examination, to see if they contain unusual measurements. Any data which is considered to be suspicious i.e large spikes, is flagged to undergo further checks. Data sets which are considered to require further investigation are checked with respect to the following:
Assessment of calibration records for drift precision /accuracy of analyser

- Negative values ie during /after TEOM filter change
- Spikes generated by analysers.
- Time/date of manual calibration no out of service switch Mobile AQ unit
- Examination of data gathered from other sites to ascertain if high values are caused by pollution episodes.
- Assessment of local activity construction/ roadworks.
- Data capture rates distribution of missing or suspect data.

Data, which is considered erroneous, is deleted.

The monitoring station located at St Leonards since 2004, is part of the Automated Urban and Rural Network, (AURN). All AURN sites are subject to an independent audit and stringent QA/QC procedures which are undertaken by Casella Stanger and A.E.A Technology on behalf of DEFRA.

Since 2007 AEA on behalf of the Scottish Government has undertaken QC and QA of all monitoring data and data assessment at all locations except the monitoring station at Currie This is carried out to the same standard required by DEFRA at the AURN stations.

Details of manual calibration checks, precision and accuracy of instruments are available on request either in electronic or paper format.

A7 QA/QC of Diffusion Tube Monitoring

Three local site operators have been trained to fulfil the requirements associated with passive diffusion tube samplers. Passive diffusion tubes are supplied and analysed by Analytical and Scientific Services, City of Edinburgh Council. The laboratory is UKAS accredited for this task and participates in the Workshop Analysis Scheme for Proficiency (WASP) inter laboratory QC/QA.The laboratories performance was rated as being good over the monitoring periods 2007, 2008, 2009 and 2010.

NO_2 diffusion tube monitoring has been conducted in accordance with the quality requirements contained in the UK NO_2 Survey Instruction Manual for local/unitary authorities and Government Guidance Document LAQM.TG (09). The diffusion tubes are located at the kerbside within 1 metre of the edge of the kerb, roadside locations are greater than 1metre from the road edge or at the façade of residential property. The tubes are attached to sign posts/lampposts using plastic spacer holders at a height of 2.0m above ground level. All exposure times and dates are recorded and retained as paper documents. Copies of which are sent with the exposed diffusion tubes to the laboratory.

Three diffusion tubes from each monthly batch are used as blanks. These tubes are not exposed and are stored in the refridgerator during the exposure period. They are analysed along with the appropriate batch of exposed tubes. The purpose of blanks is to determine whether or not NO_2 contamination occurred during tube preparation.

All passive diffusion tube monitoring data shown in this report has been corrected for diffusion tube bias in accordance with LAQM TG (09). The monthly exposed passive diffusion tubes in Edinburgh over read real- time analysers by factors of 0.85 to 0.91.

Appendix B

Raw Passive Diffusion Tube Data 2010

Note:
Data highlighted in red was excluded from the annual set, due to either very low concentrations or extremly high values that are not in keeping with the monitoring location or related to pollution episodes.

