



# **Falkirk Council**

## **2011 Air Quality Progress Report for Falkirk Council.**

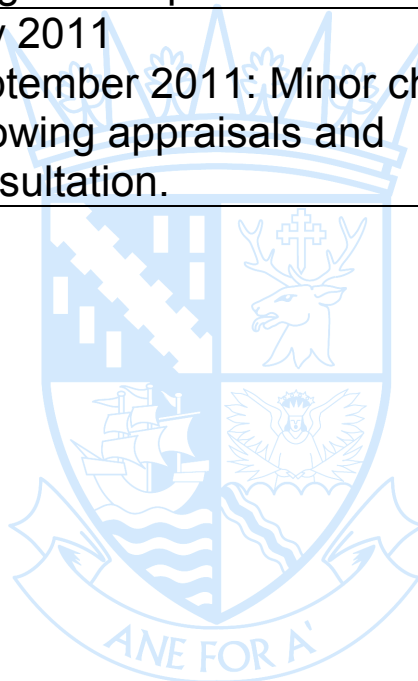
In fulfillment of Part IV of the Environment Act 1995  
Local Air Quality Management

July 2011

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## Executive Summary

Falkirk Council has examined the monitoring results for its area and concludes that no Detailed Assessments are required for any pollutant.

As in previous years a breach of the 15-minute SO<sub>2</sub> objective was recorded in 2010 at the Grangemouth Moray site. This site is within the Grangemouth AQMA, which was declared in November 2005 and for which an Action Plan is in place. The Grangemouth AURN site also recorded a breach of the objective. This is understood to be the first breach of the 15-minute SO<sub>2</sub> objective at an AURN site. The sites outside the AQMA continue to meet the objectives, including the new Polmont site. The work in relation to the Grangemouth AQMA continues as per the Action Plan. The INEOS' Tail Gas Treatment work that was described in the 2010 Progress Report was granted planning permission in December 2010.

The Falkirk Town Centre and Haggs Further Assessments have been submitted. A breach of the Scottish annual PM<sub>10</sub> objective was recorded at the Falkirk West Bridge St site in 2010. As a result of these reports it is proposed that NO<sub>x</sub> monitoring will cease and PM<sub>10</sub> monitoring will commence at Falkirk Grahams Rd. PM<sub>10</sub> monitoring may also commence at the Haggs site as result of the Further Assessment. At the time of writing the Scottish Government has rejected the Falkirk Town Centre Further Assessment, therefore no recommendation can be made in relation to the Falkirk Town Centre AQMAs. The development of the Action Plans for these AQMAs continues.

The benzene and 1,3 butadiene diffusion tubes continue to show that the objectives were met in 2010 at locations where there are relevant receptors. Monitoring will continue at Denny Cross and Glensburgh Road for NO<sub>2</sub> and an additional benzene tube has been located at Kinneil Kerse.

A review of the road traffic flow data available for the Falkirk Council area has highlighted one road that has shown an increase in traffic but according to the guidance does not need considering further. PPC changes in Falkirk Council area are discussed and do not need to be considered further.

An AQMA for PM<sub>10</sub> in Banknock has been approved in principal by elected Members and a consultation conducted. Falkirk Council will submit an Updating and Screening Assessment in 2012 unless otherwise notified by the Scottish Government.

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## Abbreviations

AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
DA	Devolved Administration
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
n/a	not applicable
n/m	not measured
NO <sub>2</sub>	Nitrogen dioxide
PM <sub>10/2.5</sub>	Particulate matter, less than 10 / 2.5 µm in diameter
QA/QC	Quality Assurance / Quality Control
R&A	Review and Assessment (Helpdesk, run by Defra / DAs)
SAQN	Scottish Air Quality Network
SEPA	Scottish Environmental Protection Agency
SO <sub>2</sub>	Sulphur dioxide
TEOM	Tapered Element Oscillating Microbalance.
VCM	Volatile Correction Model

# **1 Introduction**

## **1.1 Description of Local Authority Area**

Falkirk Council is a unitary authority located in Central Scotland, see Figure A1. Falkirk Council area encompasses 290 square kilometres with a population of approximately 151,000. The area extends from Banknock in the west to Blackness in the east and from South Alloa in the north to Limerigg in the south. It is bordered by the local authorities of North Lanarkshire, Stirling and West Lothian, with Clackmannanshire and Fife located on the north side of the Firth of Forth.

The area contains the port of Grangemouth and depends for its prosperity on a broad industrial base which includes sizeable industrial areas in Falkirk and Grangemouth. These industrial areas include an oil refinery, associated chemical industry and dockland in Grangemouth. The main towns and population base in the area are Bo'ness, Denny, Falkirk, Grangemouth and Larbert with the area around Slamannan in the south being more rural in nature.

Three motorways pass through the area, the M80, M876 and M9, in addition to the main rail line connecting Glasgow and Edinburgh and the rail lines connecting Glasgow / Edinburgh with Stirling and the north. The area also contains the Falkirk wheel which connects the Union and Forth and Clyde canals.

## **1.2 Purpose of Progress Report**

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

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

## **1.3 Air Quality Objectives**

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

**Table 1.1 Air quality objectives included in Regulations for the purpose of Local Air Quality Management in Scotland.**

Pollutant	Concentration	Measured as	Compliance date
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31/12/2003
	3.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31/12/2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31/12/2003
Carbon monoxide	10.0 $\text{mg}/\text{m}^3$	Running 8-hour mean	31/12/2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31/12/2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31/12/2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31/12/2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31/12/2005
Particles ( $\text{PM}_{10}$ , gravimetric)	50 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year	24-hour mean	31/12/2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31/12/2004
	50 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 7 times a year	24-hour mean	31/12/2010
	18 $\mu\text{g}/\text{m}^3$	Annual mean	31/12/2010
Sulphur dioxide	266 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year	15-minute mean	31/12/2005
	350 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 24 times a year	1-hour mean	31/12/2004
	125 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 3 times a year	24-hour mean	31/12/2004

## 1.4 Summary of Previous Review and Assessments

A summary of work in the last two years:

### Revised Detailed Assessment of Banknock, May 2009

Following the Scottish Government's appraisal of the original Banknock Detailed Assessment, a revised report was submitted. This considered emissions of  $\text{PM}_{10}$  and  $\text{NO}_2$  from road traffic emissions in Haggs and Banknock. Following completion of a full year of automatic  $\text{NO}_2$  monitoring at Kerr Crescent in Haggs a revised model assessment was undertaken. The revised atmospheric dispersion model included the high level of HGV traffic accessing the nearby quarry in Banknock and the traffic flows along the A80. The monitoring results and modelling assessment indicated that there were exceedances of the annual mean  $\text{NO}_2$  objective at locations of relevant exposure in Haggs and Banknock. There were no predicted exceedances of the annual mean or 24-hour mean objectives for  $\text{PM}_{10}$ .



It was recommended that the automatic analyser at Kerr Crescent be maintained and additional diffusion tube monitoring was undertaken on the north side of Kilsyth road. It was concluded that there was a requirement for an AQMA to reflect the exceedances of the annual mean NO<sub>2</sub> objective. At the time of writing the Council is awaiting the Scottish Government's appraisal of this report.

**Reference 1: For text in this section, 1.4, to this point.**

**Consultation on the declaration of two AQMAs for NO<sub>2</sub> in Falkirk town centre, May 2009**

Following analysis of the results of additional NO<sub>2</sub> monitoring and a Detailed Assessment of road traffic in Falkirk town centre, Falkirk Council identified measured exceedances of the annual mean NO<sub>2</sub> objective and modelled exceedances of the 1-hour mean objective.

**Grangemouth AQMA Action Plan Update, May 2009**

As recommended by the Review and Assessment Helpdesk, Falkirk Council submitted a separate report detailing the progress made with the Action Plan for the Grangemouth AQMA. The key measures of this Action Plan include the continuation of the text alert system for SEPA and INEOS and the extension of the working group to include INEOS and the Scottish Government. In addition, work is currently underway on a revised Further Assessment, this will provide improved modelling for the Grangemouth area and discuss the SO<sub>2</sub> monitoring data collected by the Council.

**2009 Updating and Screening Assessment, August 2009**

A review of pollutant monitoring data and atmospheric emissions sources within Falkirk Council area has been undertaken. The assessment compared the available monitoring data to national air quality standards (NAQS) in order to identify any existing exceedances of the standards.

The review of emission sources identified that emissions from shipping, rail, road traffic, domestic and industrial emissions had not changed significantly since the last round of review and assessment.

NO<sub>2</sub> concentrations measured during 2008 exceeded annual mean NAQS objective at some monitoring locations in Falkirk town centre. Falkirk Council is currently undertaking a consultation on the boundaries for two proposed Air Quality Management Areas (AQMAs) within Falkirk.

NO<sub>2</sub> concentrations measured during 2008 exceeded annual mean NAQS objective at the automatic monitoring site in Haggs. A Detailed Assessment submitted in May 2009 is currently being appraised by the Scottish Government. This report concluded that an AQMA would be required for NO<sub>2</sub> around the A80 slip road junction in Haggs / Banknock.

Monitoring of SO<sub>2</sub> within the Grangemouth AQMA indicates that the 15-minute mean SO<sub>2</sub> objective continues to be exceeded. In addition, the number of SO<sub>2</sub> exceedances has increased since 2006. The Action Plan update therefore concluded that the AQMA is still required. Monitoring of PM<sub>10</sub>, benzene and 1,3-butadiene

indicates that concentrations are below the NAQS objective levels and there are no predicted exceedances for the objective year of 2010.

### **Additional Further Assessment for the Grangemouth AQMA, April 2010.**

An additional Further Assessment for the Grangemouth AQMA was submitted, this executive summary was shown in Section 6 of the 2010 PR. Included as part of this report were polar roses (wind direction and speed versus concentration) plotted by Falkirk Council using Openair. This provided further insights into the monitoring data and was presented to the working group meeting for the AQMA in February 2010.

### **Progress Report 2010**

A review of Falkirk Council's monitoring data for 2009 showed that the 15-minute objective continued to be breached in the Grangemouth AQMA. In 2009 the Grangemouth Moray site recorded 65 exceedances. This is greater than the 35 allowed by the objective. All SO<sub>2</sub> monitors outside the AQMA met the 15-minute objective, with all sites meeting the hourly and daily SO<sub>2</sub> objectives. A breach of the 2010 annual PM<sub>10</sub> objective was recorded at the Falkirk West Bridge St site in 2009. This result will be used in the Falkirk Town Centre Further Assessment. Therefore the Council will wait for this report to be completed before considering whether to adjust the current AQMA.

Since the 2009 USA Falkirk Council has declared three AQMAs for NO<sub>2</sub>, two are in Falkirk Town Centre and one in the Haggs and Banknock area. In addition, the Banknock area near Cowdenhill Quarry remains subject to a Detailed Assessment for PM<sub>10</sub>. An Action Plan update for the Grangemouth AQMA was given. Falkirk Council continues to work on the measures outlined in the plan. In addition, a statement by INEOS about their tail gas treatment and other SO<sub>2</sub> emission reduction work was also included in the report.

It was concluded that no new Detailed Assessments were required, as exceedances of any objectives are covered by existing Detailed or Further Assessments, AQMAs or there are no relevant receptors.

A review of changes to local emission sources indicated that a number of roads were identified where the HDVs were above 20% or total traffic flows had increased. However, no Detailed Assessment is required for these or any other transport, industrial or domestic developments since the 2009 USA.

### **AQMAs**

Falkirk Council declared an AQMA for a likely breach of the 15-minute SO<sub>2</sub> objective in the Grangemouth area in November 2005, see Figure 1.1a. This AQMA is in relation to industrial emissions.

Falkirk Council declared AQMAs for NO<sub>2</sub> in Falkirk Town Centre and Haggs in March 2010, see Figures 1.1b to d. An update on all AQMAs is given in Sections 2.2.1 and 5.

### **Detailed Assessment (Banknock PM<sub>10</sub>)**

Falkirk Council is currently monitoring for PM<sub>10</sub> close to the Cowdenhill Quarry in Banknock. In December 2010 Falkirk Council submitted a Detailed Assessment to

the Scottish Government. The Scottish Government appraisal accepted the report and the need to declare an AQMA. The declaration of the Banknock PM<sub>10</sub> AQMA has been approved by elected Members and a consultation has been completed. The executive summary of the Detailed Assessment is reproduced below<sup>2</sup>:

Falkirk Council proceeded to a Detailed Assessment for particulate matter (PM<sub>10</sub>) in the Banknock area of Falkirk, in proximity to Cowdenhill Quarry, as a result of local resident complaints in respect of dust and other screening criteria required by the technical guidance. PM<sub>10</sub> monitoring commenced in the area in October 2009. The monitoring was carried out in the grounds of a dwelling in Coneypark Place, Banknock, Falkirk. An Osiris monitor was used. The site is named Banknock 1.

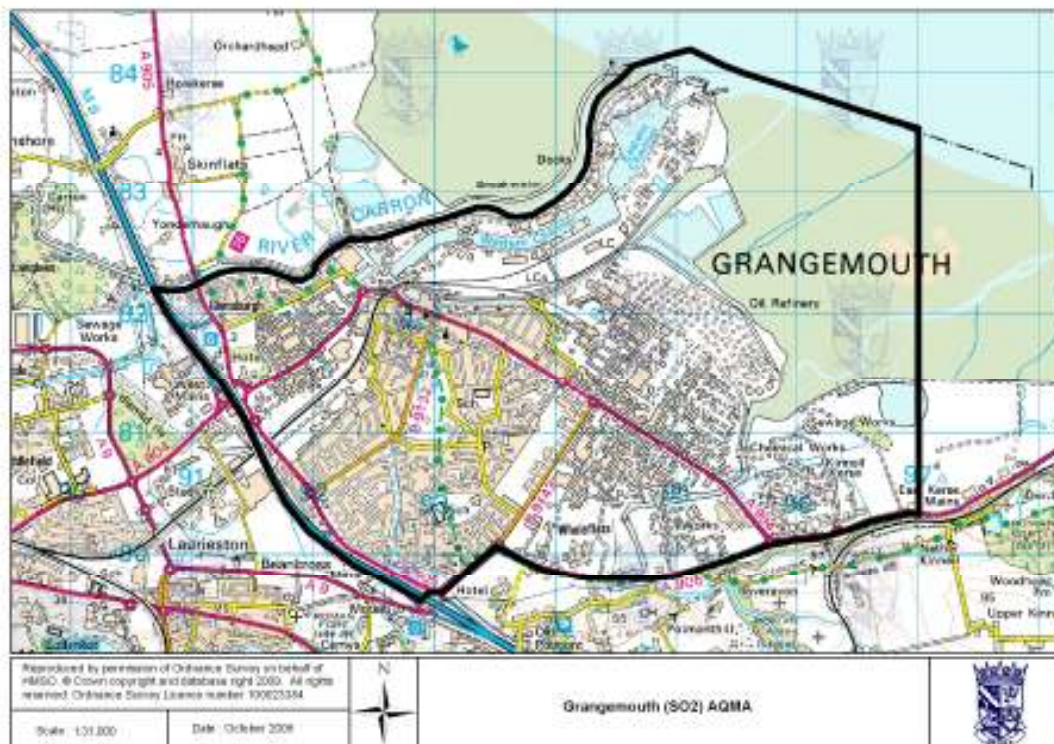
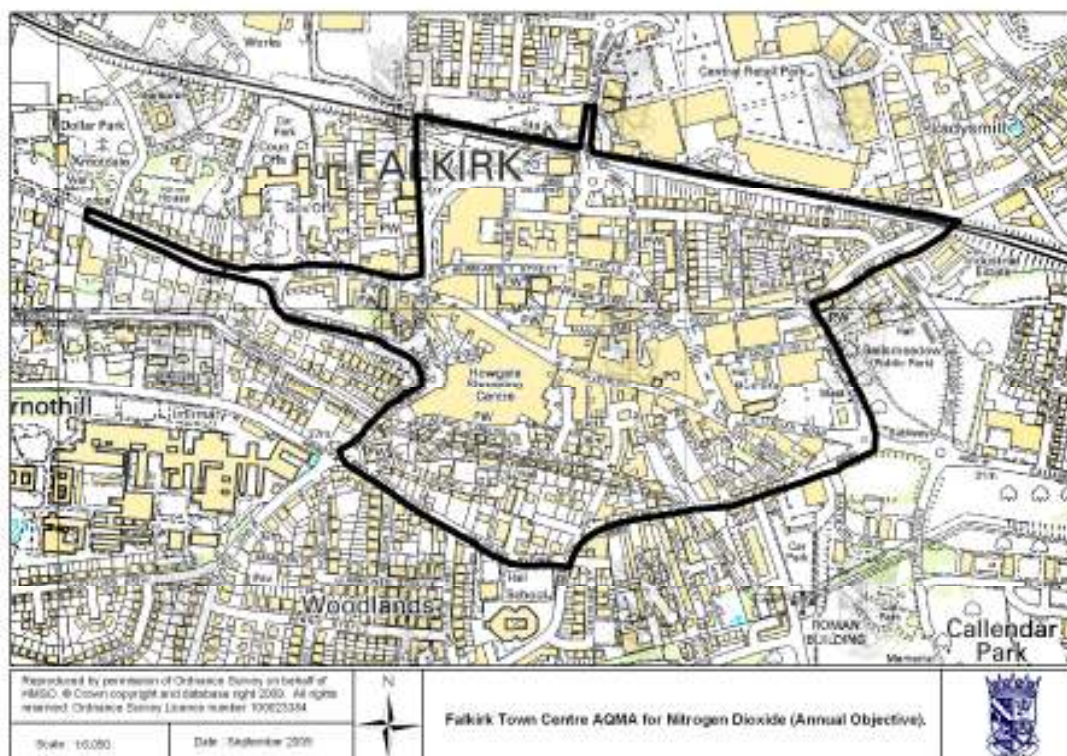
The number of daily PM<sub>10</sub> exceedances recorded in the year of monitoring was 30. This is greater than the number of daily exceedances permitted by the Scottish PM<sub>10</sub> daily objective but is within the 35 daily exceedances permitted by the UK PM<sub>10</sub> daily objective. The annual concentration recorded was 23.5 µg/m<sup>3</sup>. This is greater than the Scottish PM<sub>10</sub> annual objective of 18 µg/m<sup>3</sup> but is below the UK PM<sub>10</sub> annual objective of 40 µg/m<sup>3</sup>. A correction factor of 1.3 was used, this is discussed in detail in the report.

As Banknock 1 is located at relevant receptors for both the annual (residential building façade) and daily objectives (garden of residential property) an Air Quality Management Area (AQMA) is required. The AQMA declaration will need to include the Scottish PM<sub>10</sub> objectives and it is recommended that it should also include, due to the potential to breach, the two UK PM<sub>10</sub> objectives. This is due to the 90.4<sup>th</sup> percentile concentration being "close to" breaching the UK PM<sub>10</sub> daily objective. The monitoring was not conducted in the "worst case" modelled location due to the need to be representative of a greater number of receptors and due to limitations on issues such as power supply.

An analysis of the monitoring data has also been carried out. This highlights differences in the PM<sub>10</sub> concentrations between the Banknock 1, the background Grangemouth and the roadside Falkirk West Bridge St monitoring sites which were used as a comparison. For example, the number of daily exceedances recorded at the Banknock 1 site was greater in the summer than in the winter months and the ratio of PM<sub>2.5</sub> to PM<sub>10</sub> suggests that the particles at Banknock 1 are in the larger size fraction (2.5 to 10 µm in diameter).

