
RICARDO-AEA

# 2015 Updating and Screening Assessment for Fife Council

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

Report for Fife Council
July 2015

**Customer:**

**Fife Council.**

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# Executive Summary

This Updating and Screening Assessment has considered the following new monitoring data for calendar year 2014. During 2014, Fife Council undertook ambient monitoring using $NO_2$ tubes at 48 locations within Fife. When assessing the 2014 annual mean nitrogen dioxide concentrations (bias adjusted) against the Air Quality Strategy (AQS) annual mean objective of 40 ug $m^{-3}$, a marginal exceedence is evident at the following diffusion tube monitoring site:

- Appin Crescent 6 (A, B & C), Dunfermline (40.3 µg $m^{-3}$)

This marginal exceedence of the annual mean $NO_2$ objective was measured at one location within the Appin Crescent, Dunfermline Air Quality Management Area (AQMA). Fife Council's Air Quality Action Plan (AQAP) for Appin Crescent intends to address these exceedances through the implementation of appropriate measures.

$PM_{10}$ concentrations are measured at four locations in Fife at Bonnygate, Cupar; Appin Crescent, Dunfermline; Admiralty Road, Rosyth and St Clair Street, Kirkcaldy. Measured 2014 concentrations were below the $PM_{10}$ annual mean and daily mean objectives at all sites.

The review of all available data relating to carbon monoxide (CO), sulphur dioxide ($SO_2$) and benzene during 2014 indicates that it is unlikely that any AQS objectives relating to these pollutants were exceeded during 2014. In particular, the review of benzene data in the vicinity of Little Raith Wind Farm show that the running annual mean benzene concentrations measured at Cowdenbeath (LR01), Lochgelly (LR02) and Little Raith Farm (LR03) monitoring locations are below the AQS Objective of 3.25 µg $m^{-3}$. In addition, the operation of the Little Raith Wind Farm does not appear to have increased benzene concentrations at any of the three test locations.

Lead (Pb) is not monitored within the Fife Council boundary and no new sources have been identified that are likely to result in an exceedence of the AQS objective for lead.

The review of all other local developments has not identified any locations where there may be a risk of the air quality objectives being exceeded and so no additional air quality assessment is recommended at this time.

There are currently two AQMAs for $NO_2$ and $PM_{10}$ located within the Fife Council boundary:

- Bonnygate, Cupar, declared in October 2008
- Appin Crescent, Dunfermline, declared in November 2011 for $NO_2$ and November 2012 for $PM_{10}$.

The Air Quality Action Plan (AQAP) for the Bonnygate, Cupar AQMA is now well established and has been successful in reducing both $NO_2$ and $PM_{10}$ concentrations within the Bonnygate. The reductions have principally been a result of the traffic signalling and road

layout improvements carried out during 2009. No exceedances of the $NO_2$ or $PM_{10}$ AQS objectives were measured within the Bonnygate AQMA during 2014.

The Air Quality Action Plan for Appin Crescent, Dunfermline was finalised in May 2013 and aims to reduce $NO_2$ and $PM_{10}$ concentrations within Appin Crescent. Initially an AQMA was declared in October 2011 for $NO_2$ only, however this was amended in August 2012 to include $PM_{10}$. In 2014 only 1 diffusion tube location in Appin Crescent was found to be marginally exceeding (40.3 µg $m^{-3}$) the annual mean objective. The annual mean $NO_2$ concentration at the automatic monitoring site in Appin Crescent was 27 µg $m^{-3}$.

$PM_{10}$ concentrations at the automatic monitor in Appin Crescent have decreased during 2014 to 15 µg $m^{-3}$, from 16 µg $m^{-3}$ in 2013. Using the Bonnygate AQAP as a template, it is hoped that the Appin Crescent AQAP will achieve similar improvements in air quality.

Reports on both AQMA areas were carried out at the start of 2015. A brief description of these reports is as follows:

The Cupar North Development Zone and Relief Road: Air Quality Modelling Assessment (2015) aimed to quantify the potential air quality impact within the Bonnygate AQMA of future traffic associated with the Cupar North development zone. The conclusions of the report are that, when compared with the future 2030 baseline, small improvements in $NO_2$ and $PM_{10}$ concentrations are predicted with the completed development and the relief road in place in 2030. The executive summary for this report can be found in Appendix I of this report.

Appin Crescent Traffic Management Options Appraisal (Phase 3) Air Quality Impact Assessment (2015) investigated the potential impact of traffic management scenarios which aim to improve traffic flow though Appin Crescent and hence reduce vehicle emissions and improve local air quality. Using modelling software and monitoring data, the report explains the predicted outcomes of these scenarios in Appin Crescent, Dunfermline. The report concludes that Test Option 1 (Optimisation of Holyrood Place / Appin Crescent signals (also linked to Sinclair Gardens roundabout ) does not appear to provide any air quality benefits and may lead to an increase in annual mean $NO_2$ concentrations. Test Options 2 (Reconfigure Appin Crescent / Garvock Hill mini roundabout to signalised junction (right turn storage allowed but runs opposed) and 3 (Removal of bus stops on Appin Crescent) will provide improvements in both $NO_2$ and $PM_{10}$ concentrations but neither of these options offer the opportunity to reduce concentrations of $NO_2$ and $PM_{10}$ on Appin Crescent to below the respective air quality objectives. Test Option 3 investigated the removal of the bus stops on Appin Crescent and the predicted changes in annual mean $NO_2$ and $PM_{10}$ concentrations can be found on maps in Appendix J. The report suggests that a cost-benefit analysis of this option may be beneficial as it could be relatively inexpensive to implement and will provide improvements in $NO_2$ and $PM_{10}$ concentrations. The executive summary for this report can be found in Appendix I, along with baseline maps for test Option 3 in Appendix J of this report. This cost-benefit analysis is to be produced in 2015-2016.

Additional work carried out by Fife Council to improve air quality in Fife has included the production of an Air Quality Strategy and a review and update of their Air Quality Action Plans for both Appin Crescent, Dunfermline and Bonnygate, Cupar.

The Air Quality Strategy For Fife 2015 – 2020 was developed from the guidance of the Scottish Government and aims not only to raise awareness of air quality issues but also to promote some of the existing best practice work that the Council has undertaken within existing AQMAs to other parts of Fife. It recognises that no one single authority or Council service can have all the solutions and consequently a collaborative approach with key partners and stakeholders is considered essential in order to bring about improvements in air quality.

Fife Council has a duty to keep their action plans up to date (LAQM.PG(S) 09). The obligation to keep air quality action plans up to date provides the opportunity for local authorities to periodically review the progress that has been made in implementing the air quality action plan and assess the significance of improvements in air quality that have been observed since the adoption of the plan. Furthermore, where appropriate, the review and update of the action plan provides the opportunity for the local authority to identify new or additional measures to help to work towards attainment of the air quality objectives. The updated Action plans have yet to be published and are still in the consultation stage. A summary of the proposed measures for both action plans are included within this report.

Following the review of all available 2014 data it is recommended that Fife Council carry out the following actions:

1. Submit the next Air Quality Progress Report in May 2016.
2. Maintain and enhance (where appropriate) the current monitoring programme.
3. Implement updated Action Plans for both Appin Crescent, Dunfermline and Bonnygate Cupar.
4. Investigate the potential for submitting a grant, which will allow Fife Council to survey biomass boilers within their local authority.

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# 1 Introduction

## 1.1 Description of Local Authority Area

Fife is an area in eastern Scotland bordered on the north by the Firth of Tay, on the east by the North Sea and the Firth of Forth to the south. The route to the west is partially blocked by the mass of the Ochil Hills. Almost all traffic into and out of Fife has to pass over one of four bridges, south on the Forth Road Bridge, west on the Kincardine and Clackmannanshire Bridges or north east via the Tay Road Bridge, the exception being traffic headed north on the M90.

The coast has some small harbours, industrial docks in Burntisland and Rosyth and also fishing villages of the East Neuk such as Anstruther and Pittenweem. The large area of flat land to the north of the Lomond Hills, through which the River Eden flows, is known as the Howe of Fife. Villages and small towns in a primarily agricultural landscape are found north of the Lomond Hills. The areas in the south and west of Fife, including the towns of Dunfermline, Glenrothes, Kirkcaldy and the Levenmouth region are much more industrial and densely populated.

## 1.2 Purpose of the Updating and Screening Assessment

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy[1] and Technical Guidance[2] documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to the risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

[1] Part IV of the Environment Act 1995. Local Air Quality Management, Revised Policy Guidance LAQM.PG(09), February 2009
www.defra.gov.uk/environment/airquality/local/guidance/pdf/laqm-policy-guidance-part4.pdf

[2] Part IV of the Environment Act 1995. Local Air Quality Management. Technical Guidance LAQM.TG(09) February 2009.
www.defra.gov.uk/environment/airquality/local/guidance/pdf/tech-guidance-laqm-tg-09.pdf

## 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 (μg $m^{-3}$) (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 LAQM in Scotland***

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

## 1.4 Summary of Previous Review and Assessments

This section summarises the conclusions made by the previous three rounds of air quality review and assessments.

The first round of Review and Assessment reports concluded that additional assessment was not necessary for any pollutants in the Strategy, and that Fife Council did not need to declare any Air Quality Management Areas (AQMAs).

Since the commencement of the second round of the review and assessment process, Fife Council has completed the following Review and Assessment reports:

- Updating and Screening Assessment (2003)[3]
- Progress Report (2004)[4]
- Progress Report (2005)[5]
- Updating and Screening Assessment (2006)[6]
- Progress Report (2007)[7]
- Progress Report (2008)[8]
- Detailed Assessment (2009) Appin Crescent, Dunfermline [9]
- Detailed Assessment (2009) Admiralty Road, Rosyth [10]
- Further Assessment (2010) Bonnygate, Cupar [11]
- Progress Report (2010) [12]
- 2nd Detailed Assessment (2011) Appin Crescent, Dunfermline [13]
- Progress Report (2011)[14]
- Further Assessment (2012) Appin Crescent Dunfermline[15]
- Updating and Screening Assessment (2012)[16]
- 2nd Detailed Assessment for Admiralty Road, Rosyth, Fife (2012)[17]

[3] Air Quality Updating and Screening Assessment for Fife Council 2003. AEAT/ENV/R/1494. August 2003

[4] Air Quality Review and Assessment Progress Report for Fife Council 2004. AEAT/ENV/R/1678 Issue 2. July 2004

[5] Air Quality Review and Assessment Progress Report for Fife Council -2004/2005. AEAT/ENV/R/1955 Issue 2. Jun 2005

[6] Air Quality Updating and Screening Assessment for Fife Council 2006. AEAT/ENV/R/2237 Issue 2, July 2006

[7] Air Quality Review and Assessment Progress Report for Fife Council 2006/7. AEAT/ENV/R/2452 May 2007

[8] Air Quality Review and Assessment Progress Report for Fife Council 2007/8. AEAT/ENV/R/2597 March 2008

[9] Air Quality Detailed Assessment for Fife Council 2008: Appin Crescent, Dunfermline. AEAT/ENV/R/2705, January 2009

[10] Air Quality Detailed Assessment for Fife Council 2008: Admiralty Road, Rosyth, AEAT/ENV/R/2761, April 2009

[11] Air Quality Review and Assessment, Further Assessment, Bonnygate, Cupar 2010

[12] 2010 Air Quality Progress Report for Fife Council, AEAT/ENV/R/2977, July 2010

[13] Detailed Assessment of Air Quality: Appin Crescent, Dunfermline, AEA/ENV/R/3096 Issue 3, January 2011

[14] Air Quality Review and Assessment Progress Report for Fife Council 2011. AEA/ENV/R/3179 Issue 2. May 2011

[15] Air Quality Further Assessment (2012) Appin Crescent Dunfermline, AEA/R/ED56439. Issue 1, March 2012

[16] 2012 Air Quality Updating and Screening Assessment for Fife Council, AEAT/ENV/R/3293, July 2012

[17] Air Quality Detailed Assessment for Admiralty Road, Rosyth, Fife, AEAT/ENV/R/3321, September 2012

- Detailed Assessment for Detailed Assessment for St Clair Street, Kirkcaldy, Fife (2012)[18]
- Fife Council, Bonnygate Air Quality Action Plan [19]
- Fife Council: Air Quality Action Plan for Appin Crescent, Dunfermline[20]
- Progress Report (2013)[23]
- The Appin Crescent Traffic Management Options Appraisal: Scenario Modelling Assessment (Phase 2) [24]
- Cupar Streetscene Air Quality Modelling Assessment[25]
- Progress Report (2014)[26]
- Cupar North Development Zone and Relief Road: Air quality modelling assessment[27]
- Appin Crescent Traffic Management Options Appraisal (Phase 3) Air Quality Impact Assessment [28]

The second round of Review and Assessment reports (2003 Updating and Screening Assessment (USA) and 2004 & 2005 Progress reports) concluded that the Air Quality Objectives for sulphur dioxide ($SO_2$), carbon monoxide (CO), 1,3-butadiene, benzene and lead are unlikely to be exceeded.

The 2003 USA identified that high $NO_2$ concentrations were recorded at kerbside locations in North Approach Road in Kincardine, Carnegie Drive in Dunfermline and Admiralty Road in Rosyth. As this was based on kerbside data it was recommended that further diffusion tube monitoring be undertaken at the façade of the buildings in order to improve the assessment of potential exposure.

The 2005 Progress Report recommended that automatic monitoring of $NO_2$ be undertaken at Admiralty Road, Rosyth and Bonnygate, Cupar. Additionally, it was recommended that automatic monitoring continue at North Approach Road, Kincardine. $PM_{10}$ monitoring also commenced at Admiralty Road, Rosyth and Bonnygate, Cupar.

The 2006 USA recommended that monitoring of $NO_2$ and $PM_{10}$ continue at Bonnygate, Cupar and recommence at Admiralty Road, Rosyth to better assess concentrations of each pollutant.

Automatic monitoring of $NO_2$ was discontinued at North Approach Road, Kincardine in May 2007 as the relevant Air Quality Objectives were met at this location. As a result of a new

[18] Detailed Assessment of Air Quality 2011 Saint Clair Street, Kirkcaldy, Fife, AEA/ENV/R/3332

[19] Fife Council, Bonnygate Air Quality Action Plan, 2010, AEAT/ENV/R/ED05550006

[20] Fife Council: Air Quality Action Plan for Appin Crescent, Dunfermline, Fife, ED56439- Issue Number 1

[23] Air Quality Review and Assessment Progress Report for Fife Council 2011, Ricardo-AEA/R/3367/, Issue 2, July 2013

[24] The Appin Crescent Traffic Management Options Appraisal: Scenario modelling assessment (Phase 2), Ricardo-AEA/R/ED56439013, Issue 3, Jan 2014

[25] Cupar Streetscene Air quality modelling assessment, Ricardo-AEA/R/ED56439014, Issue 3, March 2014

[26] Air Quality Review and Assessment Progress Report for Fife Council 2014, Ricardo-AEA/ENV/PR2014, May 2014

[27] Cupar North Development Zone And Relief Road: Air Quality Modelling Assessment, Ricardo-AEA/R/ED56439015 Issue Number 2, February 2015

[28] Appin Crescent Traffic Management Options Appraisal (Phase 3) Air Quality Impact Assessment, ED56439019- Issue Number 1, February 2015

bridge crossing and northern bypass road further reductions of $NO_2$ have been realised at this location.

Monitoring data for 2006 and 2007 (automatic and diffusion tubes) indicated that it was likely the $NO_2$ and $PM_{10}$ Air Quality Objectives would not be met in Bonnygate, Cupar. The 2007 Progress Report concluded that a Detailed Assessment should be carried out at this location. Additionally, the 2008 Progress Report concluded that a Detailed Assessment should be carried out for Appin Crescent, Dunfermline ($NO_2$) and Admiralty Road, Rosyth ($PM_{10}$).

The Detailed Assessment (2007/2008) for Bonnygate, Cupar considered $NO_2$ and $PM_{10}$. The report concluded that an AQMA should be declared for both $NO_2$ and $PM_{10}$.

The Detailed Assessment (2008) for Appin Crescent, Dunfermline advised that increased monitoring of $NO_2$ should be carried out to enable improved characterisation of ambient $NO_2$ concentrations before any further decisions are made.

The Detailed Assessment (2009) for Admiralty Road, Rosyth considered $PM_{10}$ concentrations in the area and concluded that no further action was required.

The Further Assessment (2010) for Bonnygate, Cupar concluded that the AQMA was still required and that its boundary was appropriate (see Figure 1.1). The source apportionment found that heavy and light goods vehicles contributed broadly similar oxides of nitrogen (NOx) emissions and that action planning should therefore focus on both vehicle types.

An Air Quality Action Plan has been implemented for Bonnygate, Cupar by Fife Council. Progress on measures contained within the Bonnygate, Cupar Air Quality Action Plan are reported in Appendix F.

The 2010 Progress report concluded that for $NO_2$ and $PM_{10}$ monitoring, no further action was required over and above that already in progress by Fife Council. It was concluded that if $NO_2$ concentrations within the Appin Crescent area exceed the annual mean objective when 12 months diffusion tube data was available then Fife Council should proceed immediately to a Detailed Assessment.

At the end of 2010, a Detailed Assessment was carried out at Appin Crescent, Dunfermline. This Detailed Assessment considered $NO_2$ concentrations and concluded that Fife Council should consider declaring an Air Quality Management Area (AQMA) at Appin Crescent. Fife Council should therefore proceed with a Further Assessment and work towards preparing an Air Quality Action Plan. Due to the $NO_2$ concentrations measured at Appin Crescent the Detailed Assessment recommended that automatic measurement of $PM_{10}$ should be carried out.

The 2011 Progress Report concluded that monitoring of $NO_2$ at the three automatic sites in Fife showed that concentrations at Appin Crescent, Dunfermline; Bonnygate, Cupar and Admiralty Road, Rosyth, were below the annual mean objective. However, $NO_2$ and $PM_{10}$ concentrations have increased since 2009 in Admiralty Road. Fife Council concludes that to further investigate $NO_2$ concentrations within Admiralty Road diffusion tube monitoring

should be increased, incorporating more locations of relevant exposure to the general public. If measured concentrations of $NO_2$ exceed the annual mean objective, after 12 months of data from sites of relevant exposure, then in accordance with the Technical Guidance LAQM. TG (09), Fife Council should proceed with a Detailed Assessment for Admiralty Road.

Local bias adjusted diffusion tube data at 3 locations within Fife exceeded the $NO_2$ annual mean objective of 40 µg $m^{-3}$. These locations were: Appin Crescent, Dunfermline; Admiralty Road, Rosyth; St Clair Street, Kirkcaldy.

For 2010, all diffusion tubes sites (2,3,5 and 6) within Appin Crescent exceeding the objective were located on the south side of Appin Crescent between Park Lane and Couston Street. Diffusion tubes within this area have consistently shown elevated concentrations contrary to those seen at the automatic monitoring site. Data from the 2011 Progress Report supports conclusion made in the 2011 Detailed Assessment for Appin Crescent. It is concluded that Fife Council should consider declaring an AQMA at Appin Crescent, encompassing as a minimum all residential properties which lie between Park Lane and Couston Street. It also concluded that Fife Council should consider declaring an area larger than that stated to account for any uncertainties in monitoring and modelling carried out. Figure 1.2 shows the AQMA boundary encompassing residential properties located on Appin Crescent, Dunfermline.

For 2010, diffusion tube data at Bonnygate Cupar did not exceed the 40µg $m^{-3}$ objective when using the locally derived bias adjustment factor (0.71). However, when using the National derived bias adjustment factor (0.78) concentrations at one Bonnygate location exceeded the objective at a borderline concentration of 41 µg $m^{-3}$. Data shows that $NO_2$ diffusion tube concentrations have reduced since the introduction of traffic management measures in 2009. In 2008 Fife Council declared Bonnygate, Cupar as an AQMA for $NO_2$ and $PM_{10}$ and has since adopted an Air Quality Action Plan in 2010 to address the air quality issues. St Clair Street, Kirkcaldy diffusion tubes sites (1 and 2) have consistently measured concentrations around the 40 µg $m^{-3}$ objective, with concentrations exceeding the objective in 2008 and 2010. As a result of this, Fife Council have installed an automatic monitoring station (monitoring NOx and $PM_{10}$) at St Clair Street to further investigate concentrations in this area, which commenced in February 2011. If measured concentrations of $NO_2$ continue to exceed the annual mean objective, after 12 months of data has been collected, then in accordance with the Technical Guidance LAQM. TG (09), Fife Council should proceed with a Detailed Assessment for St Clair Street, Kirkcaldy.

$PM_{10}$ data collected for 2010 showed that both the Bonnygate and Admiralty Road sites exceeded the annual mean objective with concentrations of 19 µg $m^{-3}$. Bonnygate Cupar has been declared an AQMA for $PM_{10}$ since 2008 and an Action Plan has been adopted since 2010. Figure 1.1 shows the AQMA boundary encompassing Cupar Town Centre.

It has been concluded that Fife Council should continue monitoring $PM_{10}$ at Admiralty Road for another year before moving on to a Detailed Assessment. This conclusion was reached due to:

- The annual concentration (19 µg $m^{-3}$) being a borderline exceedance of the objective.

- 2010 being the first year concentrations exceeded the objective in the area.
- Unusual weather conditions for the year may have contributed to the increase in concentrations.

Both the Bonnygate and Admiralty Road sites did not exceed the 24 hour mean objective of 50 µg $m^{-3}$, with seven exceedances allowed per year.

Results for $SO_2$ monitoring in Fife in 2010 indicate that AQS objectives for $SO_2$ are unlikely to be exceeded. There are no new industrial processes, road or other developments that require detailed assessment with respect to this pollutant. Hence, new information in 2009 confirms the conclusion of previous reports that a Detailed Assessment is not required for $SO_2$.

Previous Review and Assessment reports have concluded that concentrations of lead, 1,3-butadiene and benzene are well below their respective objective at all locations in Fife. There has been no change in sources of these pollutants so they are not considered further in this report.

The Further Assessment (2012) for Appin Crescent concluded that there are continued current exceedances of the $NO_2$ annual mean objective in Appin Crescent, Dunfermline. The spatial extent of the exceedances remains quite small and the current AQMA boundary is adequate for $NO_2$ (Figure 1.2). The assessment also indicated that there are exceedances of the Scottish annual mean $PM_{10}$ objective within the Appin Crescent AQMA and as this pollutant is not currently included in the AQMA order for the location, it is recommended that the order is amended accordingly. The results of the source apportionment indicate that for $PM_{10}$, existing background concentrations are thought to be predominant in the overall concentrations at all locations in Appin Crescent. For $NOx/NO_2$ the contribution from road traffic is dominant overall. The contribution from moving and queuing vehicles was also assessed. The contribution from moving traffic is thought to predominate between the two, although emissions from queuing vehicles are also important, though perhaps more so for NOx than $PM_{10}$. Of the vehicle classes assessed, cars and HGVs are the most significant sources of vehicular NOx, whilst cars and LGVs have been identified as the most significant sources of vehicular $PM_{10}$. Buses are also an important source of both pollutants.

An Air Quality Action Plan has been implemented for Appin Crescent, Dunfermline by Fife Council. The report on the finalised Appin Crescent Air Quality Action Plan was approved in May 2013. Progress on measures contained within the Appin Crescent, Dunfermline Air Quality Action Plan are reported in Appendix G.

The Updating and Screening Assessment (2012) concluded that no further action is required with respect to pollutants carbon Monoxide, benzene, 1,3-butadiene, lead and sulphur dioxide. The assessment also indicated that the 2011 nitrogen dioxide ($NO_2$) and particulate matter ($PM_{10}$) monitoring data supports the requirement for Air Quality Management Areas in Bonnygate, Cupar and Appin Crescent, Dunfermline due to exceedances of the annual mean objectives for both pollutants. $PM_{10}$ concentrations at Admiralty Road, Rosyth have increased above the annual mean objective of 18 µg $m^{-3}$ and it is therefore recommended that Fife Council carry out a further Detailed Assessment to assess $PM_{10}$ concentrations in the area of Admiralty Road, Rosyth. The Cupar 2011 monitoring data indicate an overall

downward trend in $NO_2$ concentrations since the introduction of the traffic queue relocation system in the Bonnygate. $PM_{10}$ concentrations have also decreased relative to 2007 $PM_{10}$ levels and the exceedance is currently marginal.

The annual mean $NO_2$ objective of 40 µg $m^{-3}$ was exceeded at 6 diffusion tube sites located in three areas of Fife (Appin Crescent, Dunfermline, St Clair Street, Kirkcaldy and Bonnygate Cupar). All 6 diffusion tube sites are considered to be locations of relevant exposure. Both Appin Crescent, Dunfermline and Bonnygate, Cupar are currently included within existing Air Quality Management Areas (AQMAs). St Clair Street, Kirkcaldy is not currently included within any existing AQMAs and it is therefore recommended that Fife Council carry out a Detailed Assessment for nitrogen dioxide in the area of St Clair Street, Kirkcaldy.

The Detailed Assessment of St Clair Street, Kirkcaldy (2012) was undertaken to investigate the potential scale and extent of exceedances of Air Quality Objectives in the study area.

This modelling study, which used the most recent traffic data, $NO_2$ measurements and meteorological data for the study area indicates that there are no exceedances of the $NO_2$ annual mean objective at locations with relevant exposure. The annual mean objective exceedances are occurring at ground level locations within the study area close to main junctions on St Clair Street where congestion is known to occur. These are not however locations of relevant exposure as the properties are used for commercial purposes. $NO_2$ concentrations in excess of the annual mean objective were not observed and are not occurring where ground level or first floor residential properties are present within the study area. In light of this Detailed Assessment of Air Quality, Fife Council is not required to declare an Air Quality Management Area at this time. It was recommended that Fife Council continue to monitor $NO_2$ and $PM_{10}$ concentrations at this location and may wish to locate diffusion tube monitoring sites closer to the locations where ground floor residential properties are present on St Clair Street.

The Detailed Assessment of Admiralty Road, Rosyth, Fife (2012) was undertaken to investigate the potential scale and extent of exceedances of Air Quality Objectives in the study area. Dispersion modelling indicates that exceedances of the $PM_{10}$ annual mean objective of 18 µg $m^{-3}$ may have occurred at two receptors. It is also likely that the annual mean objective has been equalled at a further 41 receptors throughout the study area. However, the modelling also indicates that the daily mean objective has not been exceeded at any location on Admiralty Road. In light of this Detailed Assessment it is recommended that Fife Council should consider either declaring an Air Quality Management Area (AQMA) for the $PM_{10}$ annual mean objective, which should encompass the study area detailed in this report or to defer any AQMA declaration for a further year following the FDMS drier change in order to confirm the exceedance of the $PM_{10}$ annual mean objective.

Fife Council currently monitors $PM_{10}$ using a Tapered Element Oscillating Microbalance-Filter Dynamic Measurement System (TEOM-FDMS) at one location on Admiralty Road. Recent analyses of FDMS data from the UK Automatic and Urban Network (AURN) has identified baseline offsets in some FDMS analysers. As a result of this study a baseline check of the Rosyth FDMS was carried out, which consisted of running particle-free air through the analyser for 3 days. The results from this check indicate that there may be a positive offset in the 2012 Rosyth FDMS data; and as a consequence measured $PM_{10}$ concentrations might

be over-estimated at this location. Furthermore, the offset may also exist in the 2011 data; however, this cannot be confirmed as a baseline check was not carried out during 2011. It was therefore recommended that Fife Council change the drier unit to the FDMS analyser at Admiralty Road.

Also for this study, daily traffic flow data and traffic compositions were derived from Transport Scotland traffic counts collected at two automatic counting stations located on Admiralty Road. Speed data and queue data were not available for the study area. As a result professional judgment was used to estimate traffic speeds with slower speeds being used as appropriate to reflect congestion/speed around junctions. It was recommended that Fife Council implement further local traffic surveys in order to better characterise traffic flows and fleet compositions in the area.

Following discussions with the Scottish Government, it was agreed that Fife Council should defer its decision as to whether or not to declare an AQMA at Admiralty Road, Rosyth until at least six months monitoring data is available using a new FDMS drier in $PM_{10}$ monitoring equipment.

The 2013 Progress Report concluded that Fife Council should maintain its current monitoring programme and confirmed that Fife Council is not required to declare an AQMA at Admiralty Road, Rosyth at that time.

The Appin Crescent Traffic Management Options Appraisal: Scenario modelling assessment (2014) considered the possible effects that a change in traffic management will have on the $NO_2$ and $PM_{10}$ concentrations in 2015. Using modelling software and monitoring data, the report explains the predicted outcomes of possible traffic management scenarios in Appin Crescent, Dunfermline. The report concludes that none of the proposed traffic management scenarios made a significant difference to concentrations of $NO_2$ and $PM_{10}$ at locations of relevant exposure. Whilst outcomes of dispersion modelling of the proposed Appin Crescent bypass option reveal that this may reduce concentrations of $NO_2$ and $PM_{10}$ on Appin Crescent to below the relevant air quality objectives, it is still considered prudent to explore other traffic management measures that may deliver more cost effective and feasible solutions to addressing air quality issues in Appin Crescent.

The Cupar Streetscene Dispersion Modelling Report 2014 used atmospheric dispersion modelling to assess the potential air quality impacts that proposed traffic management changes in Cupar may have on the $NO_2$ and $PM_{10}$ concentrations in 2017. The report concludes that both modelled Design Options 1 (includes introduction of mini-roundabouts at the East Bridge/St Catherine Street junction as well as the East Bridge/East Burnside junctions on the A91) and 2 (includes reconfiguration of the junctions at East Bridge/St Catherine Street and East Bridge/East Burnside junctions on the A91) will lead to a general reduction in $NO_2$ and $PM_{10}$ emissions when compared to the 2017 baseline. Based on modelling predictions Option 1 provides greater air quality benefits than Option 2 for the Bonnygate AQMA. The road layout for Option 1 can be found in Appendix J. Both of these options were implemented in 2014.

The 2014 Progress Report concluded that Fife Council should maintain its current monitoring programme and there was no requirement to declare any new AQMAs. It also identified the

successful reduction of both $NO_2$ and $PM_{10}$ concentrations below the objectives within the Bonnygate AQMA. It concluded that the reductions were principally a result of traffic signalling and road layout improvements.

The Cupar North Development Zone and Relief Road: Air Quality Modelling Assessment 2015 aimed to quantify the potential air quality impact within the Bonnygate AQMA of future traffic associated with the Cupar North development zone. Future air quality impacts were assessed assuming that completion of different zones of the development are phased over time up to 2030, and that completion of the relief road may not occur until all of the residential and commercial developments are completed in 2030. This approach was used as projected vehicle pollutant emission rates and background concentrations are available until 2030 only. The report concludes that the results for each approach are very similar and indicate that there will be no exceedances of the $NO_2$ annual mean objective at the receptor locations in any of the future years assessed. However when emissions from the additional traffic from the development rollout phases are included the results indicate that exceedances of the 18 µg $m^{-3}$ Scottish $PM_{10}$ annual mean objective will occur at the same receptor locations where exceedances are predicted for the future baseline years. These receptor locations are at 1st floor height within the Bonnygate. When compared with the future 2030 baseline, small improvements in $NO_2$ and $PM_{10}$ concentrations are predicted with the completed development and the relief road in place in 2030. The report also recommends that when considering the cumulative impact of the development without the relief road in place, that air quality and potential mitigation measures to counteract the impact of the additional development traffic are considered in the planning process. The executive summary for this report can be found in Appendix H of this report.

Appin Crescent Traffic Management Options Appraisal (Phase 3) Air Quality Impact Assessment (2015) investigated the potential impact of traffic management scenarios which aim to improve traffic flow though Appin Crescent and hence reduce vehicle emissions and improve local air quality. Using modelling software and monitoring data, the report explains the predicted outcomes of these scenarios in Appin Crescent, Dunfermline. The report concludes that Test Option 1 (Optimisation of Holyrood Place / Appin Crescent signals (also linked to Sinclair Gardens roundabout)) does not appear to provide any air quality benefits and may lead to an increase in annual mean $NO_2$ concentrations. Test Options 2 (Reconfigure Appin Crescent / Garvock Hill mini roundabout to signalised junction (right turn storage allowed but runs opposed)) and test option 3 (Removal of bus stops on Appin Crescent) will provide improvements in both $NO_2$ and $PM_{10}$ concentrations but neither of these options offer the opportunity to reduce concentrations of $NO_2$ and $PM_{10}$ on Appin Crescent to below the respective air quality objectives. Test Option 3 investigated the removal of the bus stops on Appin Crescent and the predicted changes in annual mean $NO_2$ and $PM_{10}$ concentrations can be found on maps in Appendix J. The report suggests that a cost-benefit analysis of this option may be beneficial as it could be relatively inexpensive to implement and will provide improvements in $NO_2$ and $PM_{10}$ concentrations. The executive summary for this report can be found in Appendix I, along with baseline maps for test Option 3 in Appendix J of this report.

***Figure 1.1 Map of Bonnygate AQMA Boundary***

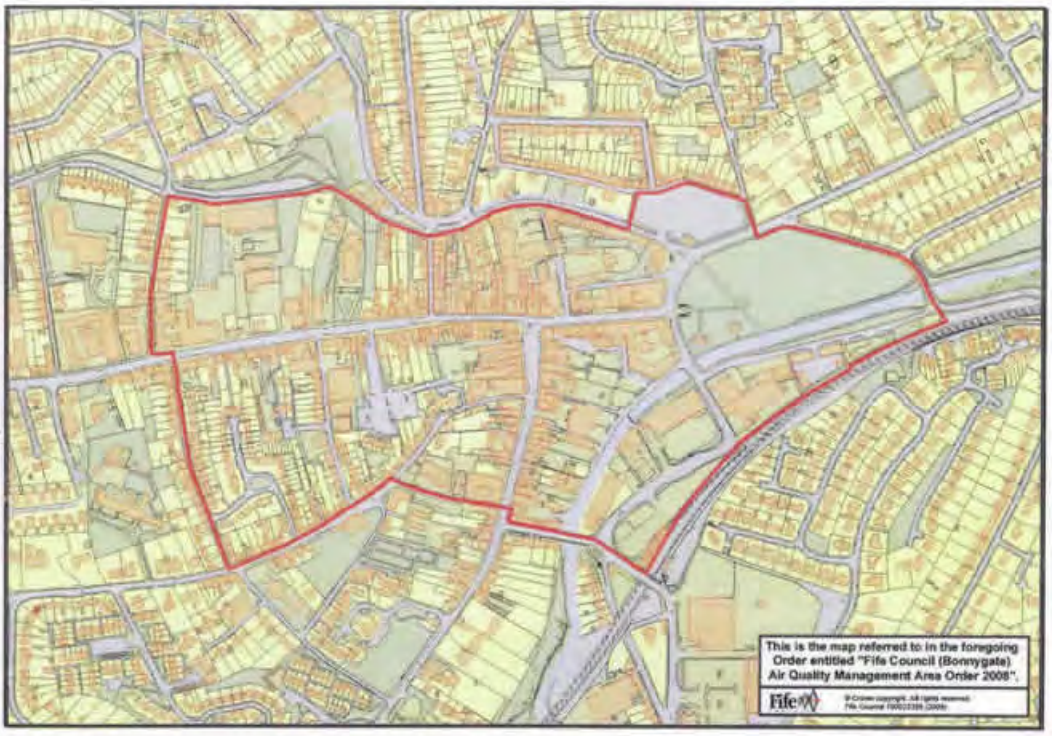
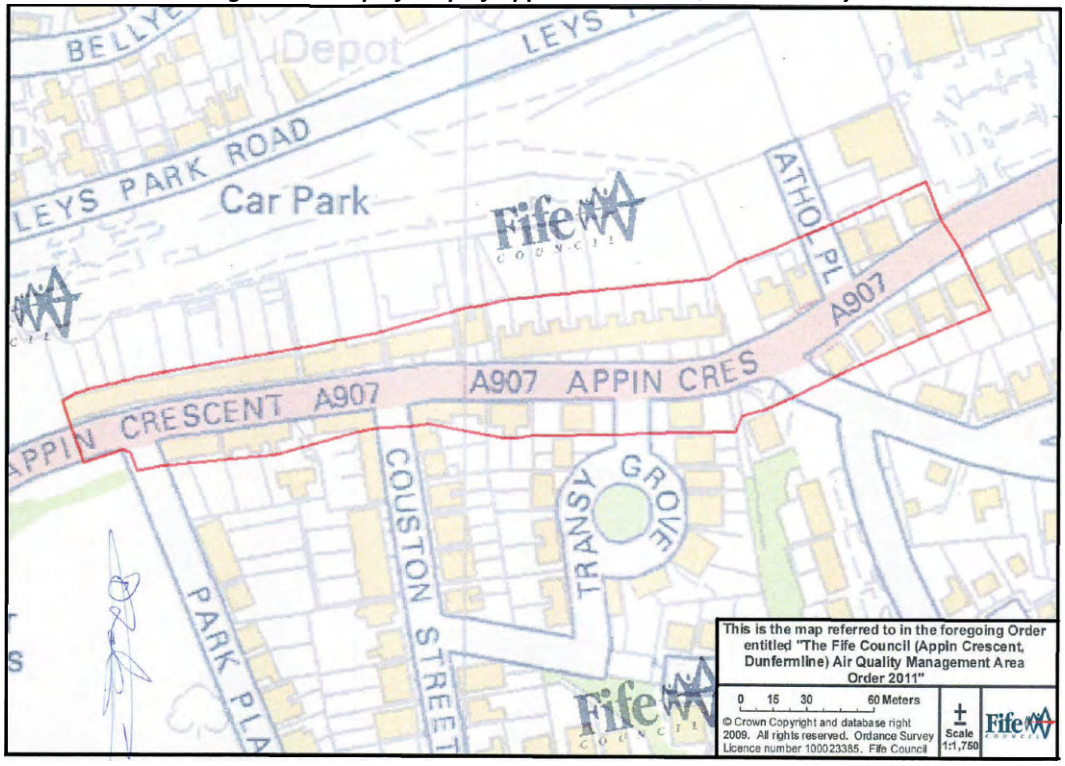





***Figure 1.2 Map of Map of Appin Crescent AQMA Boundary***



# 2 New Monitoring Data

## 2.1 Summary of Monitoring Undertaken

### 2.1.1 Automatic Monitoring Sites

Fife Council operated four automatic air quality monitoring stations during 2014. NOx (oxides of nitrogen – precursor to NO) and $PM_{10}$ concentrations are measured at each site. All automatic monitoring of $PM_{10}$ was conducted using Tapered Element Oscillating Microbalance - Filter Dynamics Measurement System (TEOM-FDMS) instruments. TEOM-FDMS analysers have been assessed as equivalent to the EU reference method without any adjustment to the data and therefore no adjustment has been applied. Figures 2.1 – 2.4 show location maps of the automatic monitoring sites with surrounding $NO_2$ diffusion tube sites under operation during 2014. Table 2.1 gives further details about each site.

