2010 Air Quality Progress Report for *The Highland Council*

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

September 2010

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Executive Summary

This document is a Progress Report undertaken by The Highland Council as part of the ongoing Local Air Quality Management Review and Assessment process.

The report considers new monitoring data and identifies new development that needs to be considered in the next updating and screening assessment report (USA), which is to be submitted in 2012.

Air Quality in the Highlands is generally good. The most recent monitoring demonstrates that the Air Quality Objectives are being met, or are likely to be met in cases where the target date is still in the future. Some new developments have been identified which will need to be considered by the next USA.

The Highland Council's 2009 Updating and Screening Assessment Report identified a need to progress to a detailed assessment of the emission from a biomass combustion plant in Halkirk, Caithness. However this plant has been the subject of a retrospective authorisation from the Scottish Environment Protection Agency and in authorised form is unlikely to cause exceedences of the air quality objectives. A detailed assessment of the process is no longer required.

The Highland Council will submit a further progress report in 2011.

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1 Introduction

1.1 Description of Local Authority Area

The area of the Highland Council covers approximately 26,500 square kilometres, excluding inland water, around one third of the Scottish mainland. The area includes Skye and other Inner Hebridean islands. The central and western regions of the area are a combination of high mountain and moorland and deep glens bordered by a coastline of sea lochs. In the north east lies the "flow" country of Caithness. Further south on the east coast lie three estuarine systems, the Dornoch, the Cromarty and the Moray firths, which are flanked by extensive arable land. The Great Glen Fault runs approximately east – west from coast to coast between Inverness and Fort William. To the south of the Great Glen Fault, lie the massive upland areas of the Monadhliath and Cairngorm mountains, including the recently formed Cairngorm National Park. To the south west the area extends to the Ardnamurchan peninsula. 15% of the land area is afforested. Over 20% of the Highlands is designated as National Scenic Area.

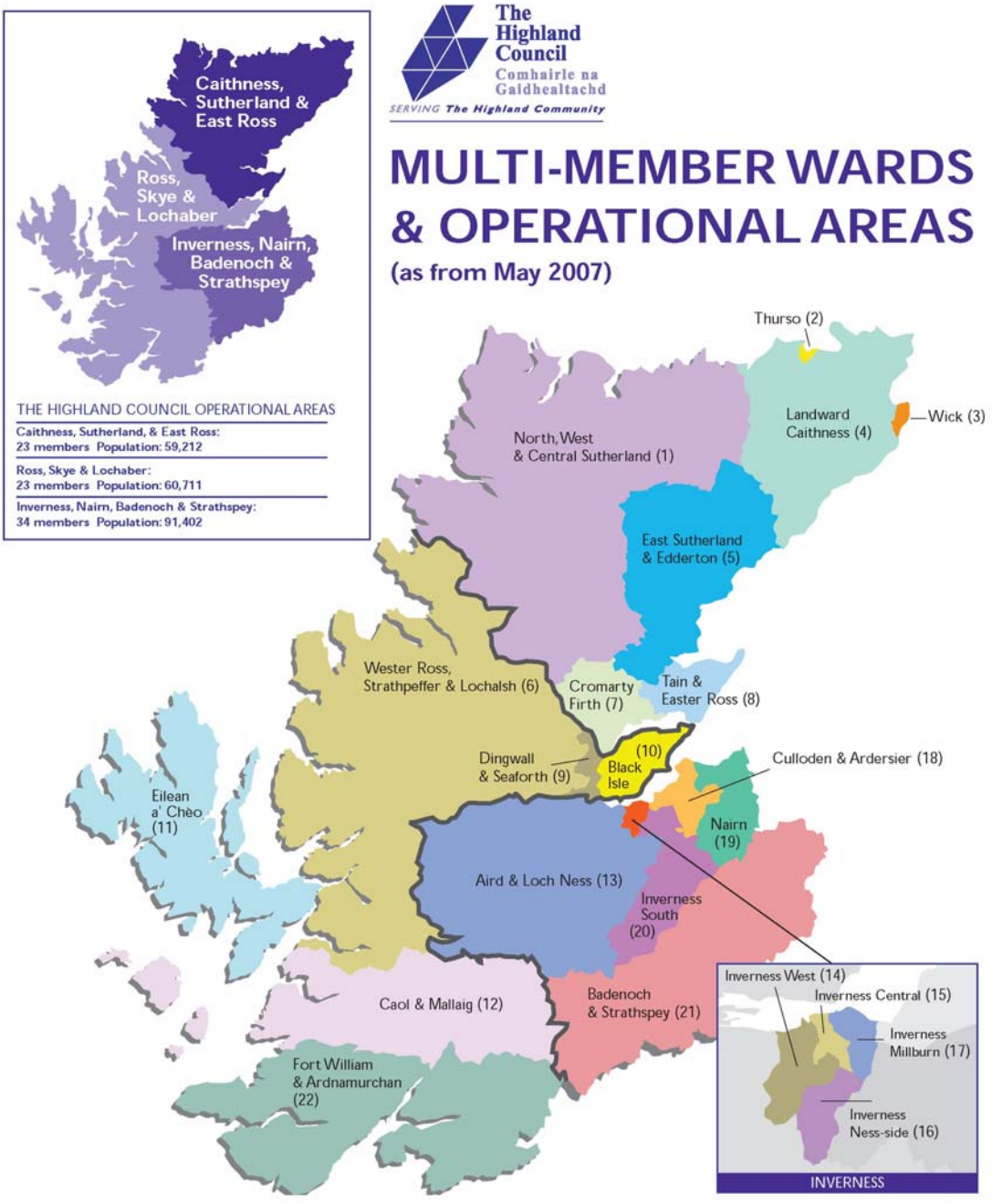
Inverness is the capital city of the Highlands and had an estimated population of 57,228 in 2007. The next largest settlements in the Highlands at that time were Nairn (population 10,831) and Fort William (9,752).