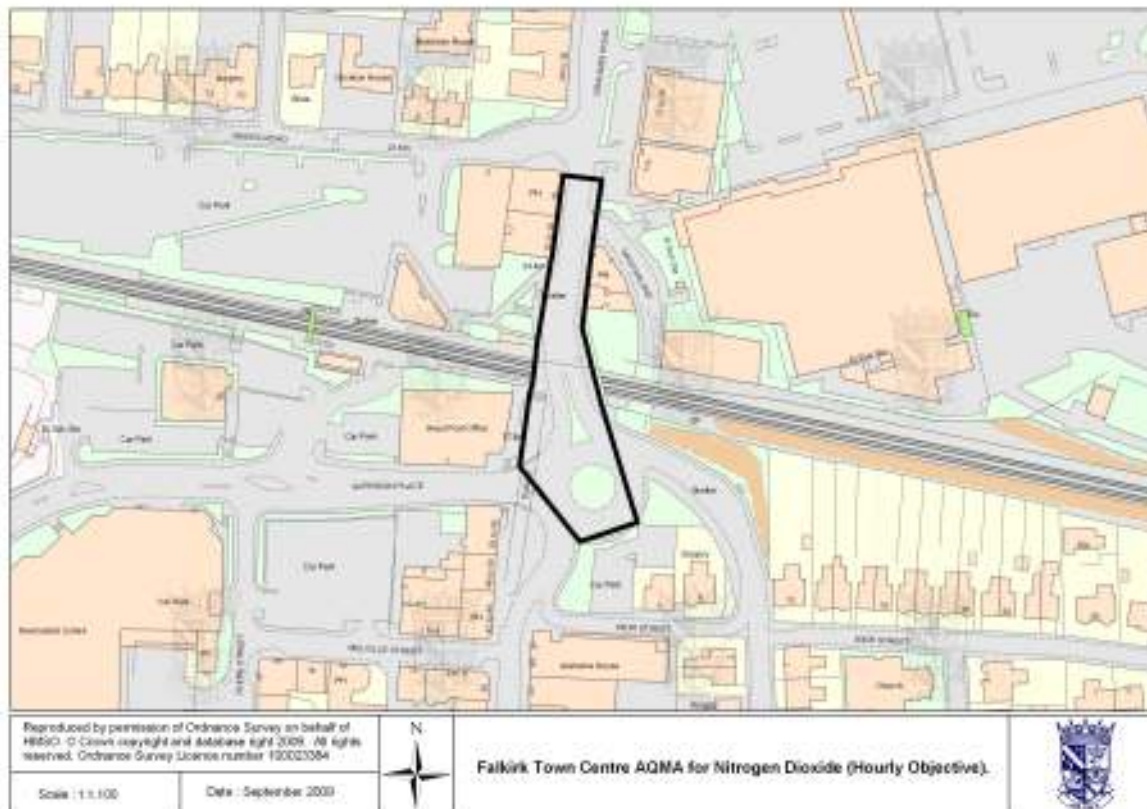
The monitoring and analysis of the data adds evidence to the theory that a possible contributor to the PM<sub>10</sub> concentrations at Banknock 1 relate to the activities of the nearby Cowdenhill Quarry.



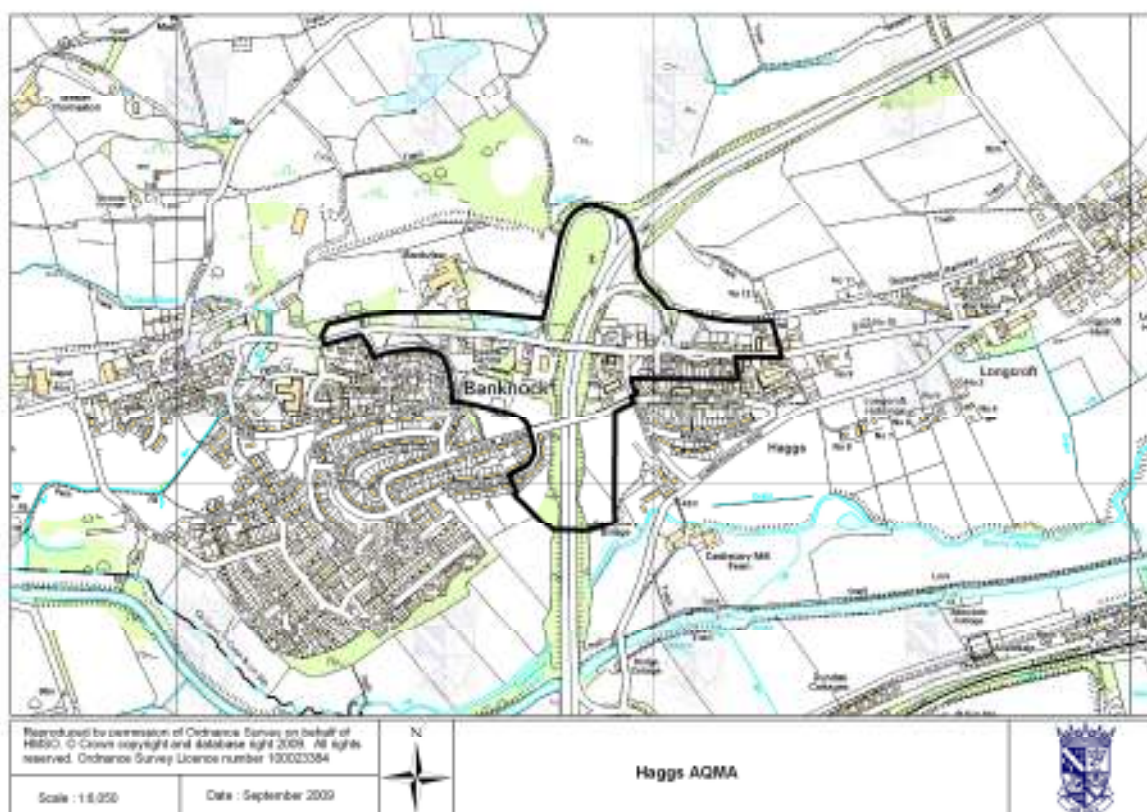
**Figure 1.1 Maps of AQMA boundaries.****a.) Grangemouth AQMA, declared November 2005.****b.) Falkirk Town Centre AQMA (annual NO<sub>2</sub>), declared March 2010.**



**c.) Falkirk Town Centre AQMA (hourly NO<sub>2</sub>), declared March 2010.**



**d.) Banknock and Haggs AQMA (annual NO<sub>2</sub>), declared March 2010.**



## **2 New Monitoring Data**

### **2.1 Summary of Monitoring Undertaken**

#### **2.1.1 Automatic Monitoring Sites**

In 2010 Falkirk Council operated automatic monitoring stations at 12 locations from Banknock in the west to Bo'ness in the east. The automatic monitoring was for the following pollutants: PM<sub>2.5</sub>, PM<sub>10</sub>, NO<sub>2</sub> and SO<sub>2</sub>.

The following changes have taken place to Falkirk Council's automatic monitoring network during 2010. The unit located at Abbotsford House ceased operation on the 16<sup>th</sup> April 2010 and commenced operation in Polmont (A11) on the 29<sup>th</sup> September 2010. The R&A process has not highlighted the Polmont area as being at risk of exceeding the SO<sub>2</sub> objectives. However, the location was chosen as it is on the one side of the Grangemouth AQMA where monitoring has not yet been conducted. Other previous or current locations include Bainsford (Abbotsford House), Bo'ness, Denny, Larbert and Skinflats.

A NO<sub>x</sub> analyser began operation at Grahams Road in Falkirk (A12) on 30<sup>th</sup> September 2010. This was installed as a Detailed Assessment predicted a breach of the hourly objective in the area. The 2010 results are shown in Tables 2.3a and b. Results through to the end May 2011 are discussed in Section 2.2.1.

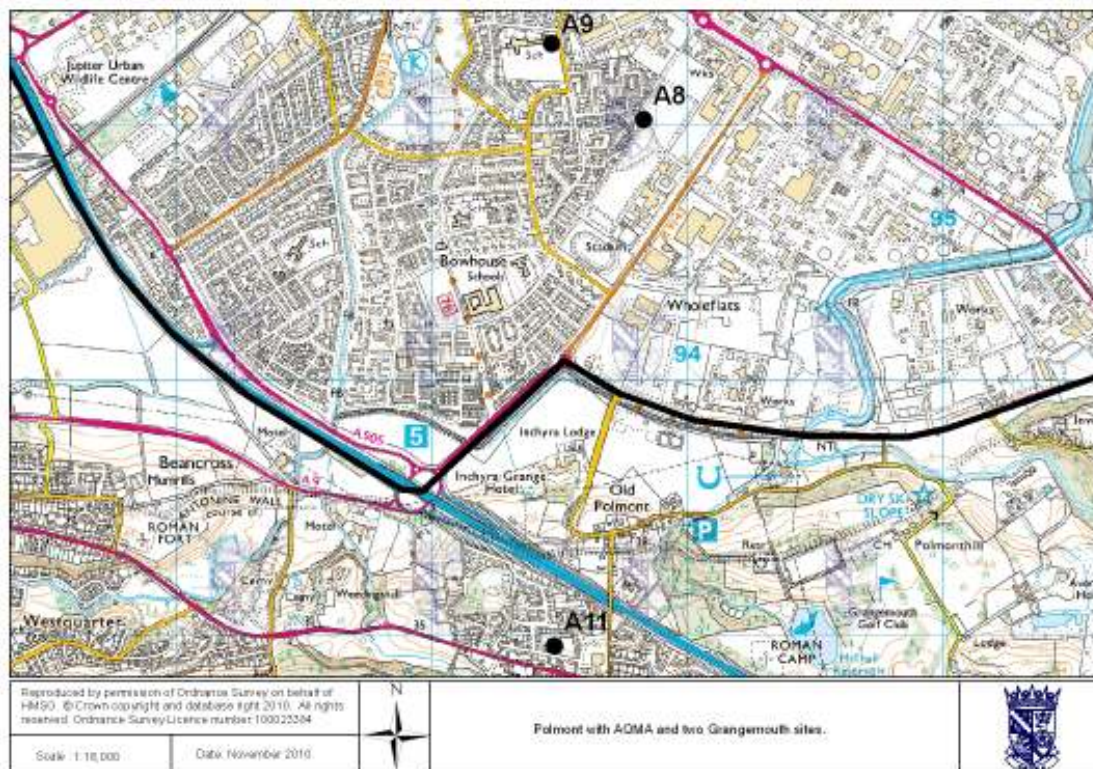
Figures 2.1 shows the location of both new monitoring sites (Falkirk Grahams Rd and Polmont) in the Falkirk Council area, neither are affiliated to the Scottish air quality network. Figure A2 shows the other two sites that are not affiliated to this network, Banknock 1 and Bo'ness. The location of the seven sites affiliated to the SAQN can be viewed at [www.scottishairquality.co.uk](http://www.scottishairquality.co.uk)

Falkirk Council operates two sites that are affiliated to the UK Automatic Urban and Rural Network (AURN): the Grangemouth site (PM<sub>10</sub><sup>\*</sup>, PM<sub>2.5</sub><sup>\*</sup>, NO<sub>x</sub>, SO<sub>2</sub> and pumped benzene diffusion tube<sup>\*</sup>) and the Grangemouth Moray site (NO<sub>x</sub>). The remaining analysers at the Grangemouth Moray site (SO<sub>2</sub> and PM<sub>10</sub>) are affiliated to the SAQN. Details of the QA / QC applied to all the sites are shown in the Appendix, A2.

(\* Defra / DA owned analysers.)



**Figure 2.1 Maps of new automatic monitoring sites: Polmont (A11) and Falkirk Grahams Rd (A12).**



**Table 2.1 Details of automatic monitoring sites**

Site Number and Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique / Equipment Supplier	In AQMA?	Relevant exposure ?	Distance to kerb of nearest road, m.	Represent worst-case exposure?
A1. Abbotsford House	Urban background / industrial.	288976	681720	SO <sub>2</sub>	Horiba	N	N	100 m *	N #
A2. Banknock 1	Roadside.	277348	679037	PM <sub>10</sub>	Osiris	(Proposed) PM <sub>10</sub>	Y (1 m)	6 m	N
A3. Bo'ness	Urban background / industrial.	299815	681481	SO <sub>2</sub>	Horiba	N	Y (5 m)	22 m *	N
A4. Falkirk Hags	Roadside.	278977	679271	NO <sub>2</sub>	Monitor Europe.	Y (NO <sub>2</sub> )	Y (5 m)	2 m	Y
A5. Falkirk Hope St	Roadside.	288688	680218	NO <sub>2</sub> , PM <sub>10</sub> , SO <sub>2</sub>	Horiba, PM <sub>10</sub> : TEOM	Y (NO <sub>2</sub> )	Y (1 m)	5 m	N
A6. Falkirk Park St	Roadside.	288892	680070	NO <sub>2</sub> , PM <sub>10</sub> , SO <sub>2</sub>	Horiba, PM <sub>10</sub> : TEOM	Y (NO <sub>2</sub> )	Y (1 m)	5 m	Y
A7. Falkirk West Bridge St	Roadside.	288457	680064	NO <sub>2</sub> , PM <sub>10</sub>	Monitor Europe, PM <sub>10</sub> : TEOM	Y (NO <sub>2</sub> )	Y (1 m)	2 m	Y
A8. Grangemouth AURN	Urban background / industrial.	293830	681022	Benzene, NO <sub>2</sub> , PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub>	Benzene (pumped tube), PM <sub>10</sub> & 2.5: FDMS, NO <sub>x</sub> / SO <sub>2</sub> : Monitor Europe.	Y (SO <sub>2</sub> )	Y (5 m)	20 m	Y
A9. Grangemouth Moray	Urban background / industrial.	293469	681321	NO <sub>2</sub> , SO <sub>2</sub> , PM <sub>10</sub>	Horiba, PM <sub>10</sub> : TEOM.	Y (SO <sub>2</sub> )	Y (1 m)	25 m	Y
A10. Grangemouth Municipal Chambers	Urban background / industrial.	292816	682009	NO <sub>2</sub> , SO <sub>2</sub> , PM <sub>10</sub>	Horiba, PM <sub>10</sub> : TEOM.	Y (SO <sub>2</sub> )	Y (1 m)	40 m	Y
A11. Polmont	Urban background.	293483	678963	SO <sub>2</sub>	Horiba: SO <sub>2</sub>	N	Y (1 m)	35 m *	N #
A12. Falkirk Grahams Rd	Roadside.	288823	680242	NO <sub>x</sub>	Monitor Europe.	Y (NO <sub>2</sub> )	Y (1 m)	10 m	N

Note: \* Stated but not relevant to the pollutant and / or reason for monitoring.

# Location not designed to represent worst case exposure for the Grangemouth AQMA but confirm AQMA boundaries.

A2 monitor (Banknock 1), AQMA approved in principle by elected Members and consultation has been conducted.



### 2.1.2 Non-Automatic Monitoring

In 2010 Falkirk Council monitored nitrogen dioxide at 71 locations, benzene at 21 locations and 1,3 butadiene at six locations. A benzene pumped diffusion tube (Defra / DA equipment) was also in operation in Grangemouth. Details of the type of tubes used and the QA / QC are given in the Appendix.

The following non-automatic sites have been removed since the 2010 report:

- NA56, Albert Avenue, Grangemouth,
- NA75, Rae St, Stenhousemuir, re-located to different location on same street due to going missing on regular basis,
- NA93, Falkirk High Station, see discussion of rail sources in Section 3.2.

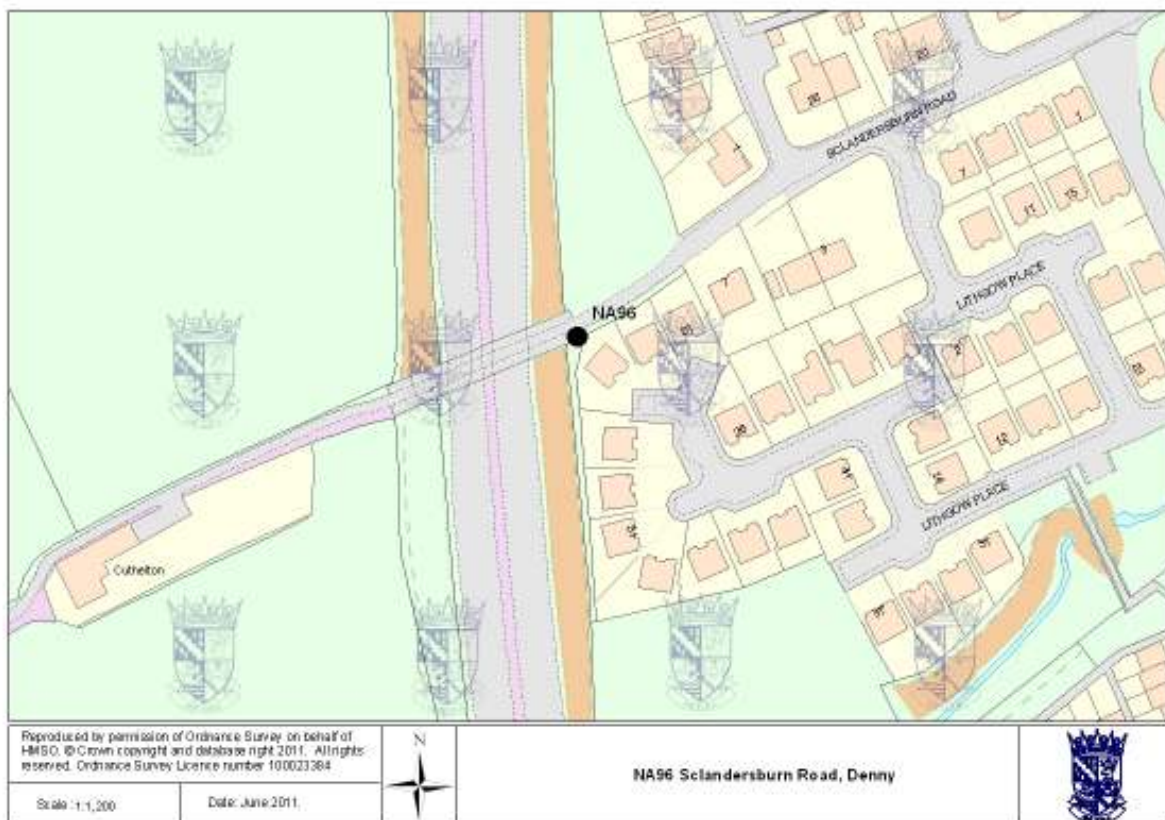
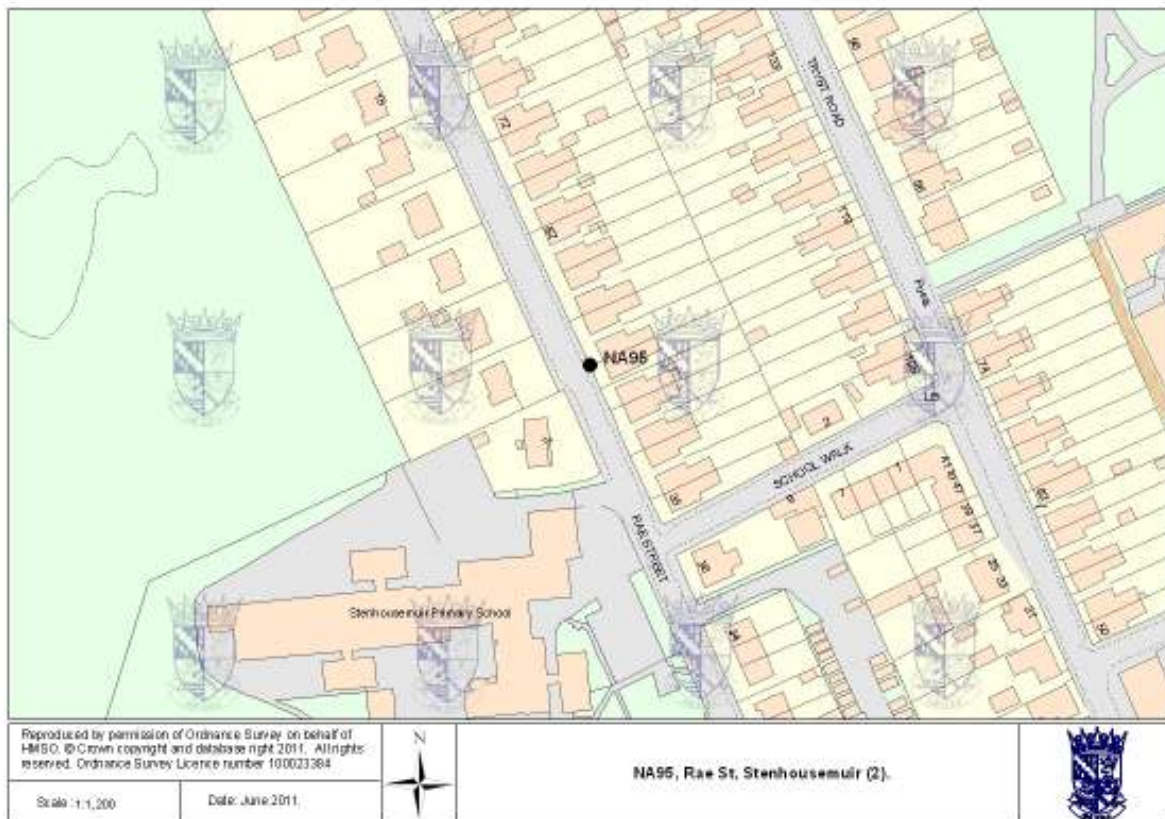
In 2010 the following sites commenced:

- NA95, Rae St (2), Stenhousemuir, see above,
- NA96, Sclandersburn Road, Denny, close to M80 and highlighted in 2010 PR.