Automatic $SO_2$ data are available from Scottish Power Generation Ltd from a monitoring site close to Longannet Power Station and is provided in their Annual Air Quality Impact Report[29]. The station's PPC permit from SEPA requires that air quality impacts around Longannet Power Station be assessed with respect to the Air Quality Strategy (AQS) objectives. The monitoring location is at Blair Mains (Grid Reference NS972864) to the north east of the power station. This location is in the area identified by modelling as likely to experience the maximum impact of the power station plume.

Short-period CO monitoring has also been undertaken by Fife Council's Transportation Department.

A summary of the INEOS Grangemouth oil refinery in their Annual Community Air Monitoring Report[30] for 2014 is also provided in this report. The report assesses concentrations of 1,3 butadiene, benzene, nitrogen dioxide and sulphur dioxide.

[29] Review of Annual Air Quality Impacts around Longannet Power Station compared to Air Quality Strategy Objectives Calendar year 2014, Iberdrola, Engineering and Construction, March 2015
[30] Community Air Quality Monitoring Report, Ambient Atmospheric Survey in the Vicinity of Grangemouth – 2014, INEOS March 2015

*Figure 2.1 Bonnygate, Cupar, Monitoring Locations*

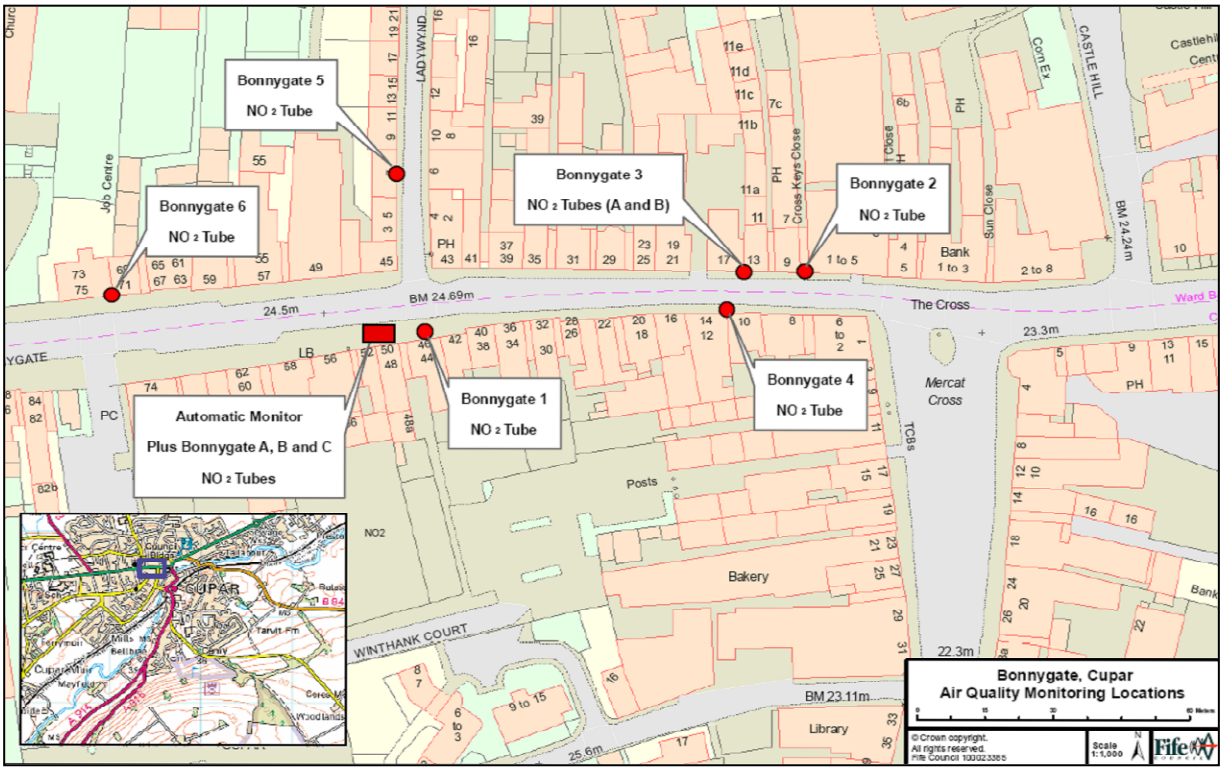



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*Figure 2.2 Appin Crescent, Dunfermline, Monitoring Locations*

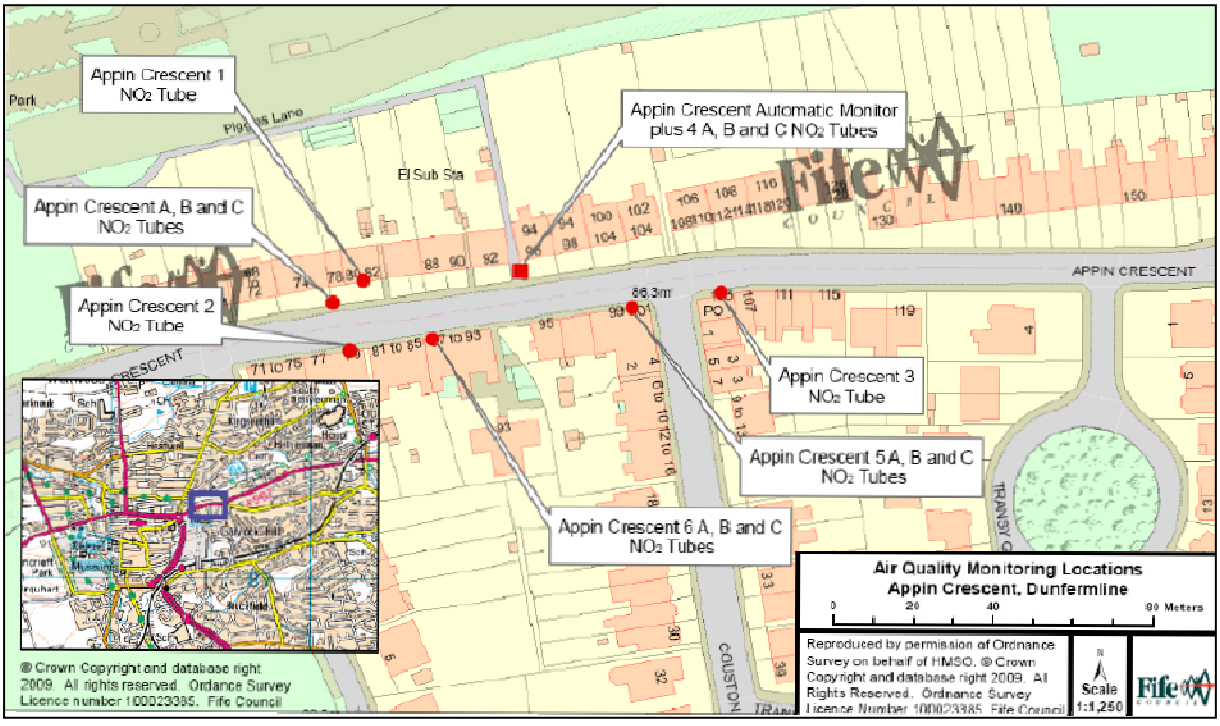


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*Figure 2.3 Admiralty Road, Rosyth, Monitoring Locations*

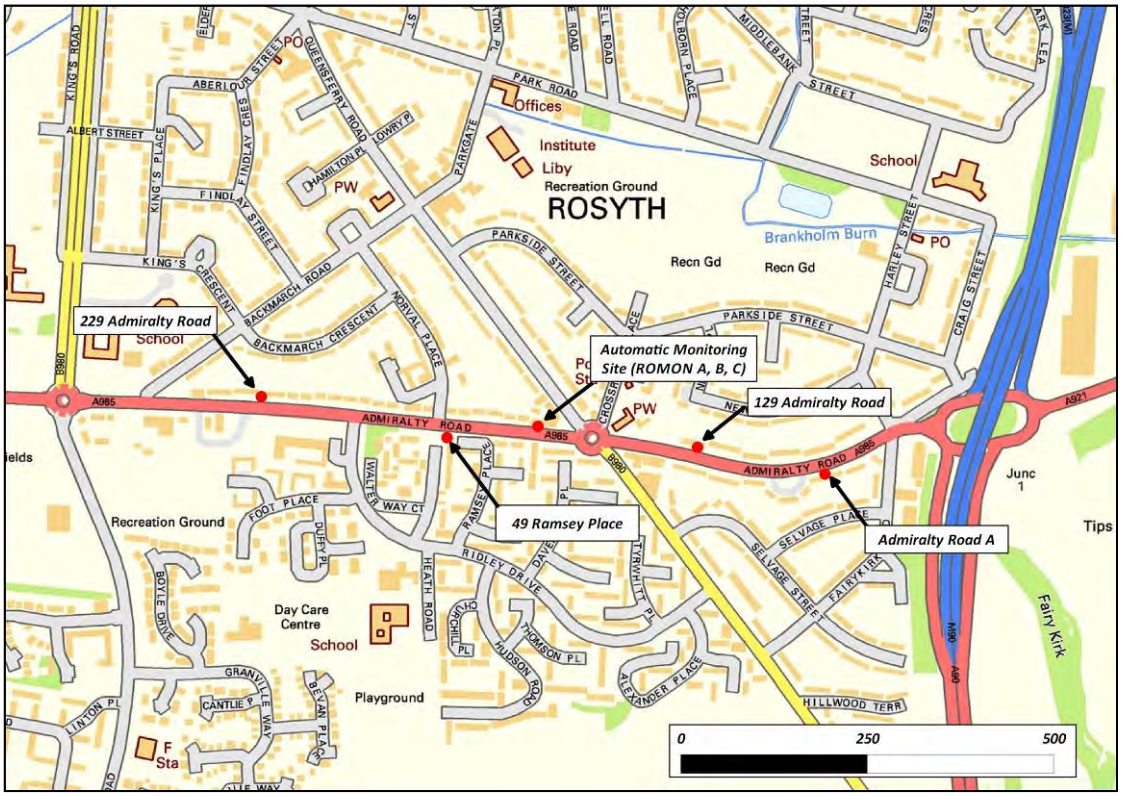


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*Figure 2.4 St Clair Street Kirkcaldy, Monitoring Locations*

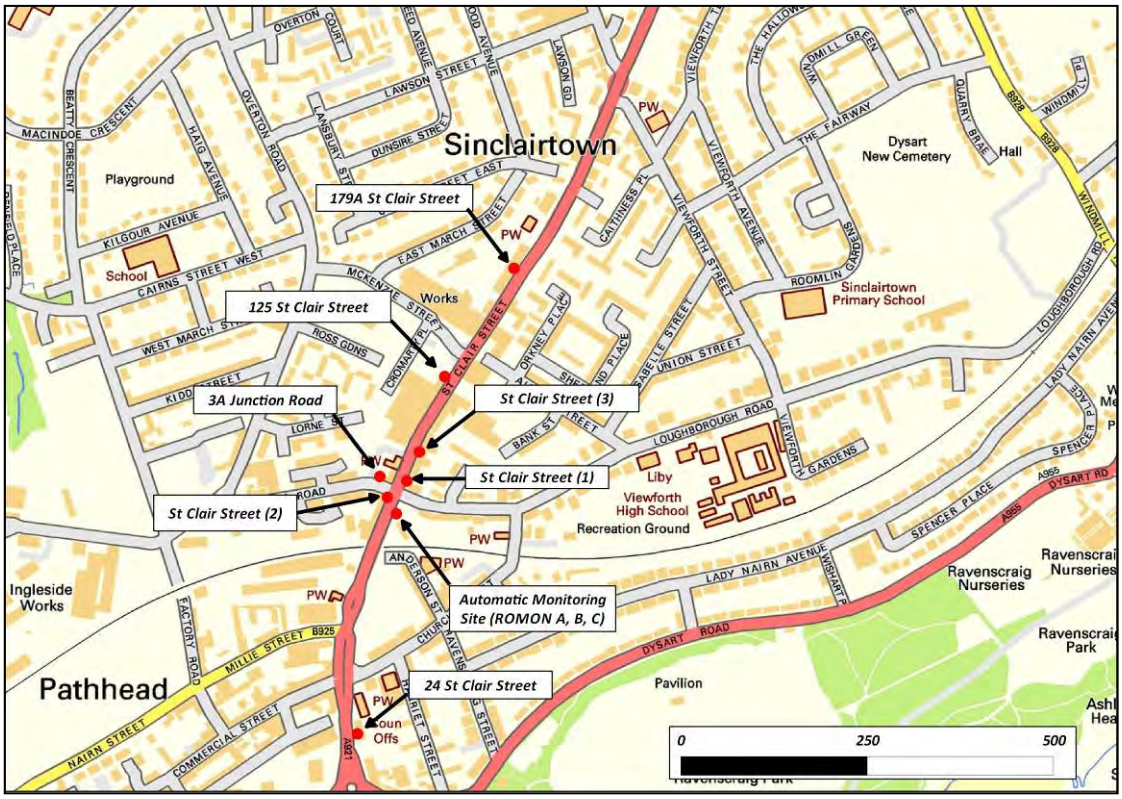


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*Table 2.1 Details of Automatic Monitoring Sites*

| Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Monitoring Technique | Relevant Exposure?) | Distance to kerb of nearest road | Does this location represent worst-case exposure? |
|---|---|---|---|---|---|---|---|---|---|
| Bonnygate, Cupar | Kerbside | 337406 | 714574 | $NO_2$, $PM_{10}$ | Y | $NO_x$ Analyser (Chemiluminescence), TEOM-FDMS | N (1.0m) | < 0.5m | Y |
| Appin Crescent, Dunfermline | Roadside | 309926 | 687722 | $NO_{2,,}$ $PM_{10}$ | Y | $NO_x$ Analyser (Chemiluminescence), TEOM-FDMS | Y (1.0m) | 4.0m | N |
| Admiralty Road, Rosyth | Roadside | 311755 | 683503 | $NO_2$ $PM_{10}$ | N | $NO_x$ Analyser (Chemiluminescence), TEOM-FDMS | Y (1.5m) | 6.0m | Y |
| St Clair Street, Kirkcaldy | Roadside | 329143 | 692986 | $NO_2$, $PM_{10}$ | N | $NO_x$ Analyser (Chemiluminescence), TEOM-FDMS | N (10.0m) | 5.0m | N |

### 2.1.2 Non-Automatic Monitoring Sites

Fife Council operates an extensive $NO_2$ diffusion tube monitoring survey with sites in East, West and Central Fife. In total there are 48 $NO_2$ diffusion tube sites throughout the Fife area. Of these, eight sites are triplicate sites, with four of these triplicate sites being co-located with the automatic analysers. In January 2015, two new diffusion tube monitoring sites were added at Pilmuir Street and Mill Street in Dunfermline, locations highlighted in Figures 2.5 and 2.6.

***Figure 2.5 Pilmuir Street Dunfermline, Monitoring Locations***

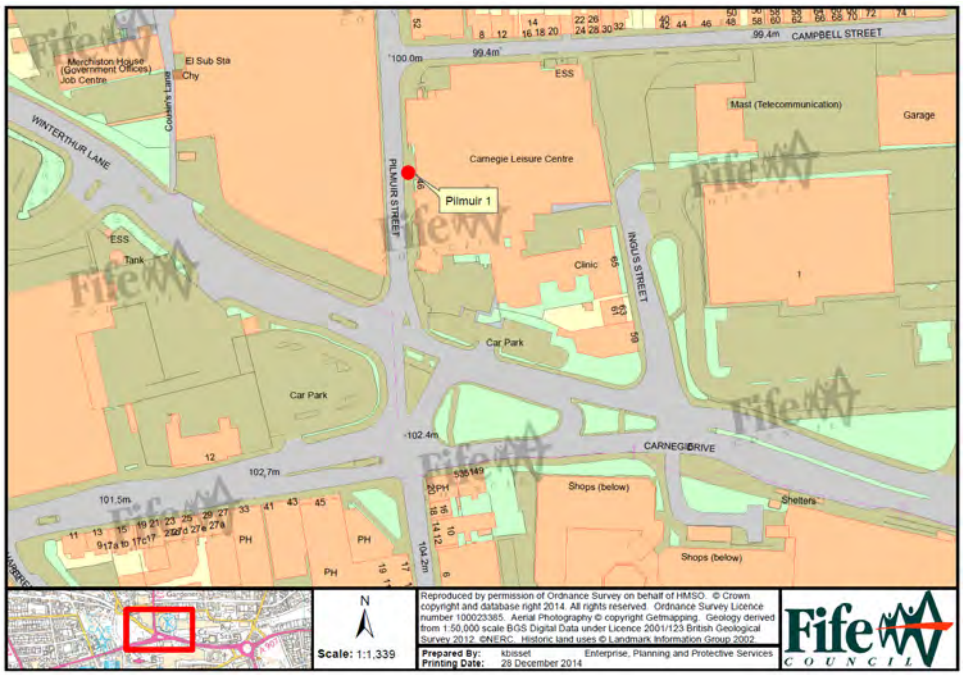
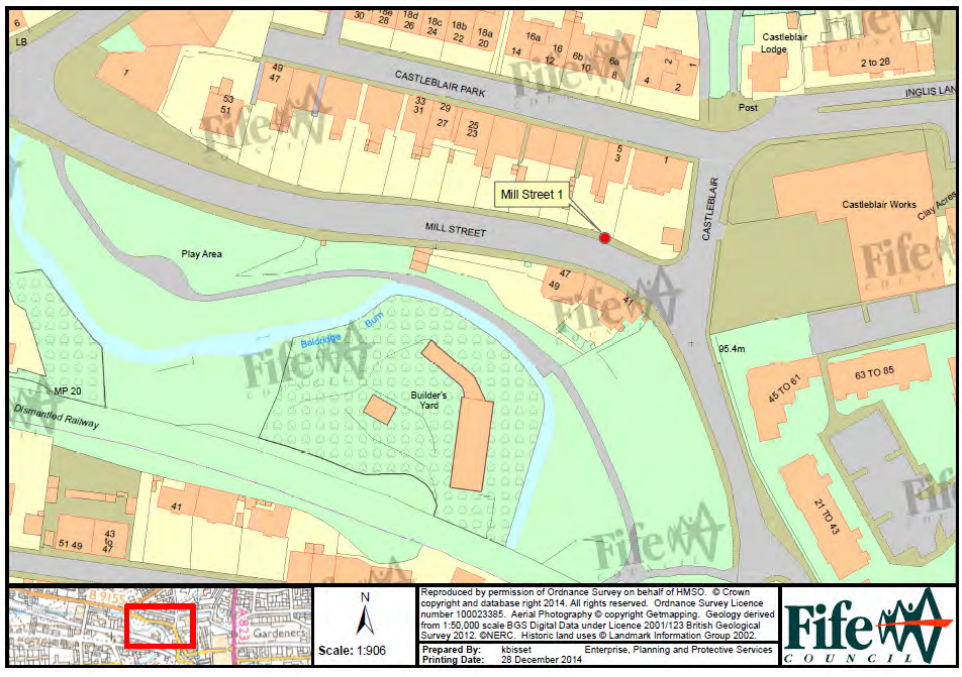



***Figure 2.6 Mill Street Dunfermline, Monitoring Locations***



Measurements of benzene and other hydrocarbon compounds are undertaken by INEOS Laboratory Grangemouth. Environmental measurements are made around the petrochemicals sites based in Grangemouth to monitor the impact of industrial activities on local communities. Monitoring is carried out over an area of approximately 50 square kilometres using stainless steel sorbent passive diffusive tubes to determine and monitor propane, n-butane, iso-butane, n-pentane, hexane, heptane, octane, nonane, decane, propylene, benzene, toluene, o-xylene, m & p-xylene, styrene, 1,3 butadiene and total C4 to C10 hydrocarbons. Glass Palmes tubes are used to determine and monitor nitrogen dioxide, sulphur dioxide and total inorganic chloride (acid gases).

NPL[31] on the behalf of BP Exploration North Sea Region monitored hydrocarbon levels on the Forth coastline during 2014 (30/12/2013-29/12/2014). Samples were collected over 2 week periods using passive samplers at 12 locations between the Forth Bridges and West Wemyss, including 4 locations between Dalgety Bay and Burntisland. Samples were analysed for iso-butane, n-butane, iso-pentane, n-pentane, n-hexane, n-heptane, benzene, toluene, xylene and total hydrocarbons (C4-C19). These hydrocarbons are emitted from a variety of sources around the Forth including the operations at Hound Point but also from traffic and other industrial sites such as the operations of ExxonMobil and Shell at Braefoot Bay and Mossmorran. The results of this monitoring indicate that concentrations of benzene over the 12 month period were low (annual means range from 0.2-0.3 ppb) and well within the air quality standard. Concentrations of other hydrocarbons were also low, but there are no air quality standards for these substances. The substance present in the greatest concentrations at most locations was n-butane for which annual mean concentrations ranged from 1.5 ppb to 6.5 ppb. Annual mean concentrations of other individual substances ranged from <0.3 ppb to 3.5 ppb. Annual mean concentrations of total hydrocarbons at different locations ranged from 7-26 ppb.

BP have commissioned monitoring along the Fife coastline for many years and there has been an overall reduction in the levels of hydrocarbons, including benzene, present in air over the last decade. Concentrations at any one locality are highly dependent on the weather. The measurements made in 2014 indicate that concentrations of most of the monitored substances were lower than 2013 at most locations.

**Diffusion Tube QA/QC Process**

Diffusion tubes used by Fife Council are supplied and analysed by Tayside Scientific Services (formerly Dundee City Council Scientific Services). The laboratory participates in three schemes which ensure that the $NO_2$ tube results meet acceptable standards.

1. The WASP scheme is run by the Health and Safety Laboratory. Each month one tube is sent for testing. Results are compared with other participating labs and feedback on performance provided.
2. Every three months three tubes and a blank (for analysis) are supplied for exposure at an intercomparison site operated as part of the Support to Local Authorities for Air Quality Management contract funded by the Scottish Government, Defra and the

[31] Extract from BP Production and Exploration, Houndpoint, 2014, NPL, April 2015

other Devolved Authorities. Again, results are compared with other participating labs and feedback on performance provided.

3. Each month a QC $NO_2$ solution is also provided via this contract. This solution is run as an internal check for $NO_2$ tubes in the laboratory. The solution is tested after every 21 $NO_2$ tube samples.

Tayside Scientific Services also use in-house quality assurance standards. The tube preparation method is 20% TEA in water.

**Bias Correction for Diffusion Tubes**

Diffusion tube samplers are a simple and cost effective method of measuring $NO_2$. However, they are classed as an indicative method and are known to have a systematic bias compared to more accurate results obtained from calibrated automatic analysers.

The degree of systematic bias depends on the laboratory preparing and analysing the tubes, and also includes the methodology employed for that analysis. Therefore, it is necessary to determine a bias adjustment factor appropriate for the particular diffusion tubes used in Fife. The methodology for determining the appropriate bias adjustment factor is outlined in LAQM TG (09); and several online tools are also available to assist with this process.

The local bias factor is calculated using sites where a triplicate set of diffusion tubes are co-located with a chemiluminescence analyser. The national bias adjustment factor is derived using the national database co-location studies.

Fife Council has four co-location sites that can be used to calculate the local bias adjustment factor. The local bias adjustment factor for each individual location was calculated using the "LAQM Tool" described in section A1.191 of LAQM TG (09). The results are shown in Table 2.2 below. The calculation spreadsheets are shown in Appendix B.

***Table 2.2 Bias correction factors for 2014 for $NO_2$ diffusion tubes in Fife***

| Source | Bias adjustment Factor 2014 |
|---|---|
| Appin Crescent, Dunfermline | 0.72 |
| Bonnygate, Cupar | 0.81 |
| Admiralty Road, Rosyth | 0.84 |
| St Clair Street, Kirkcaldy | 0.78 |
| Locally Derived (average of 4 local correction factors) | 0.79 |
| Nationally Derived (1 Study) | 0.77 |
| Locally Derived combined with Nationally Derived (5 Studies) | 0.78 |

The average of the bias adjustment factors from Appin Crescent, Bonnygate, Admiralty Road and St Clair Street is **0.79**. The nationally derived bias adjustment factor was calculated as **0.77**; however, this has been calculated using only one study from the up-to-date National Bias Adjustment Factor Spreadsheet (version number 04/15, shown in Appendix B). A

further bias adjustment factor has been calculated by combining both the locally and nationally derived factors using the method outlined in the National Bias Adjustment Factor Spreadsheet:

*"To obtain a new correction factor that includes your data, average the bias (B) values, expressed as a factor, i.e. -16% is -0.16. Next add 1 to this value, e.g. -0.16 + 1.00 = 0.84 in this example, then take the inverse to give the bias adjustment factor 1/0.84 = 1.19. (This will not be exactly the same as the correction factor calculated using orthogonal regression as used in this spreadsheet, but will be reasonably close)."*

For this report, and in line with the 2014 Progress Report, diffusion tube data have been bias adjusted using the respective locally derived bias adjustment factors. Where there is no local bias adjustment factor relevant to the location of the diffusion tube then the combined locally and nationally derived bias adjustment factor of **0.78** has been used. The diffusion tube monitoring locations are detailed in Table 2.3.

*Table 2.3 Details of Non-Automatic Monitoring Sites*

| Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Is monitoring collocated with a Continuous Analyser (Y/N) | 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? |
|---|---|---|---|---|---|---|---|---|---|
| West Area | | | | | | | | | |
| St Leonards Primary School, Dunfermline | R(F) | 309770 | 686895 | $NO_2$ | N | N | Y | 10.6 | Y |
| Carnegie Drive (A,B,C), Dunfermline* | R(F) | 309019 | 687632 | $NO_2$* | N | N | Y | 2.3 | Y |
| Rumblingwell, Dunfermline (5N) | R | 307866 | 688231 | $NO_2$ | N | N | N (6.3) | 1.7 | Y |
| Appin Crescent (A)(B)(C), Dunfermline (9N)* | R | 309897 | 687713 | $NO_2$ | Y | N | N (5.1) | 1.6 | Y |
| Appin Crescent (1) Dunfermline | R(F) | 309891 | 687716 | $NO_2$ | Y | N | Y | 6.5 | Y |
| Appin Crescent (2) Dunfermline | R(F) | 309975 | 687716 | $NO_2$ | Y | N | Y | 1.5 | Y |
| Appin Crescent (3) Dunfermline | R(F) | 309975 | 687716 | $NO_2$ | Y | N | Y | 1.8 | Y |
| Appin Crescent 4(A)(B)(C) Dunfermline* | R(F) | 309926 | 687722 | $NO_2$* | Y | Y | Y | 3.9 | Y |
| Appin Crescent 5(A)(B)(C)* | R(F) | 309974 | 687716 | $NO_2$ | Y | N | Y | 1.5 | Y |
| Appin Crescent 6(A)(B)(C)* | R(F) | 309904 | 687704 | $NO_2$ | Y | N | Y | 1.5 | Y |
| High Street, Cowdenbeath | K | 316523 | 691740 | $NO_2$ | N | N | N (3.5) | 0.5 | Y |
| North Approach Road (A, B) Kincardine | K | 293182 | 687549 | $NO_2$ | N | N | N (11.0) | 0.5 | Y |
| Pittencrieff St, Dunfermline | R(F) | 308743 | 687549 | $NO_2$ | N | N | Y | 0.5 | Y |
| 11 Halbeath RD1, Dunfermline | R (F) | 310245 | 687784 | $NO_2$ | N | N | Y | 14 | Y |
| 57 Halbeath RD2, | R (F) | 310488 | 6987873 | $NO_2$ | N | N | Y | 6 | Y |

| Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Is monitoring collocated with a Continuous Analyser (Y/N) | 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? |
|---|---|---|---|---|---|---|---|---|---|
| Dunfermline | | | | | | | | | |
| Admiralty Road A, Rosyth | R(F) | 312140 | 683439 | $NO_2$ | N | N | Y | 9 | Y |
| Admiralty Road (A,B,C) ROMON* | R(F) | 311755 | 683503 | $NO_2$* | N | Y | Y | 6.5 | Y |
| 229 Admiralty Road, Rosyth | R (F) | 311384 | 683543 | $NO_2$ | N | N | Y | 11 | Y |
| 49 Ramsay Place, Rosyth | R (F) | 311633 | 683688 | $NO_2$ | N | N | Y | 14 | Y |
| 129 Admiralty Road, Rosyth | R (F) | 311693 | 683477 | $NO_2$ | N | N | Y | 12 | Y |
| Central Area | | | | | | | | | |
| St Clair Street (1) , Kirkcaldy | R | 329157 | 693030 | $NO_2$ | N | N | N (2) | 1.3 | Y |
| St Clair Street (2) , Kirkcaldy | R | 329131 | 693008 | $NO_2$ | N | N | N (2) | 1.8 | Y |
| St Clair Street (3), Kirkcaldy | R(F) | 329174 | 693069 | $NO_2$ | N | N | Y | 2 | Y |
| St Clair Street ROMON (A,B,C,)* Kirkacaldy | R | 329143 | 692986 | $NO_2$ | N | Y | N(10.0m) | 5 | Y |
| Dunnikier Rd, Kirkcaldy | R(F) | 328152 | 692350 | $NO_2$ | N | N | Y | 3.4 | Y |
| Victoria Rd, Kirkcaldy | R(F) | 328152 | 692325 | $NO_2$ | N | N | Y | 2.5 | Y |
| Glenlyon Road, Levenmouth | K | 337357 | 701318 | $NO_2$ | N | N | N (26.8) | 1 | Y |
| Leslie High St | R(F) | 325111 | 701806 | $NO_2$ | N | N | Y | 3 | Y |
| Queensway, Glenrothes | K | 327849 | 701114 | $NO_2$ | N | N | N (17.0) | 1 | Y |
| Adsa Roundabout, Kirkcaldy | K | 328735 | 694053 | $NO_2$ | N | N | N (28.0) | 1 | Y |
| 125 St Clair Street, Kirkcaldy | R(F) | 329208 | 693170 | $NO_2$ | N | N | Y | 1.5 | Y |
| 179A St Clair Street, Kirkaldy | R(F) | 329301 | 693315 | $NO_2$ | N | N | Y | 1.5 | Y |
| 3A Junction Road, Kirkcaldy | R(F) | 329121 | 693036 | $NO_2$ | N | N | Y | 1.5 | Y |

| Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Is monitoring collocated with a Continuous Analyser (Y/N) | 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? |
|---|---|---|---|---|---|---|---|---|---|
| 24 St Clair Street, Kirkcaldy | R(F) | 329091 | 692691 | $NO_2$ | N | N | Y | 1.5 | Y |
| East Area | | | | | | | | | |
| City Road (1,2), St Andrews | R | 350586 | 716580 | $NO_2$ | N | N | N (1.0) | 1.5 | Y |
| Bell Street (1,), St Andrews | R(F) | 350708 | 716716 | $NO_2$ | N | N | Y | 1.6 | Y |
| Bell Street (2) St Andrews | R(F) | 350716 | 716669 | $NO_2$ | N | N | Y | 2.1 | Y |
| Crossgate, Cupar | K | 337536 | 714537 | $NO_2$ | Y | N | N (3.0) | 0.5 | Y |
| South Road, Cupar | R | 337513 | 713616 | $NO_2$ | N | N | N (17.0) | 1.8 | Y |
| Cupar Road, Auchtermuchty | R(F) | 324186 | 711801 | $NO_2$ | N | N | Y | 1.8 | Y |
| Bonnygate, Cupar (1N), Bonnygate 1 | R(F) | 337409 | 714570 | $NO_2$ | Y | N | Y | 5.3 | Y |
| Bonnygate, Cupar, Bonnygate 2 | R(F) | 337493 | 714586 | $NO_2$ | Y | N | Y | 1.7 | Y |
| Bonnygate, Cupar, Bonnygate 3 (A, B) | R(F) | 337480 | 714586 | $NO_2$ | Y | N | Y | 1.6 | Y |
| Bonnygate, Cupar, Bonnygate B4 | R(F) | 337471 | 714575 | $NO_2$ | Y | N | Y | 1.9 | Y |
| Ladywynd, Cupar, Ladywynd B5 | R(F) | 337405 | 714596 | $NO_2$ | Y | N | Y | 1 | Y |
| Bonnygate West, Cupar, Bonnygate B6 | R(F) | 337342 | 714579 | $NO_2$ | Y | N | Y | 3.2 | Y |
| Bonnygate, Cupar, Monitor BA, BB, BC * | K | 337406 | 714574 | $NO_2^*$ | Y | Y | N (4.8) | 0.6 | Y |
| 4 East Road, Cupar | R(F) | 337915 | 714721 | $NO_2$ | Y | N | Y | 14 | Y |

** Triplicate sites*
*K = Kerbside, 0-1m from the kerb of a busy road*
*R = Roadside, 1-5m from the kerb (up to 15m in some cases)*
*R (F) = façade of buildings on street*
*UB = Urban Background, >50m from any busy road*

## 2.2 Comparison of Monitoring Results with Air Quality Objectives

### 2.2.1 Nitrogen Dioxide

**Automatic Monitoring Data**

Table 2.4 shows 2014 statistics for automatic $NO_2$ measurements at the four locations in Fife. It shows that Appin Crescent in Dunfermline, Bonnygate in Cupar, Admiralty Road in Rosyth and St Clair Street in Kirkcaldy have no exceedances for the annual mean $NO_2$ objective.

Table 2.5 shows the results of automatic monitoring measured against the 1 hour $NO_2$ objective. There were no exceedances of the 1 hour $NO_2$ objective for any of the four automatic monitoring sites.

The trend of significantly lower concentrations seen at Bonnygate, Cupar, suggests that the traffic measurement measures introduced in mid-July 2009 is likely to be reducing levels of $NO_2$ in this area. These measures include a new Urban Traffic Management and Control System and changes to the pedestrian crossings.

The annual mean $NO_2$ concentrations from 2007-2014 are displayed in Figure 10.1 for Bonnygate, Cupar and Appin Crescent, Dunfermline (provided in section 10 of this report). The graph demonstrates that $NO_2$ concentrations are declining in both AQMAs and provides evidence of the effectiveness of the action plans.