2010	1D	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	MEAN	corr
St Johns Rd	1	M	63.6	53.5	M	M	62.9	42.3	51.8	56.7	48.8	57.6	56.9	**54.9**	
St Johns Rd	1b	M	71.3	69	52	50.5	58.8	41.7	44.1	28.7	52.2	63.7	31.2	**51.2**	
St Johns Rd Dup	1d	M	69.4	93.1	65.9	69.5	59.6	M	30	67	66.9	63.7	50.9	**63.6**	**67.3**
St Johns Rd Dup	1d	M	66.6	91.5	65.2	62.3	67.1	M	61.7	68.2	67.6	78.7	80	**71**	
West Maitland St	2	M	73.5	103.2	84.2	75.6	87.6	78.3	88	83.3	85.2	85.4	114.6	**87.2**	
West Maitland St	2	64.8	59.8	105.8	81.1	78.3	91.6	67.4	85.2	90.9	91.3	98.9	109.7	**85.4**	
Torphichen Pl	3	69.5	79.3	84.3	69	63.9	63.1	66.4	75.2	65.7	77.7	M	114.1	**75.3**	
Calder Rd	4	48.9	65.6	60.6	46.8	41.8	49.5	38.2	39.9	45.5	50.4	48.1	67.7	**50.3**	
Murieston Rd	5	84.4	79.7	78.7	67.8	49.3	56.2	59.2	<1	61.5	69.7	78.8	92.5	**70.7**	
Commercial St	7	52.8	M	53.3	22	36.6	32.7	27.7	37.2	37	40.9	46.5	55.1	**40.2**	
Morningside	8	45.3	58.2	43.7	38.7	32.2	32.1	26	27.9	38.2	M	M	55.9	**39.8**	
Commercial St	9	M	61.2	48.2	48.3	44.3	24.7	71.4	40.9	41.5	36.1	M	M	**46.3**	**43.2**
Commercial St/Portland Pl	9a	64.2	51.3	M	44.8	48.1	43.8	49.4	54.3	48.6	54.2	61	69.2	**53.5**	
Ocean Drive	9b	M	42.5	40.8	38.7	M	M	26.7	39.6	32.8	35.4	41.5	51	**38.8**	
Home St	10	38.8	54.4	46.1	45.6	37.9	41.8	32.7	33.2	44	41.4	42.4	56.3	**42.9**	
Lanark Rd	11	47.1	43.9	31.1	32.7	29.1	25.2	22.4	23.9	25.2	29.1	39.8	50.7	**33.4**	
Pier Place	12	49.8	51.6	44.9	39.9	23	27.7	24	31.7	32.5	36	M	M	**36.1**	
Deanhaugh St	13	46.3	59.9	55.7	43.3	M	31.8	26.7	36.3	39.4	<1	47.7	55.2	**44.2**	
Trinity Cres	14	44.7	45.4	44.2	35.9	32	29.4	25	31.5	25.8	41.9	M	53.5	**37.2**	
Newbridge/Glasgow Rd	15	65.7	52.8	62.2	<1	94.7	41.8	45.3	45.7	48	56	60.6	59.8	**57.5**	**53.8**
Newbridge/Glasgow Rd	16	M	88.7	51.8	58	69.6	55.9	50.8	57	63.4	61.7	73.1	78.9	**64.4**	
Gorgie Rd	18	61.3	71.6	74.6	61.3	45.9	52.8	46.1	<1	60.7	51	73.4	84.6	**62.1**	
Gorgie Rd	18	66.9	88.1	63.8	67.9	61.4	54.9	46.6	57.5	69.5	59.8	76.6	80.4	**66.1**	
Baileyfield Rd	19	49.2	42.4	M	80.1	26.9	M	18.1	30	26	9.8	41.3	49.3	**37.3**	**35.4**
MacDonald Rd/Leith Wlk	20	M	63.3	62.9	51	38.7	M	41.4	M	51.5	47.8	60.6	77.2	**54.9**	
Brunswick Rd/Leith Wlk	21	M	M	M	47.6	M	38.3	38.6	44.8	M	53.8	49.9	62.5	**47.9**	
Roseburn	23	58.2	86.3	74.3	62.5	60.2	70.1	M	89.1	62.8	56.1	73.3	60.3	**68.5**	
Princes St	24	89.1	81.8	111	86.1	72	83.4	80.3	84.2	71.6	80.6	87	103.6	**85.9**	
Princes St	47	63.3	58.6	59.8	55.1	43.6	56.2	46.3	51.3	50.6	50.8	68	67.4	**55.9**	
Easter Rd	25	67.5	71.4	63.5	54.1	47	55.6	48	45.7	49.9	59	58.7	66.9	**57.3**	
Easter Rd	25	70.6	81.3	62.5	60.2	56.7	56	55.1	49.4	48.5	55.3	60.1	M	**59.6**	
Easter Rd	25b	62.9	56.4	M	42.3	41.5	38.9	37.1	37.8	37.6	49.1	45.3	57.2	**46.0**	
Easter Rd	25c	50.1	47	57.8	48.1	33.6	31.7	34.9	39.5	36.8	43.1	44.8	65.2	**44.4**	