Figure 2.2 shows the locations of the new non-automatic sites. Falkirk Council carried out two triplicate studies in 2010. This is where three NO<sub>2</sub> diffusion tubes are co-located with an automatic monitoring station. One was at the Grangemouth Municipal Chambers site (NA42 / A10), an urban background site. The second was at the Falkirk Park St site (NA70 / A7), a roadside site, with results from both sites contributing to the R&A bias factor for Harwell Scientifics.

The local and R&A Helpdesk bias adjustment factors suggest that the diffusion tubes over-read NO<sub>2</sub> compared to the automatic monitors. Falkirk Council has used the R&A helpdesk factor for the 2010 results. However, it should be noted that this gives a conservative result for the roadside diffusion tubes as it is slightly higher than the Park St factor, see Appendix for further details. In addition, the local roadside bias factor has increased noticeably compared to 2009.

**Figure 2.2 Maps of new non-automatic monitoring sites in the Falkirk Council area.**



**Table 2.2 Details of non-automatic monitoring sites**

Site	Location	Site Type	OS Grid Ref (x, y)	Pollutants Monitored	In AQMA?	Relevant exposure?	Distance to kerb (nearest road), m.	Worst-case Location?
NA3	Tinto Drive, Grangemouth.	Urban background.	293427 680386	NO <sub>2</sub> .	Y (SO <sub>2</sub> ).	Y (<5 m)	<10	N
NA5	Copper Top pub, Camelon.	Roadside.	287332 680333	NO <sub>2</sub> .	N	Y (<2 m)	0.6 (traffic island)	Y
NA7	Irving Parish Church, Camelon.	Urban background.	287324 680442	NO <sub>2</sub> .	N	Y (<5 m)	<10	N
NA9	Bellsdyke Rd, Larbert.	Roadside.	286048 683542	NO <sub>2</sub> .	N	Y (<2 m)	0.7	Y
NA10	Muirhall Rd, Larbert.	Urban centre.	286025 683435	NO <sub>2</sub> .	N	Y (<5 m)	<5	Y
NA13	Graeme High School.	Roadside.	290197 679622	NO <sub>2</sub> .	N	Y (<2 m)	3	Y
NA19	Kilsyth Rd, Banknock.	Roadside.	278779 679301	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	2.2	Y
NA20	Garrigrew Rd, Haggs.	Urban background.	278979 679155	NO <sub>2</sub> .	N	Y (<5 m)	<10	N
NA21	Grangemouth Rd, College.	Roadside.	290112 680500	Benzene, NO <sub>2</sub> .	N	Y (<2 m)	1.8	Y
NA24	Kerse Lane, Falkirk.	Roadside.	289187 680024	Benzene, NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	3	Y
NA26	Weir St, Falkirk.	Urban background.	289207 680123	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<5 m)	<10	N
NA27	West Bridge St, Falkirk.	Roadside.	288490 680055	Benzene, 1,3 butadiene, NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	0.5	Y
NA29	Wellside Place, Falkirk.	Urban background.	288465 680220	NO <sub>2</sub> .	N	Y (<5 m)	<10	N

**Table 2.2 Details of non-automatic monitoring sites (continued)**

Site	Location	Site Type	OS Grid Ref (x, y)		Pollutants Monitored	In AQMA?	Relevant exposure?	Distance to kerb (nearest road), m.	Worst-case Location?
NA36	Kerr Crescent, Hags.	Urban background.	278985	679273	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<5 m)	<10	N
NA37	Denny Town House.	Urban centre.	281226	682526	Benzene, NO <sub>2</sub> .	N	Y (<5 m)	<5	Y
NA38	Larbert Village Primary School.	Urban background.	285930	682318	Benzene, NO <sub>2</sub> .	N	Y (<5 m)	<10	N
NA41	Seaview Place, Bo'ness.	Roadside.	299722	681594	Benzene, NO <sub>2</sub> .	N	Y (<2 m)	0.1	Y
NA42	Municipal Chambers, Grangemouth.	Urban centre / industrial.	292816	682009	1,3 butadiene, benzene, NO <sub>2</sub> *.	Y (SO <sub>2</sub> ).	Y (<5 m)	<10	Y
NA44	Greenpark Drive, Polmont.	Urban background.	293436	678938	Benzene, NO <sub>2</sub> .	N	Y (<5 m)	<10	N
NA45	N.Distributor Rd, Bainsford.	Roadside.	288444	681178	NO <sub>2</sub> .	N	N	1.6	Y
NA46	West Bridge St traffic lights, Falkirk.	Roadside.	288543	680045	Benzene, 1,3 butadiene.	N	Y (<2 m)	3.6	Y
NA47	Thistle Avenue, Grangemouth.	Roadside.	292000	680300	NO <sub>2</sub> .	Y (SO <sub>2</sub> ).	Y (<2 m)	1.3	Y
NA48	Hayfield, Falkirk.	Urban background.	289200	681580	NO <sub>2</sub> .	N	Y (<5 m)	<10	N
NA49	Lennox Terrace, Grangemouth.	Urban background / industrial.	293600	680250	Benzene, 1,3 butadiene, NO <sub>2</sub> .	Y (SO <sub>2</sub> ).	Y (<5 m)	<10	Y
NA50	Upper Newmarket St, Falkirk.	Urban background.	288671	680047	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<5 m)	<10	N

**Table 2.2 Details of non-automatic monitoring sites (continued)**

Site	Location	Site Type	OS Grid Ref (x, y)	Pollutants Monitored	In AQMA?	Relevant exposure?	Distance to kerb (nearest road), m.	Worst-case Location?
NA51	Mary St, Laurieston.	Roadside.	290965 679490	NO <sub>2</sub> .	N	Y (1 m)	4.5	Y
NA52	Main St, Larbert.	Roadside.	285866 682356	NO <sub>2</sub> .	N	Y (<2 m)	4.4	Y
NA53	Denny Cross.	Roadside.	281211 682727	NO <sub>2</sub> .	N	Y (<2 m)	0.8	Y
NA55	Inchyra Station.	Urban background / industrial.	293830 681022	Benzene, 1,3 butadiene, NO <sub>2</sub> .	Y (SO <sub>2</sub> ).	Y (<5 m)	<2	N
NA56	Albert Avenue, Grangemouth.	Urban background / industrial.	293859 681962	Benzene, 1,3 butadiene, NO <sub>2</sub> .	Y (SO <sub>2</sub> ).	Y (<5 m)	<10	Y
NA57	Inchyra Road, Grangemouth.	Urban background / industrial.	294028 680829	Benzene, 1,3 butadiene, NO <sub>2</sub> .	Y (SO <sub>2</sub> ).	Y (<5 m)	<10	Y
NA58	Callendar Rd, Falkirk.	Roadside.	289667 679724	NO <sub>2</sub> .	N	Y (<2 m)	0.5	Y
NA59	Carron Rd, Bainsford.	Roadside.	288392 681931	NO <sub>2</sub> .	N	Y (<2 m)	1.2	Y
NA60	Ronades Rd, Carron.	Roadside.	288133 681587	NO <sub>2</sub> .	N	Y (<2 m)	1.6	Y
NA61	Canal Rd, Falkirk.	Roadside.	287976 680656	NO <sub>2</sub> .	N	Y (<2 m)	1.5	Y
NA62	Arnot St, Falkirk.	Roadside.	289125 679705	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	1.2	Y
NA63	Camelon Rd, Falkirk.	Urban background.	288055 680134	NO <sub>2</sub> .	On boundary NO <sub>2</sub> .	Y (<5 m)	<10	N
NA64	New Hallglen Rd, Falkirk.	Roadside.	288807 678422	NO <sub>2</sub> .	N	Y (<2 m)	1.7	Y



**Table 2.2 Details of non-automatic monitoring sites (continued)**

Site	Location	Site Type	OS Grid Ref (x, y)		Pollutants Monitored	In AQMA?	Relevant exposure?	Distance to kerb (nearest road), m.	Worst-case Location?
NA65	Redding Rd, Redding.	Roadside.	291356	678644	NO <sub>2</sub> .	N	Y (<2 m)	0.6	Y
NA66	Holehouse, Slamannan.	Rural.	289450	672035	Benzene, NO <sub>2</sub> .	N	N (<20 m)	<10	N
NA67	Queen St, Falkirk.	Urban background.	289430	680433	NO <sub>2</sub> .	N	Y (<5 m)	<10	N
NA68	Bellevue St, Falkirk.	Roadside.	289234	679945	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	1.7	Y
NA69	Kerse Lane, Falkirk.	Roadside.	289022	679990	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	2.3	Y
NA70	Park St AQ station, Falkirk.	Roadside.	288892	680070	NO <sub>2</sub> .*	Y (NO <sub>2</sub> ).	Y (<2m)	4.7	Y
NA71	Park St, Falkirk.	Roadside.	288910	680112	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	1.5	Y
NA72	Vicar St, Falkirk.	Roadside.	288824	680120	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	1.5	Y
NA73	West Bridge St RHS, Falkirk.	Roadside.	288467	680048	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	0.3	Y
NA74	Hope St AQ station.	Roadside.	288688	680218	Benzene, NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	5.4	Y
NA75	Rae St, Stenhousemuir.	Roadside.	286793	683114	Benzene, NO <sub>2</sub> .	N	Y (<2 m)	<2	Y
NA76	Tyrst Road, Stenhousemuir.	Roadside.	286851	683229	NO <sub>2</sub> .	N	Y (<2 m)	<2	Y

**Table 2.2 Details of non-automatic monitoring sites (continued)**

Site	Location	Site Type	OS Grid Ref (x, y)	Pollutants Monitored	In AQMA?	Relevant exposure?	Distance to kerb (nearest road), m.	Worst-case Location?
NA77	Kinnaird Village.	Roadside.	286490 683775	Benzene, NO <sub>2</sub> .	N	Y (<2 m)	3.9	Y
NA78	Glen Brae, Falkirk.	Roadside.	288525 678991	NO <sub>2</sub> .	N	Y (<2 m)	2.6	Y
NA79	Gartcows Rd, Falkirk.	Roadside.	288491 679327	NO <sub>2</sub> .	N	Y (<2 m)	1.3	Y
NA80	Cow Wynd, Falkirk.	Roadside.	288765 679456	Benzene, NO <sub>2</sub> .	N	Y (<2 m)	1.8	Y
NA81	Grahams Rd, Falkirk.	Roadside.	288834 680898	Benzene, NO <sub>2</sub> .	N	Y (<2 m)	0.5	Y
NA82	Castings Ave, Falkirk.	Roadside.	288858 681036	NO <sub>2</sub> .	N	Y (<2 m)	<2	Y
NA83	Main St, Bainsford.	Roadside.	288609 681419	NO <sub>2</sub> .	N	Y (<2 m)	0.5	Y
NA84	Carriiden Brae, Bo'ness.	Roadside.	301874 680592	NO <sub>2</sub> .	N	Y (<2 m)	0.9	Y
NA85	Auchinloch Dr, Banknock.	Roadside.	278752 679049	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	<2	Y
NA86	Wolfe Rd, Falkirk.	Urban background.	289667 679871	NO <sub>2</sub> .	N	Y (<2 m)	2	N
NA87	M80 slip south, Haggs.	Roadside.	279017 679305	Benzene, 1,3 butadiene, NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	1.6	Y
NA88	Ure Crescent, Bonnybridge.	Roadside.	282391 681045	NO <sub>2</sub> .	N	Y (<2 m)	1.7 (16 to M876)	Y
NA89	Grahams Rd/Meeks Rd, Falkirk.	Roadside.	288853 680328	NO <sub>2</sub> .	N	Y (<2 m)	2.2	Y

**Table 2.2 Details of non-automatic monitoring sites (continued)**

Site	Location	Site Type	OS Grid Ref (x, y)		Pollutants Monitored	In AQMA?	Relevant exposure?	Distance to kerb (nearest road), m.	Worst-case Location?
NA90	Grahams Rd bridge east, Falkirk.	Roadside.	288855	680234	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	2.2	Y
NA91	Grahams Rd bridge west, Falkirk.	Roadside.	288835	680291	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	2.9	Y
NA92	Cochrane Avenue, Falkirk.	Roadside.	288743	679606	NO <sub>2</sub> .	Y (NO <sub>2</sub> ).	Y (<2 m)	1.7	Y
NA93	Falkirk High Station.	Urban background.	288346	679073	NO <sub>2</sub> .	N	Y (<2 m)	2	N
NA94	A905 (Glensburgh Rd), Grangemouth.	Roadside.	291213	681927	NO <sub>2</sub> .	Y (SO <sub>2</sub> ).	Y (7 m)	5.4	Y
NA95	Rae St, Stenhousemuir (2)	Roadside.	286778	683175	NO <sub>2</sub> , benzene.	N	Y (2 m)	1.5	Y
NA96	Sclandersburn Road, Denny	Roadside.	280334	681873	NO <sub>2</sub> .	N	Y (6 m)	2.4 (15 to M80)	Y



## 2.2 Comparison of Monitoring Results with Air Quality Objectives

### 2.2.1 Nitrogen Dioxide

#### Automatic Monitoring Data

In 2010 eight automatic NO<sub>2</sub> monitors were operated by Falkirk Council. Table 2.3a shows the annual NO<sub>2</sub> mean concentrations from those automatic monitoring stations for 2008 to 2010, with Table 2.3b showing the number of exceedances of the hourly limit value.

The sites to record lower than 90% data capture were the Grangemouth AURN site (marginal at 89.9%) and Falkirk Grahams Road (due to installation date).

The Haggs and Falkirk West Bridge St site recorded breaches of the NO<sub>2</sub> annual objective. No sites recorded any breaches of the hourly NO<sub>2</sub> objective, although one hourly exceedance was recorded at the Haggs site. The automatic sites have seen an increase in NO<sub>2</sub> concentrations between 2009 and 2010, which is line with the other sites in Scotland.<sup>3</sup> This is likely to be due to the cold and still weather that dominated the early and late months of 2010.

**Table 2.3a Results of automatic monitoring for nitrogen dioxide: comparison with annual mean objective.**

Site	Location	Within NO <sub>2</sub> AQMA?	Data capture for monitoring period, %	Data capture, 2010, %.	Annual mean concentrations, µg/m <sup>3</sup>		
					2008	2009	2010
A4	Falkirk Haggs	Y	n/a	97.8	<b>44.7</b>	37.6 *	<b>42</b>
A5	Falkirk Hope St	Y	n/a	98	24.5	23.8	27.7
A6	Falkirk Park St	Y	n/a	99.5	31.1	29	32.9
A7	Falkirk West Bridge St	Y	n/a	96.3	<b>47.2 *</b>	38.2	<b>43.8</b>
A8	Grangemouth AURN	N	n/a	89.9	17	17.7	19.3 *
A9	Grangemouth Moray	N	n/a	99.1	16.1 *	19.3	23.3
A10	Grangemouth Municipal Chambers	N	n/a	93.7	25 *	22.8	23.5
A12	Falkirk Grahams Rd	Y	79.3	20.2	n/m	n/m	31.7 # *

- \* Less than 90% data capture.

- # Falkirk Grahams Rd result has been annualised for 2010, see Appendix. The period monitoring result was 44.7 µg/m<sup>3</sup> and highest hourly concentration was 148 µg/m<sup>3</sup>.

**Table 2.3b Results of automatic monitoring for nitrogen dioxide: comparison with 1-hour mean objective.**

Site	Location	Within NO <sub>2</sub> AQMA?	Data capture for monitoring period, %	Data capture, 2010, %.	No. of exceedances of hourly mean (200 µg/m <sup>3</sup> ), 99.8th %ile in brackets (µg/m <sup>3</sup> )		
					2008	2009	2010
A4	Falkirk Haggs	Y	n/a	97.8	2 (163)	1 (159) *	1 (164)
A5	Falkirk Hope St	Y	n/a	98	0 (94)	0 (88)	0 (109)
A6	Falkirk Park St	Y	n/a	99.5	0 (102)	0 (107)	0 (107)
A7	Falkirk West Bridge St	Y	n/a	96.3	1 (134) *	0 (120)	0 (126)
A8	Grangemouth AURN	N	n/a	89.9	0 (111)	0 (103)	0 (124) *
A9	Grangemouth Moray	N	n/a	99.1	0 (84) *	0 (94)	0 (134)
A10	Grangemouth Municipal Chambers	N	n/a	93.7	0 (126) *	0 (104)	0 (101)
A12	Falkirk Grahams Rd	Y	79.3	20.2	n/m	n/m	0 (135)*

- \* Less than 90% data capture.

### Hourly NO<sub>2</sub> AQMA (Falkirk Town Centre)

Table 2.3a presents data for site NA12 (Falkirk Grahams Rd) for 2010 as required by the guidance. However, data through to end May 2011 has been included in this Section so that the hourly AQMA can be discussed.

As shown in Table 2.3c the average NO<sub>2</sub> concentration between 30<sup>th</sup> September 2010 and 31<sup>st</sup> May 2011 was 37 µg/m<sup>3</sup> with the highest hourly concentration being 148 µg/m<sup>3</sup>. The annualised concentration is 31.1 µg/m<sup>3</sup>. All data is ratified, QA / QC is described in the Appendix, A2. Therefore to date the annual and hourly objectives have been met at the automatic monitoring site.

It is accepted that the Falkirk Grahams Rd site is some distance, 10 m, from the kerb. This was due to the rail bridge and high voltage power lines. Given that NO<sub>2</sub> concentrations are typically higher during the winter compared to the summer these results can be seen to give a worst case scenario. This is reflected by the lower annualised concentration. In addition, the three diffusion tubes in the area (that are all closer to the road) are around the annual objective, but are well below the screening level of 60 µg/m<sup>3</sup> that could indicate a breach of the hourly objective. Using the annual concentration from Grahams Rd in the NO<sub>2</sub> distance calculator gives a concentration of 41.9 µg/m<sup>3</sup> for a receptor distance of 2 m.