The polar plots of $NO_2$ concentrations by wind speed and wind direction are shown in Figure 2.7 for Appin Crescent, Dunfermline, and Bonnygate, Cupar where AQMAs have been declared. Polar plots are useful to gain a quick graphical representation of the relationship between pollutant concentrations and the meteorological conditions.

Polar plots for both locations indicate a relationship between concentrations and wind speed/direction. There is a clear signal arising when winds blow parallel to the street canyon to the east, which is as would be expected. The plots show a broadly east-west signal which is consistent with parallel winds through the street canyon. In general terms parallel winds of low speed will produce high concentrations in canyons and this is consistent with the plots shown. There is also slight evidence in the plots of perpendicular winds causing high concentrations, which is also common in street canyons- though complex three dimensional turbulence phenomena (including a turbulent contribution from road traffic) cannot be reliably determined in an Openair plot. The results should therefore be considered indicative. The only way to fully characterise turbulence conditions in the canyon would be through application of a 3D Computational Fluid Dynamics model, which has previously been undertaken for the Bonnygate Cupar "gap site" in Cupar[32].

[32] Computational Fluid Dynamic Simulation of Air Quality: Bonnygate, Cupar AEA ED56439 October 2012

It should also be noted that the meteorological conditions in the Open Air tool on Scottish Government website are modelled, so there may be some bias in the data and subsequent analysis.

***Figure 2.7 Polar plots of $NO_2$ concentrations by wind speed and wind direction***

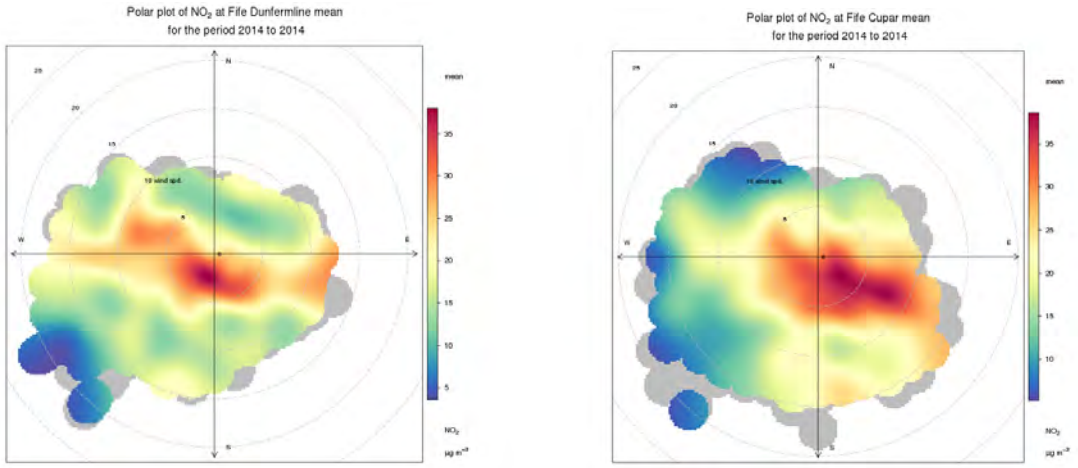


*Table 2.4 Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with Annual Mean Objective*

| Site ID | Site Type | Within AQMA? | Valid Data Capture 2014 % | Annual Mean Concentration µg/m³ | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| Appin Crescent, Dunfermline | Roadside | Y | 99.7 | 29 | 30 | 30 | 25 | 24 |
| Bonnygate, Cupar | Kerbside | Y | 87.0 | 32 | 30 | 29 | 27 | 27 |
| Admiralty Road, Rosyth | Roadside | N | 88.9 | 33 | 28 | 28 | 25 | 25 |
| St Clair Street, Kirkcaldy | Roadside | N | 97.8 | N/A | 19* | 32 | 20 | 18 |

*St Clair Street, Kirkcaldy started monitoring February 2011

*Table 2.5 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean Objective*

| Site ID | Site Type | Within AQMA? | Valid Data Capture 2014 % | Number of Exceedences of Hourly Mean (200 µg/m$^3$) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| Appin Crescent, Dunfermline | Roadside | Y | 99.7 | 0 | 0 | 0 | 0 | 0 |
| Bonnygate, Cupar | Kerbside | Y | 87.0 | 0 | 0 (120) | 0 | 0 (117) | 0 (115) |
| Admiralty Road, Rosyth | Roadside | N | 88.9 | 0 | 0 | 0 | 0 | 0 (105) |
| St Clair Street, Kirkcaldy | Roadside | N | 97.8 | N/A | 0 (71)* | 0 | 0 | 0 |

*St Clair Street, Kirkcaldy started monitoring February 2011

Data in brackets is the 99.8$^{th}$ percentile of hourly means

**Diffusion Tube Monitoring Data**

Table 2.6 gives the annual diffusion tube data for 2014. As discussed previously, the data have been bias corrected using local bias adjustment factors for diffusion tube sites located in Dunfermline (**0.72**), Rosyth (**0.84**), Cupar (**0.81**) and Kirkcaldy (**0.78**). For monitoring sites located in other areas, a combined national and local bias adjustment factor of **0.78** has been used**.**

All of the monthly diffusion tube results, and bias adjustments, are found within Appendix C of this report. Table 2.7 compares $NO_2$ diffusion data from 2010, 2011, 2012, 2013 and 2014. Duplicate and triplicate site mean concentrations have been calculated using the methodology stated in Section 3.25 in the Technical Guidance (09).

As shown in Table 2.6 and taking into consideration local, regional and national bias adjustments, only 1 location marginally exceeded the $NO_2$ annual mean objective of 40 μg $m^{-3}$. This location was Appin Crescent 6 (A, B, C) in Dunfermline with a measured bias adjusted concentration of 40.3 μg $m^{-3}$. This shows a small decrease when compared with the 40.4 μg $m^{-3}$ measured in 2013 (shown in Table 2.7). This site is located between Park Lane and Couston Street and is considered to be a location of relevant exposure to the general public. The majority of diffusion tube sites have seen a decrease in $NO_2$ concentrations when compared with data from previous years. In 2013, Appin Crescent 6 (A, B, C) also exceeded $NO_2$ annual mean objective of 40 μg $m^{-3}$.

The 2011 Detailed Assessment for Appin Crescent, Dunfermline, concluded that Fife Council should consider declaring an AQMA at Appin Crescent, Dunfermline encompassing as a minimum all residential properties which lie between Park Lane and Couston Street. The assessment also concluded that Fife Council should consider declaring an area larger than that stated to account for any uncertainties in monitoring and modelling carried out. This recommended area (illustrated previously in Figure 1.2 of this report) was declared by Fife Council in 2011 as an AQMA for $NO_2$.

$NO_2$ monitoring data are presented for INEOS Grangemouth oil refinery as part of their annual monitoring report for 2014 report. Annual average concentrations for $NO_2$ are lower than the set air quality limit of 31 μg $m^{-3}$ (16 ppb).

*Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes in 2014*

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Collocated Tube | Data Capture 2014 (%) | Annual mean concentration (µg/m$^3$) |
|---|---|---|---|---|---|---|
| $NO_2$ Diffusion Tubes West Area | | | | | | |
| AQM3 | St Leonards Primary School, Dunfermline | R(F) | N | N | 100 | 13.6 |
| C'GIE DR | Carnegie Drive (A,B,C), Dunfermline | R(F) | N | Triplicate | 97.3 | 32.0 |
| DRM5 | Rumblingwell, Dunfermline (5N) | R | N | N | 100 | 20.7 |
| DRM9 | Appin Crescent (A)(B)(C), Dunfermline (9N)* | R | Y | Triplicate | 97.3 | 30.5 |
| APP CR1 | Appin Crescent (1) Dunfermline | R(F) | Y | N | 92 | 26.3 |
| APP CR2 | Appin Crescent (2) Dunfermline | R(F) | Y | N | 92 | 38.7 |
| APP CR3 | Appin Crescent (3) Dunfermline | R(F) | Y | N | 100 | 33.1 |
| APP CR4 | Appin Crescent 4(A)(B)(C) Dunfermline | R(F) | Y | Triplicate | 92 | 24.6 |
| APP CR5 | Appin Crescent 5(A)(B)(C) | R(F) | Y | Triplicate and Co-located | 100 | 36.4 |
| APPCR6 | Appin Crescent 6(A)(B)(C) | R(F) | Y | Triplicate | 100 | 40.3 |
| C'BEATH1 | High Street, Cowdenbeath | K | N | N | 100 | 22.0 |
| K'DINE | North Approach Road (A, B) Kincardine | K | N | N | 100 | 16.1 |
| PITT ST | Pittencrieff St, Dunfermline | R(F) | N | N | 100 | 19.6 |
| HALBEATH RD1 | 11 Halbeath RD1, Dunfermline | R (F) | N | N | 100 | 17.1 |
| HALBEATH RD2 | 57 Halbeath RD2, Dunfermline | R (F) | N | N | 92 | 16.9 |
| ADM RO.A | Admiralty Road A, Rosyth | R(F) | N | N | 100 | 31.3 |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Collocated Tube | Data Capture 2014 (%) | Annual mean concentration (µg/m$^3$) |
|---|---|---|---|---|---|---|
| ROMON | Admiralty Road (A,B,C) ROMON | R(F) | N | Triplicate and Co-located | 100 | 25.1 |
| N/A | 229 Admiralty Road, Rosyth | R (F) | N | N | 50 | 21.7* |
| N/A | 49 Ramsay Place, Rosyth | R (F) | N | N | 100 | 16.9 |
| N/A | 129 Admiralty Road, Rosyth | R (F) | N | N | 100 | 24.4 |
| **$NO_2$ Diffusion Tubes Central Area** | | | | | | |
| N/A | St Clair Street (1) , Kirkcaldy | R(F) | N | N | 100 | 34.9 |
| N/A | St Clair Street (2) , Kirkcaldy | R(F) | N | N | 100 | 36.4 |
| N/A | St Clair Street (3), Kirkcaldy | R(F) | N | N | 100 | 30.8 |
| N/A | St Clair Street ROMON (A,B,C,) Kirkacaldy | R | N | Triplicate and Co-located | 100 | 18.4 |
| N/A | Dunnikier Rd, Kirkcaldy | R(F) | N | N | 100 | 26.8 |
| N/A | Victoria Rd, Kirkcaldy | R(F) | N | N | 100 | 28.7 |
| N/A | Glenlyon Road, Levenmouth | K | N | N | 100 | 25.7 |
| N/A | Leslie High St | R(F) | N | N | 100 | 20.4 |
| N/A | Queensway, Glenrothes | K | N | N | 100 | 19.6 |
| N/A | Adsa Roundabout, Kirkcaldy | K | N | N | 100 | 27.8 |
| N/A | 125 St Clair Street, Kirkcaldy | R(F) | N | N | 100 | 30.6 |
| N/A | 179A St Clair Street, Kirkaldy | R(F) | N | N | 100 | 26.1 |
| N/A | 3A Junction Road, Kirkcaldy | R(F) | N | N | 100 | 26.8 |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Collocated Tube | Data Capture 2014 (%) | Annual mean concentration (µg/m$^3$) |
|---|---|---|---|---|---|---|
| N/A | 24 St Clair Street, Kirkcaldy | R(F) | N | N | 100 | 19.7 |
| **$NO_2$ Diffusion Tubes East Area** | | | | | | |
| N/A | City Road (1,2), St Andrews | R | N | N | 100 | 24.8 |
| N/A | Bell Street (1,), St Andrews | R(F) | N | N | 100 | 31.7 |
| N/A | Bell Street (2) St Andrews | R(F) | N | N | 92 | 28.0 |
| N/A | Crossgate, Cupar | K | Y | N | 92 | 20.8 |
| N/A | South Road, Cupar | R | N | N | 100 | 11.0 |
| N/A | Cupar Road, Auchtermuchty | R(F) | N | N | 100 | 22.3 |
| N/A | Bonnygate, Cupar (1N), Bonnygate 1 | R(F) | Y | N | 100 | 26.1 |
| N/A | Bonnygate, Cupar, Bonnygate 2 | R(F) | Y | N | 92 | 25.6 |
| N/A | Bonnygate, Cupar, Bonnygate 3 (A, B) | R(F) | Y | N | 96 | 34.1 |
| N/A | Bonnygate, Cupar, Bonnygate B4 | R(F) | Y | N | 100 | 32.2 |
| N/A | Ladywynd, Cupar, Ladywynd B5 | R(F) | Y | N | 100 | 16.3 |
| N/A | Bonnygate West, Cupar, Bonnygate B6 | R(F) | Y | N | 92 | 19.3 |
| N/A | Bonnygate, Cupar, Monitor BA, BB, BC | K | Y | Triplicate and Co-located | 100 | 27.8 |
| N/A | 4 East Road, Cupar | R(F) | Y | N | 100 | 12.5 |

** Data annualised ($R_o$ of 0.986 applied to Bias corrected data) to compensate for May to December missing data*

*Table 2.7 Results of Nitrogen Dioxide Diffusion Tubes (2010 to 2014)*

| Site ID | Location | Site Type | Within AQMA? | Annual mean concentration (adjusted for bias) µg/m$^3$ | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| **$NO_2$ Diffusion Tubes West Area** | | | | | | | | |
| AQM3 | St Leonards Primary School, Dunfermline | R(F) | N | 23 (22) | 21 (20) | 17 | 14 | 14 |
| C'GIE DR | Carnegie Drive (A,B,C), Dunfermline | R(F) | N | 38 (37) | 38 (35) | 35 | 31 | 32 |
| DRM5 | Rumblingwell, Dunfermline (5N) | R | N | 27 (27) | 27 (21) | 25 | 21 | 21 |
| DRM9 | Appin Crescent (A)(B)(C), Dunfermline (9N) | R | Y | 37 (37) | 36 (34) | 34 | 31 | 31 |
| APP CR1 | Appin Crescent (1) Dunfermline | R(F) | Y | 31 (31) | 29 (28) | 27 | 25 | 26 |
| APP CR2 | Appin Crescent (2) Dunfermline | R(F) | Y | 46 (45) | 46 (44) | 41 | 39 | 39 |
| APP CR3 | Appin Crescent (3) Dunfermline | R(F) | Y | 44 (44) | 41 (39) | 39 | 33 | 33 |
| APP CR4 | Appin Crescent 4(A)(B)(C) Dunfermline | R(F) | Y | 33 (32) | 32 (30) | 28 | 25 | 25 |
| APP CR5 | Appin Crescent 5(A)(B)(C) | R(F) | Y | 44 (43) | 46 (43) | 42 | 36 | 36 |
| APPCR6 | Appin Crescent 6(A)(B)(C) | R(F) | Y | 54 (53) | 56 (47) | 46 | **40** | 40 |
| C'BEATH1 | High Street, Cowdenbeath | K | N | 27 | 22 | 24 | 21 | 22 |
| K'DINE | North Approach Road (A, B) Kincardine | K | N | 21 | 19 | 19 | 17 | 16 |
| PITT ST | Pittencrieff St, Dunfermline | R(F) | N | 24 (24) | 24 (22) | 19 | 18 | 26 |

| Site ID | Location | Site Type | Within AQMA? | Annual mean concentration (adjusted for bias) µg/m$^3$ | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| HALBEATH RD1 | 11 Halbeath RD1, Dunfermline | R (F) | N | - | 22* (20*) | 21 | 18 | 17 |
| HALBEATH RD2 | 57 Halbeath RD2, Dunfermline | R (F) | N | - | 26* (25*) | 20 | 18 | 17 |
| ADM RO.A | Admiralty Road A, Rosyth | R(F) | N | 37 (34) | 36 (31) | 33 | 32 | 31 |
| ROMON | Admiralty Road (A,B,C) ROMON | R(F) | N | 31 (28) | 29** (25**) | 28 | 26 | 25 |
| N/A | 229 Admiralty Road, Rosyth | R (F) | N | - | 24 | 24 | 22 | 22^ |
| N/A | 49 Ramsay Place, Rosyth | R (F) | N | - | 17 | 19 | 18 | 17 |
| N/A | 129 Admiralty Road, Rosyth | R (F) | N | - | 27** (23.5**) | 27 | 25 | 24 |
| $NO_2$ Diffusion Tubes Central Area | | | | | | | | |
| N/A | St Clair Street (1) , Kirkcaldy | R(F) | N | 41 | 42 (40) | 45 | 34 | 35 |
| N/A | St Clair Street (2) , Kirkcaldy | R(F) | N | 44 | 36 (35) | 41 | 36 | 36 |
| N/A | St Clair Street (3), Kirkcaldy | R(F) | N | 37 | 32 (31) | 34 | 30 | 31 |
| N/A | St Clair Street ROMON (A,B,C,)Kirkacaldy | R | N | - | 19 (19) | 25 | 20 | 18 |
| N/A | Dunnikier Rd, Kirkcaldy | R(F) | N | 33 | 30 (29) | 32 | 27 | 27 |
| N/A | Victoria Rd, Kirkcaldy | R(F) | N | 35 | 32 (31) | 34 | 29 | 29 |
| N/A | Glenlyon Road, Levenmouth | K | N | 32 | 27 | 28 | 24 | 26 |
| N/A | Leslie High St | R(F) | N | 25 | 22 | 25 | 21 | 20 |
| N/A | Queensway, Glenrothes | K | N | 24 | 22 | 25 | 20 | 20 |
| N/A | Adsa Roundabout, Kirkcaldy | K | N | 32 | 34 (33) | 33 | 30 | 28 |

| Site ID | Location | Site Type | Within AQMA? | Annual mean concentration (adjusted for bias) µg/m³ | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| N/A | 125 St Clair Street, Kirkcaldy | R(F) | N | - | - | N/A | 31 | 31 |
| N/A | 179A St Clair Street, Kirkaldy | R(F) | N | - | - | N/A | 27 | 26 |
| N/A | 3A Junction Road, Kirkcaldy | R(F) | N | - | - | N/A | 27 | 27 |
| N/A | 24 St Clair Street, Kirkcaldy | R(F) | N | - | - | N/A | 19 | 20 |
| $NO_2$ Diffusion Tubes East Area | | | | | | | | |
| N/A | City Road (1,2), St Andrews | R | N | 33 | 36 | 30 | 27 | 25 |
| N/A | Bell Street (1,), St Andrews | R(F) | N | 37 | 36 | 39 | 35 | 32 |
| N/A | Bell Street (2) St Andrews | R(F) | N | 31 | 39 | 36 | 25 | 28 |
| N/A | Crossgate, Cupar | K | Y | 26 (28) | 22 (24) | 24 | 26 | 21 |
| N/A | South Road, Cupar | R | N | 18 (19) | 12 (12) | 14 | 12 | 11 |
| N/A | Cupar Road, Auchtermuchty | R(F) | N | 29 | 24 | 28 | 25 | 22 |
| N/A | Bonnygate, Cupar (1N), Bonnygate 1 | R(F) | Y | 28 (31) | 28 (30) | 29 | 22*** | 26 |
| N/A | Bonnygate, Cupar, Bonnygate 2 | R(F) | Y | 36 (39) | 35 (38) | 36 | 32 | 26 |
| N/A | Bonnygate, Cupar, Bonnygate 3 (A, B) | R(F) | Y | 37 (41) | 36 (39) ((41)) | 37 | 31 | 34 |
| N/A | Bonnygate, Cupar, Bonnygate B4 | R(F) | Y | 31 (35) | 31 (33) | 34 | 35 | 32 |
| N/A | Ladywynd, Cupar, Ladywynd B5 | R(F) | Y | 19 (21) | 18 (19) | 18 | 18 | 16 |

| Site ID | Location | Site Type | Within AQMA? | Annual mean concentration (adjusted for bias) µg/m$^3$ | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| N/A | Bonnygate West, Cupar, Bonnygate B6 | R(F) | Y | 23 (25) | 19 (20) | 21 | 19 | 19 |
| N/A | Bonnygate, Cupar, Monitor BA, BB, BC | K | Y | 31 (34) | 30 (32) | 30 | 30 | 28 |
| N/A | 4 East Road, Cupar | R(F) | Y | 14 (16) | 13 (14) | 14 | 15 | 13 |

** 2011 data has been Period Mean Adjustment of 1.21 applied to non bias corrected data to compensate for January to September missing data*

*** 2011 data has been Period Mean Adjustment of 1.06 applied to non bias corrected data to compensate for January to April missing data*

**** Data capture <75%*

*^ Data annualised ($R_a$ of 0.986 applied to Bias corrected data) to compensate for May to December missing data*

### 2.2.2 $PM_{10}$

$PM_{10}$ concentrations are monitored at automatic monitoring sites in Bonnygate in Cupar, Admiralty Road in Rosyth, St Clair Street in Kirkcaldy and Appin Crescent in Dunfermline. Details of these sites are given in Table 2.1 and Appendix A. Table 2.8 compares $PM_{10}$ data against the annual mean air quality objectives set for Scotland (18 µg $m^{-3}$).

Data collected for 2014 shows that all the Fife monitoring sites meet the annual mean objective with concentrations of 18 µg $m^{-3}$. Annual mean concentrations at the sites are as follows: 15 µg $m^{-3}$ at Admiralty Road in Rosyth, 15 µg $m^{-3}$ at Appin Crescent in Dunfermline, 17 µg $m^{-3}$ at Bonnygate in Cupar and 11 µg $m^{-3}$ St Clair Street in Kirkcaldy were measured during 2014; all below the annual mean objective.

Table 2.9 summarises the number of exceedances of the $PM_{10}$ daily-mean objective of 50 µg $m^{-3}$ between 2010 and 2014. As can be seen the daily-mean objective of 50 µg $m^{-3}$ (not to be exceeded more than 7 times in a year) was not exceeded at any of the $PM_{10}$ monitoring sites in Fife. The Kirkcaldy site did record one daily mean over the 50 µg $m^{-3}$ (52 µg $m^{-3}$), however this is within the 7 times allowed per year.

As stated previously, Bonnygate in Cupar has been designated an AQMA for $PM_{10}$ and an Air Quality Action Plan has been adopted by Fife Council. Concentrations decreased significantly in 2013 (18 µg $m^{-3}$) and reduced further in 2014 (17 µg $m^{-3}$).

Indications are that previous traffic management measures have helped to decrease the concentration of $PM_{10}$ (and $NO_2$) since 2010 and it is hoped that future and ongoing action plan measures being carried out in Cupar will help reduce concentrations further.

The 2014 annual mean $PM_{10}$ concentration at Admiralty Road, Rosyth (15 µg $m^{-3}$) was below the annual mean $PM_{10}$ objective, but showed a slight increase from 2013 ( 14 µg $m^{-3}$). However this is a decrease from 2010, 2011 and 2012 where concentrations were exceeding the annual mean objective. The data capture rate achieved for $PM_{10}$ during 2014 was 81.2%. It was concluded in the Detailed Assessment (2012) that Fife Council should defer its decision to declare an AQMA until at least 6 months of monitoring data was made available using a new FDMS drier. The new drier was installed in September 2012. Using mean data up to the 31st March 2013 (15 µg $m^{-3}$) the 2012 Progress Report concluded that Fife Council was not required to declare an Air Quality Management Area at Admiralty Road, Rosyth. The 2013 and 2014 annual mean $NO_2$ concentrations support this conclusion.

The annual mean $PM_{10}$ concentration at Appin Crescent, Dunfermline (15 µg $m^{-3}$) was below the annual mean $PM_{10}$ objective, a reduction from the 16 µg $m^{-3}$ measured in 2013. The Appin Crescent, Dunfermline site's data capture was 98.8%. The site started monitoring $PM_{10}$ in March 2011 but data up to April 2011 was deleted during the ratification process. This may have distorted the annual mean for 2011. However, modelling undertaken as part of the Further Assessment of Air Quality in Appin Crescent (2012) indicated that the relevant $PM_{10}$ objectives may be compromised and the Air Quality Management Area Order should be amended to include this pollutant. The Appin Crescent AQMA Declaration Order was amended to include $PM_{10}$ in November 2012.

The annual mean $PM_{10}$ concentration for St Clair Street, Kirkcaldy in 2014 was well below the $PM_{10}$ objective with a measured concentration of 11 µg $m^{-3}$. The data capture for 2014 at this site was 87.3%. As shown in Table 2.8 the $PM_{10}$ concentrations at St Clair Street Kirkcaldy have been consistently well below the air quality objective.

Figure 10.2 (provide in section 10 of this report) shows the decline in $PM_{10}$ concentrations at Bonnygate, Cupar and Appin Crescent, Dunfermline from 2007 to 2014 and highlights that action plans can be effective in reducing concentrations of pollutants in AQMA's.

*Table 2.8 Results of Automatic Monitoring of $PM_{10}$: Comparison with Annual Mean Objective*

| Site ID | Site Type | Within AQMA? | Valid Data Capture 2014 % | Confirm Gravimetric Equivalent (Y or NA) | Annual Mean Concentration µg/m³ | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| Bonnygate, Cupar | Kerbside | Y | 87.1 | Y | 19 | 19 | 18 | (18)<br>18 | 17 |
| Admiralty Road, Rosyth | Roadside | N | 81.2 | Y | 19 | 20 | 17 | 14 | 15 |
| Appin Crescent, Dunfermline | Roadside | Y | 98.8 | Y | N/A | (16)<br>16* | 15 | 15 | 15 |
| St Clair Street, Kirkcaldy | Roadside | N | 87.3 | Y | N/A | 13** | 11 | 12 | 11 |

** Appin Crescent, Dunfermline started monitoring PM10 March 2011, Period Mean Adjustment of 1.03 applied.*

***St Clair Street, Kirkcaldy started monitoring February 2011*

*Data in brackets are Measurements without a period mean adjustment calculated*

*Table 2.9 Results of Automatic Monitoring for $PM_{10}$: Comparison with 24-hour mean Objective*

| Site ID | Site Type | Within AQMA? | Valid Data Capture 2014 % | Confirm Gravimetric Equivalent | Number of Exceedences of 24-Hour Mean (50 µg/m³) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| Bonnygate, Cupar | Kerbside | Y | 87.1 | Y | 3 (44) | 0 (44) | 4 | 4 (45) | 0 (39) |
| Admiralty Road, Rosyth | Roadside | N | 81.2 | Y | 0 | 3 | 1 | 2 | 0 (37) |
| Appin Crescent, Dunfermline | Roadside | Y | 98.8 | Y | N/A | 0 (38)* | 4 | 2 | 0 |
| St Clair Street, Kirkcaldy | Roadside | N | 87.3 | Y | N/A | 0 (33)** | 1 | 1 | 1 (25) |

** Appin Crescent, Dunfermline started monitoring PM10 March 2011, Period Mean Adjustment of 1.03 applied.*

***St Clair Street, Kirkcaldy started monitoring February 2011*

### 2.2.3 Sulphur Dioxide

**Automatic Monitoring Data**

$SO_2$ monitoring is undertaken on behalf of Longannet Power Station at Blair Mains, Fife (Grid Reference NS972864) to the north east of the power station. In 2014 Longannet operated with an average load factor of 48.1% (49.9% in 2013/ 47.9% in 2012 / 46.1% in 2011/ 49.6% in 2010 / 41% in 2009). The station emitted 17.9 kT of $SO_2$ during 2014 (25.8 kT in 2013/ 34.8kT in 2012 / 37.7kT in 2011/ 45.2kT in 2010 / ~32.2kT in 2009). Emissions were well below the short-term authorisation limit for $SO_2$ of 2000 mg/$m^3$ at all times.

Results for 2014 for this site are provided along with 2006 to 2013 data, and are summarised in Table 2.10.

***Table 2.10 Results of Automatic Monitoring of $SO_2$: Comparison with Annual Mean Objectives***

| Period | Valid Data Capture % | Max 15 Minute Mean (µg $m^{-3}$) | Max 1 Hour Mean (µg $m^{-3}$) | Max 24 Hour Mean (µg $m^{-3}$) |
|---|---|---|---|---|
| 2006 | N/A | 166 | 88 | N/A |
| 2007 | N/A | 138 | N/A | N/A |
| 2008 | N/A | 423 | N/A | N/A |
| 2009 | 99.9 | 150 (0) | 70 (0) | N/A (0) |
| 2010 | 99.8 | 238.6 (0) | 164.7 (0) | 22.9 (0) |
| 2011 | 96.6 | 247.6 (0) | 152 (0) | 37.5 (0) |
| 2012 | 97.4 | 201.1 (0) | 92.6 (0) | 17.3 (0) |
| 2013 | 97.6 | 178.3 (0) | 133.3 (0) | 20.7 (0) |
| 2014 | 97.8 | 192.3 (0) | 151.8 (0) | 35.5 (0) |

As detailed in the Longannet Power Station Report the measured concentrations at Blair Mains automatic monitor indicate that there were no exceedances of the 15-minute mean objective. Measured concentrations also indicated that there were no exceedances of the hourly or the daily $SO_2$ thresholds. Although maximum 24-hour mean data are not available, the 99.18th percentile daily value was 23.6 µg $m^{-3}$ (compliance value 125 µg $m^{-3}$) (15.7 µg $m^{-3}$ in 2013, 15.2 µg $m^{-3}$ in 2012 and 29.9 µg $m^{-3}$ in 2011), and the 99.73$^{th}$ percentile was 56.5 µg $m^{-3}$ (compliance value 350 µg $m^{-3}$) (57.7 µg $m^{-3}$ in 2013, 48.5 µg $m^{-3}$ in 2012 and 74.6 µg $m^{-3}$ in 2011). The period-mean for 2014 was 3.5 µg $m^{-3}$.

The measurements therefore indicate that the area around Longannet Power Station was in compliance with all relevant $SO_2$ objectives during 2014.

**Diffusion Tube data**

Additional $SO_2$ monitoring data are presented for INEOS oil refinery in their annual monitoring report for 2014. This report concludes that annual average concentrations of $SO_2$ are lower than the set air quality limit.

### 2.2.4 Benzene

There are currently three benzene monitoring programmes carried out within the Fife Council boundary:

- Monitoring in the area of the Grangemouth oil refinery on behalf of INEOS,
- Monitoring along the Fife coastline on behalf of BP,
- Monitoring to assess the possible impacts of Little Raith Wind Farm.

**INEOS Grangemouth Benzene Monitoring**

Benzene monitoring is presented for INEOS Grangemouth oil refinery in their annual monitoring report for 2014. This report concludes that the annual average concentrations of Benzene are below the Air Quality (Scotland) Regulations 2000 air quality objective of 3.25 µg $m^{-3}$ (1ppb).

**BP Benzene Monitoring**

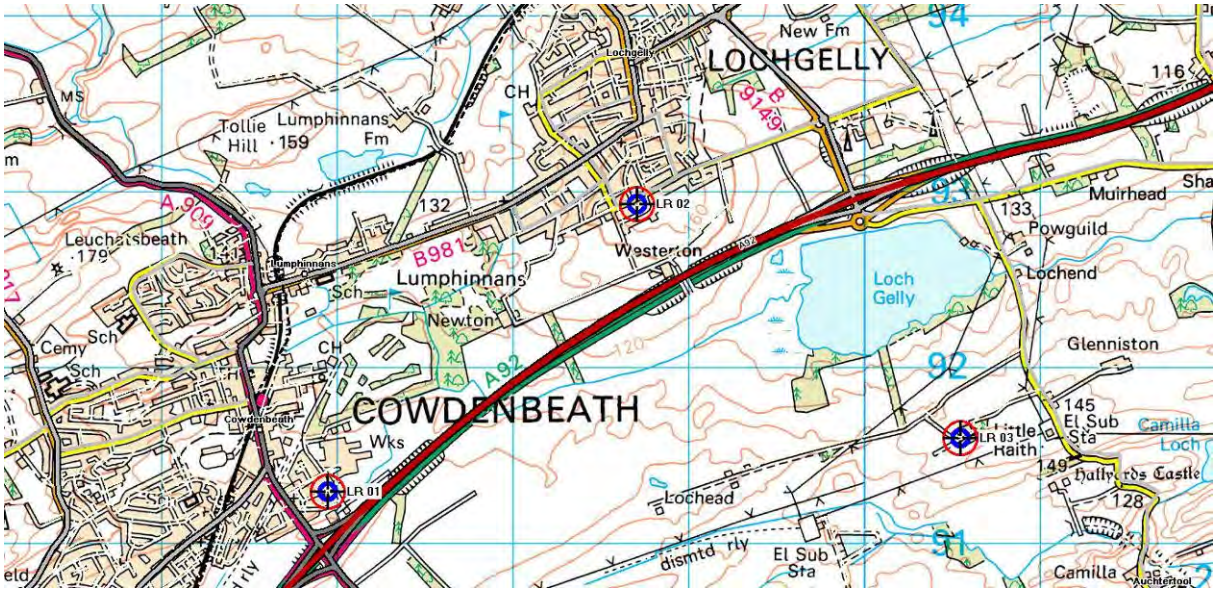
NPL on behalf of BP Exploration North Sea Region monitored hydrocarbon levels on the Forth coastline during 2014 (30/12/2013-29/12/2014). Samples were collected over 2 week periods using passive samplers at 12 locations between the Forth Bridges and West Wemyss including 4 locations between Dalgety Bay and Burntisland. Samples were analysed for iso-butane, n-butane, iso-pentane, n-pentane, n-hexane, n-heptane, benzene, toluene, xylene and total hydrocarbons (C4-C19). These hydrocarbons are emitted from a variety of sources around the Forth including the operations at Hound Point but also from traffic and other industrial sites such as the operations of ExxonMobil and Shell at Braefoot Bay and Mossmorran. The results of this monitoring indicate that concentrations of benzene over the 12 month period were low (annual means range from 0.2-0.3 ppb) and well within the air quality standard. Concentrations of other hydrocarbons were also low, but there are no air quality standards for these substances. The substance present in the greatest concentrations at most locations was n-butane for which annual mean concentrations ranged from 1.5 ppb to 6.5 ppb. Annual mean concentrations of other individual substances ranged from <0.3 ppb to 3.5 ppb. Annual mean concentrations of total hydrocarbons at different locations ranged from 7-26 ppb.

BP have commissioned monitoring along the Fife coastline for many years and there has been an overall reduction in the levels of hydrocarbons, including benzene, present in air over the last decade. Concentrations at any one locality are highly dependent on the weather. The measurements made in 2014 indicate that concentrations of most of the monitored substances were lower than 2013 at most locations.

**Little Raith Benzene monitoring**

The purpose of the Little Raith monitoring programme is to evaluate the possible air quality impacts following the development of the Little Raith Wind Farm. The wind farm began generating on the 19th of September 2012 and became fully operational by mid-November 2012. The monitoring programme, set up by the Mossmorran & Braefoot Bay Independent Air Quality Monitoring Review Group (Review Group), started in January 2011 and ended in November 2013. It consists of 3 diffusion tube sites located at Cowdenbeath (LR01), Lochgelly (LR02) and Little Raith Farm (LR03); shown in Figure 2.5.

***Figure 2.6 Benzene Diffusion Tube Monitoring Locations – Little Raith Monitoring Programme***




The wind farm became operational on the 22nd November 2012. Mean concentrations of benzene at the three locations in the 22 months prior to the wind farm becoming operational were 0.3, 0.3 and 0.6 ppb respectively. Mean concentrations since the wind farm became operational were 0.2, 0.2 and 0.3 ppb respectively[32]. Measured running annual mean benzene concentrations at all three monitoring locations have been below the AQS Objective of 1 ppb (3.25 µg $m^{-3}$) throughout the monitoring programme; and data capture rates have remained above 90%.

Long term average concentrations of benzene have been slightly lower than previously recorded since the turbines became operational in late 2012. The benzene concentrations measured at LR01 (Cowdenbeath), LR02 (Lochgelly) and LR03 (Little Raith Farm) indicate a downward trend in benzene concentrations throughout the monitoring programme and in particular at LRO3 (Little Raith Farm) location. This coincides with a request by SEPA to the local farmer to cease the burning of waste materials near to this monitoring location.

It has therefore been recommended by the Review Group that it is not necessary to instigate continuous monitoring programme for benzene[32].

### 2.2.5 Other pollutants monitored

**1,3- Butadiene**

1,3 Butadiene monitoring data are presented for INEOS Grangemouth oil refinery and BP Production and Exploration as part of their 2014 annual reports. Annual average concentrations for 1, 3 Butadiene are lower than the set air quality limit.