Easter Rd	**25d**	52.1	53.3	51.4	41.2	M	33.4	30	34	33.5	44.7	51.3	55.5	**43.7**	
Easter Rd	**25e**	47.3	52.5	44.3	41.1	36.6	33.8	29.3	29	32	40.6	43	52.5	**40.2**	
Easter Rd	**25f**	M	50.7	40.5	35.5	32.5	27.8	M	27.6	33.3	39.2	M	56.9	**38.2**	
Easter Rd	**25g**	43.3	45.4	43.6	36.3	25.3	28.7	M	26.1	28.7	37.4	41.3	M	**35.6**	
North Bridge (South bound)	**27**	58	21	69	73.3	53.7	63.8	48.1	7.3	60.7	M	65.7	68.8	**53.6**	**58.1**
West Port	**28**	M	M	55.3	63.7	M	M	M	M	50.8	M	M	66.3	**59.0**	
West Port	**28**	M	M	63.7	57.6	M	M	M	M	10	M	M	61.4	**48.2**	**60.9**
Bernard St/Leith	**29**	56.8	45.3	81.7	41.3	46.4	42.5	42.6	51.3	42.8	45.4	63.4	57.1	**51.4**	
Bernard St/Leith	**29a**	53.0	61.6	59.6	48.2	53	49.1	36.1	50.2	53.2	51.1	59.2	55.8	**52.5**	
Bernard St/Leith	**29b**	49	50.1	43.1	48.1	39.7	27.3	32.7	50.4	43.5	40.5	45.9	50.5	**43.4**	
Bernard St/Leith	**29c**	66.2	60	66.8	53.7	48.2	49.9	48.5	1.6	120.3	59.2	73.2	54.9	**58.5**	**58.1**
Gt Junction St	**30**	53.3	M	57.2	56	M	50.4	32.3	40.3	44.4	45.7	56.9	49	**48.6**	
Gt Junction St	**30**	52.6	59.9	57.8	53.6	M	48.7	35.5	38.7	52.5	44.8	49.2	53.7	**49.7**	
Dalkeith Rd	**31**	47.7	80.1	41.9	45.8	34	41.5	30.3	30.8	34.5	40.7	43.4	41.3	**42.7**	**39.3**
Niddre Mains Rd	**32**	46.6	43	49.8	M	M	M	33.2	41.3	36.3	45.4	56.9	57.5	**45.6**	
Broughton Rd	**43**	51.5	55.5	51.2	51	38.1	42	36.3	35.8	41.7	47.4	58.7	52.3	**46.8**	
Queen St	**33**	66.3	71.1	80.4	<1.1	102.7	66.8	54.4	68.3	60.8	62.9	76.9	60.6	**70.1**	**66.9**
Queen St	**33**	71.4	85.5	61.5	<1	105.5	66.8	57.7	60.5	52.2	58.9	83.7	56.5	**69.1**	**65.5**
India St	**34**	40.3	37.2	22.1	28.3	16.6	11.9	16.6	20.8	21.6	30.2	40.5	50	**28.0**	
Dundas St	**35**	M	48.5	54.9	41.6	30.6	30.5	29.4	38.5	31.8	41.9	58.2	54.8	**41.9**	
York Place	**36**	M	M	M	58	45.3	48.1	38.5	42.6	39.9	42.9	62	58.6	**48.4**	
Broughton St	**44**	M	M	38	46.3	33	39.1	29	39.2	36.2	40.3	57.5	55.9	**41.5**	
Melville Drive	**38**	29.2	41.8	36.4	M	33.8	M	27	38.2	31.1	32.9	55.4	68.8	**39.5**	
Grass Market	**37**	58.7	63.2	61.5	M	37	M	M	44.4	39.2	45.1	M	M	**49.9**	
Ferry Rd	**45**	58.3	48.3	53.6	48.1	M	42.9	34.8	38.4	43.1	M	57.7	61.9	**48.7**	
Ferry Rd	**45a**	64	4.3	54.3	40.6	37.2	32.5	33.8	38.5	35.1	M	M	50.4	**39.1**	**42.9**
Ferry Rd	**45b**	58.1	40.3	42.4	41.8	30	34.4	27.6	32	36	35	43	52.2	**39.4**	
Ferry Rd	**45d**	M	48.1	54.4	43.4	M	34.4	42.6	M	39.5	M	45	53	**45.1**	
Gt Junction St	**43**	54.9	51.9	48.9	44.5	35.8	M	39.1	46	38.9	45.2	54.3	56.8	**46.9**	
Gt Junction St	**30b**	51.3	72.4	53.3	60.8	50.6	52.6	36.8	44	48.2	43.8	M	56.8	**51.9**	
Gt Junction St	**30c**	46.6	61.9	52.6	38.8	45.6	44.6	M	43.4	43.8	40.1	49.6	49.1	**46.9**	
Gt Junction St	**30d**	51.4	54.3	53	50	42.8	36.9	33.4	40.4	34.3	46.4	50.2	52.5	**45.5**	
West Port	**28b**	66.9	84.8	M	77.4	69	62.9	<1.0	131.1	59.2	78	67.8	94.6	**79.2**	**73.4**
West Port	**28c**	46.6	M	59.3	45.7	46.8	45.5	39.4	54.7	43.8	M	50.1	56.1	**48.8**	
West Port	**28d**	M	67.4	82	64.5	48.1	58	61.7	M	1.3	108.3	M	70.8	**62.5**	**64.6**