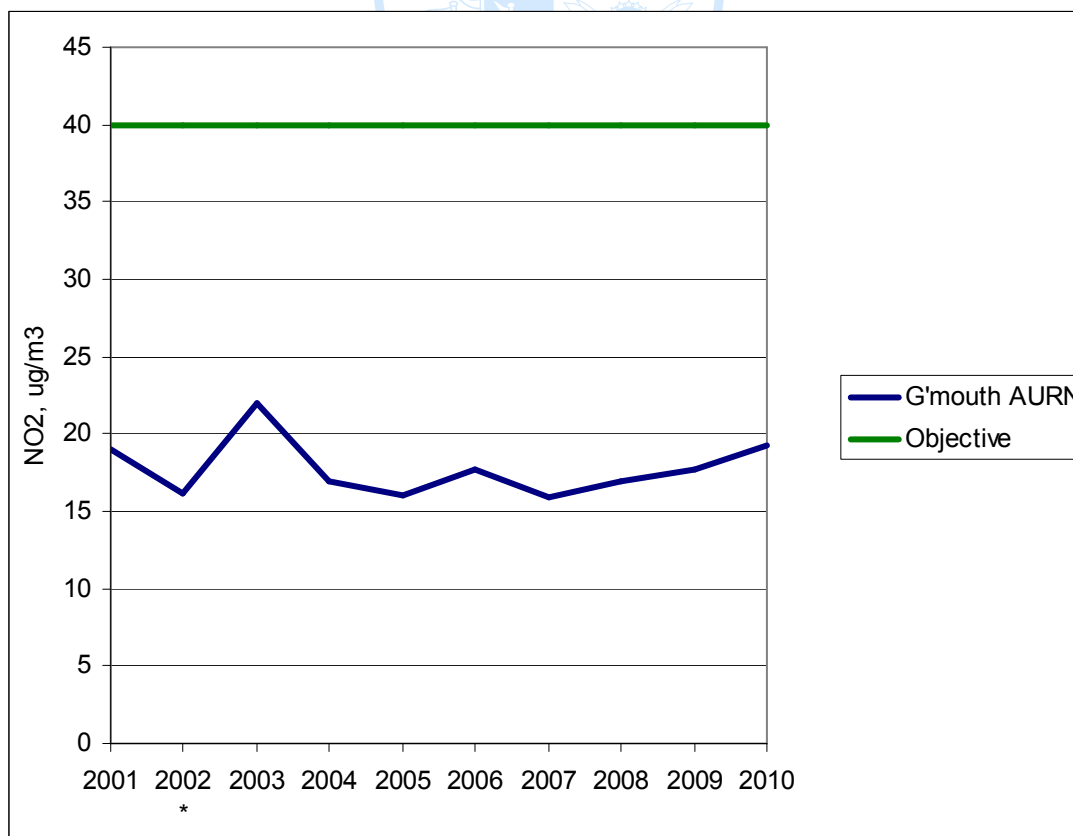
Falkirk Council has submitted Further Assessments for the Haggs and Falkirk Town Assessment. The Scottish Government has rejected the Falkirk Town Centre report and so at the time of writing Falkirk Council will not recommend any changes to the current Falkirk Town Centre AQMAs. However, with the monitoring results recorded to date the NO<sub>x</sub> analyser at Falkirk Grahams Rd will cease operation in September and be replaced by a PM<sub>10</sub> TEOM. One or two NO<sub>2</sub> tubes may remain in the area.

**Table 2.3c: Summary of Falkirk Grahams Rd monitoring.**

Falkirk Grahams Rd.	Mean, µg/m <sup>3</sup>	Maximum hourly, µg/m <sup>3</sup>	Annualised mean, µg/m <sup>3</sup>	99.8 <sup>th</sup> percentile.
A12, 30/09/2010 to 31/05/2011	37	147.6	31.1	128.2
NA89, 2010	32	n/a	n/a	n/a
NA90, 2010	39	n/a	n/a	n/a
NA91, 2010	38	n/a	n/a	n/a

Figure 2.3 shows the annual concentration at the Grangemouth AURN site (urban background / industrial). The Grangemouth AURN site shows no long term trend in NO<sub>2</sub> concentrations between 2001 and 2010, though after a decline between 2001 and 2007 an increase is recorded between 2007 and 2010. The Grangemouth AURN site along with all the other automatic monitoring stations in the Falkirk Council area have seen an increase in NO<sub>2</sub> concentrations compared to 2009.

**Figure 2.3 Trends in annual mean NO<sub>2</sub> concentration measured at Grangemouth AURN.**



### Diffusion Tube Monitoring Data

The results from Falkirk Council's NO<sub>2</sub> diffusion tubes are shown in Table 2.4. It should be noted that the R&A helpdesk bias factor that is used for the results Table 2.4 are slightly greater (0.85) than the local roadside factor from Falkirk Park St (0.84).

The following diffusion tubes recorded a concentration greater than the annual NO<sub>2</sub> objective of 40 µg/m<sup>3</sup> in 2010:

- NA27, West Bridge St, Falkirk, inside Falkirk Town Centre NO<sub>2</sub> AQMA,
- NA36, Kerr Crescent, Haggs, inside Banknock and Haggs NO<sub>2</sub> AQMA,
- NA45, Northern Distributor Rd, Bainsford, as discussed in 2010 PR no relevant receptors and concentration lower than 2009,
- NA62, Arnot Street, Falkirk, inside Falkirk Town Centre NO<sub>2</sub> AQMA,
- NA73, West Bridge St (RHS), Falkirk, inside Falkirk Town Centre NO<sub>2</sub> AQMA,
- NA94, A905 Glensburgh Road, discussed below.

The other sites to record a concentration close to the objective (36 to 40 µg/m<sup>3</sup>) were:

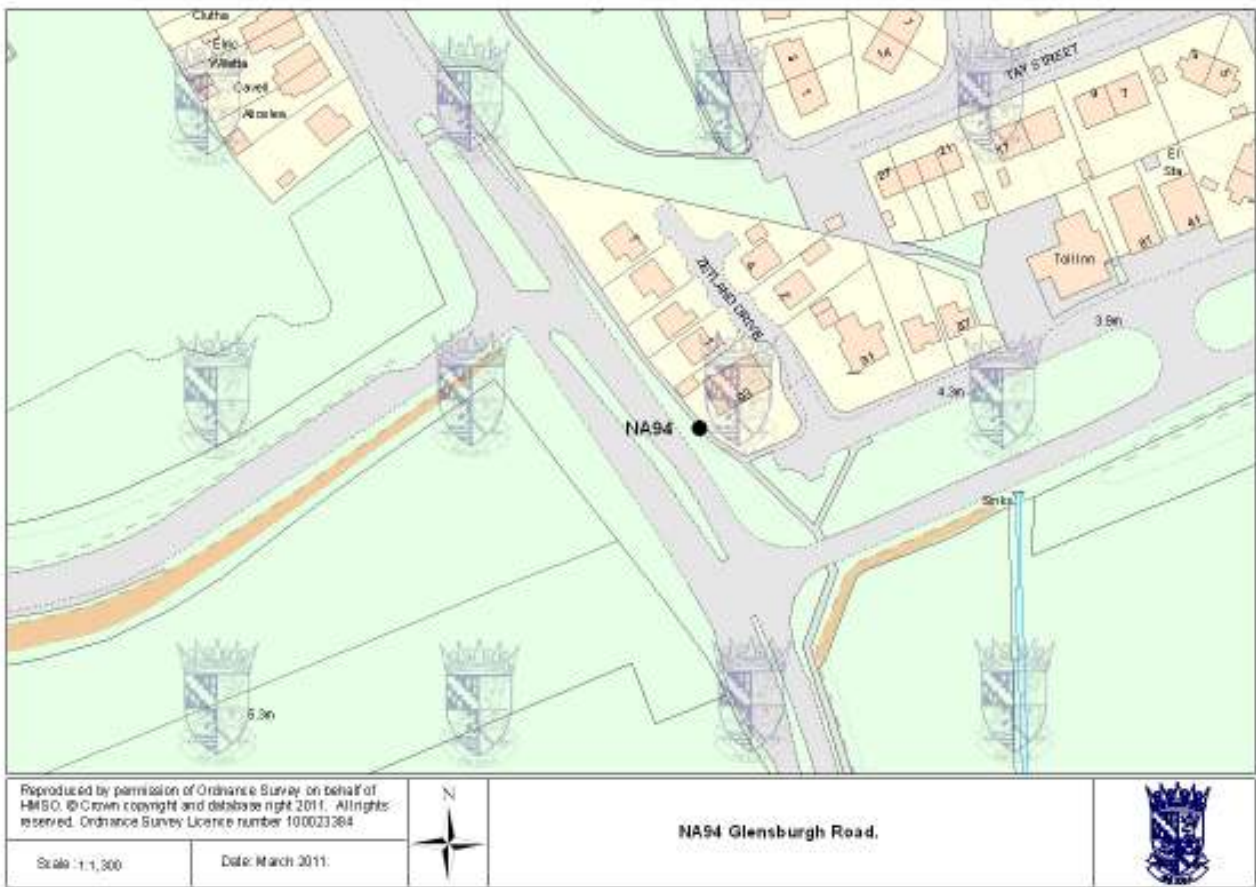
- NA13, Graeme High School, road considered in Further Assessment (2009 data),
- NA24, Kerse Lane, Falkirk, inside Falkirk Town Centre AQMA,
- NA53, Denny Cross, Falkirk, discussed below,
- NA63, Camelon Rd, Falkirk, inside Falkirk Town Centre AQMA,
- NA71, Park St, Falkirk, inside Falkirk Town Centre AQMA,
- NA72, Vicar St, Falkirk, inside Falkirk Town Centre AQMA,
- NA78, Glen Brae, Falkirk, road considered in Further Assessment (2009 data),
- NA80, Cow Wynd, Falkirk, inside Falkirk Town Centre AQMA,
- NA83, Main St Bainsford, considered in Further Assessment. Discussed in PR 2010 that this link was affected by road works, concentration has dropped from 46 µg/m<sup>3</sup> in 2009 to 37 µg/m<sup>3</sup> in 2010.
- NA90 and 91, within Falkirk Town Centre NO<sub>2</sub> AQMA.

Most of the sites above the objective have been considered in Further Assessments, are in AQMAs or are not at representative locations. No sites recorded a concentration above 60 µg/m<sup>3</sup>, which could indicate a potential breach of the hourly objective.

Of the two tubes that breached the objective and are not covered by the above reasons, NA94 and NA53, it is not proposed to proceed to a Detailed Assessment. For NA94 (Glensburgh Road) this site is in a worst-case location, with relevant receptors for the annual objective (building façade of residential property) being an additional 5 m away from the kerb and the tube (see Figure 2.4, note other building is a shed). The fall off with distance calculator gives a result of 38.1 µg/m<sup>3</sup>, less than the objective. An extra tube has been deployed on the west side of the road and monitoring will continue. Note also that the R&A helpdesk bias factor is also a slight over-estimate compared to the local roadside factor.

Site NA53 (Denny Cross) had a low data capture of 67% and so the result should be treated with caution, monitoring will continue. The NO<sub>2</sub> concentration at the new Sclandersburn Road, Denny, site (NA95) was 27 µg/m<sup>3</sup> (annualised) and so is within the annual objective.

**Figure 2.4: Area around NA94, Glensburgh Road.**



**Table 2.4 Results of nitrogen dioxide diffusion tubes for 2010.**

Site	Location	Within AQMA?	Data capture for monitoring period, %	Data capture for 2010, %	Annual mean concentrations ( $\mu\text{g}/\text{m}^3$ )		
					2008 (0.74)	2009 (0.81)	2010 (0.85)
NA3	Tinto Drive, Grangemouth.	Y (SO <sub>2</sub> ).	n/a	83	23	21	23
NA5	Copper Top pub, Camelon.	N	n/a	100	32	31	29
NA7	Irving Parish Church, Camelon.	N	n/a	100	20	22	24
NA9	Bellsdyke Rd, Larbert.	N	n/a	100	27	29	30
NA10	Muirhall Rd, Larbert.	N	n/a	100	23	26	27
NA13	Graeme High School.	N	n/a	92	31	34	40
NA19	Kilsyth Rd, Banknock.	Y (NO <sub>2</sub> ).	n/a	92	35	37	34
NA20	Garnrew Rd, Haggs.	N	n/a	100	25	27	30
NA21	Grangemouth Rd, College.	N	n/a	100	36	36	35
NA24	Kerse Lane, Falkirk.	Y (NO <sub>2</sub> ).	n/a	100	37	37	37
NA26	Weir St, Falkirk.	Y (NO <sub>2</sub> ).	n/a	100	21	22	26
NA27	West Bridge St, Falkirk.	Y (NO <sub>2</sub> ).	n/a	100	<b>49</b>	<b>50</b>	<b>48</b>
NA29	Wellside Place, Falkirk.	N	n/a	92	21	22	25
NA36	Kerr Crescent, Haggs.	Y (NO <sub>2</sub> ).	n/a	100	<b>42</b>	<b>49</b>	<b>45</b>
NA37	Denny Town House.	N	n/a	100	18	19	21
NA38	Larbert Village Primary School.	N	n/a	83	16	25	27
NA41	Seaview Place, Bo'ness.	N	n/a	100	25	27	30
NA42	Municipal Chambers, Grangemouth.	Y (SO <sub>2</sub> ).	n/a	100	21	22	24
NA44	Greenpark Drive, Polmont.	N	n/a	92	18	19	24
NA45	N.Distributor Rd, Bainsford.	N	n/a	100	<b>40</b>	<b>42</b>	<b>41</b>
NA47	Thistle Avenue, Grangemouth.	Y (SO <sub>2</sub> ).	n/a	100	24	24	29
NA48	Hayfield, Falkirk.	N	n/a	100	23	21	26
NA49	Lennox Terrace, Grangemouth.	Y (SO <sub>2</sub> ).	n/a	100	24	24	28
NA50	Upper Newmarket St, Falkirk.	Y (NO <sub>2</sub> ).	n/a	100	30	29	29
NA51	Mary St, Laurieston.	N	n/a	92	28	30	32
NA52	Main St, Larbert.	N	n/a	92	28	31	32
NA53	Denny Cross.	N	n/a	67	30	34	39



**Table 2.4 Results of nitrogen dioxide diffusion tubes (continued)**

Site	Location	Within AQMA?	Data capture for monitoring period, %	Data capture for 2010, %	Annual mean concentrations		
					2008 (0.74)	2009 (0.81)	2010 (0.85)
NA55	Inchyra Station.	Y (SO <sub>2</sub> ).	n/a	100	21	20	24
NA56	Albert Avenue, Grangemouth.	Y (SO <sub>2</sub> ).	n/a	42	21	22	26
NA57	Inchyra Road, Grangemouth.	Y (SO <sub>2</sub> ).	n/a	92	30	32	29
NA58	Callendar Rd, Falkirk.	N	n/a	83	23	26	25
NA59	Carron Rd, Bainsford.	N	n/a	100	31	34	30
NA60	Ronades Rd, Carron.	N	n/a	100	28	30	30
NA61	Canal Rd, Falkirk.	N	n/a	83	30	30	31
NA62	Arnot St, Falkirk.	Y (NO <sub>2</sub> ).	n/a	92	38	<b>41</b>	<b>46</b>
NA63	Camelon Rd, Falkirk.	On boundary NO <sub>2</sub> .	n/a	100	<b>40</b>	<b>45</b>	39
NA64	New Hallglen Rd, Falkirk.	N	n/a	100	21	20	24
NA65	Redding Rd, Redding.	N	n/a	100	25	24	28
NA66	Holehouse, Slamannan.	N	n/a	100	10	11	13
NA67	Queen St, Falkirk.	N	n/a	100	29	30	36
NA68	Bellevue St, Falkirk.	Y (NO <sub>2</sub> ).	n/a	100	34	33	32
NA69	Kerse Lane, Falkirk.	Y (NO <sub>2</sub> ).	n/a	100	36	35	34
NA70	Park St AQ station, Falkirk.	Y (NO <sub>2</sub> ).	n/a	100	33	31	32
NA71	Park St, Falkirk.	Y (NO <sub>2</sub> ).	n/a	100	38	39	36
NA72	Vicar St, Falkirk.	Y (NO <sub>2</sub> ).	n/a	100	33	31	39
NA73	West Bridge St RHS, Falkirk.	Y (NO <sub>2</sub> ).	n/a	100	35	37	40
NA74	Hope St AQ station.	Y (NO <sub>2</sub> ).	n/a	100	26	28	31
NA75	Rae St, Stenhousemuir.	N	67	17	19	23	28
NA76	Tyrst Road, Stenhousemuir.	N	n/a	100	22	25	28
NA77	Kinnaird Village.	N	n/a	100	22	22	32
NA78	Glen Brae, Falkirk.	N	n/a	100	31	34	39
NA79	Gartcows Rd, Falkirk.	N	n/a	100	23	26	31
NA80	Cow Wynd, Falkirk.	N	n/a	100	27	34	36
NA81	Grahams Rd, Falkirk.	N	n/a	100	34	35	36
NA82	Castings Ave, Falkirk.	N	n/a	100	25	23	27
NA83	Main St, Bainsford.	N	n/a	100	37	<b>46</b>	37

**Table 2.4 Results of nitrogen dioxide diffusion tubes (continued)**

Site	Location	Within AQMA?	Data capture for monitoring period, %	Data capture for 2010, %	Annual mean concentrations		
					2008 (0.74)	2009 (0.81)	2010 (0.85)
NA84	Carriden Brae, Bo'ness.	N	n/a	100	15	17	20
NA85	Auchinloch Dr, Banknock.	Y (NO <sub>2</sub> ).	n/a	92	24	26	33
NA86	Wolfe Rd, Falkirk.	N	n/a	92	n/m	17	23
NA87	M80 slip south, Haggs.	Y (NO <sub>2</sub> ).	n/a	83	n/m	32 *	36
NA88	Ure Crescent, Bonnybridge.	N	n/a	67	n/m	25 *	35
NA89	Grahams Rd/Meeks Rd, Falkirk.	N	n/a	100	n/m	32 *	32
NA90	Grahams Rd bridge east, Falkirk.	Y (NO <sub>2</sub> ).	n/a	75	n/m	30 *	39
NA91	Grahams Rd bridge west, Falkirk.	Y (NO <sub>2</sub> ).	n/a	83	n/m	33 *	38
NA92	Cochrane Avenue, Falkirk.	Y (NO <sub>2</sub> ).	n/a	100	n/m	26 *	28
NA93	Falkirk High Station.	N	n/a	100	n/m	17 *	22
NA94	A905 (Glensburgh Rd), Grangemouth.	Y (SO <sub>2</sub> ).	n/a	83	n/m	37 *	41
NA95	Rae St, Stenhousemuir (2)	N	100	75	n/m	n/m	21*
NA96	Sclandersburn Road, Denny	N	100	58	n/m	n/m	27*

- \* Result annualised, see Appendix.
- Bias adjustment result applied for each year in brackets.

### 2.2.2 PM<sub>10</sub>

In 2010 Falkirk Council monitored PM<sub>10</sub> at seven locations, of these analysers one is an FDMS, one is an Osiris and the remaining five are TEOMs. The correction of TEOM data has been done using the VCM. The annual mean concentrations recorded at these sites are shown in Table 2.5a and the number of daily exceedances is shown in Table 2.5b.

The annual data capture at the Banknock 1 site was below 90%. This monitor is in the area subject to an AQMA declaration for PM<sub>10</sub> and is currently out to consultation. The Osiris data is shown with a 1.3 and 1.14 correction factor applied. The 98<sup>th</sup> percentile was above 50 µg/m<sup>3</sup> with either correction factor applied and the 90.4<sup>th</sup> percentile was at or below 50 µg/m<sup>3</sup>.

The Falkirk West Bridge St site breached the Scottish annual objective of 18 µg/m<sup>3</sup> and was close to breaching the daily objective of seven exceedances. The UK / EU objectives were met at all sites. All other sites met the PM<sub>10</sub> objectives for 2010. The



executive summary of the Further Assessment for this area which included PM<sub>10</sub> is shown in Section 5.