**Other Hydrocarbons**

Monitored concentrations of propane, n-butane, iso-butane, n-pentane, hexane, heptane, octane, nonane, decane, propylene, toluene, o-xylene, m & p-xylene, styrene and total C4 to C10 hydrocarbons are measured at both the INEOS Grangemouth oil refinery and BP Production and Exploration as part of their annual reporting for 2014. Annual average concentrations are low, but there are no air quality standards for these substances.

The INEOS Grangemouth annual community air monitoring report for 2014 states that there were no significant changes in the annual average concentrations for all hydrocarbon components across all locations, when compared with historical data.

The annual air quality report for BP Production and Exploration, Houndpoint, 2014 states that concentrations of most of the monitored substances in 2014 were lower than 2013 at most locations. The report also adds that over the many years BP have commissioned monitoring along the Fife coastline; there has been an overall reduction in the levels of hydrocarbons, including benzene, present in air over the last decade.

The Mossmorran & Braefoot Bay Independent Air Quality Monitoring Review Group 2013 Annual Report[33] (July 2014) states that emissions from regulated sources within the Shell and ExxonMobil Plants in 2013 remained well within the limit values set by SEPA for the protection of public health and the environment. The report concluded that emissions from the Shell and ExxonMobil Plants at Mossmorran and Braefoot Bay continue to pose no significant risk to the health of members of the local community.

**Carbon Monoxide**

As in previous years, short periods of CO monitoring have been undertaken by Fife Council's Transportation Services at a number of roadside locations. Measurements were undertaken with Marksmann 660 street monitors. The results are summarised in Table 2.11. The results have been converted from ppm into mass units at 20°C and 1 atmosphere.

Whilst none of these monitoring periods are sufficiently long to permit full assessment of CO concentrations over a full annual period, they all indicate that concentrations are likely to be below the Air Quality Strategy objective of 10 mg $m^{-3}$ for the running 8 hour mean concentration.

[33] Mossmoran and Braefoot Bay Independant Air Quality Monitoring Review Group, 2013 Annual Report, July 2014

*Table 2.11 Fife Council CO Monitoring Results for 2014*

| Site Number/ Location | Monitoring Period | Max 8-Hour Concentration (mg $m^{-3}$) |
|---|---|---|
| Bothwell Gardens, Dunfermline | 15/04/14 to 21/04/14 | 0.44 |
| | 01/07/14 to 07/07/14 | 2.32 |
| | 17/10/14 to 23/10/14 | 1.21 |
| Carnegie Drive/ Pilmuir Street Dunfermline | 15/04/14 to 21/04/14 | 1.05 |
| | 01/07/14 to 07/07/14 | 2.71 |
| | 17/10/14 to 23/10/14 | 0.92 |
| Kirkcaldy, Victoria Rd/Dunnikier Rd | 07/06/14 to 13/06/14 | 0.38 |
| | 05/09/14 to 11/09/14 | 0.88 |
| | 14/03/15 to 20/03/15 | 0.61 |
| Glenlyon Road/ Windgates Road, Leven | 14/05/14 to 20/05/14 | 0.44 |
| | 02/08/14 to 08/08/14 | 0.52 |
| | 06/02/15 to 12/02/15 | 0.35 |
| Bonnygate, Cupar | 16/05/14 to 22/05/14 | 0.59 |
| | 02/08/14 to 08/08/14 | 0.99 |
| | 06/02/15 to 12/02/15 | 0.68 |
| Admiralty Rd/ Queensferry, Rosyth | 10/06/14 to 16/06/14 | 0.42 |
| | 18/09/14 to 24/09/14 | 0.32 |
| | 14/03/15 to 20/03/15 | 0.96 |
| A909, Mossmorran | 09/05/14 to 15/05/14 | 0.23 |
| | 01/07/14 to 07/07/14 | 1.77 |
| | 29/10/14 to 04/11/14 | 0.22 |
| Appin Crescent | 15/04/14 to 21/04/14 | 0.58 |
| | 01/07/14 to 07/07/14 | 0.24 |
| | 17/10/14 to 23/10/14 | 0.22 |
| Kirkcaldy St Clair Street/ Junction Road | 07/06/14 to 13/06/14 | 0.65 |
| | 05/09/14 to 11/09/14 | 0.24 |
| | 14/03/15 to 20/03/15 | 0.48 |

### 2.2.6 Summary of Compliance with AQS Objectives

New monitoring data highlighted air quality issues for $NO_2$ in Appin Crescent, Dunfermline at one diffusion tube location (Appin Crescent 6 (A, B, C)). No other air quality issue concerning $NO_2$ were highlighted by the 2014 data.

All the automatic monitoring sites in Fife measured $PM_{10}$ concentrations below the annual and daily mean objective during 2014.

Bonnygate, Cupar and Appin Crescent, Dunfermline have both already been declared AQMAs for $NO_2$ and $PM_{10}$. Fife Council are currently in the process of implementing their Air Quality Action Plans for these areas.

Fife Council has examined the results from monitoring in the Fife Council Area. Concentrations within the Appin Crescent, Dunfermline AQMA are within the air quality objectives with the exception of a marginal annual mean exceedance of $NO_2$ concentrations at one diffusion tube location. As a result, the AQMA should remain. Concentrations within the Bonnygate, Cupar AQMA are within the annual mean objectives for $PM_{10}$ however monitoring will continue given that the concentrations are just within the air quality objectives.
Concentrations of all AQS pollutants outside of the AQMA are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

# 3 Road Traffic Sources

## 3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Fife Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

## 3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

Fife Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

## 3.3 Roads with a High Flow of Buses and/or HGVs.

Fife Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

## 3.4 Junctions

Fife Council confirms that there are no new/newly identified busy junctions/busy roads.

## 3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

Fife Council confirms that there are no new/proposed roads.

## 3.6 Roads with Significantly Changed Traffic Flows

Fife Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

## 3.7 Bus and Coach Stations

Fife Council confirms that there are no bus stations in the Local Authority area which meet the specific criteria.

# 4 Other Transport Sources

## 4.1 Airports

Fife Council confirms that there are no airports in the Local Authority area which meet the specific criteria.

## 4.2 Railways (Diesel and Steam Trains)

### 4.2.1 Stationary Trains

Fife Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

### 4.2.2 Moving Trains

Fife Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

## 4.3 Ports (Shipping)

Fife Council confirms that there are no ports or shipping that meets the specified criteria within the Local Authority area.

# 5 Industrial Sources

## 5.1 Industrial Installations

### 5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

Fife Council confirms there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

### 5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

Fife Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

### 5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

Fife Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

### 5.1.4 Installations that have Ceased to Operate

The following information from SEPA provides details of industrial processes that have surrendered their PPC licence or have ceased to operate in the last year:

- O'Brian & Sons (mobile Crusher), ceased in February 2014
- Skene.Leslie (mobile cement batching plant), ceased in August 2014

## 5.2 Major Fuel (Petrol) Storage Depots

There are major fuel (petrol) storage depots within the Local Authority area, but these have been considered in previous reports.

## 5.3 Petrol Stations

Fife Council confirms that there are no petrol stations meeting the specified criteria.

## 5.4 Poultry Farms

Peacehill Poultry Farm in Wormit, Newport-on-Tay has increased its bird places from 340,000 to 500,000.

Screening has been carried out in accordance with the LAQM Technical Guidance (LAQM.TG (09)) procedures set out in section C.4 box 5.5. Though the size of the poultry farm meets the criteria to carry out a detail assessment it does not meet the criteria of relevant exposure within 100 meters of the poultry units.

It is therefore determined that there is no need to proceed to a detailed assessment.

Fife Council confirms that there are no poultry farms meeting the specified criteria.

# 6 Commercial and Domestic Sources

## 6.1 Biomass Combustion – Individual Installations

Proposed biomass installations subject to the planning consultation process in the Fife are required to submit the relevant biomass boiler registration form and where appropriate submit air quality impact assessments in accordance with LAQM TG (09) and associated technical guidance. A summary of planning applications relating to biomass planning applications can be found in Chapter 9 of this report. Further information on specific biomass boiler registration and air quality impact assessments, can be found on the Fife Council planning online website. Fife Council concludes that it will not be necessary to proceed to a Detailed Assessment. In 2016 Fife Council plan to Investigate the potential for submitting a grant, which will allow the survey of all biomass boilers within their local authority.

## 6.2 Biomass Combustion – Combined Impacts

From planning consultations and biomass boiler registration submissions received to date, the combined impacts of biomass installations are considered unlikely to compromise air quality objectives. Fife Council concludes that it will not be necessary to proceed to a Detailed Assessment.

## 6.3 Domestic Solid-Fuel Burning

Fife Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

# 7 Fugitive Sources

**Forth Replacement Crossing**

During the construction of the Forth Replacement Crossing and associated road network, air quality monitoring has been undertaken by the Forth Crossing Bridge Constructors (FCBC)[35]. Air quality is being monitored using automatic light scatter dust meters and Frisbee gauge dust deposition monitoring. Seven automatic light scatter meters were installed at various sensitive locations to measure real time particulate matter ($PM_{10}$) concentrations and the Total Suspended Particle (TSP) concentrations. Thirteen Frisbee gauges were also set up at sensitive locations across the site to measure dust deposition rates. Of all the sites currently monitored by FCBC, only the Whinny Hill light scatter meter and dust deposition Frisbee are within the Fife local authority area.

Additionally, a daily dust log for both the North and South sites was kept by the FCBC Environmental Department. This daily dust inspection was used to identify any dust occurring as a result of construction works and any actions that were required. Also included in this log was a visual record of weather conditions which included conditions that may have affected readings, such as fog.

The 2014 monitoring results for Whinny Hill indicated that there were a few elevated readings (exceedances of the thresholds set out in the FRC air quality management plan), which were explained by regional events rather than construction related. Within in the monitoring reports created the majority of $PM_{10}$ exceedances were attributed to foggy weather conditions, though Saharan Dust was mentioned as a likely cause during March. The dust deposition threshold was exceeded twice in May and November 2014. For the exceedance in May it was noted that, following further review and analysis, construction activity was responsible. However, the FCBC report for May 2014 noted that the location is directly adjacent to the A904, so could also be affected by dust from the public road.

All the Forth Replacement Crossing air quality monitoring reports are publically available at the project website

http://www.transportscotland.gov.uk/road/forth-replacement-crossing/frc-air-qualitydocuments.

**Lomond Quarry Leslie**

A number of complaints have been received from nearby residents following the introduction of hard rock blasting at Lomond quarry in 2011. These relate to perceived noise,

[35] Forth Replacement Crossing: Air Quality Monitoring Report March 2015, Forth Crossing Bridge Constructors

vibration and dust nuisance. In April 2015, a report into the impact of particulate emissions from the Lomond Quarry in Leslie, Fife[36] was carried out by Ricardo-AEA.

The pollutant assessed was particulate matter with a mean aerodynamic diameter of 10 microns or less ($PM_{10}$).

The assessment has been carried out using different emission factors for different sources within and out with the quarry; including blasting, pile storage, machinery and hauling of materials. The assessment has used internationally recognised methods and tools throughout. Air quality impacts were calculated using AERMOD, a dispersion model developed by the US EPA. The most recent version of the model was used in conjunction with one year of hourly sequential meteorological data (selected as worst case from a sensitivity analysis of a 3 year data set, 2012 - 2014). For the purposes of the study a number of receptors located in the vicinity of the quarry were considered.

The results indicate that the quarry emissions will not result in any exceedances of the Air Quality Strategy (AQS) objectives for $PM_{10}$ at any relevant receptors.

The modelling results indicate that annual mean $PM_{10}$ concentrations could increase above 40 $\mu g\ m^{-3}$ and 18 $\mu g\ m^{-3}$ within the quarry boundary only. This location is not a relevant receptor for the standards under consideration. It is therefore concluded that emissions from the quarry are unlikely to result in an exceedances of the $PM_{10}$ annual mean objectives.

The worst case results at points of relevant exposure for comparison with the annual mean objectives were predicted at receptors to the east of the quarry with total modelled $PM_{10}$ concentrations of 13.7 $\mu g\ m^{-3}$. This modelled concentration represents 76% of the annual mean objective for $PM_{10}$ (18 $\mu g\ m^{-3}$). In the case of the short term objectives, the worst case results modelled at receptor to the south of the quarry are 34.4 $\mu g\ m^{-3}$ ($98.08^{th}$ percentile) for $PM_{10}$. This modelled concentration represents 69% of the annual mean objective for $PM_{10}$ (50 $\mu g\ m^{-3}$). It is therefore unlikely that the short term AQS objective for $PM_{10}$ will be breached as a result of the quarry emissions.

Analysis of the worst-case daily $PM_{10}$ averages at nearby residential receptors suggests that these are predominantly associated with northerly to north westerly winds transporting emissions from the storage piles in the quarry. This requires a reasonably moderate wind speed of >5 m $s^{-1}$which is consistent with neutral to unstable atmospheric stability conditions. That said, even when looking at the worst case 24hr periods in the worst case year, these are not sufficient to exceed the relevant short term $PM_{10}$ standards.

Fife Council's Protective Services has been consulted on the contents of the 'Modelling the impact of particulate emissions' report from Lomond Quarry in Leslie, Fife (April 2015) and found its contents to be satisfactory.

[36] Modelling the impact of particulate emissions from Lomond Quarry in Leslie, Fife, Ricardo-AEA ED 60521 Issue Number 1, April 2015

# 8 Local / Regional Air Quality Strategies

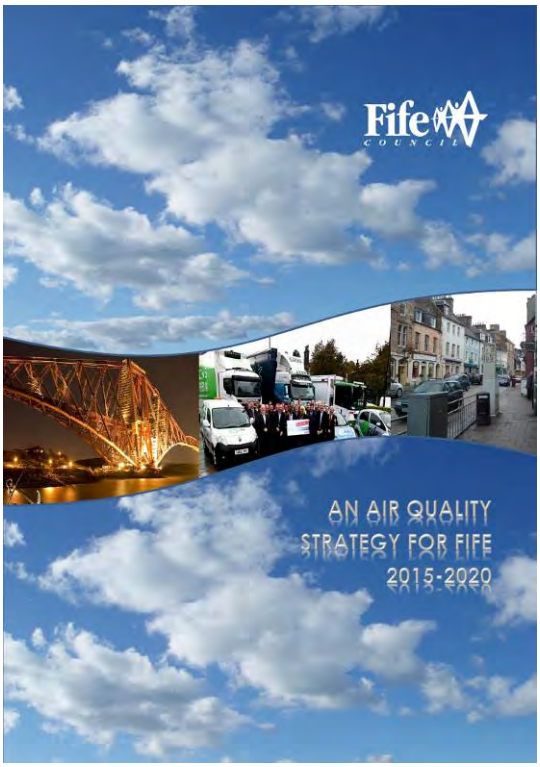
**The Air Quality Strategy for Fife 2015 – 2020**

The Air Quality Strategy For Fife 2015 – 2020 was developed from the guidance of the Scottish Government and aims not only to raise awareness of air quality issues but also to promote some of the existing best practice work that the Council has undertaken within existing AQMAs to other parts of Fife. It recognises that no one single authority or Council service can have all the solutions and consequently a collaborative approach with key partners and stakeholders is considered essential in order to bring about improvements in air quality.

This Strategy provides a brief overview of air quality in Fife and considers some of the actions taken to improve air quality to date, in particular those that are more generally applicable to the entire Fife Council area.

The key aims of the Air Quality Strategy are to:

- Minimise the potential impact of poor air quality on the health and wellbeing of residents, workers and visitors to Fife and also on Fife's natural heritage, both protected and non-protected;
- Fulfil statutory obligations for local air quality management and assist the Scottish Government in achieving the Air Quality Limit Values;
- Regularly evaluate the success of air quality action plans and where necessary identify new actions to bring about further improvements in local air quality;
- Encourage and facilitate co-ordinated working between Council Services and external stakeholders to improve local air quality (include NHS Fife, FHA and RHA);
- Evaluate, and encourage the implementation of cost-effective measures to reduce emissions and exposure to poor air quality across the Kingdom of Fife;
- Help to raise public awareness and understanding of local air quality issues within Fife, and how they can help contribute to improving the situation;
- Encourage the application of successful actions deployed in AQMAs within Fife to other areas within Fife.




This strategy pulls together existing Council activities that will work towards achieving the prescribed aims. The Air Quality Strategy can be viewed in full at www.fifedirect.org.uk.

**Fife Environmental Partnership Climate Change Strategy 2014 – 2020**

Fife is making sure it is ready to tackle the challenges posed by climate change. The Fife Environmental Partnership (FEP) launched the 'Climate Change Strategy 2014– 2020' in April 2014 (Appendix D).

The strategy aims to reduce carbon emissions and adapt to climate change in a variety of ways including:

- Using energy, waste and water more efficiently
- Getting more energy from low carbon supplies
- Encouraging more sustainable transport and travel

Fife Council is further promoting more sustainable transport and travel through current projects being carried out and the valuable information it provides on its council website.

Fife Council is encouraging the use of Electric Vehicles (EV) by promoting the many benefits of having an electric vehicle through their council website and also including electric vehicles in their fleet. Currently Fife Council and its Community Planning partners have 17 electric vehicles within their fleet. There are also 20 charging points which are available for the general public to use at Long Stay Car Parks in Town Centres and at Public Transport

Interchanges such as Railway Stations, with 3 more proposed in the near future. This includes a charger location at Bonnygate Street car park.

Fife Council explains that electric vehicles are significantly cheaper to run than conventional cars, even though they may cost more initially. The cost benefits are:

- No road tax
- Less affected by fluctuating fuel prices.
- Lower maintenance costs. The lack of complex parts (no gearboxes or engine) can make EVs cheaper to look after

The benefits to the environment of using an electric car are numerous. Electric Vehicles do not emit any pollutants at the point of use so can play an important role in tackling climate change and poor air quality in Fife particularly in the Bonnygate and Appin Crescent AQMA's.

Other forms of sustainable transport are also being invested in at locations in Cupar and Dunfermline.

Fife Council is also is also investing in the future use of cycle networks by carrying out cycle training across all schools. The Scottish Cycle Training Scheme (formerly known as cycling proficiency) has now been rebranded nationally as Bikeability Scotland by Cycling Scotland, details of which can be found in Appendix E. This will encourage children and young adults to travel to school by a sustainable means.

# 9 Planning Applications

A list is given below of the 2014 planning applications that are required to demonstrate that Air Quality Strategy Objectives are unlikely to be exceeded as a result of the developments either through screening or more detailed dispersion modelling:

**13/03907/PREAPP** – Pre-application for the erection of mixed use development (housing, business and retail) in Cupar North, Cupar. Fife Council have requested that the air quality impact assessment should fully consider the potential Air Quality impacts from this site considering that it is in close proximity to the Bonnygate Cupar Air Quality Management Area.

**14/02374/SCO** – Request for scoping opinion for the development of an area to the north of Cupar. The application includes the construction of 1400 residential units, a Class 1 retail, business and general industry area, a care home, a hotel, a primary school in Cupar North (C29 From Bank Street, Cupar To Q7 Junction, Cupar), Fife. Fife Council have requested that the Air Quality Impact Assessment should fully consider the potential air quality impacts from this site considering that it is in close proximity to the Bonnygate Cupar Air Quality Management Area.

**14/03683/FULL** - Application for the erection of fourteen new holiday units, a district biomass plant building and the refurbishment of six holiday units at Kincaple Lodge, Kincaple, St Andrews. The applicant is requested to submit an Application for the Approval Of Chimney(S) Serving Furnace(S) form as per the Clean Air Act 1993, Section 14 & 15.

**13/01956/FULL** – Application for the erection of a two storey, 60 bedroom care home with day care centre, meals on wheels facility and associated access road, car parking and landscaping at Ostlers Way Care Home, Kirkcaldy. An air quality impact assessment was provided by the applicant and concluded that air quality objectives were unlikely to be compromised. Fife Council accepted the findings of the report.

**14/00243/FULL** – Retrospective planning permission for the erection of a storage tank to the side of dwellinghouse at The Old Schoolhouse, Durie Place, Windygates. The exterior wood pellet storage tank of galvanized steel is to supply a self-feed biomass boiler. The applicant is requested to submit a Biomass Boiler Information Request Form to ensure that the new boiler does not t require an Air Quality Impact Assessment.

**13/03937/FULL** - Application for the erection of a new secondary school (Class 10); formation of car park, bus drop off area and new internal access roads; SUDS facilities; boundary fencing; ground consolidation works and the provision of 5 grass and 1 all-weather sports pitches at Buckhaven High School, Methilhaven Road, Buckhaven. The applicant is requested to submit confirmation that the installed stack height is 15.1m, as discussed in the 'Levenmouth Secondary School Biomass plant air quality impact assessment Report (March 2014)' so that there is sufficient protection at relevant receptors. An air quality impact assessment report was provided by the applicant and concluded that air quality objectives were unlikely to be compromised. Fife Council accepted the findings of the report.

**14/00637/FULL** – Application to erect an outbuilding which will house a new biomass boiler at Wormistoune House, Crail. The applicant is requested to submit a Biomass Boiler information Request Form. Fife Council also comments that the proximity of trees may affect plume dispersion and this should be taken into account when designing the stack height for the proposed boiler. An air quality impact assessment report was provided by the applicant and concluded that air quality objectives were unlikely to be compromised. Fife Council accepted the findings of the report.

**14/01287/SCR** – Request for screening opinion for resumption of extraction of peat at Peat Site, Mossmorran. Fife Council requests that any potential dusts generated by the proposed development are controlled in such a manner that these do not compromise the achievement of Scottish statutory air quality objectives for particulate matter ($PM_{10}$).

**14/01283/FULL** - Planning permission granted for the installation of a flue for a wood burning stove at 46 Sunnyside Strathkinness, St Andrews. A Biomass boiler request form was previously requested by Fife Council to ensure that an air quality impact assessment was not required.

**14/02334/EIA** – Planning application for a Renewable Energy Centre, biomass fuel storage and processing, district heating pipeline works between Guardbridge and Upper and Lower North Haugh and John Burnett Hall of Residence, and associated access, infrastructure and ancillary works at Curtis Fine Papers Ltd, Main Street, Guardbridge. Fife Council has found the air quality impact assessment as detailed in Chapter 4 Air Quality of Environ's Environmental Statement (dated July 2004) to be generally satisfactory but suggests that the methodology used to derive $PM_{10}$ and $PM_{2.5}$ (Table 4.2) be made clearer in the report.

**14/03029/PREAPP** – Pre-application discussions for mixed use development comprising of residential, commercial, employment, tourism, leisure, recreation, community and ancillary uses at Crail Airfield, Balcomie Road. The applicant is advised that an appropriate air quality impact assessment should be undertaken. Details of this assessment is to be submitted to Fife Council for further comment.

**14/02055/FULL** – Planning permission with conditions has been granted for the installation of a wood burning stove and flue at 5 Barnyards, Kilconquhar, Leven. The applicant is to submit a full technical specification for the wood burning stove associated with the flue to Fife Council to assess whether or not emissions are likely to compromise Scottish statutory air quality objectives.

**13/03752/FULL** – Application for the proposed Aldi store at South Road in Cupar, Fife. Fife Council has reviewed the air quality impact assessment for the proposed development and are generally satisfied with regards to air quality issues.

**14/03664/FULL –** Planning permission granted for the installation of a flue at The Barracks in Gillingshill, Anstruther. The work will include alterations to form a storage/work shop shed and biomass boiler room. A replacement roof will also be installed. The biomass boiler is an exempt appliance under the provisions of the Clean Air Act 1993 and is not in an Air Quality Management Area (AQMA).

**14/02991/SCO** – EIA scoping opinion request for proposed mixed use development at land to south-west of Younger Gardens, Melville Road, St Andrews. The applicant is advised that consideration will be given to any potential air quality impact. Fife Council also advises that it would welcome consultation on the Environmental Statement once it is complete so they may comment as appropriate.

**14/02733/PREAPP** - Pre-application for 51 affordable residential units and 15,000 sq ft retail store at Castle Road, Rosyth. Fife Council has stated that a Traffic Assessment should be submitted with the application. The assessment should include an air quality impact assessment of emissions from both the construction and operational phases of the development to ensure that the Scottish statutory air quality objectives will not be breached.

**14/01617/PREAPP** - Pre-application for the installation of a biomass boiler at Fife Council, Bankhead Central, Bankhead Park, Glenrothes. The applicant is required to submit a Biomass Boiler Information Request Form to Fife Council for comment. It is also advised that an appropriate air quality impact assessment is under taken to ensure Scottish statutory air quality objectives will not be compromised by this boiler. An air quality impact assessment report was provided by the applicant and concluded that air quality objectives were unlikely to be compromised. Fife Council accepted the findings of the report.

**PC140009C1 (Land & Air Quality Team reference)** Proposal for the development of an Agro-Biotech Innovation Centre at Westfield. The applicant is required to ensure that a suitable air quality impact assessment is undertaken covering both construction and operational traffic to ensure that the Scottish statutory air quality objectives will not be breached.

# 10 Implementation of Action Plans

Where an authority identifies that a given air quality objective is likely to be exceeded at a relevant location, it is obliged to declare an Air Quality Management Area (AQMA) and undertake a Further Assessment of existing and likely future air quality. The Authority must then develop an Air Quality Action Plan (AQAP), setting out the local actions that will be implemented to improve air quality and work towards meeting the objectives.

Fife Council declared an AQMA for Bonnygate, Cupar in October 2008 which came into force in December 2008. The findings of the Further Assessment indicate that road traffic is the principal source responsible for the local exceedances of $NO_2$ and makes a significant contribution to local $PM_{10}$ concentrations. Background sources constitute the principal sources of $PM_{10}$ within the Bonnygate AQMA, however background sources are difficult to address at the local level.

Fife Council declared a second AQMA for Appin Crescent, Dunfermline amended for both $NO_2$ and $PM_{10}$, which came into force on September 2012. The findings of the Further Assessment indicate that road traffic is the principal source responsible for the local exceedances of $NO_2$. The source apportionment undertaken in the further assessment indicated that background sources constitute the principal sources of $PM_{10}$ within the Appin Crescent AQMA although road traffic makes a significant contribution to local $PM_{10}$ concentrations.

A steering group including key representatives from relevant services of Fife Council was formed to develop the draft AQAPs for both Bonnygate and Appin Crescent. The steering group considered the findings of the Further Assessments and the wide range of potential options for improving air quality within the AQMAs. Subsequently the steering group undertook an assessment of each of these options. The options were assessed against the following criteria:

- How much support was there initially within the steering group for the option?
- Potential air quality impact;
- Potential costs;
- Overall cost-effectiveness;
- Potential co-environmental benefits, risk factors, social impacts and economic impact;
- Feasibility and acceptability.

The assessments were then considered in total to place the options in a prioritised order.

These assessments then became the draft AQAPs for Bonnygate and Appin Crescent.

Fife Council adopted the finalised Air Quality Action Plan for Bonnygate in October 2010. The finalised Air Quality Action Plan for Appin Crescent was published in May 2013.

The Bonnygate AQAP aims to work towards reducing transport emissions of $NO_x$ and $PM_{10}$ in the AQMA by approximately 53% and 33% respectively; using a wide range of measures such

as road and traffic signaling improvement combined with other measures, for example behavior-change. Provided in Appendix F of this Report is the Bonnygate, Cupar Air Quality Action Plan Progress Report – Summary Table for 2014. This table summarises Fife Council's progress to date in terms of implementing the finalised Action Plan for Bonnygate Cupar.

The Appin Crescent AQAP aims to work towards reducing transport emissions of $NO_x$ and $PM_{10}$ in the AQMA by approximately 18% and 40% respectively; and as with the Bonnygate AQAP will involve a combination of road layout and traffic signaling improvements combined with many other measures. Provided in Appendix G of this Report is the Appin Crescent, Dunfermline Air Quality Action Plan Progress Report – Summary Table for 2014. This table summarises Fife Council's progress to date in terms of implementing the finalised Action Plan for Appin Crescent, Dunfermline.

The required improvements appear to be quite onerous, however, it should be noted that these represent the ambient concentrations required to meet the objectives, not the reduction in mass emissions. It is anticipated that a reduction of this scale will lead to the achievement of the annual mean $NO_2$ air quality standard (40 µg $m^{-3}$) and Scottish annual mean objective for $PM_{10}$ (18 µg $m^{-3}$) within both AQMAs in future years. This has already been realised with a reduction in $NO_2$ and $PM_{10}$ annual mean concentrations to below the annual mean objective at the Cupar automatic monitoring site location; following improvements to the traffic signalling and road layout within the Bonnygate during 2009.

Figure 10.1 and 10.2 illustrate the decrease in $NO_2$ and $PM_{10}$ concentrations between 2007 and 2014 at both the Cupar and Dunfermline automatic monitoring site.

***Figure 10.1 Annual Mean $NO_2$ Concentrations at Cupar and Dunfermline, Fife – 2007 to 2014***

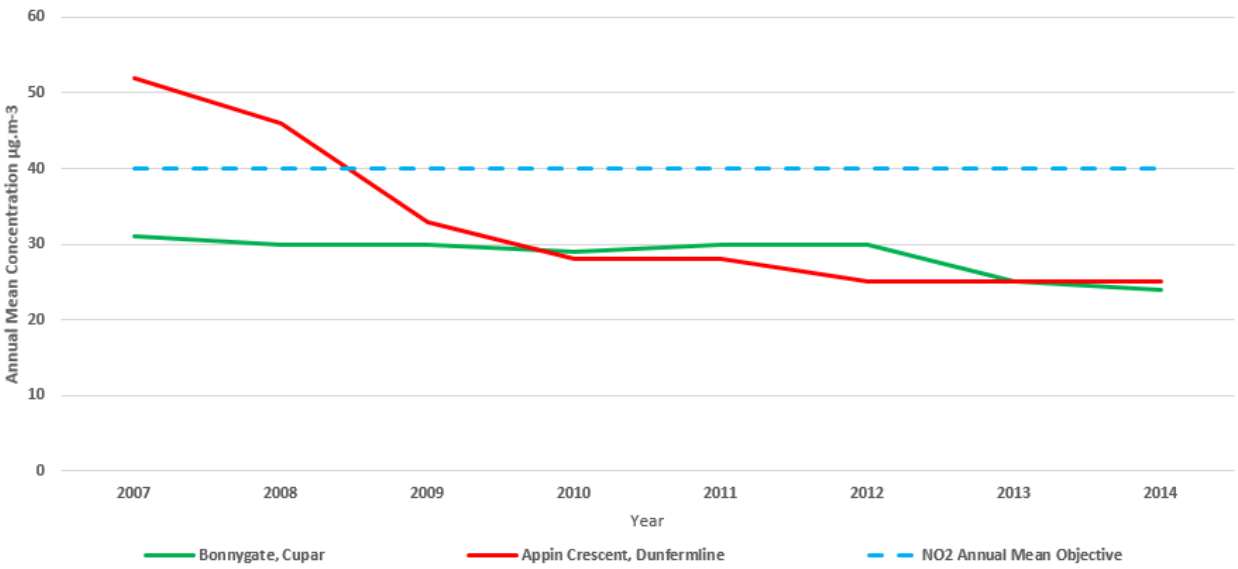
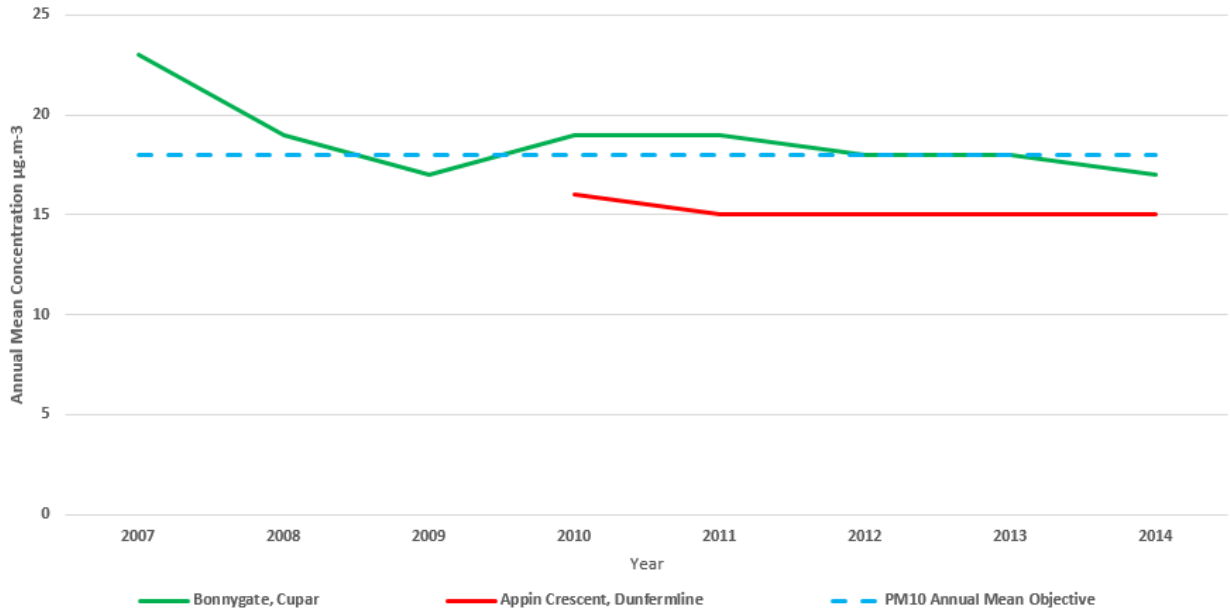


*Figure 10.2 Annual Mean $PM_{10}$ Concentrations at Cupar and Dunfermline, Fife – 2007 to 2014*




As part of the implementation of the Fife AQMA action plans, modelling studies on each of the Fife AQMAs were carried out for Fife Council. The Cupar North study assessed the potential impact within the Bonnygate AQMA of future traffic associated with the Cupar North development zone. The Appin Crescent, Dunfermline traffic management study considered the modelled effect that potential traffic management changes would have on $NO_2$ and $PM_{10}$ concentrations in the Appin Crescent AQMA. Brief outlines of the content of these reports can be found below.

The Cupar North Development Zone and Relief Road: Air Quality Modelling Assessment 2015 aimed to quantify the potential air quality impact within the Bonnygate AQMA of future traffic associated with the Cupar North development zone. Future air quality impacts were assessed assuming that completion of different zones of the development are phased over time up to 2030, and that completion of the relief road may not occur until all of the residential and commercial developments are completed in 2030. This approach was used as projected vehicle pollutant emission rates and background concentrations are available until 2030 only. The report concludes that the results for each approach are very similar and indicate that there will be no exceedances of the $NO_2$ annual mean objective at the receptor locations in any of the future years assessed, however when emissions from the additional traffic from the development rollout phases are included the results indicate that exceedances of the 18 µg $m^{-3}$ Scottish $PM_{10}$ annual mean objective will occur at the same receptor locations where exceedances are predicted for the future baseline years. These receptor locations are at 1st floor height within the Bonnygate. When compared with the future 2030 baseline, small improvements in $NO_2$ and $PM_{10}$ concentrations are predicted with the completed development and the relief road in place in 2030. The report also recommends that when considering the cumulative impact of the development without the relief road in place, that air quality and potential mitigation measures to counteract the impact of the additional development traffic are considered in the planning process. The executive summary for this report can be found in Appendix H of this report.

Appin Crescent Traffic Management Options Appraisal (Phase 3) Air Quality Impact Assessment (2015) investigated the potential impact of traffic management scenarios which aim to improve traffic flow though Appin Crescent and hence reduce vehicle emissions and improve local air quality. Using modelling software and monitoring data, the report explains the predicted outcomes of these scenarios in Appin Crescent, Dunfermline. The report concludes that Test Option 1 (Optimisation of Holyrood Place / Appin Crescent signals (also linked to Sinclair Gardens roundabout)) does not appear to provide any air quality benefits and may lead to an increase in annual mean $NO_2$ concentrations. Test Options 2 (Reconfigure Appin Crescent / Garvock Hill mini roundabout to signalised junction (right turn storage allowed but runs opposed)) and 3 (Removal of bus stops on Appin Crescent) will provide improvements in both $NO_2$ and $PM_{10}$ concentrations but neither of these options offer the opportunity to reduce concentrations of $NO_2$ and $PM_{10}$ on Appin Crescent to below the respective air quality objectives. Test Option 3 investigated the removal of the bus stops on Appin Crescent and the predicted changes in annual mean $NO_2$ and $PM_{10}$ concentrations can be found on maps in Appendix J. The report suggests that a cost-benefit analysis of this option may be beneficial as it could be relatively inexpensive to implement and will provide improvements in $NO_2$ and $PM_{10}$ concentrations. The executive summary for this report can be found in Appendix I, along with baseline maps for test Option 3 in Appendix J of this report. This cost-benefit analysis is to be produced in 2015-2016.