Grassmarket	**37a**	163.9	155.4	58.2	M	62.3	73.4	70.1	M	89	M	<1	107.5	**97.5**	**70.6**
Cowgate	**48**	M	59.5	50.9	M	43.6	40.7	M	M	M	M	58.8	73.1	**54.4**	
Cowgate	**48a**	46.9	M	48.9	42.3	38.4	42.6	33.8	M	43.6	48	50.2	48.3	**44.3**	
London Rd	**46**	53.1	69.6	47.4	54.8	51.3	50.8	41.1	51.9	48.5	52.7	56	75.5	**54.4**	
Morrison Street	**49**	58.5	68.8	63.5	69.3	50.5	75.6	54.9	59.3	63.4	61.7	62.2	81.1	**64.1**	
Quferry/Barnton	**50**	110	85.1	80.2	85.7	74.8	93.7	72.8	110.1	<1.0	M	117	101.2	**93.1**	
Whitehouse Road	**50a**	55.7	47.4	41.1	M	33.1	28.4	32.3	35.5	38	39.9	42.4	48.7	**40.2**	
Salamander St/ Place	**51a**	43.5	43.4	35.7	30.2	27	24.1	19.7	28.8	25	28.2	M	M	**30.6**	
29b Salamander St/Bath Rd	**51b**	50.7	51.5	46.2	51.3	47	51.9	33.6	49.7	40.6	41	47	58.6	**47.4**	
10 Salamander St/Baltic St	**51c**	61.1	44.6	43.5	42.1	36.2	28.5	36.8	40.3	30.3	48.4	46.6	52.9	**42.6**	
268 Ferry Road	**52**	61.9	54.8	54.5	49.6	41.6	M	28.3	38.7	37	49.7	1.2	116	**48.5**	**46.2**
6 Bowhill Terrace/Ferry Rd	**53**	49.6	47	51.6	38.1	35.1	34.6	35.9	44.3	38.2	37.7	50.5	54.7	**43.1**	
Inverleith Gdns	**54**	59.7	53.8	61.8	53.2	26	49.4	M	M	50.4	51	55.6	55.2	**51.6**	
Inverleith Row	**55**	53.3	55.4	63.2	50.3	39.4	46.7	46.7	49.7	53.1	49.2	59	55.5	**51.8**	
Glasgow Rd 18-20	**56**	57.2	48.7	51.2	49.9	M	41.1	32.1	35.4	35.6	45.3	59.7	61.8	**47.1**	
Glasgow Rd GFC 11	**56a**	59	51.1	40.1	50.3	37.9	37.7	31.4	37.1	38.5	54.8	61.8	59.3	**46.6**	
Glasgow Rd GFC 75 (158)	**57**	71.2	55.7	58.5	58.3	48	50.5	49.9	47.7	47.8	50.5	59.4	60.8	**54.9**	
Glasgow Rd GFC 319	**58**	98.1	68.5	78.7	83.8	64.8	66.2	70.8	M	M	90.4	82.3	93.4	**79.7**	
Glasgow Rd GFC 319	**58**	77.8	71	75.9	72.4	69.1	66	69.7	M	M	70.4	80.9	80.1	**73.3**	
Telford Road	**59**	60.4	70	M	45.2	46.7	50	39.4	44	42.4	M	86.1	59.2	**54.3**	
Maybury Rd/Barnton junct	**60**	56	55.2	28.1	M	M	M	M	M	M	M	53.5	57.5	**50.1**	
Maybury Rd/Quferry Rd	**61**	52.7	50.3	38.1	37.5	29.8	38.1	33.5	40.6	41.4	50.7	57.5	57.2	**44.0**	
561Quferry Rd	**62**	40.3	35.3	29.6	27.1	28.8	24.6	20.9	24.4	29.9	24	40.3	35.5	**30.1**	
544Quferry Rd	**63**	47.4	36.7	36.9	33.4	27.4	25.6	28	28.5	31.5	34.3	39.7	45.9	**34.6**	
550 Quferry Rd	**64**	106.7	90.1	84.3	68.6	73.9	81.5	77.8	93.9	84.8	80.8	108.8	1.4	**79.4**	**86.5**
Hope Park Terrace/ solic	**17a**	51.9	53.4	56.7	54.8	50.9	54.1	35.4	46.2	47.7	45.4	52.3	63.9	**51.1**	
Hope Park Terrace/ solic	**17a**	50	70.1	51.4	60.6	50.4	42.3	39.2	49.4	1.7	68.8	53.2	66.2	**50.3**	**54.7**
London Rd/Regent Pl	**66**	54.7	47.9	55.8	46.9	43.6	38.9	38	55.3	48.5	M	47.7	M	**47.7**	
London Rd/Earlston Pl	**67**	67.8	59.4	63.7	56.2	59.3	61.9	M	1.4	78.7	48.1	57.1	69.7	**56.7**	**60.4**
Parsons Green Terr	**68**	48.9	M	52.7	44.8	34	35.3	35.1	37.7	35.8	35.7	52	61.5	**43.0**	
Wolseley Pl HBOS	**69**	63.3	M	M	49.7	28.7	44.3	25.6	58.1	90.4	77.6	82.7	74.9	**59.5**	
Wolseley Terr	**70**	M	M	62.3	51.4	43.2	41.4	43.8	M	88.7	41.8	60.8	M	**54.2**	
Portobello High St	**71**	51.4	47.5	60.6	50.1	M	25.6	33.4	M	35	40.7	56.2	60.1	**46.1**	
Seafield Rd East	**72**	53.7	53.9	47.2	M	39.2	44.4	36.9	37.9	41.2	36.8	47.6	58.1	**45.2**	
Portobello High St	**73**	44.4	M	26.5	37.4	29.7	25	20.5	27.8	26.7	32.3	M	M	**30.0**	