**Table 2.5a Results of PM<sub>10</sub> automatic monitoring: comparison with annual mean objective 2010.**

Site	Location	Within PM <sub>10</sub> AQMA?	Data capture for monitoring period, %	Data capture for 2010, %.	Annual mean concentrations, µg/m <sup>3</sup>		
					2008	2009	2010
A2	Banknock 1	Proposed	n/a	86.6	n/m	15.1 # *	23.7/20.7 *
A5	Falkirk Hope St	N (FA)	n/a	95.7	15.3	15	15
A6	Falkirk Park St	N (FA)	n/a	99	16.2	15	17
A7	Falkirk West Bridge St	N (FA)	n/a	86.3	n/m	22.3 # *	21 *
A8	Grangemouth AURN	N	n/a	94.6	\$ 15.4 *	\$ 12.5	14.4
A9	Grangemouth Moray	N	n/a	99.1	13.9	14	14
A10	Grangemouth Municipal Chambers	N	n/a	95.8	15.1	14	15

**Table 2.5b Results of PM<sub>10</sub> automatic monitoring: comparison with 24-hour mean objective 2010.**

Site	Location	Within PM <sub>10</sub> AQMA?	Data capture for 2010, %.	No. of exceedances of daily mean value (50 µg/m <sup>3</sup> ), 98th percentile in brackets, µg/m <sup>3</sup> .		
				2008	2009	2010
A2	Banknock 1	Proposed	86.6	n/m	0 (57) *	30 / 18 * (122/107)
A5	Falkirk Hope St	N (FA)	95.7	3 (41)	1	0 (29)
A6	Falkirk Park St	N (FA)	99	6 (46)	2	1 (31)
A7	Falkirk West Bridge St	N (FA)	86.3	n/m	0 *	7 (47) *
A8	Grangemouth AURN	N	94.6	\$ 2 (43) *	\$ 0 (36)	1 (38)
A9	Grangemouth Moray	N	99.1	0 (36) *	0	0 (27)
A10	Grangemouth Municipal Chambers	N	95.8	0 (41)	0	0 (29)

Notes for Table 2.5 a and b:

- All TEOM results are VCM corrected.
- \* Less than 90% data capture.
- \$ TEOM data between January 2008 and April 2009, FDMS data from 29<sup>th</sup> April 2009. The TEOM data has now been VCM corrected by King's College London as part of a Defra and DA contract. Thus 2008 and 2009 data has changed to that previously reported.
- Banknock 1 results, Table 2.5b, 90.4<sup>th</sup> percentile with 1.3 and 1.14 correction factor: 50 µg/m<sup>3</sup> and 43 µg/m<sup>3</sup>.

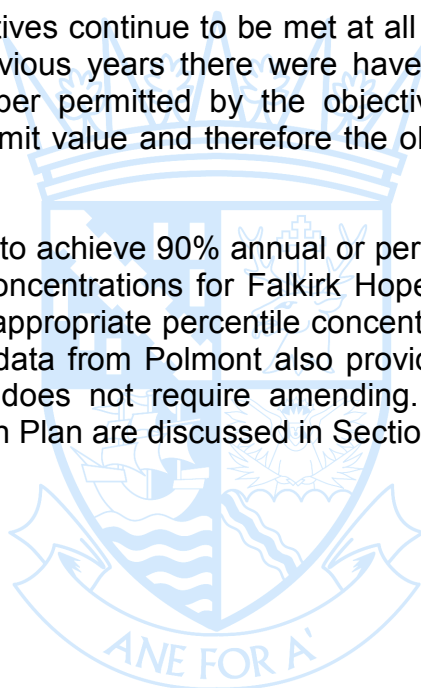
### 2.2.3 Sulphur Dioxide

Falkirk Council monitored SO<sub>2</sub> at eight locations in 2010. Three of the locations were in the Grangemouth AQMA with the other locations being outside of the AQMA.

Table 2.6 shows the number of SO<sub>2</sub> exceedances and percentile concentrations at Falkirk Council's monitoring stations in 2010. Two sites, Grangemouth Moray and Grangemouth AURN breached the 15-minute objective. The Grangemouth Moray site recorded 62 exceedances of the 15-minute objective concentration and the Grangemouth AURN site 45 exceedances. The two sites are within the Grangemouth SO<sub>2</sub> AQMA and the breach at Grangemouth Moray is consistent with breaches in previous years. The exceedances seem to have reduced at Grangemouth MC over the years but have gradually increased at the Grangemouth AURN site. As the date of compliance has passed, it is understood that this is the first breach of the 15-minute SO<sub>2</sub> objective at an AURN site.

The hourly and daily objectives continue to be met at all monitoring sites both in and outside the AQMA. In previous years there have been breaches of the daily limit value but within the number permitted by the objective. In 2010 there were no exceedances of the daily limit value and therefore the objective continues to be met at all sites.

The only SO<sub>2</sub> analyser not to achieve 90% annual or period data capture was Falkirk Hope St. The percentile concentrations for Falkirk Hope St, Abbotsford House and Polmont are all below the appropriate percentile concentrations and indicate that the objectives were met. The data from Polmont also provides additional evidence that the Grangemouth AQMA does not require amending. The long-term trends and Grangemouth AQMA Action Plan are discussed in Section 5.



**Table 2.6 Results of SO<sub>2</sub> automatic monitoring in 2010: comparison with objectives.**

Site	Location	Within SO <sub>2</sub> AQMA?	Data capture for period %	Data capture 2010, %	No. of exceedances and (appropriate percentiles, µg/m <sup>3</sup> )		
					15-minute objective	1-hour objective	24-hour objective
A1	Abbotsford House	N	99.8	28.8	1 (48)	0 (34)	0 (12)
A3	Bo'ness	N	n/a	99	1 (100)	0 (61)	0 (29)
A5	Falkirk Hope St	N	n/a	87.9	5 (133)	0 (64)	0 (50)
A6	Falkirk Park St	N	n/a	97.9	2 (116)	0 (54)	0 (38)
A8	Grangemouth AURN	Y	n/a	95.1	<b>45 (291)</b>	2 (184)	0 (75)
A9	Grangemouth Moray	Y	n/a	98.4	<b>62 (314)</b>	2 (200)	0 (91)
A10	Grangemouth Municipal Chambers	Y	n/a	98.9	12 (222)	0 (160)	0 (68)
A12	Polmont	N	98.2	25.2	1 (117)	0 (69)	0 (21)

### 2.2.4 Benzene

In 2010 Falkirk Council monitored for benzene at 21 locations using diffusion tubes. The results are shown in Table 2.7. In addition, a pumped diffusion tube is in operation at Falkirk Council's Grangemouth AURN site with results shown in Table 2.7. A pumped diffusion tube is generally considered to be more accurate than a passive diffusion tube.

The pumped diffusion tube at the Grangemouth AURN site recorded a concentration of  $1.42 \mu\text{g}/\text{m}^3$  in 2010. The data available for 2010 is a mixture of provisional and ratified. The site has seen a slight increase in annual concentrations recorded by the pumped diffusion tube from  $1.08 \mu\text{g}/\text{m}^3$  in 2007 to  $1.42 \mu\text{g}/\text{m}^3$  in 2010, mainly as a result of higher concentrations recorded in early 2010. However, the concentrations recorded continue to be within the objectives.

Table 2.7 shows Falkirk Council's passive diffusion tube results, with the monthly results shown in the Appendix. In January the results from Falkirk Council's tubes were significantly elevated. While the tube suppliers have said there were no issues with the analysis of the tubes and the high results are no reason for exclusion themselves, the results are high in comparison to both the pumped diffusion tube results and the NPL / INEOS tubes for the same period. In addition, the tubes show significant variation between results. Falkirk Council is not aware of any incidents that could have impacted upon the results. The tube in Bo'ness in October was also significantly greater than the closeby NPL / INEOS tube. Therefore the January results and one result from Bo'ness in October have been excluded.

As in 2009 one of the NPL / INEOS' tubes recorded a breach of the Scottish objective ( $4.7 \mu\text{g}/\text{m}^3$ ) but as discussed in the 2010 PR this site (Kinneil Kerse) is on the industrial site boundary and is not representative of any receptors.

Given that the NPL / INEOS and the pumped diffusion tube results show no breach of the objectives at any site with a relevant receptor, it is proposed that monitoring of benzene will continue with a Council tube moved to the Kinneil Kerse area.

**Table 2.7 Results of pumped benzene diffusion tube.**

Site	Location	Data capture for monitoring period, %	Data capture, 2010, %.	Annual mean concentration, $\mu\text{g}/\text{m}^3$		
				2008	2009	2010
A8	Grangemouth AURN	n/a	95.8	1.2	1.27	1.42

**Table 2.8 Results of benzene diffusion tubes.**

Site	Location	Within benzene AQMA?	Data capture for monitoring period, %	Data capture, 2010, %.	Annual mean concentration, $\mu\text{g}/\text{m}^3$		
					2008	2009	2010
NA21	Grangemouth Road, College	N	n/a	91.7	1.55	1.16	0.92
NA24	Kerse Lane, Falkirk	N	n/a	91.7	1.05	1.04	0.95
NA27	West Bridge Street, Falkirk	N	n/a	91.7	1.47	2.58	1.4
NA37	Denny Town House	N	n/a	91.7	0.8	1.55	0.69
NA38	Larbert Village Primary School	N	n/a	83.3	0.67	1.41	0.75
NA41	Seaview Place, Bo'ness	N	n/a	83.3	1.51	1.13	1.03
NA42	Municipal Chambers, Grangemouth	N	n/a	91.7	0.96	1.59	1.17
NA44	Greenpark Drive, Polmont	N	n/a	83.3	1.13	2.37	1.01
NA46	West Bridge Street traffic lights, Falkirk	N	n/a	91.7	1.06	1.96	1.37
NA49	Lennox Terrace, Grangemouth	N	n/a	91.7	1.44	0.95	1.26
NA55	Inchyra Station	N	n/a	91.7	1.13	1.11	1.24
NA56	Albert Ave, Grangemouth	N	80	33.3	1.14	2.01	1.5
NA57	Inchyra Road, Grangemouth	N	n/a	91.7	1.19	1.12	1.37
NA66	Holehouse, Slamannan	N	n/a	75	0.72	0.57	0.89
NA74	Hope street AQ station	N	n/a	91.7	1.06	0.97	1.07
NA75	Rae St, Stenhousemuir	N	67	16.7	0.59	1.64	1.15
NA77	Kinnaird Village	N	n/a	91.7	0.85	0.75	0.75
NA80	Cow Wynd, Falkirk	N	n/a	91.7	1.21	0.85	1.12
NA81	Grahams Road, Falkirk	N	n/a	91.7	1.44	2.32	1.34
NA87	M80 slip south, Haggs	N	n/a	91.7	n/m	0.62	0.65
NA95	Rae St, Stenhousemuir (2)	N	100	75	n/m	n/m	0.89

## 2.2.5 Other pollutants monitored

In 2010 Falkirk Council monitored 1,3 butadiene at six locations using diffusion tubes, all the results are within the objective. All monthly results were at the limit of detection and so it is likely that the concentrations were lower than those stated in Table 2.9.

**Table 2.9: Results from 1,3 butadiene diffusion tubes.**

Site ID	Location	Within 1,3 butadiene AQMA?	Data capture for monitoring period, %.	Data capture for full calendar year, %.	Annual mean concentrations ( $\mu\text{g}/\text{m}^3$ )		
					2008	2009	2010
NA27	West Bridge Street, Falkirk	N	n/a	100	0.39	0.4	0.41
NA41	Seaview Place, Bo'ness	N	n/a	100	n/m	n/m	0.41
NA49	Lennox Terrace, Grangemouth	N	n/a	100	0.4	0.4	0.41
NA55	Inchyra Station, Grangemouth	N	n/a	100	0.41	0.4	0.41
NA56	Albert Avenue, Grangemouth	N	100	41.7	0.4	0.4	0.46
NA57	Inchyra Road, Grangemouth	N	n/a	100	0.4	0.4	0.41

Note: No tube results have been annualised as no automatic monitoring data is available and all tubes results were at the limit of detection.

A Defra / DA owned  $\text{PM}_{2.5}$  FDMS-TEOM is in operation at Falkirk Council's Grangemouth AURN site. Although Council's are not required to review  $\text{PM}_{2.5}$ , the results are included here for completeness.

The results are shown in Table 2.10, although the result for 2008 should be treated with caution given the installation date of December 2008. The 2010 concentration is below the target value set by the Scottish Govt.

**Table 2.10: Results from  $\text{PM}_{2.5}$  monitoring.**

Site ID	Location	Data Capture for monitoring period %	Data Capture for 2010 %	Annual mean concentrations ( $\mu\text{g}/\text{m}^3$ )		
				2008	2009	2010
A8	Grangemouth AURN	n/a	94	12.7*	8.6	11

\* Annual data capture of 7%, data has not been annualised due to little other monitoring data being available in central Scotland in 2008.

**Summary of Compliance with AQS Objectives**

Falkirk Council has examined its monitoring results for 2010 and concludes that no Detailed Assessments are required at this time.

As in previous years a breach of the 15-minute SO<sub>2</sub> objective was recorded at the Grangemouth Moray site. In addition, a breach of the same objective was recorded at the Grangemouth AURN site. Taking into account the objective date, this is understood to be the first breach of the 15-minute objective at an AURN site in the UK. Both sites are within the Grangemouth AQMA, which was declared in November 2005 and for which an Action Plan is in place. The hourly and daily objectives continue to be met.

A breach of the 2010 annual PM<sub>10</sub> objective was recorded at the Falkirk West Bridge St site in 2010. PM<sub>10</sub> was included in the Falkirk Town Centre Further Assessment. It is proposed that operation of the Falkirk Grahams Rd site ceases and is replaced by a PM<sub>10</sub> TEOM. One or two NO<sub>2</sub> tubes may remain in the area.

The proposed AQMA in relation to the Banknock 1 work is currently out for consultation.

All tubes recording breaches of the NO<sub>2</sub> annual objective do not need to be considered further as they are within Further Assessment areas or are not representative of relevant receptors. Monitoring will continue at Denny Cross and Glensburgh Road.

Benzene monitoring will continue, including an additional site at Kinneil Kerse. The 1,3 butadiene objectives continue to be met.





### 3 New Local Developments

This Section will review any changes in the Falkirk Council area that may affect air quality, for example new transport sources, industrial emissions or new receptors. It will focus on locations which have not been assessed during the earlier rounds, or where there has been a change to an existing installation or a new development.

The minimum requirement for a Progress Report is to log changes to local developments.

#### 3.1 Road Traffic Sources

This Section will review any changes to the following since the 2010 PR:

- Narrow congested streets with residential properties close to the kerb,
- Busy streets where people may spend one 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 Updating and Screening Assessment,
- Roads with significantly changed traffic flows,
- Bus or coach stations.

The main pollutants that Council's are required to assess from road traffic are NO<sub>2</sub> and PM<sub>10</sub>. Benzene and 1,3 butadiene can also occur from road traffic emissions, though these emissions are now insignificant.

##### Local Roads

A review of the local road traffic data has been completed, although less data was available than in previous years. One road link in Polmont was identified where a significant increase in flow had been recorded since 2007, but it remains below the threshold for consideration of 10,000 vehicles per day and so does not need to be considered at this time.

The Glenbervie slip roads project will commence construction within the next year. Overall this work will remove traffic from the local road network due to the limited slip roads available onto the M876 in this area. There are some receptors close to the junction, so when available an NO<sub>2</sub> tube may be placed in the area.

##### Trunk Roads

At the time of writing no trunk road (Transport Scotland) traffic flow data was available for review. The only likely significant change is the ongoing work to upgrade the A80. This is due to be completed in September 2011 with the junction at the north end of this upgrade within the Banknock and Haggs NO<sub>2</sub> AQMA.

The Sclandersburn Road (NA96) tube next to the M80 was within the objective in 2010.



## 3.2 Other Transport Sources

This Section considers the potential emissions from other types of transport. This includes airports, diesel and steam trains (both stationary and moving) and movements of ships to and from ports.

### Ports

In 2009, 1,884 ships called at the docks, of which 27 were large (defined as 20,000-50,000 deadweight range). In 2010, 1,721 ships called at the docks of which 45 were large.<sup>4</sup> The docks are within the Grangemouth SO<sub>2</sub> AQMA and have been considered in the original Further Assessment. With a decrease in the number of ships calling and the number of large ships remaining small, the docks do not need to be considered further. In addition, the Grangemouth MC SO<sub>2</sub> monitor is close to the docks.

### Airports

Edinburgh Airport has not moved and remains more than 1 km from the Falkirk Council boundary. Falkirk Council is not aware of any significant changes to Cumbernauld airport, which is a small airport just outside the boundary and there are no new airports either.

### Railways

Although Falkirk Council was not required to assess the Glasgow to Edinburgh (via Falkirk High) rail line due to the background NO<sub>x</sub> concentrations being less than 25 µg/m<sup>3</sup>, a NO<sub>2</sub> diffusion tube (NA93) was placed near Falkirk High Station as a precaution. The results for a full of year of monitoring in 2010 show that the concentration is well below the NO<sub>2</sub> annual mean objective, with a concentration of 22 µg/m<sup>3</sup>. The site has been discontinued.

The Airdrie to Bathgate rail scheme is 1.3 km south of the Falkirk Council boundary and was completed in December 2010. It does not need considering due to this distance and as the passenger trains on the line are electric class 334s which have been cascaded from the Strathclyde network.

## 3.3 Industrial Sources

This Section considers the potential emissions from the following sources:

- Industrial installations: new or proposed installations for which an air quality assessment has been carried out,
- Industrial installations: existing installations where emissions have increased substantially or new relevant exposure has been introduced,
- Industrial installations: new or significantly changed installations with no previous air quality assessment,
- Major fuel storage depots storing petrol, petrol stations and poultry farms.

SEPA have informed Falkirk Council of the following changes to operations with PPC permits:

- Tesco Meadow Street (Falkirk) are not operating from July 2010, permit not surrendered.

- Maddiston Road Service Station are not operating from December 2010, permit not surrendered as site is up for sale.
- Central Painting and Blasting have moved out of Whitecross Industry Park in December 2010 to Cumbernauld, permit still to be surrendered.
- H&J Burgoyne has surrendered their permit as they are using less than 2 tonnes of solvent for vehicle re-spraying.
- Tesco TFS Redding opened July 2010, new permit issued.

There are no relevant receptors within 10 m of the Tesco Redding petrol station and so it does not need to be considered further.

### 3.4 Commercial and Domestic Sources

This Section considers the potential emissions from the following sources:

- Biomass combustion plant, individual installations,
- Areas where the combined impact of several biomass combustion sources may be relevant,
- Areas where domestic solid fuel burning may be relevant.

Forth Valley College and the Scottish Biomass Heat Support Scheme have confirmed that no biomass plants were built or supported in the Falkirk Council area in 2010.<sup>5 and 6</sup> Falkirk Council is not aware of any new significant areas of domestic solid fuel or biomass burning its area in 2010.

### 3.5 New Developments with Fugitive or Uncontrolled Sources

This Section considers the potential emissions from the following sources:

- Landfill sites,
- Quarries,
- Unmade haulage roads on industrial sites,
- Waste transfer stations etc,
- Other potential sources of fugitive particulate emissions.

The declaration of an AQMA in relation to PM<sub>10</sub> in Banknock (close to Cowdenhill Quarry) has been approved in principal by elected Members and is now subject to consultation. The executive summary of the Detailed Assessment report is shown in Section 1.4. The 2010 monitoring results from the Banknock 1 site are shown in Tables 2.5 a and b, both of the Scottish (2010) PM<sub>10</sub> objectives were breached at the monitoring site regardless of whether a 1.3 or 1.14 correction factor was used. The Detailed Assessment also proposed that as a precaution the UK (2004) objectives were included in the AQMA.

Falkirk Council is not aware of any significant changes for the potential sources listed above.

A review of the road traffic flow data available for the Falkirk Council area has highlighted one road that has shown an increase in traffic but it does not need considering further. PPC changes in the Falkirk Council area are discussed and do not need to be considered further.

## 4 Planning Applications

The following planning applications for 2010 were identified that may have an impact on air quality or introduce new receptors to the Council area.