## 10.1 Review and update of the Air Quality Action Plans

Fife Council has a duty and statutory obligation to keep their action plans up to date (LAQM.PG(S) 09). The obligation to keep air quality action plans up to date provides the opportunity for Fife Council to periodically review the progress that has been made in implementing the air quality action plan and assess the significance of improvements in air quality that have been observed since the adoption of the plan. Furthermore, where appropriate, the review and update of the action plan provides the opportunity for Fife Council to identify new or additional measures to help to work towards attainment of the air quality objectives.

In April 2015 a review and update of both the Appin Crescent and Bonnygate Air Quality Action Plans was completed by Fife Council. These amended documents have yet to be published as they are still in the consultation process and await approval by the statutory body. However a brief summary of the proposed measures for both action plans are provided in the tables below. These will be further explained within the Action Plans once approved.

***2.12 Summary of proposed new measures for inclusion within the Bonnygate Air Quality Action Plan (2015)***

| No. | Measure | Timescale |
|---|---|---|
| 1 | Fife ECO Stars | Short Term |
| 2 | Fife Council Air Quality Strategy 2015-2020 | Short Term |
| 3 | Air Quality and Planning Toolkit | Short Term |

***2.13 Summary of proposed new measures for inclusion within the Appin Crescent Air Quality Action Plan (2015)***

| No. | Measure | Timescale |
|---|---|---|
| 1 | Fife ECO Stars | Short Term |
| 2 | Fife Council Air Quality Strategy 2015-2020 | Short Term |
| 3 | Air Quality and Planning Toolkit | Short Term |
| 4 | Cost-Benefit-Analysis of options to improve air quality within Appin Crescent | Short Term |
| 5 | Proposed air dispersion modelling study of the potential Dunfermline Northern Link Road | Short Term |

**Fife ECO Stars Scheme**

The Fife ECO Stars programme was successfully launched by Fife Council in October 2014 and a workshop for local fleet operators was hosted on Thursday 19th March 2015 in the City Chambers, Dunfermline. At the event a variety of topics were discussed related to improving fleet efficiency. Currently there are 44 members already signed up to the scheme which seeks to improve air quality in the Fife area.

## 10.2 Scottish Government Grant Funding 2015-2016

Fife council has obtained grant funding from the Scottish Government for 2015 – 2016. The funding will be used to carry out the following air quality initiatives and studies. These will be carried out in line with the current action plans for both Appin Crescent, Dunfermline and Bonnygate, Cupar and the Air Quality Strategy for Fife.

**Dispersion Modelling study of the Northern Link Road in Dunfermline**

The 2011 Dunfermline Strategic Land Allocation (SLA) Transport Assessment concluded that for effective operation of the road network, and in addition to a number of other upgrades to the road infrastructure, a link road will likely be required at some point between 2021 and 2029 depending on the rollout of residential and commercial developments in the SLA area.
To inform the action plan for the Appin Crescent AQMA in the medium to long term, Fife Council plan to investigate the future baseline air quality with and without the Northern Link Road in place. This would aim to estimate the air quality impact of the increase in traffic attributable to the development of the SLA area in Dunfermline up to 2029; and also quantify the effect the proposed link road will have on air quality in Appin Crescent. This will provide valuable evidence that may help inform the development of the northern link road.

**GIS Dispersion Modelling Toolkit to aid in planning decisions**.

Fife Council plan to develop an innovative GIS based dispersion modelling toolkit which will assist planners and other local authority officers in the consideration of air quality issues in the development management process.

**Cost Benefit analysis of traffic management options for Appin Crescent AQMA**

As recommended in the Appin Crescent Traffic Management Options Appraisal (Phase 3) Air Quality Impact Assessment (2015), Fife Council plan on carrying out a Cost Benefit Analysis study of the traffic management options recommended.

**$PM_{2.5}$ Monitoring in Rosyth**

Fife Council have acquired funding to purchase equipment that will allow them to measure a range of PM including $PM_{10}$ and $PM_{2.5}$. This equipment will help Fife Council meet any future requirements to measure the small particulate fractions such as $PM_{2.5}$. Fife Council will undertake this additional monitoring at the current Rosyth monitoring station.

**Fife ECO Stars Scheme**

Fife Council will continue the Fife ECO Stars scheme with the grant funding and also aim to extend it to the taxi fleet for further air quality improvements in the Fife area through reduced vehicle emissions.

# 11 Conclusions and Proposed Actions

## 11.1 Conclusions from New Monitoring Data

**Nitrogen Dioxide**

This Progress Report considered the following new monitoring data for the 2014 calendar year. During 2014, Fife undertook ambient monitoring using $NO_2$ tubes at 48 locations within Fife. New monitoring data highlighted air quality issues at Appin Crescent, Dunfermline.

When assessing the annual mean nitrogen dioxide concentrations (bias adjusted) against the AQS annual mean objective of 40 µg $m^{-3}$, exceedances are evident at the following diffusion tube monitoring site:

- Appin Crescent 6 (A,B,C), Dunfermline (40.3 µg $m^{-3}$)

This marginal exceedance of the annual mean $NO_2$ objective was measured at one location within Appin Crescent, Dunfermline, which has been declared an Air Quality Management Area (AQMA). Fife Council's Air Quality Action Plan (AQAP) for Appin Crescent intends to address these exceedances through the implementation of appropriate measures.

**Particulate Matter**

$PM_{10}$ concentrations are measured at four locations in Fife at Bonnygate in Cupar; Appin Crescent in Dunfermline; Admiralty Road in Rosyth and St Clair Street in Kirkcaldy. Measured 2014 concentrations were below the $PM_{10}$ annual mean objective. There was one exceedance of the daily mean $PM_{10}$ objective at St Clair Street, Kirkcaldy (52 ug $m^{-3}$). There were no exceedances of the daily mean $PM_{10}$ objective at Bonnygate, Appin Crescent, or Admiralty Road. In turn this means that there were no exceedances of the daily mean objective (50 µg $m^{-3}$ not to be exceeded more than 7 times a year).

**Sulphur Dioxide**

The 2014 results for $SO_2$ monitoring in Fife indicate that AQS objectives for $SO_2$ are unlikely to be exceeded. There are no new industrial processes, road or other developments that require detailed assessment with respect to this pollutant. Hence, new information in 2014 confirms the conclusion of previous reports that a Detailed Assessment is not required for $SO_2$.

**Carbon Monoxide**

Short-term monitoring undertaken by Fife Council's Transportation Services during 2014 indicates that the AQS objective for CO is unlikely to have been exceeded during 2014. There are no new industrial processes, roads or other developments that require detailed assessment with respect to this pollutant. Hence, new information in 2014 confirms the conclusion of previous reports that a Detailed Assessment is not required for CO.

**1,3 Butadiene and Benzene**

Benzene and 1,3 Butadiene monitoring carried out in the area of the Grangemouth refinery show that it is unlikely that the AQS objective for these pollutants have been exceeded within the Fife Council boundary.

The review of benzene data in the vicinity of Little Raith Wind Farm show that the running annual mean benzene concentrations measured at Cowdenbeath (LR01), Lochgelly (LR02) and Little Raith Farm (LR03) monitoring locations are below the AQS Objective of 3.25 µg $m^3$. In addition, these data also indicate that benzene concentrations do not appear to have increased as a result of the commissioning of Little Raith Wind Farm.

## 11.2 Conclusions from Assessment of Sources

There is no requirement to proceed to a Detailed Assessment for the following sources:

- Busy Streets where people may spend 1-hour or more close to traffic;
- Roads with a high flow of buses and/or HGVs;
- Junctions;
- New Roads constructed or proposed since the last round of review and assessment;
- Roads with significantly changed traffic flows and
- Bus and coach stations.

### 11.2.1 Other Transport Sources

There is no requirement to proceed to a Detailed Assessment for the following sources:

- Airports;
- Railways (diesel and steam trains) and
- Ports (shipping).

### 11.2.2 Industrial Sources

There is no requirement to proceed to a Detailed Assessment for the following sources:

- Industrial installations;
- New or significantly changed installations with no previous air quality assessment;
- Major fuel (petrol) storage depots
- Petrol stations and
- Poultry Farms.

### 11.2.3 Commercial and Domestic Sources

There is no requirement to proceed to a Detailed Assessment for the following sources:

- Biomass combustion- Individual installations;
- Biomass combustion- Combined Impacts;
- Domestic Solid Fuel Burning and
- Proposed Residual and Commercial Installations.

## 11.3 Proposed Actions

Following the review of all available data it is recommended that Fife Council carry out the following actions:

1. Submit the next Air Quality Progress Report in May 2016.

2. Maintain and enhance (where appropriate) the current monitoring programme.

3. Implement updated Action Plans for both Appin Crescent, Dunfermline and Bonnygate, Cupar.

4. Promote the aims and objectives of the Air Quality Strategy for Fife 2015 - 2020.

5. Investigate the potential for a submitting a grant, which will allow Fife Council to survey biomass boilers within their local authority.

Fife Council agrees with the content of this report and will implement these recommendations.

# Appendices

Appendix A: Automatic Monitoring Sites

Appendix B: Quality Assurance / Quality Control (QA/QC) Data

Appendix C: $NO_2$ Diffusion Tube Data

Appendix D: Fife Environmental Partnership Climate Change Strategy 2014 – 2020

Appendix E: Bikeability Scotland

Appendix F: Bonnygate Air Quality Action Plan Progress Report – Summary Table

Appendix G: Appin Crescent Air Quality Action Plan Progress Report – Summary Table

Appendix H: Cupar North Development Zone and Relief Road: Air quality Modelling Assessment 2015 – Executive Summary

Appendix I: Appin Crescent Traffic Management Options Appraisal (Phase 3) Air Quality Impact Assessment – Executive Summary

Appendix J: Appin Crescent Traffic Management Options Appraisal (Phase 3) Air Quality Impact Assessment –Test Option 3 vs. 2015 Baseline Maps

# Appendix A: Automatic Monitoring Sites

Appin Crescent, Dunfermline

| | |
|---|---|
| Station Name: | Appin Crescent, Dunfermline |
| Site Owner/operator: | Fife Council |
| Easting: | 309926 |
| Northing: | 687722 |
| Distance to kerb and road name/number | 3m + (A907) |
| Zone/agglomeration: | |
| Site Classification: | Roadside |
| Manifold type and height: | Single Teflon tube, inlet height 1.7m |
| Network affiliation: | Scottish Air Quality Database |
| Quality control procedures: | UKAS calibration by AEA with Air Liquide gas cylinder |
| Pollutants measured on site: | $NO_x$, NO $NO_2$, $PM_{10}$ (since March 2011) |
| Instrument manufacturer: | Monitor Europe ME 9841 B |
| Calibration procedure and frequency: | 3-weekly manual calibration and autocalibration every 3 days. |
| Site service arrangements: | 6-monthly service by air monitors |
| Co-located passive sampler | Triplicate $NO_2$ tubes installed |

Bonnygate Cupar, Fife


| | |
|---|---|
| Station Name: | Bonnygate, Cupar |
| Site Owner/operator: | Fife Council |
| Easting: | 337406 |
| Northing: | 714574 |
| Altitude: | |
| Zone/agglomeration: | |
| Site Classification: | Kerbside (<1m from Kerb) |
| Distance to kerb and road name/number | 0.5m to Bonnygate (A91) |
| Distance to nearest junction and joining road name/number | Opposite the junction with Ladywynd |
| Start date of monitoring | 19 December 2005 |
| Manifold type and height: | Single Teflon tube, Inlet height 1.7m |
| Network affiliation: | Scottish Air Quality Database |
| Quality control procedures: | UKAS calibration by AEA with Air Liquide gas cylinder |
| Pollutants measured on site: | $PM_{10}$ (TEOM) NOx, NO, $NO_2$ |
| Instrument manufacturer: | FDMS<br>NOx – Thermo i-series |
| Calibration procedure and frequency: | 2-weekly manual calibration |
| Site service arrangements: | 6-monthly service by Air Monitors |
| Co-located passive sampler | Triplicate $NO_2$ tubes installed |

Admiralty Road, Rosyth

| | |
|---|---|
| Station Name: | Admiralty Road, Rosyth |
| Site Owner/operator: | Fife Council |
| Easting: | 311755 |
| Northing: | 683503 |
| Altitude: | |
| Zone/agglomeration: | |
| Site Classification: | Roadside |
| Distance to kerb and road name/number | 6m (A985(T)) |
| Start date of monitoring | March 2008 |
| Manifold type and height: | Single Teflon tube, Inlet height 2m |
| Network affiliation: | Scottish Air Quality Database |
| Quality control procedures: | UKAS calibration by AEA with Air Liquide gas cylinder |
| Pollutants measured on site: | $PM_{10}$ (FDMS) NOx, NO, $NO_2$ |
| Instrument manufacturer: | FDMS– R and P<br>NOx – Thermo 42i |
| Calibration procedure and frequency: | 3-weekly manual calibration and autocalibration every 3 days. |
| Site service arrangements: | 6-monthly service by air monitors |
| Co-located passive sampler | Triplicate $NO_2$ tubes installed |

St Clair Street, Kirkcaldy


| | |
|---|---|
| Station Name: | St Clair Street , Kirkcaldy |
| Site Owner/operator: | Fife Council |
| Easting: | 329143 |
| Northing: | 692986 |
| Altitude: | |
| Zone/agglomeration: | |
| Site Classification: | Roadside |
| Distance to kerb and road name/number | 4.8m, Saint Clair Street/A921 |
| Start date of monitoring | February 2011 |
| Manifold type and height: | Single Teflon tube, Inlet height 2.5m |
| Network affiliation: | Scottish Air Quality Database |
| Quality control procedures: | UKAS calibration by AEA with Air Liquide gas cylinder |
| Pollutants measured on site: | $PM_{10}$ (FDMS) NOx, NO, $NO_2$ |
| Instrument manufacturer: | FDMS– R and P<br>NOx – Thermo 42i |
| Calibration procedure and frequency: | 3-weekly manual calibration and autocalibration every 3 days. |
| Site service arrangements: | 6-monthly service by air monitors |
| Co-located passive sampler | Triplicate $NO_2$ tubes installed |

# Appendix B: Quality Assurance / Quality Control (QA/QC) Data

**Diffusion Tube Bias Adjustment Factors**

Diffusion tubes may systematically under or over-read NO2 concentrations when compared to the reference chemiluminescent analyser. This is described as bias and can be corrected for to improve the accuracy of the diffusion tube results, using a suitable bias adjustment factor.

The diffusion tubes deployed by Fife Council are supplied and analysed by Tayside Scientific Services using a preparation mixture of 20% triethanolamine (TEA) in water. The bias adjustment factor of 0.77 reported in the national diffusion tube bias adjustment factor spreadsheet (version 03/15), conducted using diffusion tubes prepared and analysed by Tayside Scientific Services during 2014, has been used to adjust the diffusion tube results.

The National Spreadsheet of Bias Adjustment Factors (version 03/15) is shown below in Figure B.1 and Figures B2 – B5 show the locally derived adjustment factors.

**Figure B.1 Bias adjustment factor used for 2014 diffusion tube results**

## National Diffusion Tube Bias Adjustment Factor Spreadsheet

Spreadsheet Version Number: 03/15

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2015

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

| Step 1: | Step 2: | Step 3: | Step 4: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Select the Laboratory that Analyses Your Tubes from the Drop-Down List | Select a Preparation Method from the Drop-Down List | Select a Year from the Drop-Down List | **Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.** | | | | | | | | |
| If a laboratory is not shown, we have no data for this laboratory. | If a preparation method is not shown, we have no data for this method at this laboratory. | If a year is not shown, we have no data[2] | If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953 | | | | | | | | |
| **Analysed By[1]** | **Method** To see your selection, choose (All) from the drop-down list | **Year[2]** To see your selection, choose (All) | **Site Type** | **Local Authority** | **Length of Study (months)** | **Diffusion Tube Mean Conc. (Dm) (µg/m³)** | **Automatic Monitor Mean Conc. (Cm) (µg/m³)** | **Bias (B)** | **Tube Precision[5]** | **Bias Adjustment Factor (A) (Cm/Dm)** | |
| Tayside Scientific Services | 20% TEA in water | 2014 | R | Fife Council | 9 | 35 | 28 | 26.9% | G | **0.79** | |
| Tayside Scientific Services | 20% TEA in water | 2014 | R | Fife Council | 12 | 24 | 19 | 25.6% | G | **0.80** | |
| Tayside Scientific Services | 20% TEA in water | 2014 | R | Fife Council | 10 | 30 | 25 | 19.7% | G | **0.84** | |
| Tayside Scientific Services | 20% TEA in water | 2014 | R | Fife Council | 11 | 34 | 24 | 39.7% | G | **0.72** | |
| Tayside Scientific Services | 20% TEA in water | 2014 | KS | Marylebone Road Intercomparison | 12 | 113 | 80 | 40.4% | G | **0.71** | |
| Tayside Scientific Services | 20% TEA in water | 2014 | | **Overall Factor[3] (5 studies)** | | | | **Use** | | **0.77** | |

**Factor from Local Co-location Studies**

***Figure B.2 Locally Derived Bias Adjustment Factor – Cupar***

## Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

**Diffusion Tubes Measurements**

| Period | Start Date dd/mm/yyyy | End Date dd/mm/yyyy | Tube 1 $\mu gm^{-3}$ | Tube 2 $\mu gm^{-3}$ | Tube 3 $\mu gm^{-3}$ | Triplicate Average | Standard Deviation | CV | 95% CI mean |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 10/01/2014 | 07/02/2014 | 32.8 | 26.9 | 27.6 | 29.1 | 3.22 | 11.08 | 8.01 |
| 2 | 07/02/2014 | 07/03/2014 | 18.4 | 18.6 | 18.5 | 18.5 | 0.10 | 0.54 | 0.25 |
| 3 | 07/03/2014 | 04/04/2014 | 45.4 | 45.1 | 44.0 | 44.8 | 0.74 | 1.64 | 1.83 |
| 4 | 04/04/2014 | 02/05/2014 | 25.8 | 27.0 | 25.0 | 25.9 | 1.01 | 3.88 | 2.50 |
| 5 | 02/05/2014 | 30/05/2014 | 44.2 | 41.9 | 41.4 | 42.5 | 1.49 | 3.51 | 3.71 |
| 6 | 30/05/2014 | 04/07/2014 | 30.5 | 29.9 | 29.5 | 30.0 | 0.50 | 1.68 | 1.25 |
| 7 | 04/07/2014 | 01/08/2014 | 24.0 | 35.5 | 36.3 | 31.9 | 6.88 | 21.55 | 17.10 |
| 8 | 01/08/2014 | 29/08/2014 | 48.5 | 47.6 | 48.3 | 48.1 | 0.47 | 0.98 | 1.17 |
| 9 | 29/08/2014 | 03/10/2014 | 34.0 | 29.3 | 29.8 | 31.0 | 2.58 | 8.32 | 6.41 |
| 10 | 03/10/2014 | 31/10/2014 | 37.4 | 35.0 | 36.3 | 36.2 | 1.20 | 3.32 | 2.98 |
| 11 | 31/10/2014 | 05/12/2014 | 26.9 | 28.3 | 25.5 | 26.9 | 1.40 | 5.20 | 3.48 |
| 12 | 05/12/2014 | 09/01/2015 | 47.2 | 43.5 | 48.2 | 46.3 | 2.48 | 5.35 | 6.15 |
| 13 | | | | | | | | | |

**Data Quality Check**

| Diffusion Tubes Precision Check |
|---|
| Good |
| Good |
| Good |
| Good |
| Good |
| Good |
| Poor Precision |
| Good |
| Good |
| Good |
| Good |
| Good |
| |

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Jaume Targa, for AEA

Version 04 - February 2011

**Site Name/ ID:** Fife Cupar

**Adjusted measurement (95% confidence level)**
**Without periods with CV larger than 20%**

Bias calculated using 8 periods of data
Tube Precision: 4 Automatic DC: 95%
Bias factor A: 0.81 (0.61 - 1.2)
Bias B: 24% (-16% - 63%)

*Information about tubes to be adjusted*
Diffusion Tube average: 34 $\mu gm^{-3}$
Average Precision (CV): 4
Adjusted Tube average: 28 +/- 11 $\mu gm^{-3}$

**Adjusted measurement (95% confidence level)**
**with all data**

Bias calculated using 9 periods of data
Tube Precision: 6 Automatic DC: 95%
Bias factor A: 0.79 (0.62 - 1.09)
Bias B: 27% (-9% - 62%)

*Information about tubes to be adjusted*
Diffusion Tube average: 34 $\mu gm^{-3}$
Average Precision (CV): 6
Adjusted Tube average: 7 +/- 10 $\mu gm^{-3}$

*Figure B.3 Locally Derived Bias Adjustment Factor - Dunfermline*

## Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

**Diffusion Tubes Measurements**

| Period | Start Date dd/mm/yyyy | End Date dd/mm/yyyy | Tube 1 $\mu gm^{-3}$ | Tube 2 $\mu gm^{-3}$ | Tube 3 $\mu gm^{-3}$ | Triplicate Average | Standard Deviation | CV | 95% CI mean | Data Quality Check: Diffusion Tubes Precision Check |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 08/01/2014 | 04/02/2014 | 43.9 | 42.1 | 43.6 | 43.2 | 0.96 | 2.23 | 2.40 | Good |
| 2 | 04/02/2014 | 05/03/2014 | 38.6 | 33.7 | 36.7 | 36.3 | 2.47 | 6.80 | 6.14 | Good |
| 3 | 05/03/2014 | 03/04/2014 | 33.2 | 36.6 | 36.1 | 35.3 | 1.84 | 5.20 | 4.56 | Good |
| 4 | 03/04/2014 | 29/04/2014 | | | | | | | | |
| 5 | 29/04/2014 | 27/05/2014 | 30.1 | 30.1 | 29.1 | 29.8 | 0.58 | 1.94 | 1.43 | Good |
| 6 | 27/05/2014 | 03/07/2014 | 24.3 | 25.6 | 24.7 | 24.9 | 0.67 | 2.68 | 1.65 | Good |
| 7 | 03/07/2014 | 30/07/2014 | 27.4 | 26.8 | 25.9 | 26.7 | 0.75 | 2.83 | 1.88 | Good |
| 8 | 30/07/2014 | 27/08/2014 | 29.8 | 28.3 | 29.8 | 29.3 | 0.87 | 2.96 | 2.15 | Good |
| 9 | 27/08/2014 | 01/10/2014 | 35.1 | 32.7 | 33.0 | 33.6 | 1.31 | 3.89 | 3.25 | Good |
| 10 | 01/10/2014 | 28/10/2014 | 30.6 | 28.7 | 30.9 | 30.1 | 1.19 | 3.97 | 2.96 | Good |
| 11 | 28/10/2014 | 02/12/2014 | 39.5 | 39.7 | 36.9 | 38.7 | 1.56 | 4.04 | 3.88 | Good |
| 12 | 02/12/2014 | 06/01/2015 | 50.9 | 47.6 | 46.8 | 48.4 | 2.17 | 4.49 | 5.40 | Good |
| 13 | | | | | | | | | | |

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Jaume Targa, for AEA

Version 04 - February 2011

| Site Name/ ID: | Fife Dunfermline |
|---|---|

**Adjusted measurement (95% confidence level)**
**Without periods with CV larger than 20%**

Bias calculated using 11 periods of data
Tube Precision: 4 Automatic DC: 100%
Bias factor A: 0.72 (0.63 - 0.83)
Bias B: 40% (21% - 59%)

*Information about tubes to be adjusted*
Diffusion Tube average: 34 $\mu gm^{-3}$
Average Precision (CV): 4
Adjusted Tube average: 25 +/- 3 $\mu gm^{-3}$

**Adjusted measurement (95% confidence level)**
**with all data**

Bias calculated using 11 periods of data
Tube Precision: 4 Automatic DC: 100%
Bias factor A: 0.72 (0.63 - 0.83)
Bias B: 40% (21% - 59%)

*Information about tubes to be adjusted*
Diffusion Tube average: 34 $\mu gm^{-3}$
Average Precision (CV): 4
Adjusted Tube average: 25 +/- 3 $\mu gm^{-3}$

***Figure B.4 Locally Derived Bias Adjustment Factor - Kirkcaldy***

## Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

**Diffusion Tubes Measurements**

| Period | Start Date dd/mm/yyyy | End Date dd/mm/yyyy | Tube 1 $\mu gm^{-3}$ | Tube 2 $\mu gm^{-3}$ | Tube 3 $\mu gm^{-3}$ | Triplicate Average | Standard Deviation | CV | 95% CI mean |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 06/01/2014 | 03/02/2014 | 26.5 | 24.7 | 27.5 | 26.2 | 1.42 | 5.41 | 3.52 |
| 2 | 03/02/2014 | 04/03/2014 | 24.0 | 24.9 | 24.3 | 24.4 | 0.46 | 1.88 | 1.14 |
| 3 | 04/03/2014 | 01/04/2014 | 26.4 | 24.8 | 24.7 | 25.3 | 0.95 | 3.77 | 2.37 |
| 4 | 01/04/2014 | 29/04/2014 | 21.8 | 18.8 | 23.1 | 21.2 | 2.21 | 10.39 | 5.48 |
| 5 | 29/04/2014 | 26/05/2014 | 18.6 | 18.9 | 17.1 | 18.2 | 0.96 | 5.30 | 2.40 |
| 6 | 26/05/2014 | 30/06/2014 | 16.9 | 18.5 | 16.1 | 17.2 | 1.22 | 7.12 | 3.04 |
| 7 | 30/06/2014 | 29/07/2014 | 19.9 | 19.1 | 18.9 | 19.3 | 0.53 | 2.74 | 1.31 |
| 8 | 29/07/2014 | 25/08/2014 | 20.3 | 22.4 | 21.5 | 21.4 | 1.05 | 4.92 | 2.62 |
| 9 | 25/08/2014 | 29/09/2014 | 25.3 | 26.3 | 23.5 | 25.0 | 1.42 | 5.67 | 3.52 |
| 10 | 29/09/2014 | 29/10/2014 | 25.7 | 27.2 | 23.6 | 25.5 | 1.81 | 7.09 | 4.49 |
| 11 | 29/10/2014 | 03/12/2014 | 33.3 | 11.5 | 31.4 | 25.4 | 12.08 | 47.54 | 30.00 |
| 12 | 03/12/2014 | 05/01/2015 | 32.4 | 34.7 | 34.3 | 33.8 | 1.23 | 3.64 | 3.05 |
| 13 | | | | | | | | | |

**Data Quality Check**

| Diffusion Tubes Precision Check |
|---|
| Good |
| Good |
| Good |
| Good |
| Good |
| Good |
| Good |
| Good |
| Good |
| Good |
| Poor Precision |
| Good |
| |

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Jaume Targa, for AEA

Version 04 - February 2011

| Site Name/ ID: | Fife Kirkcaldy |
|---|---|

**Adjusted measurement (95% confidence level)**
**Without periods with CV larger than 20%**

Bias calculated using 11 periods of data
Tube Precision: 5 Automatic DC: 97%
Bias factor A: 0.78 (0.72 - 0.85)
Bias B: 28% (17% - 39%)

*Information about tubes to be adjusted*
Diffusion Tube average: 23 $\mu gm^{-3}$
Average Precision (CV): 5
Adjusted Tube average: 18 +/- 2 $\mu gm^{-3}$

**Adjusted measurement (95% confidence level)**
**with all data**

Bias calculated using 12 periods of data
Tube Precision: 9 Automatic DC: 97%
Bias factor A: 0.8 (0.73 - 0.88)
Bias B: 26% (14% - 37%)

*Information about tubes to be adjusted*
Diffusion Tube average: 24 $\mu gm^{-3}$
Average Precision (CV): 9
Adjusted Tube average: 19 +/- 2 $\mu gm^{-3}$

*Figure B.5 Locally Derived Bias Adjustment Factor - Rosyth*

## Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

**Diffusion Tubes Measurements**

| Period | Start Date dd/mm/yyyy | End Date dd/mm/yyyy | Tube 1 $\mu gm^{-3}$ | Tube 2 $\mu gm^{-3}$ | Tube 3 $\mu gm^{-3}$ | Triplicate Average | Standard Deviation | CV | 95% CI mean | Data Quality Check: Diffusion Tubes Precision Check |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 08/01/2014 | 04/02/2014 | 44.5 | 40.6 | 38.3 | 41.1 | 3.13 | 7.62 | 7.79 | Good |
| 2 | 04/02/2014 | 05/03/2014 | 28.1 | 29.8 | 27.9 | 28.6 | 1.04 | 3.65 | 2.59 | Good |
| 3 | 05/03/2014 | 03/04/2014 | 15.3 | 27.5 | 25.6 | 22.8 | 6.56 | 28.79 | 16.31 | Poor Precision |
| 4 | 03/04/2014 | 29/04/2014 | 25.1 | 26.6 | 26.3 | 26.0 | 0.79 | 3.05 | 1.97 | Good |
| 5 | 29/04/2014 | 27/05/2014 | 29.0 | 26.4 | 26.7 | 27.4 | 1.42 | 5.20 | 3.53 | Good |
| 6 | 27/05/2014 | 03/07/2014 | 27.4 | 27.8 | 25.8 | 27.0 | 1.06 | 3.92 | 2.63 | Good |
| 7 | 03/07/2014 | 30/07/2014 | 28.1 | 25.5 | 28.8 | 27.5 | 1.74 | 6.33 | 4.32 | Good |
| 8 | 30/07/2014 | 27/08/2014 | 27.6 | 26.8 | 25.3 | 26.6 | 1.17 | 4.40 | 2.90 | Good |
| 9 | 27/08/2014 | 01/10/2014 | 36.1 | 34.6 | 30.1 | 33.6 | 3.12 | 9.29 | 7.76 | Good |
| 10 | 01/10/2014 | 28/10/2014 | 30.4 | 29.9 | 26.8 | 29.0 | 1.95 | 6.72 | 4.84 | Good |
| 11 | 28/10/2014 | 02/12/2014 | 35.8 | 40.9 | 32.5 | 36.4 | 4.23 | 11.63 | 10.51 | Good |
| 12 | 02/12/2014 | 06/01/2015 | 32.0 | 32.8 | 31.6 | 32.1 | 0.61 | 1.90 | 1.52 | Good |
| 13 | | | | | | | | | | |

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Jaume Targa, for AEA

Version 04 - February 2011

**Site Name/ ID:** Fife Rosyth

**Adjusted measurement (95% confidence level)**
**Without periods with CV larger than 20%**

Bias calculated using 9 periods of data
Tube Precision: 6 Automatic DC: 99%
Bias factor A: 0.84 (0.76 - 0.95)
Bias B: 19% (5% - 32%)

*Information about tubes to be adjusted*
Diffusion Tube average: 30 $\mu gm^{-3}$
Average Precision (CV): 6
Adjusted Tube average: 26 +/- 3 $\mu gm^{-3}$

**Adjusted measurement (95% confidence level) with all data**

Bias calculated using 10 periods of data
Tube Precision: 8 Automatic DC: 97%
Bias factor A: 0.84 (0.76 - 0.93)
Bias B: 20% (8% - 32%)

*Information about tubes to be adjusted*
Diffusion Tube average: 30 $\mu gm^{-3}$
Average Precision (CV): 8
Adjusted Tube average: 25 +/- 3 $\mu gm^{-3}$

**Discussion of Choice of Factor to Use**

**QA/QC of Automatic Monitoring**

The QA/QC procedures follow the requirements of the Technical Guidance (09) and are equivalent to those used at UK level for the National Network (AURN) monitoring sites. This gives a high degree of confidence in the data obtained, both for measured concentrations at the automatic sites and for establishing robust bias correction factors for diffusion tubes.

In order to satisfy the requirement outlined in the Technical Guidance (09), the following QA/QC procedures were implemented:

- 3-weekly calibrations of the NOx analyser;
- 6-monthly audits and servicing of the monitoring site;
- Data ratification.

Calibrations of the NOx analyser were carried out using certified compressed gas standards (ISO17025). This ensured that the calibration gas was traceable to national and international standards. In addition to the calibration, sample filters were changed for NOx and TEOM FDMS analysers and any faults were identified thus minimising data loss.

Audits of the monitoring sites consisted of a number of performance checks to identify any faults with the equipment. The calibration cylinder was also checked against another gas standard in order to confirm the gas concentration. Any identified faults were forwarded on to the service unit for repair.

The final stage of the QA/QC process was to ratify the data. During ratification, all calibration, audit and service data are collated and the data are appropriately scaled. Any suspect data identified are deleted therefore ensuring that the data are of a high quality.
Casella Measurement carried out QA/QC procedures at the $SO_2$ automatic monitoring site at Blair Mains. These procedures were also to a standard equivalent to the AURN.

**QA/QC of diffusion tube monitoring**

Diffusion tubes used by Fife Council are supplied and analysed by Tayside Scientific Services (formerly Dundee City Council Scientific Services). The laboratory participates in three schemes which ensure that the $NO_2$ tube results meet acceptable standards.

1. The WASP scheme is run by the Health and Safety Laboratory. Each month one tube is sent for testing. Results are compared with other participating labs and feedback on performance provided.
2. Every three months three tubes and a blank (for analysis) are supplied for exposure at an intercomparison site operated as part of the Support to Local Authorities for Air Quality Management contract funded by the Scottish Government, Defra and the

other Devolved Authorities. Again, results are compared with other participating labs and feedback on performance provided.

3. Each month a QC $NO_2$ solution is also provided via this contract. This solution is run as an internal check for $NO_2$ tubes in the laboratory. The solution is tested after every 21 $NO_2$ tube samples.

Tayside Scientific Services also use in-house quality assurance standards. The tube preparation method is 20% TEA in water.