75 George St HBOS K	**74A**	50.1	52.7	60.4	58.4	57.5	50	M	M	57.1	M	59.9	65.8	**56.9**
107 George St F	**74B**	51.4	52.4	60.8	55.4	49	49.8	M	45.4	42.4	40.6	55	M	**50.2**
41 George St K	**74C**	55.5	58.2	65.9	56.5	47.2	60.4	45.4	58.2	50.9	M	66.1	84.3	**59.0**
20 George St K	**74D**	56.9	M	74.5	54.9	51.9	53.9	M	44.4	54	59.5	52.9	78.3	**58.1**
George St Charlotte Sq	**74E**	86.5	60.9	80.4	63.6	61.3	69.2	69.6	59.2	59.8	71.6	69.3	74.1	**68.8**
112 George St F	**74F**	64.9	50.5	59.1	50.7	45.2	46	44	40.6	34.1	52.8	59.6	66	**51.1**
St Colme St*	**75A**	62.9	55.5	58.1	49.1	38.5	56.6	M	59.3	52.9	56.1	57.9	64.6	**55.6**
Gt Stuart St	**75B**	71	51.9	51.4	46.1	31	38.3	34.5	55	41.9	42	55.6	61.8	**48.4**
Angle Park Terrace	**76**	58.1	68.1	67.2	62.3	54.8	60.7	41.8	54.5	64.2	60.6	72.6	81.9	**62.2**
Slateford Road (97)	**77**	56	67.9	66.1	39.9	50	52.4	M	44.7	56	56.5	52.7	73.4	**56.0**
Slateford Road Maltings	**78**	42.3	51	45.9	M	29	34.1	23.8	M	M	42.1	47.4	64.2	**42.2**
Tollcross	**79**	M	70	M	M	M	40.6	42.4	40.6	48.1	55.4	M	M	**49.5**
Gorgie Road (Chesser)	**80**	61.7	71.5	65.1	58.9	44.2	48.6	41.1	45.1	55.3	55.5	52.3	70.4	**55.8**
St Johns Rd	**39**	M	56.6	62	54.4	31.2	38.9	34.9	45.3	42.7	40.7	55.6	74.9	**48.8**
Hillhouse Rd	**40**	M	60.1	59.5	43	42.7	53.2	38.1	40.9	46.6	44.8	54.3	65.3	**49.9**
Hillview Terrace	**41**	29.8	41.3	30.8	23.6	18.8	19	16.2	18	21.6	26.4	35.4	35.5	**26.4**
Midmar Dr	**42**	28	32.6	23.6	21.8	14.3	15.9	13.1	17.2	18	19	24.7	30.9	**21.6**