Planning appl no.	Details	Address	Granted?	Comments
P/10/0512/PPP	Tamfourhill Masterplan.	Land To The North Of Tamfourhill Road Tamfourhill Road Falkirk	Pending decision.	
P/10/0186/FUL	Variation of Condition 1 of Planning Permission Ref: F/98/0002 to allow the Extraction of Sand and Gravel, Infilling with Inert Waste, Restoration to Recreational/Amenity Use to Continue to 31 December 2014	Northfield Quarry	Yes	Now PPC process.
P/10/0185/FUL.	Variation of Condition 1 of Planning Permission Ref: P/07/0490/MRL to allow the Extraction of Sand and Gravel, Infilling with Inert Waste, Restoration to Recreational Use (Extension to Existing Working) to continue to 31 December 2014.	Northfield Quarry	Yes	Now PPC process.
Helix project consultation	Forth and Clyde canal extension and Kelpie lock, pool and structures.	Near M9.	Scoping.	Small part in Grangemouth AQMA.
Whitecross Masterplan Scoping			Scoping.	
PPC/B/1084042	Tesco petrol filling station.	Tesco Petrol filling station, Redding Rd, Falkirk.	PPC permit	No air quality impact, application for >100m3 <or equal to 1000m3. Stage 2 vapour recovery to be fitted.
PPC/E/20059	Variation to PPC permit, new landfill gas engine.	Avondale Non-Hazardous Landfill, Polmont	PPC permit	No PM10 impact. 8th engine limited impact for NOx/SO2. Outside AQMA.
P/10/0423/FUL	SABIC, Operations Yard/Waste Recycling/Transfer Facility	SABIC, Bo'ness Road, Grangemouth.	Pending decision.	
P/10/0374/FUL	P/10/0374/FUL Amendment to Planning Consent P/07/0720/REM for the Development of Waste Treatment Facility		Granted.	Only height change to buildings, previous applied in 2007.
P/10/0719/FUL	TGT for SRUs	INEOS, Bo'ness Rd.	Granted.	Significant reduction in no. of 15-min exceedances and increase probability that 15-min objective will be met.
P/10/0761/PPP	Mixed Use Development of Canal Hub Facility Comprising Marina, Pontoon Moorings, Visitor Facility, Hotel/ Tourism Accommodation, Canal Footbridge, Boat Service Buildings, Car Parking, Lay-By, Natural Landscaping	Land to the North West of Almondhall Farm, Polmont, Falkirk.	Granted.	The proposed development is not located within an Air Quality Management Area. The closest Falkirk Council AQMA is six km away in Falkirk Town Centre.
ENQ/2010/0408	Biomass plant, Grangemouth	Site to the West of Forth Ports PLC, Central Dock Road, Grangemouth.	Pending (Scottish Ministers).	Consultation on an Application under Section 36 of the Electricity Act 1989 to construct and operate a Biomass Renewable Energy Plant with a net electrical output of 100 Megawatts (MWe).

The work in relation to INEOS' Tail Gas Treatment (discussed in the 2010 PR) was granted planning permission in December 2010. Forth Valley Royal Hospital (in Larbert) is now open, an NO<sub>2</sub> tube has been located close to the new roundabout at the main entrance.

## 5 Implementation of Action Plans

### Falkirk Town Centre and Haggs NO<sub>2</sub> AQMAs

The Falkirk Town Centre and Haggs NO<sub>2</sub> AQMAs were declared in March 2010. The Haggs Further Assessment was submitted in May 2011 and the Falkirk Town Centre Further Assessment was submitted in June 2011.

Executive summaries of the reports are shown below (references 7 and 8):

#### **Haggs:**

##### **Executive Summary**

BMT Cordah Limited has been commissioned by Falkirk Council to conduct a Further Assessment of air quality within its Air Quality Management Area (AQMA) at Haggs. The assessment aims to build on the review and assessment of air quality already conducted for this location which identified that nitrogen dioxide (NO<sub>2</sub>) concentrations were in excess of the United Kingdom air quality objectives. The assessment considers the pollutants NO<sub>2</sub> and PM<sub>10</sub> which are the main pollutants emitted by road traffic.

Analysis of the available automatic monitoring data has shown that annual mean concentrations measured at Haggs were in excess of the NAQS NO<sub>2</sub> objectives in 2008 and decreased in 2009 to less than the objective. Annual mean NO<sub>2</sub> concentrations measured using diffusion tubes have however remained fairly constant at most of the tube locations over the last three years with only small fluctuations observed.

To examine the spatial extent of any exceedance of NAQS objectives, a dispersion modelling study of local emissions sources has been undertaken. The dispersion modelling study utilised emissions data compiled in an inventory of local emissions sources. Analysis of the emissions inventory has identified that the majority of NO<sub>x</sub> and PM<sub>10</sub> emissions at Haggs are attributable to road traffic emissions.

The results of the dispersion modelling study have indicated that the NO<sub>2</sub> annual mean objective of 40 µg/m<sup>3</sup> is predicted to be exceeded at ground level locations up to approximately 75m from the M80 roadside and up to 30m from the Kilsyth Road close to the roundabout. As several residential properties are present close to the roads modelled, this represents many locations of relevant human exposure. The dispersion modelling has therefore confirmed that the declaration of the existing NO<sub>2</sub> AQMA is valid and that the boundary that has been set should be maintained.

The predicted annual mean PM<sub>10</sub> concentrations in 2010 indicate that the Scottish objective of 18 µg/m<sup>3</sup> may be exceeded at residential properties on Kilsyth Road near the roundabout. The predicted concentrations have not however been verified with monitoring data, and have been adjusted upwards using the correction factor derived for road NO<sub>x</sub> which may not be representative of what is actually happening at this location. Based on this, monitoring of PM<sub>10</sub> concentrations is recommended to establish if PM<sub>10</sub> should be considered in any future air quality assessment work at this location.

Modelling of future scenarios accounting for traffic volume growth and reductions in vehicle emissions has indicated that a reduction in overall NO<sub>2</sub> and PM<sub>10</sub> concentrations is predicted at most receptors, the reductions are, however, insufficient to enable the NAQS objective for annual mean NO<sub>2</sub> concentrations to be met. A reduction in road traffic emissions via other action plan measures is therefore required to enable future compliance with the NO<sub>2</sub> air quality objective at this location.



## Falkirk Town Centre:

### Executive Summary

In March 2010, Falkirk Council declared two air quality management areas (AQMA) in Falkirk Town Centre. The AQMA were declared in recognition of the potential to exceed national air quality objectives for nitrogen dioxide (NO<sub>2</sub>).

This report comprises the Local Air Quality Management (LAQM) Further Assessment for both of the Falkirk Town Centre AQMA.

The study considered NO<sub>2</sub> and PM<sub>10</sub> concentrations in and around the Falkirk Town Centre AQMA using a combination of new monitoring data and dispersion modelling. The study considered emissions from all emissions sources within the town centre, which were in turn categorised into relevant groups. The assessment of emissions identified that the principal source of NO<sub>x</sub> emissions within the AQMA was from road traffic, with commercial and domestic combustion and rail emissions also providing a significant contribution. Similarly, emissions from road traffic were the principal source of PM<sub>10</sub> emissions.

Using the estimated emissions data a dispersion model was created. The atmospheric dispersion model predicted pollutant concentrations based upon the traffic volume, street geometry, traffic composition, traffic speed, background sources and meteorological and topographical conditions of the area.

Road traffic emissions were modelled for 2009 as a baseline scenario with predicted pollutant concentrations compared with measured concentrations in line with technical guidance. The model was found to be under-estimating pollutant concentrations, therefore the modelling predictions were adjusted accordingly.

The final model predictions indicate that the annual mean NO<sub>2</sub> objective is being exceeded at receptors on West Bridge Street. Annual mean NO<sub>2</sub> concentrations across the rest of the AQMA are predicted below the objective, although predicted concentrations are elevated and within 10% of the objective on the following roads:

- Park Street;
- Princes Street;
- Grahams Road, from town centre to Bainsford Bridge; and
- Arnot Street.

Based on the adjusted predicted NO<sub>2</sub> concentrations it is considered that the existing AQMA (annual) remains valid and the extent of the AQMA remains appropriate.

The modelling study predicted 1-hour mean NO<sub>2</sub> concentrations in exceedance of the 1-hour mean NO<sub>2</sub> objective on West Bridge Street, with elevated concentrations on Grahams Road and Arnot Street. No adjustment of the model was made with respect to measured 1-hour mean NO<sub>2</sub> concentrations, however, and no exceedances of the 1-hour mean



objective were measured at any of the town centre monitoring sites in 2009. It is, therefore, considered that the model is over-estimating hourly mean NO<sub>2</sub> concentrations, and that an exceedance of the objective is unlikely. The Council will report the 2010 diffusion tube and automatic monitor concentrations from Grahams Rd in the 2011 Progress Report.

Based on the modelling study it is considered unlikely that there will be any exceedance of the 1-hour mean NO<sub>2</sub> objective and the Council should continue to monitor to confirm this and thereafter revoke the AQMA.

The final model predictions indicate that the annual mean PM<sub>10</sub> objective is being exceeded on the following roads:

- West Bridge Street;
- Princes Street / Park Street Junction;
- Grahams Road / Park Street roundabout junction; and
- Arnot Street.

Based on the area of predicted exceedance the Council should consider amending the existing Town Centre AQMA for annual mean NO<sub>2</sub> concentrations to also include PM<sub>10</sub> annual mean objective.

Source apportionment of both NO<sub>x</sub> and PM<sub>10</sub> emissions at a number of locations within the AQMA has also been carried out and the results of this will feed into the Council's developing action plan. Analysis of the source apportionment information shows that emissions from road traffic contribute the largest proportions to the locally generated road component, although the contribution from queuing of all vehicle classes is the major contributor at some locations.

The study indicates that a reduction of road traffic related emissions is required to enable compliance with the PM10 and NO<sub>2</sub> air quality objectives at all areas of relevant public exposure. The level of reduction required is significant at certain sites. The greatest reduction of road NO<sub>x</sub> is on West Bridge Street, with a 34% reduction in NO<sub>x</sub> required to meet the objective levels.

As a result of these reports and as partly discussed in Section 2.2.1 it proposed that Falkirk Council will:

- Cease NO<sub>x</sub> monitoring and install a PM<sub>10</sub> monitor at Falkirk Grahams Rd, therefore PM<sub>10</sub> monitoring would not continue at Falkirk Hope St.
- Possibly install a PM<sub>10</sub> monitor at the Falkirk Hags site with monitoring therefore ceasing at Grangemouth MC or Grangemouth Moray.

As result of the Falkirk Town Centre Further Assessment rejection the Council is not currently in a position to recommend amending the current AQMAs.

### **Grangemouth AQMA**

The Grangemouth AQMA was declared in November 2005 for what at the time was considered to be a likely breach of the 15-minute SO<sub>2</sub> air quality objective. The monitoring since the declaration has shown that at least one monitoring station in the AQMA breached the 15-minute objective since 2007. The hourly and daily objectives continue to be met at all sites, both inside and outside the AQMA.

In July 2007 Falkirk Council submitted its Action Plan for this AQMA to the Scottish Government and SEPA. The Action Plan is available to view on either the Defra or Scottish AQ websites. Council's are required to provide an annual update on their Action Plans, the first was therefore submitted in May 2009. This Section includes the 2011 update. Table 6.1 shows the four measures of the Action Plan and the progress that has been made with each measure.

**Measure 1:**

Seven of Falkirk Council's automatic monitoring stations are affiliated to either the AURN or the Scottish Air Quality Network with the data displayed on the appropriate website. This includes five of the seven SO<sub>2</sub> analysers that are used for monitoring in relation to the Grangemouth AQMA. The data from the Abbotsford House, Bo'ness and Polmont sites are available on request.

Falkirk Council sends through provisional SO<sub>2</sub> and met data to SEPA and INEOS when an SO<sub>2</sub> exceedance is recorded at a monitoring station. In addition, a monthly summary is sent, part of which is shown in Figure 6.1. The monthly email includes a summary of the data for each site that has recorded an exceedance, along with a full list of the exceedances.

**Measure 2:**

A working group meeting will be organised when the post-TGT modelling study is completed.

**Measure 3:**

Falkirk Council's text alert system has been implemented and is being maintained.

**Measure 4:**

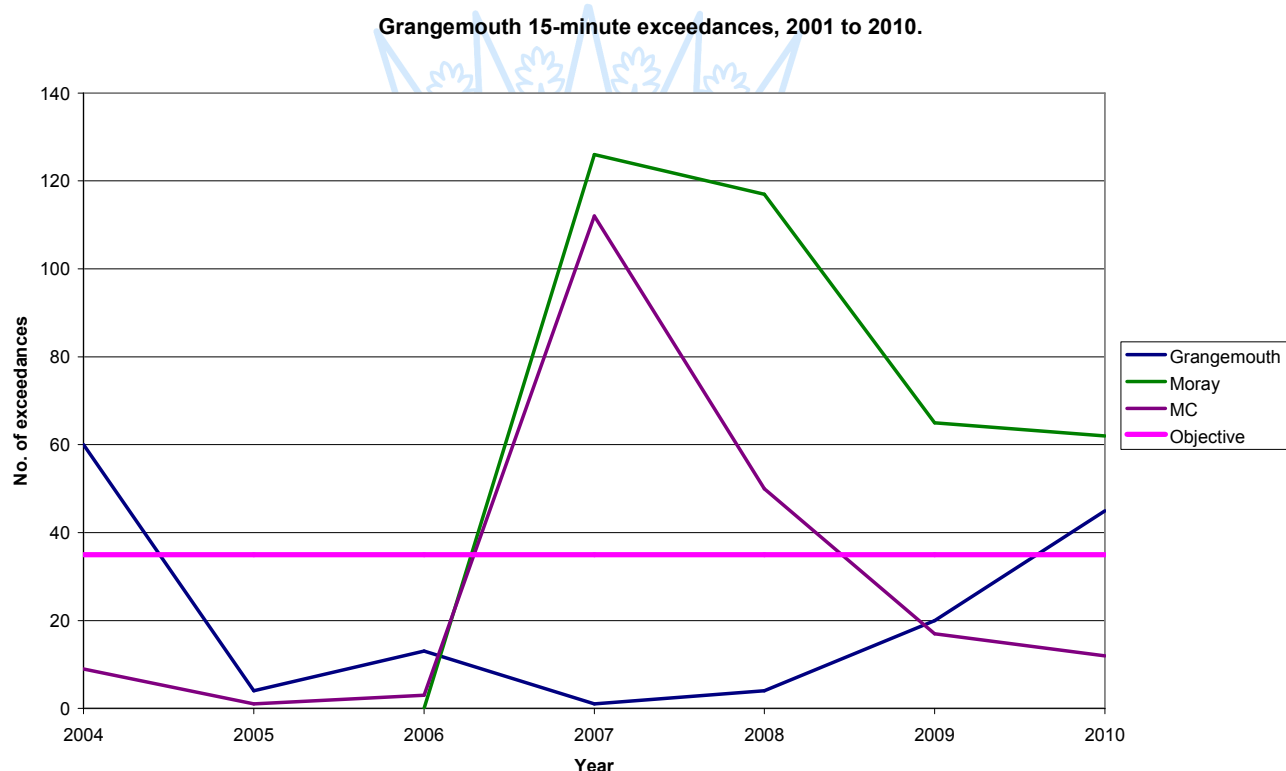
The Abbotsford House monitor ceased operation on the 16<sup>th</sup> April 2010. This site has been relocated to Polmont and commenced operation in September 2010. Although this location is outside of the AQMA, it is on the side of the AQMA (the south-eastern side) where no monitoring has previously been conducted and will generally give a better distribution of Falkirk Council's SO<sub>2</sub> monitors in relation to the AQMA. The Polmont site has met the SO<sub>2</sub> objectives in the three months of monitoring conducted in 2010.

**Table 6.1 Grangemouth AQMA Action Plan progress**

Measure Number	Measure	Focus	Lead authority	Progress to date	Progress in last 12 months	Estimated completion date	Comments relating to emission reductions
1	Improving data access / website	Supplying monitoring data to SEPA and INEOS.	Falkirk Council	Data sent after exceedances.	Increasing amounts of information in monthly summary. Analysis and polar plots of monitoring data.	Ongoing.	See comments below.
2	Working group.	Bring together FVHB, INEOS, S Govt, SEPA and Falkirk Council.	Falkirk Council	Meetings in November 2008, May 2009 and February 2010.	To meet when post-TGT report completed.	Ongoing, to meet annually.	See comments below.
3	Text alert system.	Real-time notification of exceedances.	Falkirk Council	Implemented.	Maintenance of system.	Completed and ongoing.	See comments below.
4	Monitoring network.	Review monitoring network.	Falkirk Council	Grangemouth Moray site installed and in AURN / SAQN.	Unit at Abbotsford House relocated to Polmont and commenced operation.	Ongoing.	See comments below.

**Figure 6.1: Part of the monthly summary of data supplied to INEOS and SEPA.**

Site	No. of exceedances of limit value.			Highest concentration, $\mu\text{g m}^{-3}$			Data capture, %		Status
	15-min	Hourly	Daily	15-min	Hourly	Daily	Period	Annual	
Grangemouth AURN	44	2	0	628	471	119	n/a	94.6	Ratified to end June.
Moray	62	2	0	766	436	109	n/a	98.2	Ratified to end June.
Municipal Chambers	12	0	0	447	317	116	n/a	98.6	Ratified to end June.
Abbotsford House	1	0	0	269	113	34	99.8	28.8	Ceased operation 16/04/2010, ratified.
Bo'ness	1	0	0	322	252	31	n/a	98.9	Ratified to end Sept.
Falkirk Hope St	5	0	0	471	309	55	n/a	83.9	Provisional
Falkirk Park St	3	0	0	380	231	45	n/a	94.2	Provisional
Polmont	0	0	0	149	116	28	97.8	18.4	Started 29/09/2010, ratified to end Sept.

**Figure 6.2: The number of 15-minute exceedances recorded at the sites in the Grangemouth AQMA between 2004 and 2010.**

Note: Grangemouth Moray commenced operation in September 2006.

As discussed in previous reports a significant increase in the number of exceedances was recorded at the Grangemouth Municipal Chambers site between 2006 and 2007. The Grangemouth Moray site also experienced a significant increase, however, this monitor only commenced operation in September 2006. In 2010 the number of exceedances at the Grangemouth AURN site followed previous years and increased, particularly at the beginning of 2010. Conversely the MC site has seen a decrease, such that the objective was met in 2010.

A direct comparison between the numbers of exceedances recorded in each year can give an indication of the trends in the number of exceedances and concentrations. However, it should be treated with some caution, as the local

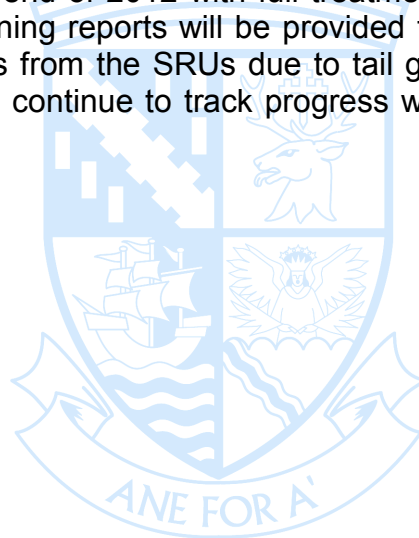
meteorological conditions will also have an impact on the number of exceedances recorded at each monitoring station. These conditions will of course vary from year to year.

In SEPA's Air Quality Report for 2008 it is stated that the significant increase in the number of exceedances seen between 2006 and subsequent years is likely to have been due to a change in the crude oil feed used by the refinery which has increased sulphur content.<sup>9</sup>

The Tail Gas Treatment works that have been discussed in previous reports were granted planning permission in December 2010.

SEPA have provided a statement for this report in relation to the Tail Gas Treatment:

"The project involves installing SO<sub>2</sub> abatement on the two sulphur recovery units (SRUs) at the Refinery. This will be a single abatement plant (tail gas treatment unit) which is to be fully operational by June 2013 with the aim of reducing emissions by 85%. SEPA has been tracking progress to ensure compliance with the PPC permit conditions and can confirm the project is on schedule. Treatment should begin on one of the SRUs from the end of 2012 with full treatment of both units on schedule for June 2013. Commissioning reports will be provided to SEPA to demonstrate the reduction in SO<sub>2</sub> emissions from the SRUs due to tail gas treatment as required by the PPC permit. SEPA will continue to track progress with the project over the next 18 months."





## **6 Conclusions and Proposed Actions**

### **6.1 Conclusions from New Monitoring Data**

Falkirk Council has examined the monitoring results for its area and concludes that no Detailed Assessments are required for any pollutant.