# Appendix C: $NO_2$ Diffusion Tube Data

| 2014 $NO_2$ Tube Results - EAST | | NOTE: units µgm$^{-3}$ | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Auchtermuchty | St Andrews | | | | | Cupar | | | |
| ON / OFF Date | Cupar Road | Bell Street 1 | Bell Street 2 | City Road 1 | City Road 2 | ] | Bonnygate 2 (11) | Bonnygate 3A (13A) | Bonnygate 3B (13B) | Bonnygate 4B |
| 10.01.14 - 07.02.14 | 25.9 | 35.6 | 32.4 | 29.1 | 29.9 | 30.0 | 35.4 | 30.0 | 33.1 | 29.7 |
| 07.02.14 - 07.03.14 | 16.3 | 26.4 | 45.9 | 16.7 | 14.4 | 19.1 | 19.3 | 19.7 | 22.3 | 21.3 |
| 07.03.14 - 04.04.14 | 36.7 | 60.9 | 41.0 | 42.4 | 40.0 | 41.9 | 52.2 | 55.6 | 61.6 | 55.8 |
| 04.04.14 - 02.05.14 | 20.1 | 28.2 | 24.9 | 29.5 | 27.1 | 21.2 | 25.2 | 32.8 | 32.0 | 33.8 |
| 02.05.14 - 30.05.14 | 28.7 | 35.7 | 31.8 | 38.3 | 39.7 | 38.7 | Tube missing | 50.4 | 54.4 | 51.3 |
| 30.05.14 - 04.07.14 | 28.8 | 38.1 | 33.1 | 35.8 | 26.9 | 24.6 | 26.9 | 33.9 | 37.7 | 36.0 |
| 04.07.14 - 01.08.14 | 31.0 | 43.1 | Tube missing | 38.2 | 38.6 | 31.0 | 33.8 | Tube missing | 52.3 | 50.6 |
| 01.08.14 - 29.08.14 | 43.9 | 57.6 | 47.8 | 47.4 | 49.5 | 44.5 | 40.5 | 52.1 | 68.9 | 60.9 |
| 29.08.14 - 03.10.14 | 26.9 | 43.8 | 34.7 | 28.7 | 29.0 | 24.9 | 26.9 | 26.9 | 40.9 | 37.2 |
| 03.10.14 - 31.10.14 | 26.8 | 41.0 | 38.4 | 31.0 | 31.8 | 52.8 | 31.5 | 60.5 | 61.2 | 39.3 |
| 31.10.14 - 05.12.14 | 23.4 | 36.0 | 28.0 | 16.0 | 16.4 | 24.2 | 27.1 | 33.6 | 32.8 | 26.4 |
| 05.12.14 - 09.01.15 | 35.2 | 41.4 | 36.7 | 31.0 | 35.9 | 34.3 | 28.7 | 35.6 | 41.4 | 35.1 |
| Running mean (per Tube) | 28.6 | 40.7 | 35.9 | 32.0 | 31.6 | 32.3 | 31.6 | 39.2 | 44.9 | 39.8 |
| Running mean (Duplicate/ triplicate) | | | | 31.8 | | | | 42.0 | | |
| **National Bias Adjustment Factor (April '15)** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** |
| **Locally Derived combined with Nationally D** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** |
| **Local Bias Adjustment Factor** | | | | | | **0.81** | **0.81** | **0.81** | **0.81** | **0.81** |
| **Number of Months with Data Capture** | **12** | **12** | **11** | **12** | **12** | **12** | **11** | **11** | **12** | **12** |
| **Data Capture (%)** | **100%** | **100%** | **92%** | **100%** | **100%** | **100%** | **92%** | **92%** | **100%** | **100%** |
| **Annual Average per site** | **28.6** | **40.7** | **35.9** | **32.0** | **31.6** | **32.3** | **31.6** | **39.2** | **44.9** | **39.8** |
| **Annual Concentration (Locally Derived combined with Nationally Derived Factor)** | **22.3** | **31.7** | **28.0** | **25.0** | **24.6** | **25.2** | **24.6** | **30.6** | **35.0** | **31.0** |
| **Annual Concentration (Duplicate/ triplicate** | | | | **24.8** | | | | **32.8** | | |
| **Annual Concentration (Local Bias Adjustment Factor used)** | | | | | | **26.1** | **25.6** | **31.7** | **36.4** | **32.2** |
| **Annual Concentration (Duplicate/ triplicate only)** | | | | | | | | **34.1** | | |

| | Cupar | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ON / OFF Date | Monitor BA | Monitor BB | Monitor BC | Bonnygate West B6 | Crossgate | 4 East Road | Ladywynd B5 | South Road |
| 10.01.14 - 07.02.14 | 32.8 | 26.9 | 27.6 | 18.1 | 26.5 | 13.5 | 20.5 | 14.4 |
| 07.02.14 - 07.03.14 | 18.4 | 18.6 | 18.5 | 11.1 | 14.9 | 11.2 | 14.5 | 10.6 |
| 07.03.14 - 04.04.14 | 45.4 | 45.1 | 44.0 | 29.3 | 39.3 | 20.6 | 25.4 | 15.8 |
| 04.04.14 - 02.05.14 | 25.8 | 27.0 | 25.0 | 21.3 | 24.7 | 9.6 | 18.5 | 7.9 |
| 02.05.14 - 30.05.14 | 44.2 | 41.9 | 41.4 | 27.7 | 32.1 | 14.8 | 20.3 | 12.6 |
| 30.05.14 - 04.07.14 | 30.5 | 29.9 | 29.5 | 17.9 | 21.2 | 10.0 | 15.2 | 9.4 |
| 04.07.14 - 01.08.14 | 24.0 | 35.5 | 36.3 | 25.0 | 26.3 | 15.7 | 19.7 | 11.8 |
| 01.08.14 - 29.08.14 | 48.5 | 47.6 | 48.3 | 32.9 | Tube missing | 18.6 | 25.5 | 15.8 |
| 29.08.14 - 03.10.14 | 34.0 | 29.3 | 29.8 | Tube missing | 19.8 | 15.8 | 18.2 | 14.7 |
| 03.10.14 - 31.10.14 | 37.4 | 35.0 | 36.3 | 24.7 | 14.4 | 16.4 | 20.2 | 18.2 |
| 31.10.14 - 05.12.14 | 26.9 | 28.3 | 25.5 | 19.9 | 21.0 | 17.1 | 14.0 | 14.1 |
| 05.12.14 - 09.01.15 | 47.2 | 43.5 | 48.2 | 34.5 | 42.6 | 21.7 | 28.9 | 17.6 |
| Running mean (per Tube) | 34.6 | 34.1 | 34.2 | 23.9 | 25.7 | 15.4 | 20.1 | 13.6 |
| Running mean (Duplicate/ triplicate) | | 34.3 | | | | | | |
| **National Bias Adjustment Factor (April '15)** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** |
| **Locally Derived combined with Nationally D** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** |
| **Local Bias Adjustment Factor** | **0.81** | **0.81** | **0.81** | **0.81** | **0.81** | **0.81** | **0.81** | **0.81** |
| **Number of Months with Data Capture** | **12** | **12** | **12** | **11** | **11** | **12** | **12** | **12** |
| **Data Capture (%)** | **100%** | **100%** | **100%** | **92%** | **92%** | **100%** | **100%** | **100%** |
| **Annual Average per site** | **34.6** | **34.1** | **34.2** | **23.9** | **25.7** | **15.4** | **20.1** | **13.6** |
| **Annual Concentration (Locally Derived combined with Nationally Derived Factor)** | **27.0** | **26.6** | **26.7** | **18.6** | **20.1** | **12.0** | **15.7** | **10.6** |
| **Annual Concentration (Duplicate/ triplicate** | | **26.7** | | | | | | |
| **Annual Concentration (Local Bias Adjustme** | **28.0** | **27.6** | **27.7** | **19.3** | **20.8** | **12.5** | **16.3** | **11.0** |
| **Annual Concentration (Duplicate/ triplicate** | | **27.8** | | | | | | |

2014 NO2 Tube Results - CENTRAL

| | Glenrothes | Leslie | Leven | | | | | | | | Kirkcaldy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ON / OFF Date | Queensway | High Street | Glenlyon | ASDA Roundabout | Dunnikier Road | 3A Junction Road | St Clair Street 1 | ST Clair Street 2 | St Clair Street 3 | 24 St Clair Street | 125 St Clair Street | 179A St Clair Street |
| 06.01.14 - 03.02.14 | 27.0 | 27.3 | 31.1 | 37.4 | 36.8 | 35.8 | 44.2 | 46.8 | 43.6 | 24.0 | 40.6 | 32.3 |
| 03.02.14 - 04.03.14 | 27.8 | 27.6 | 28.8 | 37.8 | 34.6 | 30.8 | 40.9 | 52.2 | 38.0 | 25.6 | 40.5 | 37.4 |
| 04.03.15 - 01.04.14 | 25.4 | 24.9 | 29.7 | 40.7 | 31.7 | 35.5 | 42.7 | 46.8 | 40.1 | 25.7 | 39.2 | 32.8 |
| 01.04.14 - 29.04.14 | 27.2 | 28.3 | 33.9 | 38.4 | 37.1 | 39.1 | 52.3 | 44.8 | 36.9 | 23.0 | 31.1 | 27.0 |
| 29.04.14 - 26.05.14 | 23.4 | 25.0 | 32.8 | 34.3 | 33.6 | 34.8 | 45.5 | 41.4 | 39.1 | 20.7 | 33.3 | 26.9 |
| 26.05.14 - 30.06.14 | 22.0 | 23.6 | 29.5 | 32.6 | 33.1 | 34.1 | 44.0 | 36.1 | 37.2 | 21.1 | 30.1 | 23.9 |
| 30.06.14 - 29.07.14 | 21.6 | 21.3 | 28.4 | 34.0 | 33.2 | 33.7 | 44.6 | 38.8 | 40.5 | 21.4 | 36.2 | 27.8 |
| 29.07.14 - 25.08.14 | 21.8 | 21.7 | 33.3 | 27.4 | 27.1 | 27.8 | 35.6 | 47.0 | 30.3 | 21.6 | 37.7 | 30.9 |
| 25.08.14 - 29.09.14 | 27.2 | 28.1 | 36.6 | 39.8 | 37.6 | 38.5 | 51.5 | 41.9 | 44.0 | 27.2 | 41.3 | 37.2 |
| 29.09.14 - 29.10.14 | 24.5 | 21.7 | 31.9 | 30.2 | 31.7 | 31.9 | 41.5 | 53.1 | 39.1 | 24.3 | 39.9 | 35.4 |
| 29.10.14 - 03.12.14 | 34.9 | 33.5 | 35.6 | 35.5 | 45.8 | 40.6 | 52.8 | 52.2 | 48.5 | 31.9 | 47.0 | 42.8 |
| 03.12.14 - 05.01.15 | 18.8 | 30.6 | 43.5 | 40.2 | 30.0 | 29.2 | 40.7 | 58.8 | 36.7 | 36.1 | 53.1 | 47.2 |
| Running mean (per Tube) | 25.1 | 26.1 | 32.9 | 35.7 | 34.4 | 34.3 | 44.7 | 46.7 | 39.5 | 25.2 | 39.2 | 33.5 |
| Running mean (Duplicate/ triplicate) | | | | | | | | | | | | |
| **National Bias Adjustment Factor (April '15)** | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 |
| **Locally Derived combined with Nationally Derived Factor** | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 |
| **Local Bias Adjustment Factor** | | | | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 |
| **Number of Months with Data Capture** | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| **Data Capture (%)** | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **Annual Average per site** | 25.1 | 26.1 | 32.9 | 35.7 | 34.4 | 34.3 | 44.7 | 46.7 | 39.5 | 25.2 | 39.2 | 33.5 |
| **Annual Concentration (Locally Derived combined with** | 19.6 | 20.4 | 25.7 | 27.8 | 26.8 | 26.8 | 34.9 | 36.4 | 30.8 | 19.7 | 30.6 | 26.1 |
| **Annual Concentration (Duplicate/ triplicate only)** | | | | | | | | | | | | |
| **Annual Concentration (Local Bias Adjustment Factor used)** | | | | 27.8 | 26.8 | 26.8 | 34.9 | 36.4 | 30.8 | 19.7 | 30.6 | 26.1 |
| **Annual Concentration (Duplicate/ triplicate only)** | | | | | | | | | | | | |

| | Kirkcaldy | | | | | |
|---|---|---|---|---|---|---|
| ON / OFF Date | ir Street Ror | ir Street Ro | Street Rd | Victoria Road | Travel Blank 1 | Travel Blank 2 |
| 06.01.14 - 03.02.14 | 26.5 | 24.7 | 27.5 | 35.5 | | |
| 03.02.14 - 04.03.14 | 24.0 | 24.9 | 24.3 | 33.0 | 0.3 | 0.3 |
| 04.03.15 - 01.04.14 | 26.4 | 24.8 | 24.7 | 33.7 | | |
| 01.04.14 - 29.04.14 | 21.8 | 18.8 | 23.1 | 40.4 | | |
| 29.04.14 - 26.05.14 | 18.6 | 18.9 | 17.1 | 38.0 | 0.2 | 0.3 |
| 26.05.14 - 30.06.14 | 16.9 | 18.5 | 16.1 | 36.8 | | |
| 30.06.14 - 29.07.14 | 19.9 | 19.1 | 18.9 | 35.5 | | |
| 29.07.14 - 25.08.14 | 20.3 | 22.4 | 21.5 | 31.0 | | |
| 25.08.14 - 29.09.14 | 25.3 | 26.3 | 23.5 | 42.6 | 0.3 | 0.2 |
| 29.09.14 - 29.10.14 | 25.7 | 27.2 | 23.6 | 30.6 | | |
| 29.10.14 - 03.12.14 | 33.3 | 11.5 | 31.4 | 46.9 | | |
| 03.12.14 - 05.01.15 | 32.4 | 34.7 | 34.3 | 38.1 | 0.5 | 0.2 |
| Running mean (per Tube) | 24.3 | 22.7 | 23.8 | 36.8 | 0.3 | 0.3 |
| Running mean (Duplicate/ triplicate) | | 23.6 | | | | |
| **National Bias Adjustment Factor (April '15)** | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 |
| **Locally Derived combined with Nationally Derived Factor** | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 |
| **Local Bias Adjustment Factor** | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 |
| **Number of Months with Data Capture** | 12 | 12 | 12 | 12 | 4 | 4 |
| **Data Capture (%)** | 100% | 100% | 100% | 100% | 33% | 33% |
| **Annual Average per site** | 24.3 | 22.7 | 23.8 | 36.8 | 0.3 | 0.3 |
| **Annual Concentration (Locally Derived combined with** | 18.9 | 17.7 | 18.6 | 28.7 | 0.3 | 0.2 |
| **Annual Concentration (Duplicate/ triplicate only)** | | 18.4 | | | | |
| **Annual Concentration (Local Bias Adjustment Factor use** | 18.9 | 17.7 | 18.6 | 28.7 | 0.3 | 0.2 |
| **Annual Concentration (Duplicate/ triplicate only)** | | 18.4 | | | | |

## 2014 $NO_2$ Tube Results - WEST

**NOTE:** units = $gm^{-3}$

| | Cowdenbeath | Kincardine | | Rosyth | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | High Street | N. Approach Road A | N. Approach Road B | Admiralty Road A | 129 Admiralty Road | 229 Admiralty Road | Admiralty Road | Admiralty Road | Admiralty Road | 49 Ramsay Place |
| Site code | CBEATH | KDINE1 | KDINE2 | ADMRDA | - | - | ROMONA | ROMONB | ROMONC | - |
| Tube number | D5 | D6 | D7 | D17 | D30 | D28 | D23A | D23B | D23C | D29 |
| ON / OFF Date | | | | | | | | | | |
| 08.01.14 - 04.02.14 | 37.2 | 27.8 | 31.3 | 46.7 | 35.0 | 31.2 | 44.5 | 40.6 | 38.3 | 25.0 |
| 04.02.14 - 05.03.14 | 28.0 | 24.4 | 26.3 | 34.0 | 24.8 | 24.3 | 28.1 | 29.8 | 27.9 | 18.3 |
| 05.03.14 - 03.04.14 | 27.1 | 18.8 | 21.5 | 36.8 | 27.4 | 22.7 | 15.3 | 27.5 | 25.6 | 18.2 |
| 03.04.15 - 29.04.14 | 28.1 | 7.9 | 19.1 | 33.8 | 26.4 | 23.3 | 25.1 | 26.6 | 26.3 | 20.3 |
| 29.04.14 - 27.05.14 | 29.4 | 16.1 | 15.5 | 37.4 | 28.6 | 23.7 | 29.0 | 26.4 | 26.7 | 17.6 |
| 27.05.14 - 03.07.14 | 26.6 | 16.3 | 16.3 | 33.7 | 24.5 | | 27.4 | 27.8 | 25.8 | 14.8 |
| 03.07.14 - 30.07.14 | 24.2 | 15.7 | 16.0 | 32.3 | 25.6 | Property under | 28.1 | 25.5 | 28.8 | 17.1 |
| 30.07.14 - 27.08.14 | 24.1 | 15.8 | 15.5 | 33.5 | 25.1 | refurbishment - tube | 27.6 | 26.8 | 25.3 | 17.0 |
| 27.08.14 - 01.10.14 | 30.0 | 21.4 | 21.4 | 39.2 | 33.4 | placement not | 36.1 | 34.6 | 30.1 | 23.0 |
| 01.10.14 - 28.10.14 | 21.4 | 20.2 | 18.3 | 37.3 | 27.5 | possible | 30.4 | 29.9 | 26.8 | 19.5 |
| 28.10.14 - 02.12.14 | 35.8 | 25.1 | 21.1 | 43.8 | 38.5 | | 35.8 | 40.9 | 32.5 | 29.1 |
| 02.12.14 - 06.01.15 | 25.9 | 33.1 | 29.8 | 38.6 | 31.6 | 31.8 | 32.0 | 32.8 | 31.6 | 22.2 |
| Running mean (per Tube) | 28.2 | 20.2 | 21.0 | 37.3 | 29.0 | 26.2 | 30.0 | 30.8 | 28.8 | 20.2 |
| Running mean (Duplicate/triplicate) | | 20.6 | | | | | | 29.8 | | |
| National Bias Adjustment Factor (April '15) | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 |
| Locally Derived combined with Nationally Derived Factor | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 |
| Local Bias Adjustment Factor | | | | 0.84 | 0.84 | 0.84 | 0.84 | 0.84 | 0.84 | 0.84 |
| Number of Months with Data Capture | 12 | 12 | 12 | 12 | 12 | 6 | 12 | 12 | 12 | 12 |
| Data Capture (%) | 100% | 100% | 100% | 100% | 100% | 50% | 100% | 100% | 100% | 100% |
| Annual Average per site | 28.2 | 20.2 | 21.0 | 37.3 | 29.0 | 26.2 | 30.0 | 30.8 | 28.8 | 20.2 |
| Annual Concentration (Locally Derived combined with | 22.0 | 15.8 | 16.4 | 29.1 | 22.6 | 20.4 | 23.4 | 24.0 | 22.5 | 15.7 |
| Annual Concentration (Duplicate/triplicate only) | | 16.1 | | | | | | 23.3 | | |
| Annual Concentration (Local Bias Adjustment Factor used) | | | | 31.3 | 24.4 | 22.0 | 25.2 | 25.8 | 24.2 | 16.9 |
| Annual Concentration (Duplicate/triplicate only) | | | | | | | | 25.1 | | |
| Period Mean | 30.0 | 19.0 | 22.7 | 37.7 | 28.4 | | 28.4 | 30.2 | 29.0 | 19.9 |
| Ratio (Annual Mean/ Period Mean) | 0.940 | 1.064 | 0.924 | 0.987 | 1.021 | | 1.055 | 1.019 | 0.995 | 1.015 |
| Average Ratio (R a) | 1.002 | | | | | | | | | |
| Annualized and Bias Corrected for Annual Mean | | | | | | 22.0 | | | | |

| | Dunfermline | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Appin Crescent 1 | Appin Crescent 2 | Appin Crescent 3 | Appin Crescent 4A | Appin Crescent 4B | Appin Crescent 4C | 11 Halbeath Road | 57 Halbeath Road | Pittencrieff Street | Rumblingwell | St Leonards Primary Sch |
| Site code | APP CR1 | APP CR2 | APP CR3 | APP CR4A | APP CR4B | APP CR4C | HALBEATH RD1 | HALBEATH RD2 | PITT ST | DRM5 | AQM3 |
| Tube number | D18 | D19 | D20 | D22A | D22B | D22C | D26 | D27 | D21 | D1 | D9 |
| ON / OFF Date | | | | | | | | | | | |
| 08.01.14 - 04.02.14 | | | | | | | | | | | |
| 04.02.14 - 05.03.14 | 37.9 | 65.0 | 61.3 | 43.9 | 42.1 | 43.6 | 33.8 | 32.2 | 35.7 | 34.1 | 26.7 |
| 05.03.14 - 03.04.14 | 34.7 | 57.5 | 48.5 | 38.6 | 33.7 | 36.7 | 26.3 | 27.9 | 28.2 | 31.6 | 18.3 |
| 03.04.15 - 29.04.14 | 36.2 | 51.8 | 44.8 | 33.2 | 36.6 | 36.1 | 26.4 | 25.4 | 27.3 | 26.7 | 14.1 |
| 29.04.14 - 27.05.14 | 48.9 | 44.2 | 44.2 | Tube missing | Tube missing | Tube missing | 21.8 | 21.5 | 26.7 | 24.6 | 16.9 |
| 27.05.14 - 03.07.14 | 31.9 | 47.2 | 42.5 | 30.1 | 30.1 | 29.1 | 0.4 | 20.8 | 26.8 | 25.7 | 15.7 |
| 03.07.14 - 30.07.14 | 24.1 | 46.9 | 41.1 | 24.3 | 25.6 | 24.7 | 31.0 | 18.2 | 21.0 | 22.7 | 15.2 |
| 30.07.14 - 27.08.14 | Tube missing | 47.6 | 35.3 | 27.4 | 26.8 | 25.9 | 18.3 | 18.9 | 21.9 | 25.9 | 15.5 |
| 27.08.14 - 01.10.14 | 31.2 | Tube missing | 38.8 | 29.8 | 28.3 | 29.8 | 19.4 | 18.7 | 22.2 | 23.8 | 16.9 |
| 01.10.14 - 28.10.14 | 35.2 | 48.6 | 45.9 | 35.1 | 32.7 | 33.0 | 21.9 | 23.0 | 25.8 | 30.3 | 20.6 |
| 28.10.14 - 02.12.14 | 34.6 | 53.6 | 35.8 | 30.6 | 28.7 | 30.9 | 23.3 | 19.7 | 30.5 | 27.1 | 15.6 |
| 02.12.14 - 06.01.15 | 41.9 | 63.6 | 56.8 | 39.5 | 39.7 | 36.9 | 28.0 | 29.8 | 33.0 | 36.0 | 27.5 |
| | 45.3 | 64.8 | 56.5 | 50.9 | 47.6 | 46.8 | 33.9 | 34.4 | 27.4 | 37.1 | 23.9 |
| Running mean (per Tube) | | | | | | | | | | | |
| Running mean (Duplicate/triplicate) | 36.5 | 53.7 | 46.0 | 34.9 | 33.8 | 34.0 | 23.7 | 23.5 | 27.2 | 28.8 | 18.9 |
| National Bias Adjustment Factor (April '15) | | | | | | | | | | | |
| Locally Derived combined with Nationally Derived Factor | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 | 0.77 |
| Local Bias Adjustment Factor | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 |
| Number of Months with Data Capture | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 |
| Data Capture (%) | 11 | 11 | 12 | 11 | 11 | 11 | 12 | 11 | 12 | 12 | 12 |
| Annual Average per site | 92% | 92% | 100% | 92% | 92% | 92% | 100% | 92% | 100% | 100% | 100% |
| | 36.5 | 53.7 | 46.0 | 34.9 | 33.8 | 34.0 | 23.7 | 23.5 | 27.2 | 28.8 | 18.9 |
| Annual Concentration (Locally Derived combined with | 28.5 | 41.9 | 35.8 | 27.2 | 26.4 | 26.5 | 18.5 | 18.3 | 21.2 | 22.5 | 14.7 |
| Annual Concentration (Duplicate/triplicate only) | | | | | 26.7 | | | | | | |
| Annual Concentration (Local Bias Adjustment Factor used) | 26.3 | 38.7 | 33.1 | 25.1 | 24.3 | 24.4 | 17.1 | 16.9 | 19.6 | 20.7 | 13.6 |
| Annual Concentration (Duplicate/triplicate only) | | | | | 24.6 | | | | | | |
| Period Mean | 37.9 | 53.1 | 48.3 | 36.5 | 35.6 | 36.4 | | | | | |
| Ratio (Annual Mean/ Period Mean) | 0.964 | 1.011 | 0.952 | 0.956 | 0.949 | 0.933 | | | | | |
| Average Ratio (R a) | | | | | | | | | | | |
| Annualized and Bias Corrected for Annual Mean | | | | | | | | | | | |

| 2014 NO2 Tube Results - WEST | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dunfermline | | | |
| | Appin Crescent 5A | Appin Crescent 5B | Appin Crescent 5C | Appin Crescent 6A | Appin Crescent 6B | Appin Crescent 6C | Appin Crescent A | Appin Crescent B | Appin Crescent C | Carnegie Drive A | Carnegie Drive B | Carnegie Drive C |
| Site code | APP CR5A | APP CR5B | APP CR5C | APP CR6A | APP CR6B | APP CR6C | DRM9A | DRM9B | DRM9C | C'GIE DR.A | C'GIE DR.B | C'GIE DR.C |
| Tube number | D24A | D24B | D24C | D25A | D25B | D25C | D4A | D4B | D4C | D16A | D16B | D16C |
| ON / OFF Date | | | | | | | | | | | | |
| 08.01.14 - 04.02.14 | 59.9 | 57.3 | 60.1 | 65.3 | 65.3 | 73.7 | 53.5 | 52.1 | 44.6 | 55.6 | 56.6 | 57.9 |
| 04.02.14 - 05.03.14 | 57.0 | 57.2 | 53.9 | 55.7 | 59.7 | 62.7 | 47.9 | 46.2 | 36.5 | 48.4 | 43.8 | 44.8 |
| 05.03.14 - 03.04.14 | 50.3 | 51.3 | 52.3 | 55.0 | 51.7 | 52.7 | 41.9 | 47.3 | 42.2 | 39.3 | 40.6 | 37.9 |
| 03.04.15 - 29.04.14 | 45.9 | 46.7 | 44.3 | 49.2 | 48.0 | 53.6 | 37.2 | 45.6 | 40.7 | 42.6 | 38.3 | 42.2 |
| 29.04.14 - 27.05.14 | 45.3 | 45.6 | 47.8 | 54.5 | 54.5 | 53.3 | 42.9 | 40.2 | Tube missing | 46.5 | `46.8 | 44.9 |
| 27.05.14 - 03.07.14 | 37.7 | 41.3 | 40.2 | 45.9 | 43.8 | 48.7 | 37.4 | 32.5 | 32.5 | 40.8 | 42.4 | 44.6 |
| 03.07.14 - 30.07.14 | 42.0 | 42.2 | 42.4 | 49.6 | 53.4 | 49.7 | 38.3 | 33.7 | 35.2 | 44.3 | 42.0 | 42.9 |
| 30.07.14 - 27.08.14 | 44.0 | 45.4 | 44.2 | 46.6 | 46.3 | 49.9 | 44.0 | 35.4 | 41.3 | 37.2 | 38.6 | 40.0 |
| 27.08.14 - 01.10.14 | 49.3 | 50.0 | 51.9 | 57.8 | 60.6 | 58.7 | 42.3 | 39.3 | 43.3 | 44.6 | 45.8 | 46.8 |
| 01.10.14 - 28.10.14 | 47.5 | 47.7 | 50.4 | 52.2 | 58.7 | 52.4 | 36.9 | 37.1 | 42.6 | 43.0 | 45.2 | 43.3 |
| 28.10.14 - 02.12.14 | 57.4 | 55.6 | 54.9 | 55.3 | 66.8 | 64.9 | 44.6 | 44.0 | 42.6 | 54.1 | 50.5 | 51.3 |
| 02.12.14 - 06.01.15 | 69.6 | 66.9 | 65.9 | 65.9 | 66.7 | 67.1 | 60.1 | 51.6 | 50.1 | 36.9 | 41.6 | 39.0 |
| | | | | | | | | | | | | |
| Running mean | **50.5** | **50.6** | **50.7** | **54.4** | **56.3** | **57.3** | **43.9** | **42.1** | **41.1** | **44.4** | **44.1** | **44.6** |
| Running mean (Duplicate/ triplicate) | | **50.6** | | | 56.0 | | | 42.4 | | | 44.4 | |
| **National Bias Adjustment Factor (April '15)** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** | **0.77** |
| **Locally Derived combined with Nationally Derived Factor** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** | **0.78** |
| **Local Bias Adjustment Factor** | **0.72** | **0.72** | **0.72** | **0.72** | **0.72** | **0.72** | **0.72** | **0.72** | **0.72** | **0.72** | **0.72** | **0.72** |
| **Number of Months with Data Capture** | **12** | **12** | **12** | **12** | **12** | **12** | **12** | **12** | **11** | **12** | **11** | **12** |
| **Data Capture (%)** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **92%** | **100%** | **92%** | **100%** |
| **Annual Average per site** | **50.5** | **50.6** | **50.7** | **54.4** | **56.3** | **57.3** | **43.9** | **42.1** | **41.1** | **44.4** | **44.1** | **44.6** |
| | | | | | | | | | | | | |
| **Annual Concentration (Locally Derived combined with** | **39.4** | **39.5** | **39.5** | **42.4** | **43.9** | **44.7** | **34.3** | **32.8** | **32.0** | **34.7** | **34.4** | **34.8** |
| **Annual Concentration (Duplicate/ triplicate only)** | | **39.5** | | | **43.7** | | | **33.0** | | | **34.6** | |
| **Annual Concentration (Local Bias Adjustment Factor use** | **36.4** | **36.4** | **36.5** | **39.2** | **40.5** | **41.2** | **31.6** | **30.3** | **29.6** | **32.0** | **31.8** | **32.1** |
| **Annual Concentration (Duplicate/ triplicate only)** | | **36.4** | | | **40.3** | | | **30.5** | | | **32.0** | |

## Appendix D: Fife Environmental Partnership Climate Change Strategy 2014 - 2020



Fife Environmental Partnership

# Climate Change Strategy 2014 - 2020

Tackling Climate Change

Fife Environmental Partnership Strategy
**Climate Change Strategy 2014 - 2020**

# Introduction

**Climate Change is going to have a dramatic impact on our future.**

The effects of a changing climate are already beginning to be seen in Fife, with increasingly frequent severe weather events requiring responses from the Council, the emergency services and our Community Planning Partners.

These events are having increased consequences for both the human and natural environments. Action needs to be taken to help us adapt to the impacts of climate change.

Fife's first Climate Change Strategy 2014-2020 identifies key areas that we need to address to meet the challenges and take advantage of opportunities associated with climate change. It sets out six outcomes that we will work towards over the next six years.

# Contents

Fife Environmental Partnership Strategy
**Climate Change Strategy 2014 - 2020**

# Foreword

Fife Environmental Partnership Chair
Katherine Leys, Operations Manager, Scottish Natural Heritage

Fife Partnership is committed to making Fife a great place to live, work and visit.

One of the biggest challenges it has to deal with in order to deliver this commitment is the impact of climate change. This could affect our communities for generations. We need to act now to reduce the contribution that Fife makes to greenhouse gasses and to adapt to the impacts that climate change brings.

As outlined in Fife's Community Plan 2011 to 2020 *"The challenge of reducing our production of carbon dioxide and other greenhouse gases[1] will require changes to the way we work and live, improvements in technology, and the generation, use and export of renewable energy."*

[1] 'Carbon dioxide equivalent' ($CO_2e$) is the technical term for carbon dioxide plus the other greenhouse gases. Throughout this document we will use the term 'carbon' to cover these gases. (Appendix 1, Glossary)

Reducing our contribution to climate change isn't just about challenges. There are opportunities to become national and international leaders in the development of renewable technology and generation of renewable energy, and in developing an education and training sector that provides the knowledge and skills that the transition to a low carbon economy requires. There are opportunities to make our communities more resilient, and to reduce the waste of resources without compromising our quality of life.

This strategy aims to achieve 6 medium term outcomes:

Reducing Carbon Emissions

- More efficient use of resources (energy, waste and water)
- More energy is from low carbon supplies
- Encourage more sustainable transport and travel including reducing the need to travel
- Ecosystems are used sustainably and strengthened

Adapting to Climate Change

- Places are adapting to cope with Climate Change (including land use, coastlines, buildings and infrastructure)
- People are adapting to cope with Climate Change

Fife Environmental Partnership is committed to working together to deliver this strategy. We would also encourage businesses, community groups and individuals to do what they can to adopt the **key commitments** in this strategy and work together to contribute to a Low Carbon Future for Fife.

Fife Environmental Partnership Strategy
**Climate Change Strategy 2014 - 2020**

## 1.1 What is Climate Change?

Climate change is evidenced by increases in global average air and ocean temperatures, widespread melting of snow and ice and a rising global average sea level. Most of the increase in global average temperatures since the mid 20th century is extremely likely to be due to the observed increase in greenhouse gas concentrations from human influence, which have increased by 70% between 1970 and 2004.

The increasing likelihood and severity of extreme weather events are expected to have adverse effects on natural and human systems. In responding to climate change, we will need to take into account measures both for adaptation (how to live with change) and mitigation (to minimise further impacts).

Climate change will affect all aspects of life, increasing risks to food security, water availability, infrastructure and human health. If emissions are reduced early and rapidly, the extent of climate change will be mitigated. If greenhouse gas emissions continue unabated, the implications grow more severe, posing even greater risk to life on Earth. In view of the threat and risks of inaction, it is essential that public bodies put climate change strategies in place and act sustainably to address climate change in Scotland.

## 1.2 Introduction

This document sets out a number of key elements that the Fife Partnership has identified as contributing to or influencing human made climate change. It commits Fife's community planning partners to meeting a number of targets that aim to reduce our impact on climate change, and sets out the principles that will be adopted in pursuit of the targets. The next stage will be the development of detailed strategies and plans that will enable the community planning partners to turn the aspirations of this document into reality.

## 1.3 Strategic Context

A whole raft of EU, UK and Scottish legislation and guidance has been produced in recent years. The Climate Change (Scotland) Act 2009 is arguably the key piece of climate change legislation relating to Fife and the Fife Partnership. It sets mandatory targets to reduce Scottish greenhouse gas emissions by 42% by 2020 and by 80% by 2050. It also requires Scottish Ministers to lay before Parliament, and subsequently report on, programmes for climate change adaptation.

## 1.4 Public Duties

Of particular relevance to most partner organisations in Fife is the guidance on the duties placed on all public bodies under the Climate Change (Scotland) Act published on 4th February 2011. In exercising their functions, all public bodies must act:

- in the way best calculated to contribute to the delivery of the Act's (national) emissions targets;
- in the way best calculated to deliver any statutory adaptation programme; and
- in a way that it considers the most sustainable.

## 1.5 Community Plan & Single Outcome Agreement

Fife's Community Plan 2011-2020 is the overarching strategic plan for Fife and provides a framework for every other strategy and plan produced by partner organisations within the Fife Partnership. The Fife Partnership recognises the importance of tackling climate change as one of three high

level outcomes identified in Fife's Community Plan 2011-2020, recently approved by Fife Partnership Board.

The Fife Partnership 2009-2012 Single Outcome Agreement (SOA) 'A Stronger Future for Fife' identifies areas for action to deliver a better quality of life for the people of Fife. The SOA sets out how the Fife Partnership will work towards improving outcomes for the local people in a way that reflects local circumstances and priorities, within the context of the Government's 15 National Outcomes. Action on climate change mitigation is an integral part of the Fife SOA, including action in relation to National Outcome 14: reducing the local and global environmental impact of our consumption and production.

This Climate Change Strategy comprises the Fife Partnership's response to the national and Fife-wide priority of tackling climate change and should be taken account of in all future planning and policy work undertaken by Fife's partners, including in the evolution of the partner strategies listed in Appendix 2. Taking cognisance of the two long term outcomes identified within the Community Plan 2011-2020:

- Reducing carbon emissions
- Adapting to climate change

Preparing for the impact of climate change will require investment in adaptation on the part of businesses, organisations and households, so that they can cope with the climate as it changes, and so that they may even be able to take advantage of new opportunities.

Partners and partnerships will have to work more closely together to achieve these outcomes - showing strong commitment and leadership. They will have to recognise and support the assets and aspirations of individuals and communities, while being open to doing things differently.

The following five sustainability principles, will underpin Fife Environmental Partnership's work.

***Education and awareness***

Work to raise awareness of environmental issues and promote education through conceptual, technical and social learning.

***Community engagement***

Encourage communities to have aspirations and vision and support them to achieve these. This will be done in ways that promote community resilience by offering targeted support, access to information and resources.

***Promoting sustainable behaviours***

Promote sustainable behaviours in its own work and in communities by publicising best practice and leading by example, providing appropriate infrastructure, through regulation and by using incentives, campaigns and supportive community engagement.

***Reducing Environmental Inequalities***

Aim to identify those individuals and communities that experience environmental inequalities and take positive action to reduce these for current and future generations.

***Enforcement***

Where appropriate take enforcement action in line with existing legislation where other interventions have not resolved a problem

Fife Environmental Partnership Strategy
**Climate Change Strategy 2014 - 2020**

## Reducing Carbon Emissions (Long Term Outcome)

Through key partner consultation, Fife Environmental Partnership has developed six medium term outcomes which we aim to achieve over the next seven years, working closely with communities, organisations and other partnership groups.