* Final calculation modified to take account of site location change.

Appendix C

Data used for trend analysis within AQMAs

	2003	2004	2005	2006	2007	2008	2009	2010
1 St Johns Rd	46	45	52	57	54	50	43	47
1b St Johns Rd		41	59	51	51	49	44	44
1d St Johns Rd		66	79	80	82	76	58	59
2 West Maitland St	78	77	85	96	104	97	57	73
3 Torphican Pl	63	72	87	77	87	67	65	64
18 Gorgie Rd	46	43	43	48	47	52	45	55
20 MacDonald Rd	41	42	43	45	47	64	44	47
23 Roseburn Terr	47	40	49	52	70	67	48	58
24 Princes St	84	85	84	87	93	79	46	73
27 North Bridge	58	54	49	52	56	52	48	49
33 Queen St	44	44	44	46	53	53	51	56
36 York Place	44	42	46	44	52	54	38	41
30 Gt Junction St	40	43	39	43	49	45	44	42
55 West Port				68	65	73	67	62
Mean	**54**	**53**	**58**	**60**	**65**	**63**	**50**	**55**

Appendix D

Reductions in NO_x and PM_{10} emissions (tonnes per year) in each AQMA

Figures 8.1 to 8.3 Reduction in NOx Emissions

Figures 8.4 to 8.6 Reduction in PM_{10} Emissions.