As in previous years a breach of the 15-minute SO<sub>2</sub> objective was recorded in 2010 at the Grangemouth Moray site. This site is within the Grangemouth AQMA, which was declared in November 2005 and for which an Action Plan is in place. The Grangemouth AURN site also recorded a breach of the objective. This is understood to be the first breach of the 15-minute SO<sub>2</sub> objective at an AURN site. The hourly and daily objectives continue to be met at all sites.

A breach of the 2010 annual PM<sub>10</sub> annual objective was recorded at the Falkirk West Bridge St site in 2010 and PM<sub>10</sub> was included in the Further Assessment for this area.

All tubes recording breaches of the NO<sub>2</sub> annual objective do not need to be considered further as they are within Further Assessment areas or are not representative of relevant receptors.

The other diffusion tubes continue to show that the benzene and 1,3 butadiene objectives were met in 2010 at locations where there are relevant receptors.

### **6.2 Conclusions relating to New Local Developments**

A review of the road traffic flow data available for the Falkirk Council area has highlighted one road that has shown an increase in traffic but it does not need considering further.

PPC changes in the Falkirk Council area are discussed and do not need to be considered further.

### **6.3 Other Conclusions**

Falkirk Council has provided an update on the Action Plan in relation to the Grangemouth AQMA. This shows that a breach of the 15-minute air quality objective continues to be recorded in the AQMA.

Summaries of the Falkirk and Haggs AQMAs are also provided and the actions relating to this are discussed in Sections 6.1 and 6.4.

### **6.4 Proposed Actions**

- The work in relation to the Grangemouth AQMA will continue as per the Action Plan.
- The Falkirk Town Centre and Haggs Further Assessments have been submitted. The development of the Action Plans continues. A statement in

relation to the Falkirk Town Centre Further Assessment will be submitted separately to the Scottish Government.

- Preparatory work for the Further Assessment for the Banknock PM<sub>10</sub> AQMA has begun.
- Monitoring of NO<sub>x</sub> will cease at the Falkirk Grahams Road site. This is likely to be replaced by a PM<sub>10</sub> monitor as per Further Assessment recommendation.
- As recommended in the Further Assessment for Haggs a PM<sub>10</sub> monitor may be installed at the Haggs site.
- Falkirk Council will submit a USA in 2012 unless otherwise notified by the Scottish Government.



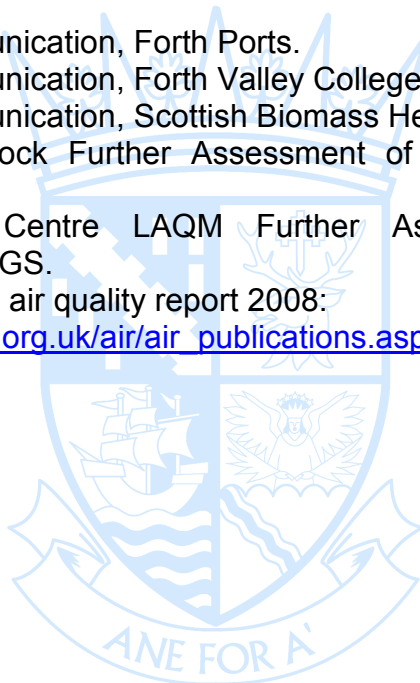
## 7 References

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Technical Guidance LAQM.TG(09), Defra and Devolved Administrations, February 2009.

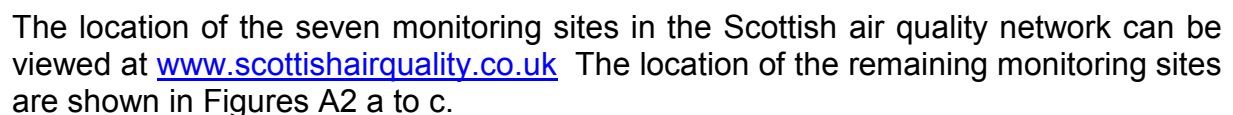
### Specific:

1. 2009 Updating and Screening Assessment, G\_FAL\_030/04-02-01, BMT Cordah.
2. Detailed Assessment of PM<sub>10</sub> in Banknock, Falkirk Council, December 2010,  
[http://www.falkirk.gov.uk/services/development/environmental\\_protection/air\\_quality/air\\_quality\\_reports.aspx](http://www.falkirk.gov.uk/services/development/environmental_protection/air_quality/air_quality_reports.aspx)
3. Figure 5.2, Air Pollution in Scotland, Scottish Government / AEA, April 2011.
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6. Personal communication, Scottish Biomass Heat Support Scheme.
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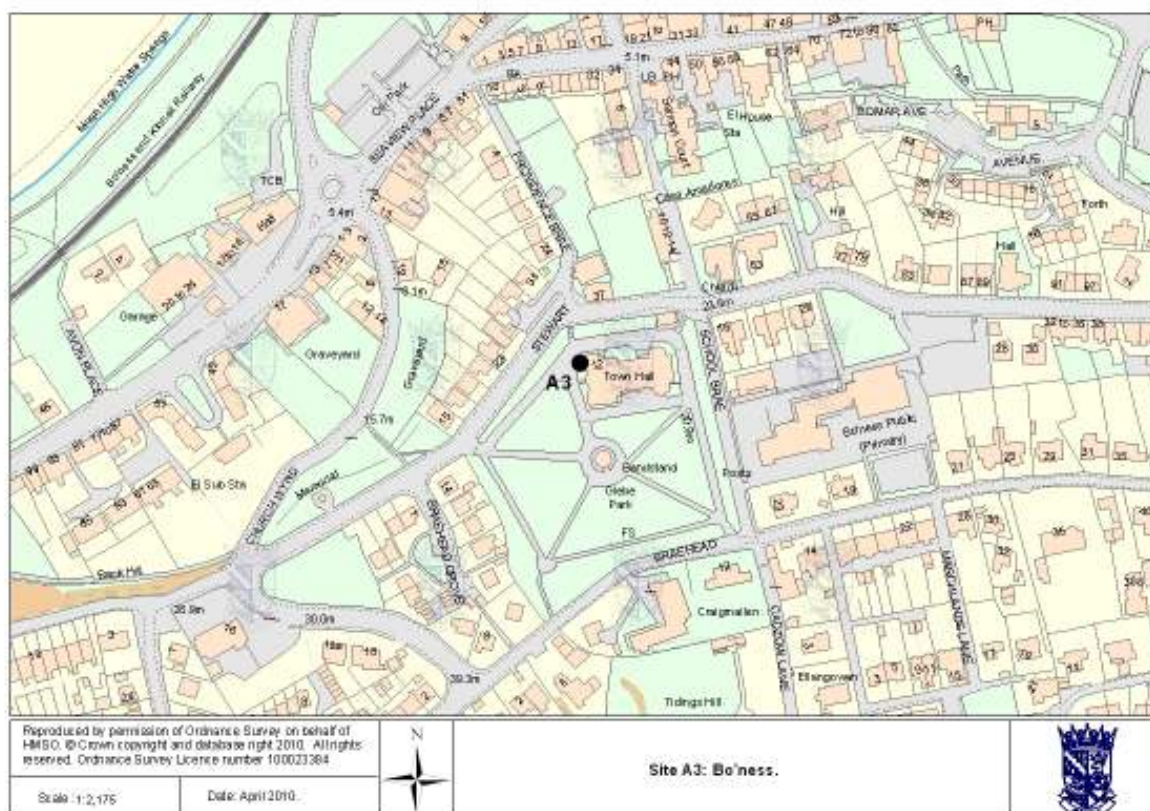


Appendix 1: Falkirk Council Area and Monitoring Locations.  
Appendix 2: QA / QC Data.

**Figure A1: The boundary of the Falkirk Council area.**





**Figure A2a: The location of the Banknock 1 site.****Figure A2b: The location of the Bo'ness site.**



## Appendix 2: QA / QC of Data

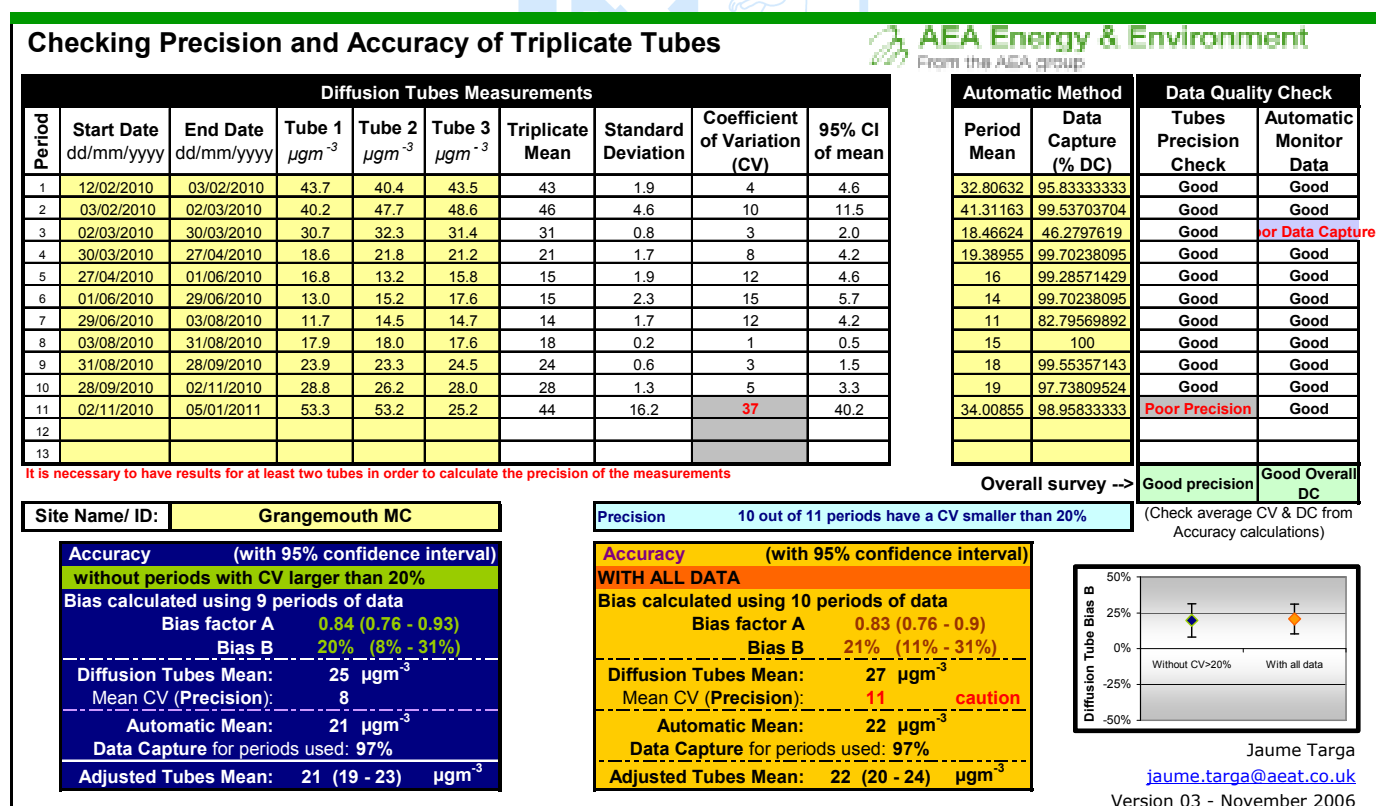
### Diffusion tube bias adjustment factors

The nitrogen dioxide, benzene and 1,3 butadiene tubes used by Falkirk Council are supplied and analysed by Harwell Scientifics. The method used for the NO<sub>2</sub> tubes is 50% acetone and 50% tri-ethanolamine. The tubes used for benzene are Chromosorb ATD (atomic thermal desorption) tubes and for 1,3 butadiene are molecular sieve ATD tubes.

Falkirk Council carried out two triplicate studies for NO<sub>2</sub>, the first at the Grangemouth Municipal Chambers (site NA42 / A10), an urban background site. The second at the Falkirk Park St (NA70 / A7), a roadside site, spreadsheets showing calculations are shown in Figure A3. The automatic monitoring data used for the two sites was provisional for the second half of the year.

The bias factor for the Grangemouth MC site was 0.83 and for Falkirk Park St site 0.84. In previous years the factor for the background site has usually been greater than the roadside site. The bias adjustment factor from the R&A Helpdesk database for 2010 is 0.85. The two local studies carried out by Falkirk Council contributed to this factor and both are slightly lower than this value.

**Figure A3: NO<sub>2</sub> bias adjustment factors for Grangemouth MC (A10) and Falkirk Park St (A6).**



## Checking Precision and Accuracy of Triplicate Tubes



Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 $\mu\text{gm}^{-3}$	Tube 2 $\mu\text{gm}^{-3}$	Tube 3 $\mu\text{gm}^{-3}$	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	12/01/2010	02/02/2010	48.7	39.8	49.5	46	5.4	12	13.4
2	02/02/2010	02/03/2010	57.6	53.7	53.4	55	2.3	4	5.8
3	02/03/2010	30/03/2010	52.3	47.4	52.9	51	3.0	6	7.5
4	30/03/2010	27/04/2010	34.9	36.2	30.9	34	2.8	8	6.9
5	27/04/2010	01/06/2010	29.1	28.6	29.6	29	0.5	2	1.2
6	01/06/2010	29/06/2010	22.8	24.7	27.3	25	2.3	9	5.6
7	29/06/2010	03/08/2010	23.2	23.7	24.5	24	0.7	3	1.6
8	03/08/2010	31/08/2010	27.8	22.1	23.5	24	3.0	12	7.4
9	31/08/2010	28/09/2010	36.7	34.7	36.1	36	1.0	3	2.5
10	28/09/2010	02/11/2010	36.4	34.3	39.1	37	2.4	7	6.0
11	02/11/2010	05/01/2011	62.1	60.0	22.5	48	22.3	46	55.4
12									
13									

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
38.6	99.4	Good	Good
49.8	100.0	Good	Good
37.7	99.9	Good	Good
31.0	99.9	Good	Good
27.2	99.8	Good	Good
23.3	99.9	Good	Good
17.4	96.5	Good	Good
21.9	99.9	Good	Good
26.3	99.9	Good	Good
26.9	99.9	Good	Good
44.4	99.6	Poor Precision	Good

Overall survey -->

Good precision

Good Overall DC

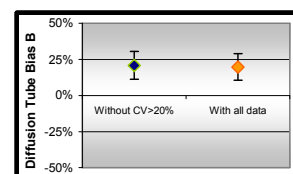
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Falkirk Park St

Precision 10 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)	
without periods with CV larger than 20%	
Bias calculated using 10 periods of data	
Bias factor A	0.83 (0.77 - 0.91)
Bias B	20% (10% - 30%)
Diffusion Tubes Mean:	36 $\mu\text{gm}^{-3}$
Mean CV (Precision):	7
Automatic Mean:	30 $\mu\text{gm}^{-3}$
Data Capture for periods used:	99%
Adjusted Tubes Mean:	30 (28 - 33) $\mu\text{gm}^{-3}$

Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	0.84 (0.78 - 0.91)
Bias B	19% (9% - 28%)
Diffusion Tubes Mean:	37 $\mu\text{gm}^{-3}$
Mean CV (Precision):	10 <b>caution</b>
Automatic Mean:	31 $\mu\text{gm}^{-3}$
Data Capture for periods used:	99%
Adjusted Tubes Mean:	31 (29 - 34) $\mu\text{gm}^{-3}$



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Version 03 - November 2006

## Discussion of choice of factor to use

The automatic data capture was good for both sites. The diffusion tubes precision check show as marginal fails due to a high uncertainty in the November / December results. The R&A factor has been used for NO<sub>2</sub> concentrations in this report, the factor is fairly similar to both Park St and Grangemouth MC. However, it should be noted that this gives a slightly conservative result for the roadside diffusion tubes as it is slightly higher than the Park St factor.

## PM<sub>10</sub> monitoring adjustment

All TEOM data from the Scottish air quality network sites presented in this report has been adjusted using the King's College (London) Volatile Correction Method (VCM). This has been carried out by AEA as part of the Scottish Government's contract for the SAQN. The Grangemouth AURN site has an FDMS and so no correction factor has been applied to the data.

The Banknock 1 Osiris data has had an adjustment factor of 1.3 and 1.14 applied. The Osiris output is a 15-minute average, these have been converted to an hourly and daily average using Enview software. Subject to power availability, a TEOM will be installed in the area this year and the Osiris relocated to a background location.

## Short-term to long-term data adjustment

Short term to long term data adjustments were carried out for the Falkirk Grahams Rd (A12) analyser and for two diffusion tubes. Background AURN sites have been used for the corrections, two from the Falkirk Council area.

**Table A1: NO<sub>2</sub> short to long-term data adjustments.****A12: Falkirk Grahams Rd (2010 data)**

Site	Site Type	Annual Mean, µg/m <sup>3</sup>	Period Mean, µg/m <sup>3</sup>	Ratio
Grangemouth AURN	Urban background.	19.3	27.2	0.71
Grangemouth Moray	Urban background.	23.3	33.2	0.70
Edinburgh St. Leonards	Urban background	31.1	43.5	0.71
Average				0.71

**A12: Falkirk Grahams Rd, 30/09/10 to 31/05/11 (annual mean June 2010 to May 2011).**

Site	Site Type	Annual Mean, µg/m <sup>3</sup>	Period Mean, µg/m <sup>3</sup>	Ratio
Grangemouth AURN	Urban background.	17.7	21.4	0.83
Grangemouth Moray	Urban background.	21.7	26.2	0.83
Edinburgh St. Leonards	Urban background	30.6	35.3	0.87
Average				0.84

**Tube NA95, Rae St, Stenhousemuir.**

Site	Site Type	Annual Mean, µg/m <sup>3</sup>	Period Mean, µg/m <sup>3</sup>	Ratio
Grangemouth AURN	Urban background.	19.3	16.7	1.15
Grangemouth Moray	Urban background.	23.3	20.0	1.16
Edinburgh St. Leonards	Urban background	31.1	29.3	1.06
Average				1.13

**Tube NA96: Sclandersburn Road, Denny.**

Site	Site Type	Annual Mean, µg/m <sup>3</sup>	Period Mean, µg/m <sup>3</sup>	Ratio
Grangemouth AURN	Urban background.	19.3	17.7	1.09
Grangemouth Moray	Urban background.	23.3	21.8	1.07
Edinburgh St. Leonards	Urban background	31.1	31.0	1.00
Average				1.05

**QA / QC automatic monitoring data**

Table A2 shows the QA / QC status for each monitor in Falkirk Council's air quality network in 2010. A description of the procedures for each network then follows.

**Table A2: QA / QC applied to automatic monitoring data in 2010.**

<b>QA / QC for 2010.</b>		
<b>Site</b>	<b>Analyser</b>	<b>Network</b>
A1. Abbotsford House	SO <sub>2</sub>	Local *
A2. Banknock 1	PM <sub>10</sub> (Osiris)	Local #
A3. Bo'ness	SO <sub>2</sub>	Local *
A4. Falkirk Haggs	NO <sub>x</sub>	SAQN
A5. Falkirk Hope St	NO <sub>x</sub>	SAQN
	PM <sub>10</sub> (TEOM)	SAQN
	SO <sub>2</sub>	SAQN
A6. Falkirk Park St	NO <sub>x</sub>	SAQN
	PM <sub>10</sub> (TEOM)	SAQN
	SO <sub>2</sub>	SAQN
A7. Falkirk West Bridge St	NO <sub>x</sub>	SAQN
	PM <sub>10</sub> (TEOM)	SAQN
A8. Grangemouth AURN (Inchyra)	NO <sub>x</sub>	AURN
	PM <sub>10</sub> (TEOM-FDMS)	AURN
	PM <sub>2.5</sub> (TEOM-FDMS)	AURN
	SO <sub>2</sub>	AURN
A9. Grangemouth Moray	NO <sub>x</sub>	AURN
	PM <sub>10</sub> (TEOM)	SAQN
	SO <sub>2</sub>	SAQN
A10. Grangemouth Municipal Chambers	NO <sub>x</sub>	SAQN
	PM <sub>10</sub> (TEOM)	SAQN
	SO <sub>2</sub>	SAQN
A11. Polmont	SO <sub>2</sub>	Local *
A12. Falkirk Grahams Rd	NO <sub>x</sub>	Local *

**Local \* sites:**

- Suspicious data or data recorded when a fault is occurring is automatically marked invalid by software. Data is also manually checked and marked invalid if it is suspicious.
- All NO<sub>x</sub> and SO<sub>2</sub> analysers receive fortnightly zero and span checks and filter changes.
- All LSO site visits are carried out by Council staff that are audited to AURN standard.
- Receive a service every six months.