**1. More efficient use of resources (energy, waste and water)**

We will –

- Take a partnership approach to providing clear resource efficiency messages;
- Work with housing providers and householders to improve energy and water efficiency in new and existing buildings
- Develop a joint asset management strategy
- Work with businesses to promote the use of energy audits
- Work with local organisations to promote opportunities to encourage reuse
- Identify opportunities to look for potential sources of waste that can be used as a resource

**2. More energy is from low carbon supplies**

We will -

- Investigate opportunities for partnership working to deliver renewable energy
- Develop a heat map to identify opportunities for district heat in Fife
- Explore feasibility of alternative sources of renewable energy generation
- Identify potential sites for on shore wind developments
- Support the transition to a low carbon economy
- Identify opportunities for the creation of green jobs

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### 3. Encourage more sustainable transport and travel

We will –

- Work with SEStran Freight Quality Partnership in support of the Scottish Freight Action Plan (Sustainable Freight Transport System)
- Encourage improvements to the public transport network
- Further develop the core path network
- Encourage use of low carbon and electric vehicles
- Establish a network of electric charging points across Fife
- Support projects to encourage walking and cycling as a mode of transport
- Promote sustainable travel choices in local areas

### 4. Ecosystems are used sustainably and strengthened

We will –

- Ensure coastal ecosystems are protected and enhanced, and that their potential benefits are fully considered in regard to Climate Change Adaptation
- Ensure the provision of new woodlands are included in Development Plans
- Contribute to the development of the River Basin Management Planning as part of the Water Framework Directive
- Establish a 'stalled spaces' project on derelict land
- Creation of ponds and wetlands with local community groups
- Make use of the integrated Habitat Network tool to identify priority areas
- Support communities to manage habitats

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## Adapting to cope with Climate Change (Long Term Outcome)

**5. Places are adapting to cope with climate change (including land use, coastlines, buildings and infrastructure)**

We will –

- Create or enhance natural wetlands, flood attenuation areas, and other similar measures to assist in reducing flooding and to deal with surface water run off from new and existing developments
- Actively seek funding for the promotion of flood protection and coastal erosion studies and projects based on the priorities set out in the Local Flood Risk Management Plans and the Fife Shoreline Management Plan
- Encourage partners to sign up to the implementation of Fife's Shoreline Management Plan and work together to implement its policies
- Encourage trees in urban areas
- Adapt grounds maintenance regimes in regard to drainage and appropriate species planting
- Ensure sustainability building regulations are applied when building in high risk areas
- Ongoing review of land use allocations in the Local Plans / Local Development Plan in regard to potential climate change effects

**6. People are adapting to cope with Climate Change**

We will –

- Develop local, targeted campaigns to raise awareness of the potential impacts of climate change and the responsibilities of communities and individuals
- Work with vulnerable communities to provide guidance in regard to adapting to specific climate change issues
- Promote the use of small scale, low cost, and sustainable measures where appropriate

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# Measuring Our Progress

In order to measure progress in achieving Fife Environmental Partnership outcomes and in particular Fife Partnership's commitment to tackling climate change we will use a range of indicators:

| National Outcome | Local Outcome | Indicator | Baseline | Target |
|---|---|---|---|---|
| 14. We reduce the local and global environmental impact of our consumption and production. | Reducing carbon emissions (by reducing energy use, more sustainable transport and less waste) | CO2 emissions for Fife (000 tonnes) | 3,658 (2008) | Reduce to 2,117 by 2020 (to reflect government target of 42% reduction from 2005 by 2020) |
| Adapting to climate change | Self assessment of preparedness for climate change | No self-assessment undertaken (2011) | Level 4 by 2013 | |

Outcome measures are listed below. These will be monitored on an ongoing basis and inform six monthly reports to the Fife Partnership Executive Group on the delivery of Fife's Community Plan and Single Outcome Agreement.

More detailed indicators, including baselines and targets, will be included in a partnership performance framework for monitoring and progress reporting by the outcome groups.

| **Medium Term Outcome 1** - More efficient use of resources (energy, waste and water) | |
|---|---|
| **Indicator** | **Source** |
| Fife Carbon Footprint – Industrial and Commercial (inc public sector) | Department of Energy and Climate Change (DECC) |
| Fife Carbon Footprint - Domestic | DECC |
| Carbon Footprint – Infrastructure (street lighting) | Fife Council |
| % of household waste recycled/composted | Scottish Environment Protection Agency (SEPA) |

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| **Medium Term Outcome 2** - More energy is from low carbon supplies | |
|---|---|
| **Indicator** | **Source** |
| Large scale renewable energy in operation in Fife | Fife Council |
| % of renewable electricity generated in Fife | Fife Council |

| **Medium Term Outcome 3** - Encourage more sustainable transport and travel | |
|---|---|
| **Indicator** | **Source** |
| Fife Carbon Footprint – Road Transport | DECC |
| % of pupils walking/cycling to school | Fife Council |
| Increase cycle use on key monitored routes | Fife Council |

| **Medium Term Outcome 4** - Ecosystems are used sustainably and strengthened | |
|---|---|
| **Indicator** | **Source** |
| Fife Carbon Footprint – Land Use, Land Use Change, Forestry | DECC |
| Woodland cover as a % of land area | Forestry Commission |

| **Medium Term Outcome 5** - Places are adapting to cope with CC (including land use, coastlines, buildings and infrastructure) | |
|---|---|
| **Indicator** | **Source** |
| Number of wetlands, flood attenuation areas, or similar measures created or enhanced | Fife Council |
| Number of properties in Potentially Vulnerable Areas with reduced flood risk | Fife Council |
| Progress with studies and works identified within the Shoreline Management Plan action plan | Fife Council |
| Progress on actions identified within the Local Flood Risk Management Plans in accordance with timelines set out | Fife Council |

| **Medium Term Outcome 6** - People are adapting to cope with Climate Change | |
|---|---|
| **Indicator** | **Source** |
| Number of specific community engagements on climate change adaptation | Fife Council / SEPA / Scottish Flood Forum |
| Number of small scale, low cost, and sustainable measures implemented | Fife Council / Scottish Flood Forum |

# Appendix 1: Glossary

| Word/ Phrase | Definition |
|---|---|
| Adaptation | In terms of climate change, is the action to plan, prepare and respond to the potential impacts of weather. |
| Carbon | Universal shorthand for Carbon Dioxide, or Carbon Dioxide equivalent greenhouse gases. |
| Carbon Dioxide ($CO_2$) | Carbon dioxide is the most common greenhouse gas contributing to human made climate change. |
| Carbon dioxide equivalent ($CO_2e$) | In addition to Carbon Dioxide there are several other greenhouse gases. Because it is necessary to reduce all greenhouse gas emissions these are referred to collectively as Carbon Dioxide equivalent gases. |
| Carbon emissions | Release of $CO_2e$ into the atmosphere. |
| Carbon Footprint | A measure of the carbon emissions produced as a result of an organisation's or service's activities. |
| Carbon neutral | When, through a transparent process of measuring emissions, reducing those emissions and offsetting any unavoidable emissions, net calculated emissions equal zero. (DECC) |
| Carbon offsetting | Offsetting aims to make it possible to compensate for unavoidable emissions by helping to fund projects that deliver equivalent emissions savings elsewhere. |
| Climate change | Cumulative changes in the Earth's temperature and weather due to increased levels of greenhouse gases as a consequence of human activity. |
| Climate Change (Scotland) Act 2009 | Legislation introduced by the Scottish Government to set a mandatory target of cutting carbon emissions by 42% by 2020 and 80% by 2050. |
| Climate Change Act 2008 | Legislation passed by the UK Government in late 2008 to set a mandatory target of cutting carbon emissions by 80% by 2050. |
| DECC | The Department for Energy and Climate Change (www.decc.gov.uk) may take up some of DEFRA's responsibilities in future. |
| DEFRA | The Department for the Environment, Food and Rural Affairs provide the carbon emissions conversion factors used for calculating the carbon footprint. |
| Ecosystem | A system that includes all living organisms in an area as well as its physical environment functioning together as a unit. |
| Greenhouse Gases | Gases that enhance the greenhouse effect and hence climate change. The issue of concern is greenhouse gases emitted over and above natural levels as a consequence of human activity such as through burning fossil fuels. Greenhouse gases in general are often referred to as "Carbon Dioxide equivalent" in terms of their potential climate change impact. |
| Mitigation | The attempt to lessen future climate change and its social, economic and environmental consequences by reducing the greenhouse gas emissions we make. |

Fife Environmental Partnership Strategy
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| Word/ Phrase | Definition |
|---|---|
| Scotland's Climate Change Declaration | A commitment made by all Scotland's 32 local authorities to mitigate their impact on climate change through reducing greenhouse gas emissions and to adapt to climate change impacts. |

# Appendix 2
# Associated Plans & Strategies

The Fife Environmental Partnership Strategy focuses on joint outcomes where one or more partner is involved in their delivery. The strategy does not cover in detail the work that various partners carry out on an individual basis. The following list provides links to other related strategies and plans that contribute to the delivery of wider environmental outcomes:

- Fife Community Plan 2011 -2020
- Fife Council Plan 2017
- Fife Health & Wellbeing Plan 2011-2014
- Fife's Greenspace Strategy 2010 – 2015
- 2011 Fife Shoreline Management Plan
- Fife Local Biodiversity Action Plan

**Community Plan Outcome 2011-2020**

- Sustaining and improving the environment

**Long Term Outcomes**

- Reducing carbon emissions
- Adapting to climate change

**Medium Term Outcomes**

- More efficient use of resources (energy, waste and water)
- More energy is from low carbon supplies
- Carbon emissions from travel and transport have reduced
- Ecosystems are used sustainably and strengthened
- Places are adapted to cope with climate change (including land use coastlines, buildings and infrastructure)
- People are adapting to cope with Climate Change

# Fife Environmental Partnership Strategy
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## Appendix E: Bikeability Scotland

The Scottish Cycling Training Scheme (formerly known as cycling proficiency) has now been rebranded nationally as Bikeability Scotland by Cycling Scotland. This new programme is being delivered in Fife Council.

**Bikeability** Scotland has three levels which help pupils to improve their cycling knowledge and ability:

- **Level 1** teaches children the basic skills of riding a bike, such as balance, control and making turns and takes place in the playground. It is recommended that pupils in Primary 5 should have this training but as it is playground based Fife is encouraging this training to take place from primary 1. Giving pupils the skills and knowledge from an early age.
- **Level 2** teaches children how to ride a bike safely on the road and navigate basic junctions. It is usually delivered to children in Primary 6 and takes place in the playground and on quiet roads. Level 2 is very similar to the old cycling proficiency training.
- **Level 3** teaches children how to navigate more complex junctions and plan journeys effectively. It is aimed at Primary 7 and secondary school pupils and supports them to make independent journeys and plan the quietest and safest route available. Level 3 training is delivered on road, on a route that has been risk assessed by a qualified cycle trainer.

## Appendix F: Bonnygate Air Quality Action Plan Progress Report – Summary Table

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Improving links with Local Transport Strategy/ Area Transport Plan | Reference to Bonnygate AQMA and measures included in Air Quality Action Plan. Integration of plan. | Fife Council Transportation and Environmental Services (TES) and Economy, Planning and Employability Services (EPES) | Original: 2009-2010; Amended: 2014 | Benefit to local air quality - enables the consideration of Air Quality issues in the Bonnygate into Local Transport Planning considerations. | Fife Council are producing an Air Quality Strategy for Fife. This is to include updates to Appin Crescent and Bonnygate AQAPs and exploration of the Scottish Government's draft low emissions strategy | | Not possible to assign a quantitative indicator. These are strategic options which will be reported in future versions of LTS and proposed Fife Council Air Quality Strategy and relevant commentary will be provided on specific air quality provisions in such documentation. | |
| 1 | | Options that will be implemented via the Area Transport Plan (ATP) | Fife Council TES and EPES | Originally: 2010; Amended: 2011 - 12 | Provision of a cycle-way from the town centre to the trading estate should encourage walking and cycling and contribute to reducing car usage and associated emissions. | Cycle Path completed in 2014 | Scottish Government grant funding for 2013/14 received for completion of cycle path. | Actions to be detailed in LTS and ATP. | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 2 | Improving Air Quality links with Local Planning and Development Framework | (a)Integrate AQ Action Plan with Local Plan - liaise with Development Management staff re: inclusion of specific reference within Local Plan policies for Air Quality Issues and legislative requirements. | Fife Council EPES | Original: 2010-2011; Amended: 2010-2012 | | The Strategic Development Plan for the TAYplan region has considered air quality issues associated with future development in the North East Fife area and makes specific reference to Cupar Relief Road and reducing air pollution. An Air Quality Management Guidance Note has been developed by Fife Council and made available on the Council's website | Fife Council is to explore potential to produce supplementary planning guidance for air quality issues within the proposed FIFEplan framework | Inclusion of reference to Bonnygate AQAP within Local Development Plan 2011. | Protective Services has provided air quality comments in relation to proposed FIFEplan consultation process |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 2 | | (b) Ensure development proposals in AQMA are assessed for AQ impacts - Development Management staff to consider Air Quality issues and consult Developer's Guidance note when determining applications within AQMA. | Fife Council EPES | 2010-2015 | The guidance note will increase awareness and consideration of potential air quality impacts of new developments and thus help to prevent deteriorations in local air quality. | Air Quality Development Management Guidance Note 2011 published on Fife Direct website. Development Management staff provided with model planning condition for air quality issues. | Positive feedback already received by developers on the user friendly content of Air Quality Development Management Leaflet. | Publication of Developers Guidance Note on Fife Direct. | EPES to continue providing comment on air quality issues on planning applications. This includes routine screening of weekly planning application lists. |
| 2 | | (c) Developers guidance note. EPES teams to continue to liaise to ensure continued understanding and correct interpretation of Developer's Guidance note – linked to Action (e) | Fife Council EPES | 2010 | The guidance note will increase awareness and consideration of potential air quality impacts of new developments and thus help to prevent deteriorations in local air quality. | Air Quality Development Management Guidance Note (2011) published on Fife Direct website . | Positive feedback already received by developers on the user friendly content of Air Quality Development Management Leaflet. | Publication of relevant promotional materials. Identification of relevant points of contact within associated Council Services. | EPES to continue providing comment on air quality issues on planning applications. This includes routine screening of weekly planning application lists. |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 2 | | (d) Promote sustainable developments to minimise AQ impacts - Local Plan policy requires all new developments to incorporate sustainable technology and/or methods. | Fife Council EPES | 2010-2015 | The incorporation of sustainable technologies and methods in new developments should help to minimise the potential air quality impacts of new developments. This measure may require additional consideration of the impacts of biomass boilers in new developments. | Sustainability Checklist Supplementary Planning and Customer Guidance produced in 2010. | Progression has been made for the communication and training of staff and elected members on the Sustainability Checklist and this will continue through organised future workshops including House Builders Forum. | Provision of in-house seminars by EPES and also presentations to colleagues in Development Management | EPES to continue providing comment on air quality issues on planning applications. This includes routine screening of weekly planning application lists. |
| 2 | | (e) Internal seminar on AQ – EPES to co-ordinate internal seminar aimed at Development Management Staff dealing directly with applications or new proposals in Local Plans. | Fife Council EPES | Original: 2010; Amended: 2011 | This measure will raise awareness of local air quality issues within the Development Management team and facilitate their consideration when applications for new developments are being appraised. | Internal Seminar on Air Quality and Development Management delivered | Seminar event proved very popular and has raised knowledge of air quality issues in Development Management Staff as evidenced through outputs realised in the planning consultation process. | Completion of internal seminar. | Ongoing presentations and meetings with Development Management colleagues to reinforce importance of tackling air quality issues. |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 3 | Encourage Integration AQ with other Council strategies | Implementation of AQAP | Fife Council and community planning partners | 2010-2015 | The integration of Air Quality with other Council strategies will facilitate joined-up thinking and the consideration of possible air quality impacts from the implementation of different strategies. | Air Quality steering group meeting held. Members include individuals from different departments who pool information and proposed plans. | Sustainable transport themes are included in the Councils Climate Strategy 2014 - 2020. | Comparison with AQ Objectives. Please refer to recent monitoring data for Cupar town centre reported in Section(s) of this report. Due to the variability of air quality monitoring data, and the seasonal influences of numerous factors (e.g. prevailing weather), it is recommended that this data is treated with caution until a definitive trend in concentrations can be identified. | Implementation of relevant AQS 2015-2020 objectives. |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 4 | Target reduced local emissions from freight operations | (a) Undertake a study to assess the feasibility e.g. encouraging freight operators to utilise the South Road (A914) approach to the town in preference to the Bonnygate (A91) | Fife Council Transportation and Environmental Services | Original: 2010-2011; Amended: 2011 onwards. | This measure was assessed in the further assessment and offers the potential of reducing freight associated emissions in the Bonnygate - and associated reductions in air quality pollutant concentrations. The extent of the effect would be dependent upon the proportion of freight that was redirected. | This project is not considered feasible in the context of the current south road configuration. | Proposed re-routing of traffic has raised concerns regarding health and safety issues including overhead lines. Therefore this option is currently not considered as being viable. | Assess the possibility of moving all freight to the South Road. Assess the feasibility of encouraging freight operators to use the South Road. | No new proposals/objectives identified as making a significant contribution at this stage for this particular action plan measure. It is proposed to remove this measure in updating the set of Bonnygate Air Quality action plan measures in 2014-2015 |
| 4 | | (b) Continue to meet with stakeholders through the SEStran Freight Quality Partnership to identify key needs, issues and areas for progress. | Fife Council Transportation and Environmental Services | 2009-2015 | By attending and providing input to SEStran, Fife Council are able to influence actions of the partnership that will potentially help to reduce the impact of road freight on air quality in Cupar and Fife in general. | Representatives from Fife Council continue to attend meetings and seek to influence actions of the partnership to improve local air quality. | | Continue to attend the SEStran Freight Quality Partnership and contribute to Air Quality Group within the partnership | Advice from the Scottish Transport Emission Partnership (STEP) to be sought in seeking to look at such issues. |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 4 | | (c) Assess potential for the development of local freight quality partnership aimed at reducing emissions within AQMA and wider area. | Fife Council Transportation and Environmental Services | Original: 2010-2011; Amended: 2011 onwards. | Local freight partnerships offer the potential to reduce local emissions from freight activities and thus contribute to improving air quality. The potential impact of this measure is dependent on its successful adoption and implementation. | | | Discuss with local operators vehicle emissions and routing policies. | Advice from the Scottish Transport Emission Partnership (STEP) to be sought in seeking to look at such issues<br><br>To consider these issues also in production of Air Quality strategy for Fife |
| 5 | Implementation of new Urban Traffic Management and Control System and changes to pedestrian crossings | (a) Installation of new pedestrian crossings in Bonnygate linked to new traffic management system. | Fife Council Transportation and Environmental Services | 2009 | The UTMC and changes to pedestrian crossings have been successfully implemented. These measures combined with 5(b) have helped to reduce traffic queuing in the Bonnygate street canyon, and thus help to reduce localised concentrations of air quality pollutants. | Measure complete - Installation of new pedestrian crossings in Bonnygate linked to new traffic management system | The introduction of these measures has coincided with a decline in concentrations of $NO_2$ and $PM_{10}$ within the Bonnygate for 2013. However, due to the potential variation in air pollutant concentrations and effects of factors such as weather conditions, it is recommended that these | Completed | Air quality monitoring at the Bonnygate will continue to confirm the effectiveness of these measures. |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | potential impacts are treated with caution until a distinct trend can be identified. | | |
| 5 | | (b) Implementation of new UTMC in Cupar town centre with synchronised fixed time signals. | Fife Council Transportation and Environmental Services | 2009-2011 | New UTMC will aim to maximise the efficiency of traffic flow through the town centre and minimise unnecessary traffic queuing within the Bonnygate. This measure aims to reduce emissions from stationary vehicles within the AQMA. | Measure complete | The introduction of these measures has coincided with a decline in concentrations of $NO_2$ and $PM_{10}$ within the Bonnygate in 2013. However, due to the potential variation in air pollutant concentrations and effects of factors such as weather conditions, it is recommended that these potential impacts are treated with caution until a distinct trend can be identified. | Completed | Air quality monitoring at the Bonnygate will continue to confirm the effectiveness of these measures. |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 6 | Parking Management and Control | (a) Support the objectives of Fife Council's Parking Strategy to discourage long stay commuter parking. | Fife Council – Transportation and Environmental Services | 2009-2015 | The inclusion of measures to discourage long stay commuter parking could contribute to reducing traffic volume in Cupar and associated emissions by encouraging the use of public transport. | | | Discourage long stay commuter parking as part of Fife Council's Parking Strategy. | To be reviewed as part the Air Quality Strategy for Fife |
| 6 | | (b) Length of stay restrictions and parking controls in town centre should be monitored and reviewed annually. | Fife Council – Transportation and Environmental Services | 2009-2015 | Regular reviews of parking restrictions/ controls can help to encourage the use of public transport when travelling to Cupar. | | | On-going monitoring | To be reviewed as part the Air Quality Strategy for Fife |
| 6 | | (c) Continued enforcement of loading restrictions within AQMA. | Fife Council – Transportation and Environmental Services and Fife Constabulary | 2009-2015 | Inappropriate loading/ unloading activities can result in bottle-necks within the Bonnygate and Crossgate - which can result in additional traffic queuing and increases in emissions. The enforcement of loading restrictions | | | Police enforce traffic road orders | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | should minimise the potential for such events. | | | | |
| 6 | | (d) Assess the need for on street parking charges to manage the demand for parking. | Fife Council – Transportation and Environmental Services | 2010-2011 | The management of parking availability should function to encourage the use of public transport instead of private vehicles when travelling to Cupar. | | | Carry out assessment.<br><br>The Council has received parking control grant funding from the Scottish Government. | To be reviewed as part the Air Quality Strategy for Fife |
| 7 | Review and support proposed infrastructure changes that will contribute to delivering improvements in local air quality | (a) Review and support the proposed delivery of a new relief road which would come forward as part of a new strategic land allocation to the north of Cupar (Structure Plan). | Fife Council – Transportation and Environmental Services and EPES (Development Management and Protective Services) | 2012-2015 | Adoption of this measure ensures that Fife Council will review any proposed infrastructure changes for their potential impact on local air quality. Where such proposals will contribute to improving local air quality and have neutral/ positive effects on other (socio-economic and environmental) factors, these proposals will be supported. | Cupar Streetscape Improvements have received appropriate funding and are in the process of being implemented. In addition, the Council has undertaken modelling studies assessing the potential air quality impact of the proposed Cupar relief road | Preliminary dispersion modelling to be undertaken on assessing potential air quality impacts of proposed Cupar Relief Road on Bonnygate AQMA | This scheme would be developer funded and therefore could only be implemented through the Development Plan process. | |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 7 | | (b) Review and support the proposed Cupar, St Catherine Street and The Cross, Traffic and Streetscape Improvements that will contribute to more efficient vehicle movements and enhanced pedestrian accessibility within Cupar Town centre. | Fife Council – Transportation and Environmental Services and EPES (Development Management and Protective Services) | 2009-2013 | The successful implementation of this measure should contribute to more efficient vehicle movements and enhanced pedestrian accessibility, and should thus contribute to improving local air quality within Cupar by helping to reduce emissions from road transport. This measure has been designed but implementation is dependent upon capital funding. | Cupar Streetscape Improvements have received appropriate funding and are in the process of being implemented. Updates will be provided in future Air Quality Progress Reports. | Impacts on air quality of these Streetscape improvements have been assessed by dispersion modelling exercise in 2014 and are considered unlikely to have any deleterious effects on air quality. | Feasibility and design to implement proposals. | Ongoing monitoring to assess air quality following the introduction of these traffic management measures |
| 8 | Target reduction in emissions from buses | (a) Liaise with local bus operators to establish the potential for developing a local bus quality partnership. | Fife Council - Transportation and Environmental Services | 2010-2015 | The development of a local bus partnership would aim to promote environmental improvement (among other issues), with reductions in emissions (GHG and AQ) from the current fleet being a key objective. If successfully | Reviewed and discussed other local authorities' approaches to establishing Bus Quality Partnerships. | | Establish a Bus Quality Partnership | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | implemented this action should contribute to improving air quality within the Bonnygate and Cupar in general (dependent upon activity data, verified emission factors and maintenance of the fleet vehicles). | | | | |
| 8 | | (b) Encourage bus operators to improve emission performance of their fleet. | Fife Council - Transportation and Environmental Services | 2010-2015 | It is anticipated that gradual improvements to the bus fleet that cover the Bonnygate should contribute to potential reductions in emissions of air quality pollutants (dependent upon activity data and maintenance of vehicles). | | | New buses and technologies being developed all the time. Local bus fleets, both council and commercial have made significant investment in the fleet to the latest engine standards. | To be reviewed as part the Air Quality Strategy for Fife |
| 9 | Continue to target reduction in emissions from Council Fleet and contract | (a) Continue procurement of low emission vehicles. | Fife Council – Fleet Operations and Procurement and Supplies | 2009-2015 | Improvements in fleet demonstrate that Fife Council is leading by example. Improvements in fleet should make a small contribution to | 2012 – 2014 fleet / plant replacement plan now in place with 3 new vans in service which the | Fife council had reduced its fleet to 1705 in December 2013, from 1922 in 2011.<br><br>All Council fleet | Fife Council tender specification insists all new vehicles must have exhaust trap and | To be reviewed as part the Air Quality Strategy for Fife. Includes considering introduction of “Fuel Champions” in Fife Council. |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| | vehicles | | | | reducing emissions of $CO_2$ and Air Quality Pollutants within the Bonnygate. This is dependent upon verified emission factors, continued maintenance of the vehicles and no increase in activity within Bonnygate area. | manufacturer states will provide a possible 10% fuel reduction. | Vehicles fitted with ERG systems to reduce NOx emissions.<br><br>Fife Council is also running low sulphur vehicles within its fleet which continue to be monitored and assessed.<br><br>Use of vehicle tracking systems which reduces idling. | particulate filtration systems | |
| 9 | | (b) Monitor and assess alternative fuels, technologies and fuel additives. | Fife Council – Fleet Operations and Procurement and Supplies | 2009-2015 | The replacement of fleet car(s) with electric alternatives should make a small contribution to reducing emissions of air quality pollutants in the Bonnygate. This is dependent upon the electric vehicle replacing an existing vehicle and not an addition to the existing fleet. | 17 fully electric vehicles in the Fife Council fleet to date. | 7% bio-diesel from renewable sources is added to the councils fuel stocks. | Increase in fleet using alternative fuels | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 9 | | (c) SAFED training. | Fife Council – Fleet Operations and Procurement and Supplies | 2009-2015 | It is hoped that driver training will facilitate more fuel efficient driving practices, a reduction in fuel consumption, associated emissions and concentrations of air quality pollutants. | CPC (Certificate of Professional Competence) for HGV drivers (almost 500 Council staff as of March 2015), along with driver training for all other smaller type vehicles, are now running alongside. | | Driver certification<br><br>CPC (Certificate of Professional Competence) | |
| 9 | | (d) Assess potential for emissions standards for fleet contracts. | Fife Council – Fleet Operations and Procurement and Supplies | 2009-2015 | By ensuring that contractor fleets have newer vehicles, Fife Council are encouraging the use of lower emitting vehicles under its contracts. | 2012 – 2014 fleet / plant replacement plan now in place with specific vehicles being targeted for renewal by smaller more appropriate sized vehicles. | Fleet operations now insist that any heavy goods vehicles supplied must be fitted with an exhaust trap and particulate filtration system.<br><br>Some retro fitting of exhaust emissions systems have been fitted to the existing Fife Council fleet with more planned in future. | Fife Council tender specification insists all new vehicles must have exhaust trap and particulate filtration systems. | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 10 | AQMA Awareness Signs | To design and erect AQMA signs at various locations within Cupar Town Centre. | Fife Council – Transportation and Environmental Services | 2010-2011 | | | | Authorisation, design, procurement and installation. | To be reviewed as part the Air Quality Strategy for Fife |
| 11 | Travel plans for large organisations and businesses | (a) Continue the implementation of Fife Council's Travel Plan. | Fife Council – Transportation and Environmental Services | 2009-2015 | Travel plans include a package of measures to encourage relevant individuals (staff, pupils, students etc.) to use alternatives modes of transport rather than single occupancy cars. Measures may include improved cycling facilities, provision of information, car sharing schemes and improved public transport provisions. If implemented effectively, travel plans can help to reduce traffic congestion and also traffic volumes generally. Consequently, travel | Looking at best means to interrogate existing records for number of Travel Plans submitted to Council. | | Results of Council travel surveys | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| | | | | | plans can have a positive impact on the users, but also the environment - such as reducing $CO_2$ and air quality emissions through reduced fuel consumption. | | | | |
| 11 | | (b) Continue to support the implementation of School Travel Plans. | Fife Council – Transportation and Environmental Services | 2009-2015 | | | | Travel plans implemented and promoted in all schools | To be reviewed as part the Air Quality Strategy for Fife |
| 11 | | (c) Work with local businesses /organisations to encourage the development and implementation of travel plans. | Fife Council – Transportation and Environmental Services | 2009-2015 | | | | Number of large businesses approached regarding the development of travel plans. | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 12 | Promotion of Cycling and Walking | (a) Development of walking and cycling routes within Cupar. | Fife Council – Transportation and Environmental Services | 2009-2015 | The provision of an area wide map for cycling and walking should encourage the cycling and walking in preference to the car for some users. This measure therefore offers the potential to help reduce emissions from private vehicles. | A feasibility study was carried out on creating a cycle route from Cupar to Guardbridge along the A91. However due to the complexity of multiple land owners this will not go ahead in the short term. | | Number/ length of cycling and walking routes developed. | Additional cycle parking to be added in Cupar |
| 12 | | (b) Signage and Interpretation. | Fife Council – Transportation and Environmental Services | 2009-2015 | The provision of adequate signage can encourage cycling and walking in preference to private cars. Consequently, this measure could contribute to reducing road traffic emissions and help contribute to local improvements in air quality. | | | Installation of Signage | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 12 | | (c) Provision of Cycle Parking throughout the town centre; at workplaces and at Transport Interchange points. | Fife Council – Transportation and Environmental Services | 2009-2015 | The provision of more cycle parking facilities should encourage the use of bicycles in preference to the use of private motor vehicles. | | | Installation of cycle parking points. | Cycle parking is being placed in Cupar as part of the Town Centre Traffic Scheme. |
| 12 | | (d) A programme of led Cycle Rides will be set up in Cupar to encourage people to cycle as part of their daily routine. | Fife Council – Transportation and Environmental Services | Original: 2010-2015; Amended: 2011-2015 | This measure aims to encourage people to cycle and may result in some existing car users to cycle instead of drive for some journeys. | | | Number of led cycle rides. | To be reviewed as part the Air Quality Strategy for Fife |
| 13 | Promoting Travel Choices | (a) Production of a Travel Choices map of Cupar | Fife Council – Transportation and Environmental Services | 2010-2015 | The provision of a travel choices map for Cupar aims to encourage the use of sustainable forms of transport in preference to private motor vehicles. This measure therefore offers the potential of reducing future emissions from road transport. | | | Creation and publication of map. | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 13 | | (b) A Mass Marketing Campaign for Cupar to raise awareness about the project and encourage people to take sustainable modes of travel. | Fife Council – Transportation and Environmental Services | 2010-2015 | Fife Council has undertaken an extensive marketing exercise to raise awareness about the Bonnygate AQAP including the "TRY IT" campaign. This has included press releases, a stall at the Farmer's market, and close working with NHS Fife, Community Groups and Schools within Cupar. | | | Undertake marketing | To be reviewed as part the Air Quality Strategy for Fife |
| 13 | | (c) Production of a community booklet. | Fife Council – Transportation and Environmental Services | 2010-2015 | | | | Production of booklet. | To be reviewed as part the Air Quality Strategy for Fife |
| 13 | | (d) Production of a residential travel pack. | Fife Council – Transportation and Environmental Services | 2010-2015 | This measure aims to provide guidance on travel options to local residents and thus encourage the use of sustainable forms of transport. | | | Production of travel pack. | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 13 | | (e) Undertaking individualised Travel Marketing at households throughout Cupar. | Fife Council – Transportation and Environmental Services | 2010-2015 | This measure aims to provide guidance on travel options to local residents and thus encourage the use of sustainable forms of transport. | | | Undertaking visits with households. | To be reviewed as part the Air Quality Strategy for Fife |
| 13 | | (f) Undertaking individualised Travel Marketing at businesses throughout Cupar. | Fife Council – Transportation and Environmental Services | 2010-2015 | This measure aims to provide guidance on travel options to local businesses and thus encourage the use of sustainable forms of transport. | | | Undertaking visits to businesses throughout Cupar to discuss Travel. | To be reviewed as part the Air Quality Strategy for Fife |
| 13 | | (g) New housing developments in Cupar to be designed with the Scottish Government's travel hierarchy in mind and new residential developments set up Car Clubs for use by residents. | Fife Council – Transportation and Environmental Services | 2010-2015 | | | | Obtain internal and developer agreement to progress the car club's approach by Transport Planning and Development Management | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 13 | | (h) Residential Travel Packs, to be issued to all 'new built' homes identified in the local plan through the planning process. | Fife Council – Transportation and Environmental Services | 2010-2015 | | | | Travel packs to be distributed to 'new build' homes | To be reviewed as part the Air Quality Strategy for Fife |
| 13 | | (i) Setting up a car club so that Fife Council pool cars are able to be used by the community for hire at evenings and weekends. | Fife Council – Transportation and Environmental Services | 2010-2015 | This measure aims to make Council 'pool cars' available for members of the public to hire in the evenings and weekends. This measure provides an alternative to private vehicle ownership and encourages the use of sustainable forms of transport by users at other times. | | | Establish Car Club. | To be reviewed as part the Air Quality Strategy for Fife |
| 13 | | (j) Continue to provide information about public transport services through the Council website. | Fife Council – Transportation and Environmental Services | 2009-2015 | This measure aims to increase awareness of public transport options in Fife and therefore encourage their use in preference to private motor vehicles. | The Fife Council Air Quality website has been redesigned and now includes updated information on both road traffic pollution and other potential | | Regular updates of public transport information on Council website | |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| | | | | | | sources of air pollutants e.g. biomass boilers. In addition relevant Council committee reports continue to be produced on an annual basis | | | |
| 14 | Provision of information relating to Air Quality and Travel options | (a) Continue to make information relating to local air quality management available through Council website | Fife Council – Transportation and Environmental Services and Protective Services | 2009-2015 | The provision of LAQM reports provides a valuable source of information to the local public and increases awareness of local air quality issues. | The Fife Council Air Quality website has been redesigned and now includes updated information on both road traffic pollution and other potential sources of air pollutants e.g. biomass boilers. In addition relevant Council committee reports continue to be produced on an annual basis | In addition relevant Council committee reports on air quality issues continue to be produced on an annual basis | Publication of new LAQM reports and details relating to the Bonnygate AQMA/ AQAP on the Fife direct. | An under spend in a Scottish Government grant funding for 2013/14 for completion of cycle path was used to fund mobile monitoring in Bonnygate, the outcomes of which are likely to raise awareness of importance of air quality issues. |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 14 | | (b) Undertake a publicity campaign to raise awareness of the Bonnygate AQMA. | Fife Council – Transportation and Environmental Services and Protective Services | 2010-2011 | The publicity campaign will raise awareness of Local Air Quality issues in general and of the Bonnygate AQMA in particular. The measure intends to work with other associated activities in the plan to encourage activities that will contribute to improving local air quality in the Bonnygate AQMA. | The "TRY IT" Cupar campaign (www.fifedirect.org.uk/tryit) has been particularly successful in raising awareness of local air quality issues of both the Bonnygate AQMA and air quality issues in general. Presentations provided to FPH, NHS and GreenFleet Scotland events in 2013-2014 in raising awareness of air quality issues. | Sustainable Cupar's energy group is in the early stages of developing a plan to buy a London cab or similar vehicle, and convert it so it can run on used fat from local takeaway restaurants. The group has already received backing for its project from the Green Insurance company which has awarded it a 'Green Grant' of £1600 to get the idea off the ground. Presentations provided to FPH, NHS and GreenFleet Scotland events in 2013-2014 in raising awareness of air quality issues. | Publication of materials, events held, website statistics. | Fife Council will continue to incorporate the most recent developments in our understanding of air quality issues within the context of public communication media mechanisms. |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 14 | Fife ECO Stars | Develop and promote Fife ECO Stars, a new green recognition scheme aiming to tackle air pollution from transport. | Fife Council – Transportation and Environment Services | | There is potential to reduce emissions from buses, HGVs, LDVs and HDVs across Fife, including Dunfermline. | ECO Stars was launched in October 2014.<br><br>The Council held a workshop event at the City Chambers in Dunfermline with local fleet operators on 19th March 2015 | Currently there are 44 members already signed up to the scheme | Encourage operators of buses, coaches, HGVs and LDVs to sign up to voluntary scheme which encourages and promotes 'clean operators' | |
| 16 | Air Quality Strategy for Fife | Develop and adopt an Air Quality Strategy that aims to raise awareness of air quality issues and to promote some of the existing best practice work that the Council has undertaken within existing AQMAs to other parts of Fife | Fife Council | | | | | . | Increase awareness of local air quality issues and promote good practice in reducing emissions of air quality pollutants |
| 17 | Air Quality and Planning Toolkit | Develop a GIS based dispersion modelling toolkit | Fife Council | | | | | | The potential implementation of this proposed |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| | | to assist planners and other local authority officers in the consideration of the air quality issues in the development management process. | | | | | | | measure is dependent upon funding and approval from the Scottish Government |