Fig 8.1 Reduction in NOx Emissions (tonnes per year) Central AQMA

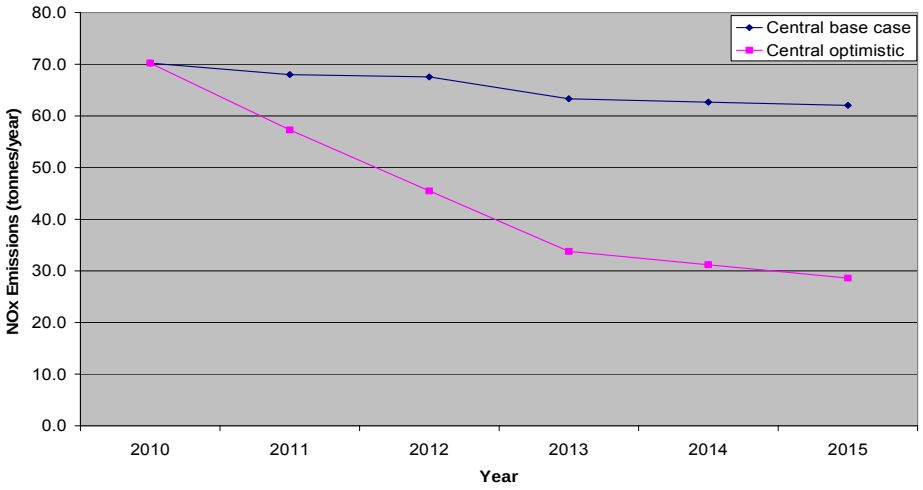

Fig 8.2 Reduction in NO_x Emissions (tonnes per year) St Johns Road AQMA

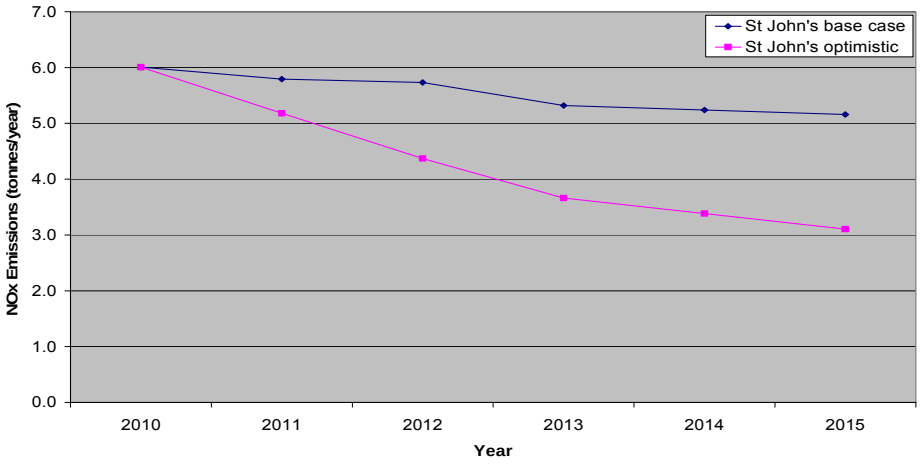

Fig 8.3 Reduction in NO_x Emissions (tonnes per year) Gt Junction St (Leith) AQMA