- Are covered by a contract for emergency callout.
- Zero and span scaling is carried out on the data in-house based on the fortnightly site visits and additionally for the Horiba sites the auto-calibrations occurring every three days. Span adjustments are based on the concentration that is stated on the gas cylinders. No independent check is made of the cylinder concentrations, though cylinders are replaced if contamination is suspected.

**Local # site:**

- Data is downloaded at site and a flow check is carried out on a fortnightly basis.
- A filter change is carried out on an approximate four weekly basis, although this is dependent on the weather and the filter loading. The filters are retained for analysis.
- The analyser has remained on GMT for the duration of the monitoring. Some minor adjustment of the times for the data has taken place. This is because between a flow check or filter change and the next midnight hour, the Osiris records data in 15-minute blocks at say 12, 27, 42, 57 mins past the hour rather than the usual 15, 30, 45 and 00. This should have little effect on the results and permits the data to fit into the Council's monitoring database which it otherwise would not.
- All LSO site visits are carried out by Falkirk Council staff.
- The Osiris is serviced on an annual basis and covered by a service agreement.
- A 1.3 / 1.14 correction factor has been applied to the PM<sub>10</sub> data for Banknock 1. It was confirmed with King's College London that the VCM could not be applied to Osiris data.

**AURN and Scottish AQ network sites:**

- All NO<sub>x</sub> and SO<sub>2</sub> analysers receive fortnightly zero and span checks and filter changes.
- TEOM heads are cleaned and the filter changed on a four weekly basis or more frequently if the filter loading goes above 90%.
- TEOM-FDMS heads are cleaned and filters changed as directed by AURN CMCU (i.e. at 90% loading).
- All LSO site visits are carried out by Falkirk Council staff that are audited to AURN standard.
- Are covered by a contract for emergency callout.
- Receive a service every six months.
- QA/QC is to either 'AURN' or 'national' standards, see:  
[http://www.airquality.co.uk/verification\\_and\\_ratification.php](http://www.airquality.co.uk/verification_and_ratification.php)  
[http://www.scottishairquality.co.uk/verification\\_and\\_ratification.php](http://www.scottishairquality.co.uk/verification_and_ratification.php) for details.
- Falkirk Council also checks the data on its systems and has to be in constant communication with AEA to ensure the best data quality. Unscaled data is supplied to AEA for the Scottish AQ Network sites on a six monthly basis. This significantly improves data capture.
- For the time that a monitor is affiliated to the AURN or SAQN, data has been downloaded from either the Air Quality Archive or the Scottish Air Quality Network or as supplied direct from AEA.



**QA / QC diffusion tube monitoring**

The full set of monthly diffusion tube results are shown in Figure A3.

Harwell Scientifics are rated in the 'good' category for the WASP (Workplace Analysis Scheme for Proficiency) scheme. Harwell follow their internal standard operating procedure, this meets the guidelines set out in Defra's 'Diffusion Tubes For Ambient NO<sub>2</sub> Monitoring: Practical Guidance.' Harwell Scientifics recorded 'good' precision throughout 2008 and 2009 bar one result, see Figure A4.

Tube results are checked on a monthly basis and at the end of the year. Results under 4 µg/m<sup>3</sup> are not included. If a tube is found on the ground or with a spider in etc, an assessment is made at the end of the year as to whether the result seems appropriate for that site and time of year.



**Table A3: Benzene and monthly NO<sub>2</sub> (uncorrected for bias) diffusion tubes results.**

Benzene results 2010															
Site number	Location	Grid Reference .x	Grid Reference .y	January	February	March	April	May	June	July	August	September	October	November	December
21	Grangemouth Road, College	290112	680500	-	0.55	0.12	0.2	0.2	0.15	0.08	0.16	0.78	0.8	0.042	0.042
24	Kerse Lane, Falkirk	289195	680040	-	0.39	0.24	0.1	0.22	0.1	0.08	0.1	0.85	0.862	0.14	0.14
27	West Bridge Street, Falkirk	288470	680040	-	1.1	0.1	0.28	0.37	0.62	0.23	0.17	1	0.295	0.29	0.29
37	Denny Town House	281227	682725	-	0.1	0.22	0.13	0.22	0.11	0.15	0.1	0.41	0.615	0.14	0.14
38	Larbert Village Primary School	285960	682400	-	0.26	0.26	0.35	0.16	0.14	0.12	0.12	0.64	-	0.13	0.13
41	Seaview Place, Bo'ness	299720	681600	-	0.1	0.6	0.79	0.35	0.28	0.19	0.25	0.1	-	0.25	0.25
42	Municipal Chambers, Grangemouth	292800	682000	-	0.64	0.1	0.1	0.25	0.2	0.08	0.26	0.71	0.892	0.37	0.37
44	Greenpark Drive, Polmont	293550	678860	-	0.56	0.27	0.21	0.15	0.19	0.08	-	0.47	0.769	0.2	0.2
46	West Bridge Street traffic lights, Falkirk	288543	680045	-	0.8	0.27	0.25	0.23	0.1	0.31	0.2	1.1	1.08	0.14	0.14
49	Lennox Terrace, Grangemouth	293600	680250	-	0.66	0.21	0.27	0.12	0.27	0.15	0.16	1.2	0.985	0.12	0.12
55	Inchyra Station	293833	681014	-	0.73	0.3	0.16	0.28	0.18	0.17	0.2	0.89	0.862	0.22	0.22
56	Albert Ave, Grangemouth	293880	682000	-	0.9	0.27	0.33	0.35	-	-	-	-	-	-	-
57	Inchyra Road, Grangemouth	292800	682000	-	0.67	0.29	0.32	0.4	0.22	0.19	0.27	1.1	1.08	0.042	0.042
66	Holehouse, Slamannan	289450	672035	-	0.24	0.1	0.1	0.37	0.11	0.08	0.14	0.46	0.862	-	-
74	Hope St AQ station	288678	680218	-	0.57	0.37	0.28	0.2	0.14	0.15	0.11	0.64	0.8	0.09	0.09
				-	0.1	0.3	0.1	0.26	0.25	0.08	0.21	0.75	1.08	0.33	0.33
75	Rae St, Stenhousemuir	286793	683114	-	0.42	0.29	-	-	-	-	-	-	-	-	-
77	Kinnaird Village	286490	683775	-	0.4	0.21	0.31	0.32	0.12	0.08	0.1	0.77	0.077	0.08	0.08
80	Cow Wynd	288765	679456	-	0.55	0.34	0.25	0.13	0.13	0.17	0.1	0.87	0.954	0.14	0.14
81	Grahams Road, Falkirk	288834	680898	-	0.66	0.3	0.32	0.16	0.18	0.22	0.22	0.62	1.17	0.34	0.34
87	M80 slip south, Hags	279017	679305	-	0.35	0.31	0.19	0.1	0.17	0.08	0.1	0.1	0.615	0.09	0.09
95	Rae St, Stenhousemuir (2)	286778	683175	-	-	-	0.92	0.14	0.17	0.16	0.11	0.62	0.077	0.14	0.14

Site No	Address	Grid ref. x	Grid ref. y	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
3	Tinto Drive, Grangemouth	293427	680386	40.2	51.2	34.4	22.9	17.5	17.3	13.6	18.2	26.2	28.3	-	-
5	Copper Top Pub, Camelon	287332	680333	53	56.5	41.5	30.9	26.6	25.7	23.3	30.3	35.5	42.3	22.5	22.5
7	Irving Parish Church, Camelon	287332	680442	42.3	44.4	29.5	23.1	17.6	15.5	13.7	18.1	22.9	25.7	44.8	44.8
9	Belsdyke Road, Larbert	286048	683542	45.6	53.4	38.7	22.3	22.7	18.7	19.4	24.2	28.5	36.3	55.8	55.8
10	Muirhall Road, Larbert	286025	683435	46.7	49.5	32.9	23.1	18.4	15.7	13.6	16.3	25.5	31.3	53	53
13	Grange High School	290197	679622	61.9	70	44.5	38.2	29.9	29.5	-	32.3	38.7	47.2	68.8	63.8
19	Kilwin Road, Banknock	278779	679301	61.9	69.4	41.1	46.2	40.8	38.4	19.5	17.6	35.3	45.9	23.2	23.2
20	Camelon Road, Hags	278779	679355	50.6	49.2	43.8	42.1	42.6	41.2	40.5	42.3	43.8	43.9	38.9	33.9
21	Grange Road, Hags	280182	680182	47.4	50.4	35.1	25.1	22.6	21.2	23.5	24.3	30.9	38.9	68.9	63.9
24	Grange Road, Hags	280182	680024	70.4	63.1	55.5	45	38.3	38.2	34.2	41.8	43.2	45.4	24.9	24.9
26	West Street, Falkirk	285027	680123	42.1	51.6	31.3	22.1	16.7	15.5	14.3	17.1	23.8	29	51	51
27	West Bridge Street, Falkirk	285490	680055	73.9	89.1	64.4	62.6	60.4	48.8	44.8	48.3	62.2	63.5	32.4	32.4
29	Wellside Place, Falkirk	285490	680220	38.4	49.3	30.2	20.4	15.6	16	-	16.2	16.7	24.5	47.9	47.9
36	Kerr Crescent, Hags	278985	679273	86.8	77.8	63	53	47.9	38.3	43	52.2	54	66.7	28.9	28.9
37	Denny Town House	281226	682526	30.4	36.5	25.2	16.5	18.2	13.9	13	15	16.9	23.8	44	44
38	Lairburn Village Primary School	285930	682318	37.9	45.3	31.6	22.1	19.3	16.3	17.3	23.7	-	-	55.2	55.2
41	Seaview Place, Bonness	299722	681594	44.6	54.8	39.9	28.8	26.5	19.6	20.5	21	28.1	34.4	51.2	51.2
42	Municipal Chambers, Grangemouth	292817	682000	43.7	40.2	30.7	18.6	16.8	13.0	11.7	17.9	23.9	28.8	53.3	53.3
42				40.4	47.7	32.3	21.8	13.2	15.2	14.5	18	23.3	28.2	53.2	53.2
42				43.5	48.6	31.4	21.2	15.8	17.6	14.7	17.6	24.5	28	25.2	25.2
44	Greenpark Drive, Polmont	293436	678938	34.9	43.1	27	15.6	14.9	11.2	11.1	-	22.1	21	57.1	57.1
45	N Distributor Road, Bainsford	285444	681178	72	83.5	55.4	46.5	41.3	35	34.3	42.8	53.9	56.6	27.8	27.8
47	Thistle Avenue, Grangemouth	292000	681580	44.9	53.1	37.6	26.2	19.8	17.8	15.2	24.3	27.9	32.4	58.6	58.6
48	Hayfield, Falkirk	285200	681580	45.1	50.4	32.5	20.6	17.8	16.7	13.5	18.3	25.5	22	52.5	52.5
49	Lemox Terrace, Grangemouth	293800	680250	40	52.9	33.9	23.9	24.1	22.4	15.8	18.2	25.2	31.4	55.1	55.1
50	Upper Newmarket Street	285871	680047	50.3	63.9	37.4	30.9	31.8	34.2	20.1	24.5	34.8	32.1	23.8	23.8
51	Main Street, Lanisston	285865	680040	53.9	76.2	32.9	24.9	30.8	26.3	22.6	29.3	35.7	37.7	54.9	54.9
53	May Street, Larbert	285865	682355	48.4	53.9	46.2	34.9	30.8	26.3	22.6	29.3	35.7	37.7	54.9	54.9
53	May Street, Larbert	281216	682727	56.3	71.6	44.3	39.5	37.7	-	22.6	32.5	39.4	44	45	45
55	Inchva Station	293829	681023	43.2	43.4	28.7	21.2	16.6	13.0	5.9	15.2	20.9	26.9	54.1	54.1
56	Albert Ave, Grangemouth	293859	681962	39.1	49.4	30.6	19	17.1	-	-	-	-	-	-	-
57	Inchva Road, Grangemouth	294028	680829	51.2	61.7	37.2	32.2	27.1	20.4	-	24.1	33.9	39	22.3	22.3
58	Callender Road, Falkirk	289667	679724	46.1	54.2	36.4	25.3	15.8	17.4	18.5	21.3	28.2	32.3	-	-
59	Carron Road, Bainsford	285392	681931	57.7	59.7	44.4	33	29.1	24.5	23.1	32.9	37.8	39.9	23.4	23.4
60	Ronades Road, Carron	284133	681587	61.1	66.4	44.7	33.3	26	22.8	23.2	28.1	27.8	35.1	24.1	24.1
61	Canal Rd, Falkirk	287576	680656	52.9	65.1	41.7	28.2	23.2	21.4	22.2	30.3	37	39	-	-
62	Arnot Street, Falkirk	285125	679705	68.4	75.1	63.7	51.8	43.1	-	37.9	46.1	48.6	59	48.4	49.4
63	Camelon Road, Falkirk	285055	680134	59	71.8	59.6	47.1	40.8	43.4	36.4	41.2	48.2	45.4	25.7	25.7
64	New Hagden Road, Hagden	285807	678422	44	45.9	29.1	20.6	17.2	18.5	14.8	18.3	24.2	25.4	43.7	43.7
65	Redding Road, Redding	291356	678644	41.9	51.8	33.1	26.9	20.6	18.8	18.6	23.1	27.3	29.5	54.8	54.8
66	Hedderhouse, Simanman	285450	672035	22.8	22.9	18.3	8.8	9	8.8	8.9	8.8	11	12.8	25.9	25.9
67	Queen Street, Falkirk	285430	680433	53.1	62.5	43.2	37.2	34.7	27.8	25.1	33.8	37.4	40.1	63.7	63.7
68	Bellwood Street, Falkirk	285234	679945	50.9	59.6	46.6	41.7	33.3	28.1	24.5	35.5	30.6	45.3	24.4	24.4
69	Kerse Lane, Falkirk	285022	679960	55.2	71.6	51.8	45	38.7	34.9	24.5	29.8	40.9	45.2	24.2	24.2
70				46.7	67.6	52.3	34.9	29.1	24.9	23.2	27.8	36.7	38.4	62.1	62.1
70				48.8	63.7	52.6	36.2	29.6	27.3	24.5	29.5	35.1	38.4	62.1	62.1
71				49	63.7	52.6	36.2	29.6	27.3	24.5	29.5	35.1	38.4	62.1	62.1
72	Park Street AQ station, Falkirk	285892	680070	-	-	-	-	-	-	-	-	-	-	-	-
72	Vicar Street, Falkirk	285824	680120	61.3	65.3	46.8	40.5	32	30.8	28.3	34	40.6	39.8	65.8	65.8
73	West Bridge Street, RHS, Falkirk	285048	680048	63.9	67.5	50.2	37.6	41.6	38.2	32.7	32.2	43.8	50.2	54.8	54.8
74	Hope street AQ station	285898	680216	49.7	58.4	35.6	28.2	18.8	19.6	17.2	23.8	28.8	36.3	59.9	59.9
75	Rae St, Stenhousemuir	285793	683114	36.7	-	29.4	-	-	-	-	-	-	-	-	-
76	Tryst Road, Stenhousemuir	285851	683229	45.3	50.8	35.2	24.5	19.1	13.8	15.4	20.1	24.8	34.9	58.3	58.3
77	Kinnaird Village	285490	683775	44.6	53	41.1	29.8	25.2	22.1	20.5	26.4	28.2	37	61.7	61.7
78	Glen Brae, Falkirk	285525	678991	53.9	78	48.3	38.1	34	31	29	35	37.6	40.3	62.6	62.6
79	Garlicowie Road, Falkirk	285491	679327	45.9	60.1	39	26.3	23.8	17.9	19.6	22.8	29.5	33.5	57.8	57.8
80	Cow Wynd, Falkirk	285765	679456	42.9	56.4	47.8	40.2	33.1	29.4	27.8	31.5	30.6	45.4	62.2	62.2
81	Grahams Road, Falkirk	285834	680888	50.5	65.1	46.9	31.5	24	27.9	24.3	28.3	36.2	39.7	64.4	64.4
82	Castles Ave, Falkirk	285858	681036	44.7	51.5	37.4	20.5	16.3	13.9	15.1	18.5	25.2	29.2	54.3	54.3
83	Main Street, Bainsford	285809	681419	70.6	71.6	55	42.1	34.3	32	26.7	40.3	43.9	53.3	27.4	27.4
84	Carden Brae Bonness	301674	680592	29.5	36.7	22.8	15.2	33.6	14.5	10.1	14.6	17.2	21.2	35.3	35.3
85	Auchincloch Drive, Banknock	278752	679049	45.1	62.6	36.4	27	22.9	21.9	-	34.6	25.1	33.9	61.8	61.8
86	Wode Rd, Falkirk	285867	679871	37.6	45.6	27.2	14.4	14.8	12.3	-	19.3	21.7	43.2	43.2	43.2
87	M60 slip south, Hags	278017	679305	32.8	47.3	46.1	38.9	37.9	34.7	32.6	39.9	36.1	46.6	-	-
88	Ure Crescent, Bonnybridge	282472	681097	61.8	70.1	46.4	37	35.1	30.1	-	-	-	-	25.2	25.2
89	Grahams Rd/Meeks Rd, Falkirk	285853	680328	57.6	60.8	50	41.2	36.8	34.2	30.9	28.1	32.2	37.4	23.5	23.5
90	Grahams Rd bridge east, Falkirk	285853	680234	60.4	71	55.7	43.7	-	32.1	28.1	31.6	37.6	49.9	-	-
91	Grahams Rd bridge west, Falkirk	285835	680291	53.2	62.7	45.3	42	34	-	24.2	31.1	39.8	59.2	-	-
92	Cochrane Avenue, Falkirk	285743	679606	52.4	59.7	41.2	33.7	30.1	27.7	20.8	26.4	23.8	36	20.9	20.9
93	Falkirk High Station	285346	679073	32.6	48	28.8	19.8	18.7	16.5	16.8	18.5	17.3	14.2	39.4	39.4
94	A905 (Glasburgh Rd), Grangemouth	291213	681927	72.1	63.8	59.8	43	42.4	33.2	31.5	44.6	41.7	50.2	-	-
95	Rae St, Stenhousemuir (2)	286778	683173	-	-	-	18.7	14.1	10.8	9.2	14.4	17.9	23.3	45.1	45.1
96	Slendersburn Road, Denny	286034	681673	-	-	-	-	-	18.9	24	28.2	24	27.7	48.8	48.8

**Table A4: a.) Dates of diffusion tube changeovers and b.) Harwell Scientifics precision.**

Month	Start date	End date
January	<b>13/01/2010</b>	03/02/2010
February	03/02/2010	03/03/2010
March	03/03/2010	31/03/2010
April	31/03/2010	28/04/2010
May	28/04/2010	02/06/2010
June	02/06/2010	30/06/2010
July	30/06/2010	04/08/2010
August	04/08/2010	01/09/2010
September	01/09/2010	29/09/2010
October	29/09/2010	03/11/2010
November	03/11/2010	Not changed.
December	Not changed.	05/01/2011

[illegible]

### Pumped diffusion tube (Grangemouth AURN)

Falkirk Council Officers act as the LSOs for the pumped diffusion tube at the Grangemouth AURN site. The tubes are changed on a fortnightly basis. In 2010 analysis and QA / QC was performed by NPL (to end June) and AEA (from July) under contract to Defra / DAs. Two audits are carried out per year. The results included in this report have been downloaded from the Defra Air Quality website.