## Appendix G: Appin Crescent Air Quality Action Plan Progress Report – Summary Table

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Liaise with the Scottish Government regarding the consideration of national measures to reduce background concentrations of PM | Contact the Scottish Government lead regarding the consideration of national measures to reduce PM | Fife Council – Protective Services | 2012 | Possible future reduction in background concentrations of PM | Air Quality Strategy 2015-2020. There has been integration of air quality issues into both the development planning framework and recognising synergies with climate change strategy | | Meeting / consultation with Scottish Government | |
| 2 | Feasibility study | a) Undertake a feasibility study to assess the potential impact of local infrastructure developments and traffic management optimisation on | Fife Council – Transportation and Environmental Services and Enterprise, Planning and Employability Services | 2012 onwards | | Feasibility studies have been carried out on four local infrastructure developments and traffic management optimisation | | Feasibility study reports (2014 onwards) | |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| | | air quality in Appin Crescent.<br>1) Appin Crescent bypass<br>2)Traffic management optimisations<br>3) Halbeath Park and Ride<br>4) The Northern Link Road | (EPES) | | | traffic options. Further feasibility studies are to be undertaken to look at traffic signalling in Appin Crescent area. | | | |
| 2 | | b) Publish findings of study and undertake consultation with relevant organisations regarding future progress | Fife Council – Transportation and Environmental Services and EPES | 2012 - 2015 | | The Appin Crescent bypass is included in the Dunfermline and West Fife Local Plan and has been promoted by a number of local organisations and individuals as a potential solution to the air quality issues | | Findings of feasibility studies in 2014 have been discussed by Air Quality Steering Group and it has been agreed –subject to provision of Scottish Government air quality grant – that traffic signalling arrangements in the Appin Crescent area be reviewed in | |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| | | | | | | identified. The diversion is planned to the north of Appin Crescent at Leys Road, Dunfermline. The feasibility study carried out shows that the proposed by-pass appears to offer the achievement of the AQ objectives, however there is no funding available at the moment | | terms of improving traffic flow and easing congestion. | |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 3 | Improving links with Local Transport Strategy | a) Reference to Appin Crescent AQMA and measures included in Air Quality Action Plan. Integration of plan with LTS. | Fife Council – EPES | 2012-2013 | Benefit to local air quality - enables the consideration of Air Quality issues in the Appin Crescent into Local Transport Planning considerations. | Meeting arranged with Transportation and Environment Services to discuss integration of different strategies within the overall AQ Strategy for Fife | | Not possible to assign a quantitative indicator. These are strategic options which will be reported in future versions of LTS and relevant commentary will be provided on specific air quality provisions in such documentation. | To be reviewed as part the Air Quality Strategy for Fife |
| 3 | | b) Develop action plan options that will be implemented via the local transport strategy. | Fife Council – EPES | 2012-2015 | Provision of a large scale project to develop a cycle network in Dunfermline should encourage cycling and contribute to reducing car usage and associated emissions. | | | Actions to be detailed in LTS and ATP. | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 4 | Improving Air Quality links with Local Planning and Development Framework | a) Integration of Appin Crescent AQAP with future versions of Local Plan. | Fife Council – EPES | 2012-2015 | | Meeting held with Council's Sustainabilty Team to discuss integration with Climate Change Strategy (Appendix D) | | No quantitative indicator | To be reviewed as part the Air Quality Strategy for Fife |
| 4 | | b) Ensure that development proposals with the potential to exert an impact on the Appin Crescent AQMA are assessed for air quality impacts and where necessary, appropriate mitigation measures adopted. | Fife Council – EPES | 2011-2015 | The guidance note will increase awareness and consideration of potential air quality impacts of new developments and thus help to prevent deteriorations in local air quality. | Air Quality Development Management Guidance Note 2011 published on Fife Direct website. Development Management staff provided with model planning condition for air quality issues. Ongoing discussion with Development Management colleagues on | | No quantitative indicator | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| | | | | | | FIFEplan | | | |
| 4 | | c) Continue to promote sustainable developments | Fife Council EPES | 2011-2015 | Incorporation of sustainable technologies and methods in new developments should help minimise the potential air quality impacts of new developments.<br><br>The guidance note will increase awareness and consideration of potential air quality impacts of new developments and thus help to prevent deteriorations in local air quality | Air Quality Development Management Guidance Note (2011) published on Fife Direct website | | Publication of promotional materials | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 4 | | d)Maintain and make available - air quality guidance note for developers. | Fife Council EPES | 2011-2015 | The incorporation of sustainable technologies and methods in new developments should help to minimise the potential air quality impacts of new developments by increasing developer awareness of air quality issues | | | Publication of relevant promotional material | |
| 5 | Encourage Integration of AQ with other Council strategies | a) Enhance joint working between Council Services to encourage consideration of potential air quality implications | Fife Council and community planning partners | 2012-2015 | This will encourage contributions towards improving local air quality and minimising negative impacts from existing and future council strategies, which will possibly lead to the achievement of AQ Objectives | Air Quality steering group meeting held. Members include individuals from different departments who pool information and proposed plans. | Fife Council's Single Outcome Agreement (SOA) with the Scottish Government outlines the aim of providing better water, air and land quality under the banner of Sustaining and Improving Our Environment | Evidence of Joint working | |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 5 | | b) Maintain regular and ongoing communication between members of the Appin Crescent AQAP steering group. | Fife Council and community planning partners | 2012-2015 | | Air Quality steering group meetings continue to be held. | | Regular steering group meetings and minutes | To be reviewed as part the Air Quality Strategy for Fife |
| 6 | Consideration of development of Appin Crescent bypass (dependent upon feasibility study) | Development of an Appin Crescent bypass . | Fife Council | - | This is dependent on the conclusions within the feasibility study and related factors | The feasibility study suggests that the proposed bypass appears to offer the achievement of Air Quality objectives however there is no funding in the short term. | | Progress of this action is dependent on the conclusions of the feasibility study and related factors | To consider other traffic management options that may realise similar air quality improvements but may be more cost effective and practicable. |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 7 | Optimisation of the traffic management system | Optimisation of the traffic management system at Appin Crescent and the surrounding network. | Fife Council | | This is dependent on the conclusions within the feasibility study and related factors | A study was undertaken to assess traffic signalling arrangements at Garvock Hill roundabout. | The study was finalised in 2015 and also considered the optimisation of traffic light sequencing in Sinclair gardens roundabout and relocation of bus stops. Revised lane markings and signage were introduced in March 2013 which appear to be decreasing $NO_2$ concentrations on South Side of Appin Crescent. | Progress of this action is dependent on the conclusions of the feasibility study and related factors | To be reviewed as part the Air Quality strategy for Fife |
| 8 | Investigate the potential for establishing voluntary bus agreements | a) Liaise with local bus operators to establish the potential for developing local bus quality agreements. | Fife Council (Transportation and Environmental Services) | 2013-2015 | Increased Operator awareness of air quality issues. | Fife Council liased with bus operators to increase awareness of Air Quality issues | | Bus quality agreement. Similar to P&R at Ferrytoll 2016/2017 link to Forth Replacement Crossing | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| | | b) Liaise with bus operators regarding emissions from the bus fleet and improvements to bus service infrastructure. | Fife Council (Transportation and Environmental Services) | 2012-2015 | Increased Operator awareness of air quality issues. | | | Existing arrangements with Operators | To be reviewed as part the Air Quality Strategy for Fife |
| 9 | Continue to target reductions in emissions from the Council fleet and contract vehicles. | a) Continue periodic procurement of low emission vehicles; | Fife Council (Fleet Services/ Procurement and Supplies) | 2012-2015 | Improvements in fleet demonstrate that Fife Council is leading by example. Improvements in fleet should make a small contribution to reducing emissions of $CO_2$ and Air Quality Pollutants within Appin Crescent. This is dependent upon verified emission factors, continued maintenance of the vehicles and no increase in activity within the Appin Crescent area. | 2012 – 2014 fleet / plant replacement plan now in place with 3 new vans in service which the manufacturer states will provide a possible 10% fuel reduction | Fife Council had reduced its fleet to 1705 in December 2013, from 1922 in 2011.<br><br>Fife Council is also running low sulphur vehicles within its fleet which continue to be monitored and assessed | Fife Council tender specification insists all new vehicles must have exhaust trap and particulate filtration systems | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 9 | | b) Monitor and assess viable options for alternative fuels, technologies and fuel additives. | Fife Council (Fleet Services/ Procurement and Supplies) | 2012-2015 | The replacement of fleet car(s) with electric alternatives should make a small contribution to reducing emissions of air quality pollutants in the Appin Crescent. This is dependent upon the electric vehicle replacing an existing vehicle and not an addition to the existing fleet | 18 fully electric vehicles in the Fife Council fleet to date. 2 hybrid vehicles are in the process of being purchased. | 7% bio-diesel from renewable sources is added to the councils fuel stocks. | Increase in fleet using alternative fuels | To be reviewed as part the Air Quality Strategy for Fife |
| 9 | | c) Undertake periodic training for vocational fleet drivers including Safe and Fuel Efficient Driving (SAFED). | Fife Council (Fleet Services/ Procurement and Supplies) | 2012-2015 | It is hoped that driver training will facilitate more fuel efficient driving practices, a reduction in fuel consumption, associated emissions and concentrations of air quality pollutants. | CPC (Certificate of Professional Competence) for HGV drivers, along with driver training for all other smaller type vehicles, are now running alongside. | Almost 500 Council staff have CPC | Driver certification<br><br>CPC (Certificate of Professional Competence) | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 9 | | d) Assess potential for emissions standards for fleet contracts. | Fife Council (Fleet Services/ Procurement and Supplies) | 2012-2015 | By ensuring that contractor fleets have newer vehicles, Fife Council are encouraging the use of lower emitting vehicles under its contracts. | 2012 – 2014 fleet / plant replacement plan now in place with specific vehicles being targeted for renewal by smaller more appropriate sized vehicles. | Fleet Operations now insist that any heavy goods vehicles supplied must be fitted with an exhaust trap and particulate filtration system.<br><br>Some retro fitting of exhaust emissions systems have been fitted to the existing Fife Council fleet with more planned in future. | Around 30 fleet vehicles replaced each year by the Council<br><br>Anticipate third of the replacements will be electric | To be reviewed as part the Air Quality Strategy for Fife |
| 10 | Provision of Information and Promotion of Travel options | a) Produce Travel Choices facility for Dunfermline. | Fife Council (EPES) and SEStran | 2013-2015 | Increased awareness of travel choices will encourage a change in behaviour that will contribute to improving local air quality. | | | Creation and publication of map | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 10 | | b) Undertaking Travel Marketing in Dunfermline. | Fife Council (EPES) and SEStran | 2013-2015 | | | | Undertake marketing | To be reviewed as part the Air Quality Strategy for Fife |
| 10 | | c) Undertake a publicity exercise to raise awareness of the Appin Crescent AQMA and encourage people to use sustainable forms of transport wherever possible. | Fife Council (EPES Transportation and Environmental Services) and SEStran | 2013-2015 | Raised awareness of the Appin Crescent AQMA will encourage people to use sustainable forms of transport which will in turn lead to improvements in air quality | In Dunfermline there have been various promotions and marketing activities carried out to encourage more people to use bikes for short journeys in preference to private cars. | | Undertake Marketing | To be reviewed as part the Air Quality Strategy for Fife |
| 10 | | d) Maintain and promote the use of Tripshare Fife, car-sharing initiative. | Fife Council (EPES) and SEStran | 2013-2015 | Encouraging individuals to car share will reduce the number of vehicles on the road at peak times and can contribute to air quality objectives being met | | | Increased take up of car share journeys | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 10 | | e) Continue to provide information about public transport services through the Council website. | Fife Council (EPES and Transportation and Environmental Services) and SEStran | 2013-2015 | Providing information to the public through the council website allows individuals to make informed choices with regards to their travel and can contribute to air quality objectives being met | | | Continue updates on the council website | To be reviewed as part the Air Quality Strategy for Fife |
| 10 | | f) Ensure cycle networks and facilities are provided, as a matter of course, within existing and new networks and developments. | Fife Council (EPES and Transportation and Environmental Services) and SEStran | 2012 – 2014 | By providing facilities individuals are more likely to use sustainable means of transport, thus this can contribute to Air quality objectives being met | Work is currently being carried out on the Linburn corridor cycleway and Greenspace project. | | Signage. Number/ length of cycling and walking routes established | Large scale development to the cycle network in Dunfermline is planned for 2014 – 2016. |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 10 | | f) To improve integration between cycling, walking and public transport. | Fife Council (EPES and Transportation and Environmental Services) and SEStran | 2012-2014 | Improved integration will improve journey times and promote sustainable transport options. This will lead to fewer journeys being made by car at peak times and contribute to the AQ objectives being met | | | Signage | To be reviewed as part the Air Quality Strategy for Fife |
| 10 | | g) Increase cycling trips to employment, education and leisure facilities. | Fife Council (EPES and Transportation and Environmental Services) and SEStran | 2012-2015 | Increased use of planned cycling network will lead to fewer journeys being made by car at peak times and contribute to the AQ objectives being met | In 2014, it is planned that there will be cycling training rolled out across schools in Dunfermline.<br><br>Adult cycling initiatives will also be set up. | | | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
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| 10 | | h) Improve pedestrian facilities such as new footpaths and crossings. | Fife Council (EPES Transportation and Environmental Services) and SEStran | 2013-2015 | Increased use of pedestrian facilities will lead to fewer journeys being made by car at peak times and contribute to the AQ objectives being met | | | | To be reviewed as part the Air Quality Strategy for Fife |
| 11 | Provision of Information and raising awareness of Air Quality issues | a) Continue to make information relating to local air quality management available through the Council website. | Fife Council (EPES and Transportation and Environmental Services) | 2011-2015 | Access to information about Air Quality Issues will improve public understanding, therefore promoting use of sustainable transport and contribute to the AQ objectives being met. | Presentations to NHS, FPH and Green FleetScotland and STEP. | | Publication of LAQM reports | To be reviewed as part the Air Quality Strategy for Fife |
| 11 | | b) Undertake a publicity campaign to raise awareness of the Appin Crescent AQMA | Fife Council (EPES and Transportation and Environmental Services) | 2012-2013 | Access to information about Air Quality Issues will improve public understanding, therefore promoting use of sustainable transport and contribute to the AQ objectives being met. | Presentations to NHS, FPH and Green FleetScotland and STEP | | Publication of materials, events held and website statistics | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 12 | Travel Plans for Large Institutions and Businesses | a) Continue the implementation of Fife Council's travel plan; | Fife Council | 2012-2015 | Travel plans include a package of measures to encourage relevant individuals (staff, pupils, students etc.) to use alternatives modes of transport rather than single occupancy cars. Measures may include improved cycling facilities, provision of information, car sharing schemes and improved public transport provisions. If implemented effectively, travel plans can help to reduce traffic congestion and also traffic volumes generally. Consequently, travel plans can have a positive impact on the users, but also the environment - such as reducing $CO_2$ and air quality emissions through reduced fuel consumption. | Latest developments discussed at quarterly Air Quality Steering Group meetings. | | Council travel surveys | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 12 | | b) Continue to support the implementation of School travel plans; | Fife Council | 2012-2015 | | Latest developments discussed at quarterly Air Quality Steering Group meetings | | Implemented and promoted in schools | To be reviewed as part the Air Quality Strategy for Fife |
| 12 | | c) Work with local businesses/ organisations to encourage the development and implementation of travel plans. | Fife Council | 2012-2015 | | | | Number of large businesses approached to develop travel plans. | To be reviewed as part the Air Quality Strategy for Fife |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 13 | Fife ECO Stars | Develop and promote Fife ECO Stars, a new green recognition scheme aiming to tackle air pollution from transport. | Fife Council – Transportation and Environment Services | | There is potential to reduce emissions from buses, HGVs, LDVs and HDVs across Fife, including Dunfermline. | ECO Stars was launched in October 2014.<br><br>The Council held a workshop event at the City Chambers in Dunfermline with local fleet operators on 19th March 2015 | Currently there are 44 members already signed up to the scheme | Encourage operators of buses, coaches, HGVs and LDVs to sign up to voluntary scheme which encourages and promotes 'clean operators' | |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 14 | Air Quality Strategy for Fife | Develop and adopt an Air Quality Strategy that aims to raise awareness of air quality issues and to promote some of the existing best practice work that the Council has undertaken within existing AQMAs to other parts of Fife | Fife Council | | | | | | Increase awareness of local air quality issues and promote good practice in reducing emissions of air quality pollutants |
| 15 | Air Quality and Planning Toolkit | Develop a GIS based dispersion modelling toolkit to assist planners and other local authority officers in the consideration of the air quality issues in the development management process. | Fife Council | | | | | | The potential implementation of this proposed measure is dependent upon funding and approval from the Scottish Government |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 16 | Cost-Benefit-Analysis of traffic management options to improve air quality within Appin Crescent | a) Measure looking at the removal of bus stops within Appin Crescent to improve traffic flow. | Fife Council | | | | | | Facilitate the consideration of the full costs and air quality benefits associated with the removal of bus stops from Appin Crescent and potential reconfiguration of the Appin Crescent/ Garvock Hill mini roundabout |
| 16 | | b)Measures relating to the potential reconfiguration of the Appin Crescent/ Garvock Hill mini roundabout | Fife Council | | | | | | Facilitate the consideration of the full costs and air quality benefits associated with the removal of bus stops from Appin Crescent and potential reconfiguration of the Appin Crescent/ Garvock Hill mini roundabout |

| Item | Action | Sub-action | Lead Authority | Timescale | Effect on Air Quality | Progress with measure (against indicators where possible) | Comments | Indicators listed in AQAP | New Proposals/ Objectives for 2015-2016 |
|---|---|---|---|---|---|---|---|---|---|
| 17 | Proposed air dispersion modelling study of the potential Dunfermline Northern Link Road | Undertake a detailed air quality dispersion model of the proposed Link Road as an option intervention to assess any implications on air quality on Appin Crescent. | Fife Council | | | | | | Facilitate the consideration of the potential air quality impacts on Appin Crescent of the proposed development of the Dunfermline Northern Link Road |

# Appendix H: Cupar North Development Zone and Relief Road: Air Quality Modelling Assessment 2015 – Executive Summary

Fife Council declared an Air Quality Management Area (AQMA) in the Bonnygate area of Cupar in 2008. This was required as annual mean nitrogen dioxide ($NO_2$) and fine particulate ($PM_{10}$) concentrations in excess of the Scottish air quality objectives were known to be occurring at locations where local residents may be exposed. Road traffic emissions are the main source of these pollutants within the AQMA.

Measure 7 of the Bonnygate Air Quality Action Plan outlined the intention to review and support the proposed delivery of a new relief road which may come forward as part of a new strategic land allocation (SLA) to the north of Cupar and may also contribute to improving air quality within the Bonnygate AQMA.

This assessment aims to quantify the potential air quality impact within the Bonnygate AQMA of future traffic associated with the Cupar North development zone. The relief road is planned as part of this overall development and is considered a key requirement; it is not however yet known at which stage of the development the relief road will become operational.

Future air quality impacts have been assessed assuming that completion of different zones of the development are phased over time up to 2030, and that completion of the relief road may not occur until all of the residential and commercial developments are completed in 2030. This approach has been used as projected vehicle pollutant emission rates and background concentrations are available until 2030 only.

Although assumptions relating to the phased rollout of the development are based mainly on professional judgement; the assessment aims to provide a reasonable indication of the air quality impact of additional traffic passing through the AQMA in future years. The assessment considers annual mean $NO_2$ and $PM_{10}$ concentrations.

Vehicle trip generation and distribution data from a transport assessment conducted in 2006 has been used in combination with the latest projections for vehicle emissions factors and background pollutant concentrations. Uncertainties in the transport assessment, arising from both the modelling itself and the time interval that has now passed since its completion, will carry forward into this assessment.

Two approaches to estimating the future rollout of the development have been modelled as listed below. A future baseline i.e. 'without development' has also been modelled for each future year for comparison with each 'with development' scenario.

- Approach 1 assumes that the development is phased sequentially every 3-4 years as per the numbered development zones in the WSP 2006 Transport Assessment Report. The future scenarios for Approach 1 were:
    a) 2019 – Zone 1a + 1b complete – no relief road
    b) 2023 – Zone 1a + 1b + Zone 2 complete – no relief road
    c) 2027 – Zone 1a + 1b + Zone 2 + Zone 3 complete – no relief road
    d) 2030 - Zone 1a + 1b + Zone 2 + Zone 3 + Zone 4 complete – no relief road
    e) 2030 - Zone 1a + 1b + Zone 2 + Zone 3 + Zone 4 complete – with relief road
- Approach 2 assumes that 25% of each development zone is completed every 3-4 years. The future scenarios for Approach 2 are:
    a) 2019 – 25% of all zones complete – no relief road

b) 2023 – 50% of all zones complete – no relief road
c) 2027 – 75% of all zones complete – no relief road
d) 2030 - 100% of all zones complete – no relief road
e) 2030 - 100% of all zones complete – with relief road

The results for each approach are similar and indicate that there will be no exceedances of the $NO_2$ annual mean objective at the receptor locations in any of the future years assessed. The maximum predicted increase for the $NO_2$ annual mean is 2.9 µg $m^{-3}$ which occurs in 2030 (with no relief road) at a 1st floor height receptor within the Bonnygate.

Using the current EPUK impact descriptors, this would be classified as a medium increase in concentration however as the predicted concentration is well below the 40 µg $m^{-3}$ objective, a medium change in concentration is classified as a negligible impact on annual mean $NO_2$ concentrations.

When emissions from the additional traffic from the development rollout phases are included; the results indicate that exceedances of the 18 µg $m^{-3}$ Scottish $PM_{10}$ annual mean objective will occur at the same receptor locations where exceedances are predicted for the future baseline years; these are at 1st floor height within the Bonnygate. The maximum predicted magnitude of change for the $PM_{10}$ annual mean at a location where there is relevant exposure is 2.4 µg $m^{-3}$ which occurs in 2030 (with no relief road).

Using the current EPUK impact descriptors, this magnitude of change would be classified as a large increase in concentration as it is greater than 10% of the 18 µg $m^{-3}$ objective. As the predicted concentration is greater than the 18 µg $m^{-3}$ objective; a large change in concentration is classified as a substantial adverse impact on annual mean $PM_{10}$ concentrations.

With the completed development and the relief road in place in 2030; the predicted change in $NO_2$ and $PM_{10}$ concentrations indicates that there will be small improvements in $NO_2$ and $PM_{10}$ concentrations within the Bonnygate AQMA when compared with the 2030 future baseline.

Based on the outcome of this modelling assessment, it is recommended that when considering the cumulative impact of the development without the relief road in place; that air quality and potential mitigation measures to counteract the impact of the additional development traffic are considered in the planning process.

# Appendix I: Appin Crescent Traffic Management Options Appraisal (Phase 3) Air Quality Impact Assessment – Executive Summary

Fife Council declared an Air Quality Management Area (AQMA) at Appin Crescent, Dunfermline in October 2011. This was required as annual mean nitrogen dioxide ($NO_2$) and fine particulate ($PM_{10}$) concentrations in excess of the Scottish air quality objective were known to be occurring at locations where local residents may be exposed. Subsequent air quality assessment work has identified that road traffic emissions are the main source of $NO_2$ and $PM_{10}$ within the Appin Crescent AQMA.

An Action Plan setting out the measures Fife Council intends to take to achieve compliance with the air quality objectives within the area covered by the AQMA is currently being implemented. One element of the action plan is to consider a number of traffic management scenarios to help reduce vehicle emissions and ambient $NO_2$ and $PM_{10}$ concentrations.

Two phases of the traffic management options feasibility study have been conducted so far; this report describes Phase 3 of the study which investigates the potential impact of three more traffic management scenarios which aim to improve traffic flow though Appin Crescent and hence reduce vehicle emissions and improve local air quality. The design options have been conceived and tested by traffic engineering consultancy SIAS Ltd using the S-Paramics traffic micro-simulation model.

The 2015 future baseline and six traffic management scenarios have been modelled to predict their potential impact on air quality within the Appin Crescent AQMA. The assessment has been conducted using atmospheric dispersion modelling of road traffic emissions and utilises the outputs from traffic micro-simulation modelling for some of the scenarios modelled.

A summary of the findings of each scenario assessed is as follows:

- Atmospheric dispersion modelling of road traffic emissions verified using 2013 $NO_2$ and $PM_{10}$ annual measurements indicates that the annual mean objectives for both pollutants are currently being exceeded at some locations where relevant human exposure exists within Appin Crescent. Comparison of the modelled $NO_2$ concentrations with local measurements has shown that the model is in fairly good agreement with the measurements. As already known from previous air quality assessments, the worst case locations for both $NO_2$ and $PM_{10}$ concentrations are at the facades of the residential properties close to the roadside on the south side of Appin Crescent.
- Modelling of the 2015 future baseline included predicted growth and changes to traffic flows attributable to redistribution of traffic on the Dunfermline road network due to committed commercial and residential developments. The dispersion model results indicates that for the 2015 future baseline there will be an increase in predicted annual mean $NO_2$ concentrations when compared with the 2013 baseline; with increases of up to 4.5 $\mu g\ m^{-3}$ being predicted at some receptor locations on Appin Crescent. The model predicts that the $NO_2$ annual mean objective will be exceeded at locations of relevant exposure in 2015. Similarly for $PM_{10}$ in 2015 the annual mean concentrations are predicted to increase at most of the receptors at Appin Crescent.
- Three design options relating to potential changes to how traffic flows are managed in Appin Crescent have been assessed as follows:

- Test Option 1: Optimisation of Holyrood Place / Appin Crescent signals (also linked to Sinclair Gardens roundabout)
- Test Option 2: Reconfigure Appin Crescent / Garvock Hill mini roundabout to signalised junction (right turn storage allowed but runs opposed)
- Test Option 3: Removal of bus stops on Appin Crescent.

- For Test Option 1 SIAS Ltd reported that the S-Paramics traffic micro-simulation model results generally indicate minimal changes in queuing at the Appin Crescent / Holyrood Place junction in both the AM and PM peak periods; and that speeds along Appin Crescent show little benefit in either peak period. The dispersion modelling results indicate that, for Design Option 1 on average across the receptors modelled, there will be an increase in predicted annual mean $NO_2$ concentrations when compared with the 2015 future baseline. $NO_2$ increases of up to 0.5 µg $m^{-3}$ are predicted at some diffusion tube sites and residential receptor locations on Appin Crescent. Similarly for $PM_{10}$ the modelling predicts that there will be an increase of up to 0.1 µg $m^{-3}$ in annual mean concentrations when compared with the 2015 future baseline. Changes in $PM_{10}$ concentration of this magnitude can reasonably be considered as negligible. Overall the dispersion modelling results indicate that this traffic management option does not offer any air quality benefits within the Appin Crescent AQMA and may lead to increased annual mean $NO_2$ concentrations when compared with the 2015 future baseline.

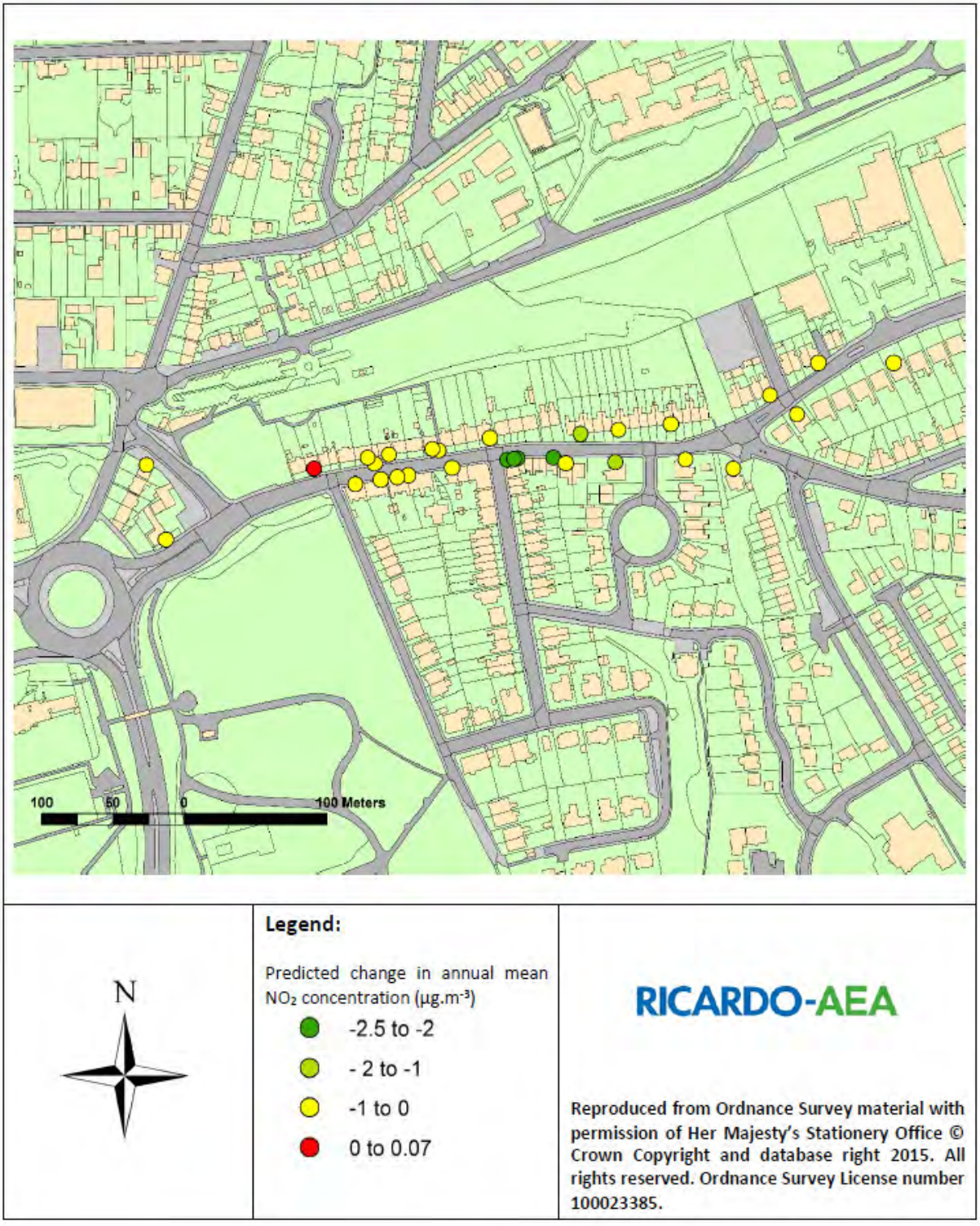
- Test Option 2 investigated the reconfiguration of the Appin Crescent/Garvock Hill mini roundabout. For this case the dispersion model indicates that annual mean $NO_2$ concentrations will reduce at some receptor locations by up to 2.6 µg $m^{-3}$ and increase by up to 0.6 µg $m^{-3}$ at some other receptors when compared with the 2015 future baseline. On average across all receptors modelled there is an overall reduction in concentrations. However, at the receptor locations where the worst case annual mean concentrations in excess of the 40 µg $m^{-3}$ objective occur (at the western end of Appin Crescent), only increases in concentrations are predicted.

- Test Option 3 investigated removal of the bus stops on Appin Crescent. SIAS Ltd concluded that there were benefits in terms of reduced traffic queuing on Appin Crescent during both the AM and PM peak periods. The dispersion model results indicate that for Design Option 3 there will be a small change in predicted annual mean $NO_2$ concentrations when compared with the 2015 future baseline; with reductions of up to 2.5 µg $m^{-3}$ being predicted at most of the modelled receptor locations on Appin Crescent with the exception of one receptor location at the western end of the Crescent. For $PM_{10}$ the predicted reduction in annual mean concentration is very small with reductions of up to 0.1 µg $m^{-3}$ predicted at all of the modelled receptor locations on Appin Crescent.

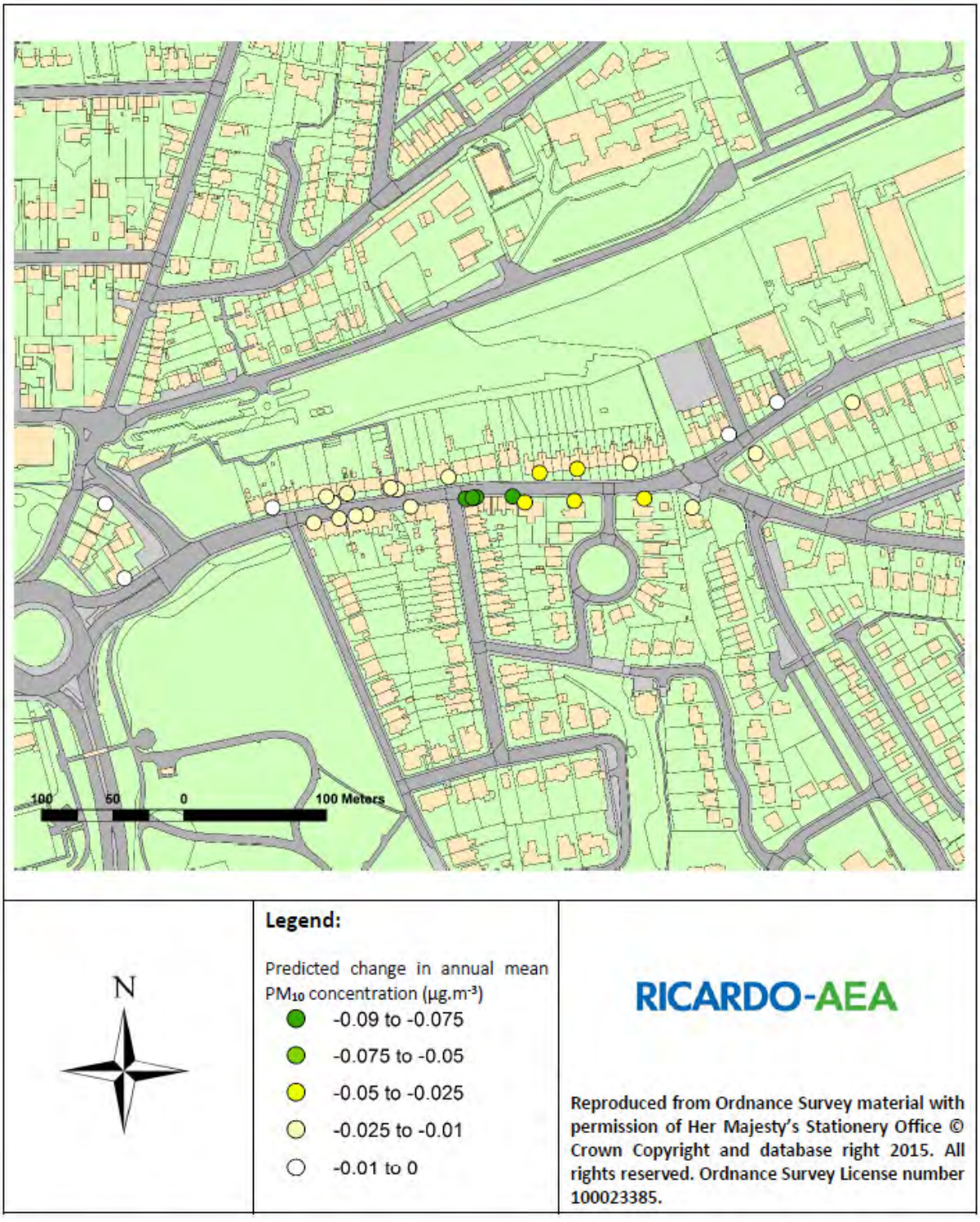
In conclusion, Test Option 1 does not appear to provide any air quality benefits and will likely lead to an increase in annual mean $NO_2$ concentrations. Although Test Option 2 and Test Option 3 do provide improvements in both $NO_2$ and $PM_{10}$ concentrations; neither of these options offer the opportunity to reduce concentrations of $NO_2$ and $PM_{10}$ on Appin Crescent to below the respective air quality objectives. As Test Option 3 may be relatively inexpensive to implement, it may be beneficial to conduct a cost benefit analysis for this scheme considering the net change in emissions that could be achieved and assigning a damage cost using current Defra and devolved administrations guidance.

# Appendix J: Appin Crescent Traffic Management Options Appraisal (Phase 3) Air Quality Impact Assessment –Test Option 3 vs. 2015 Baseline Maps

***Figure K.1 – Test Option 3 vs. 2015 Baseline – Predicted Change In Annual Mean $NO_2$ Concentration***



***FigureKJ.2 – Test Option 3 vs. 2015 Baseline - Predicted Change In Annual Mean $PM_{10}$ Concentrations***



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