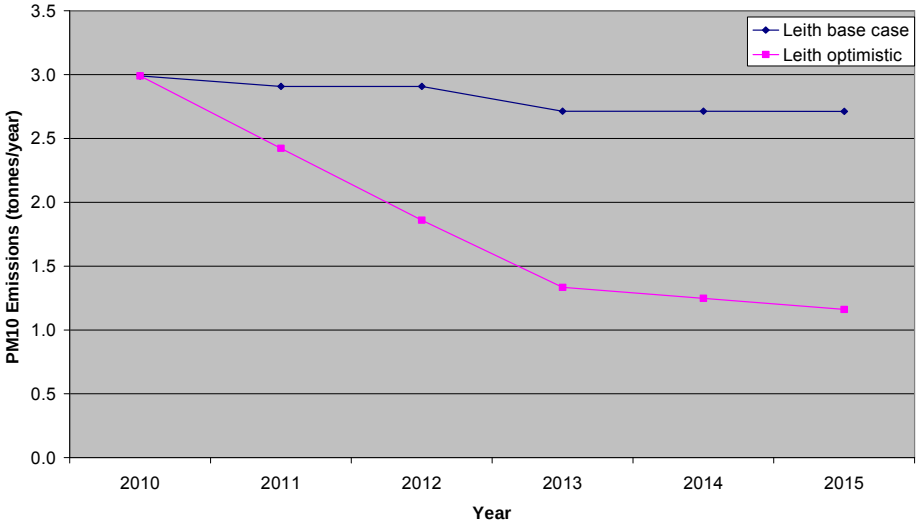

Fig 8.4 Reduction in PM_{10} Emissions (tonnes per year) Central AQMA

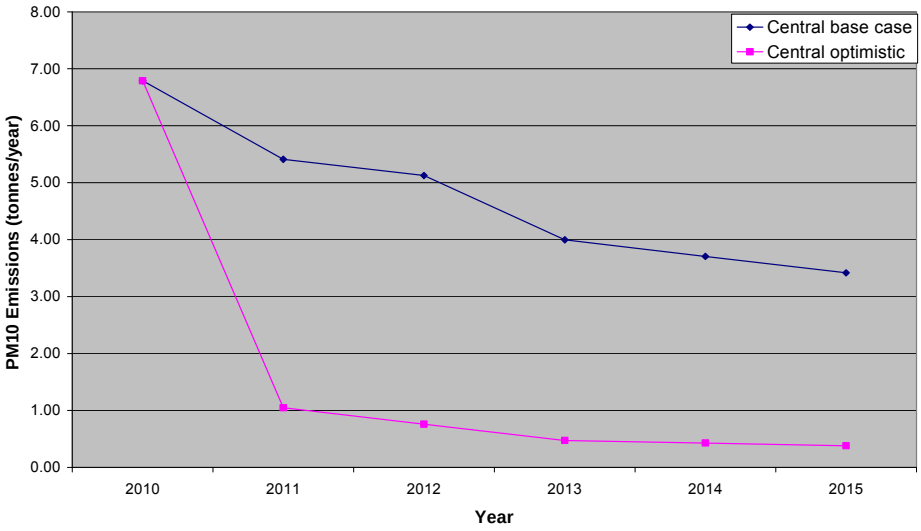

Fig 8.5 Reduction in PM_{10} Emissions (tonnes per year) St Johns Road AQMA

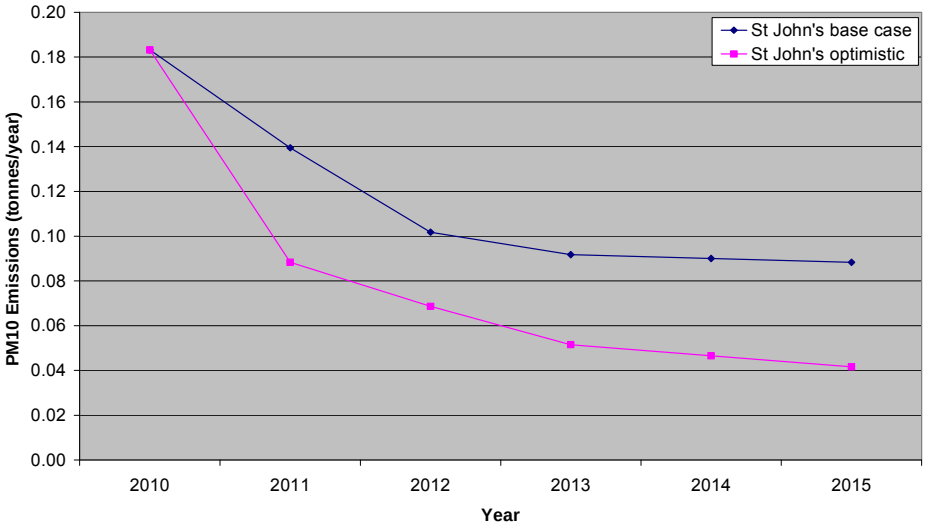

Fig 8.6 Reduction in PM_{10} Emissions (tonnes per year) Gt Junction St (Leith) AQMA