In 2007 the total population of the Highlands was over 217,000. The majority of the population live in the eastern coastal areas of the Highlands, in the rapidly growing city of Inverness and in the numerous smaller towns along the A9 and A96 transport corridors.

Industrial development is also concentrated in south and east, although there are some other significant industrial developments elsewhere such as the “Alcan” facility at Fort William.

Over most of the Highlands the transport network is sparse and for a large proportion of the network the usage is very light. 85% of the road network is classified as rural.

Figure 1.1 Map of The Highland Council Area.



CAITHNESS, SUTHERLAND & EASTER ROSS OPERATIONAL AREA

Ward No./ Ward Name		No. of Members	2004 Population
1	North, West & Central Sutherland	3	6,055
2	Thurso	3	7,849
3	Wick	3	7,506
4	Landward Caithness	4	9,809
5	East Sutherland & Edderton	3	7,620
7	Cromarty Firth	4	11,652
8	Tain & Easter Ross	3	8,721
	TOTAL	**23**	**59,212**

ROSS, SKYE & LOCHALSH OPERATIONAL AREA

Ward No./ Ward Name		No. of Members	2004 Population
6	Wester Ross, Strathpeffer & Lochalsh	4	11,758
9	Dingwall & Seaforth	4	11,073
10	Black Isle	4	9,468
11	Eilean a' Cheo	4	9,694
12	Caol & Mallaig	3	8,080
22	Ft William & Ardnamurchan	4	10,638
	TOTAL	**23**	**60,711**

INVERNESS, NAIRN, BADENOCH & STRATHSPEY OPERATIONAL AREA

Ward No./ Ward Name		No. of Members	2004 Population
13	Aird & Loch Ness	4	10,020
14	Inverness West	3	8,106
15	Inverness Central	4	12,672
16	Inverness Ness-Side	4	10,477
17	Inverness Millburn	3	8,657
18	Culloden & Ardersier	4	11,523
19	Nairn	4	10,809
20	Inverness South	4	7,156
21	Badenoch & Strathspey	4	11,983
	TOTAL	**34**	**91,402**

1.2 Purpose of Progress Report

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

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

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in Scotland are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 97), the Air Quality (Scotland) (Amendment) Regulations 2002 (Scottish SI 2002 No 297), and are shown in Table 1.1.

This table shows the objectives in units of microgrammes per cubic metre, $\mu g/m^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

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

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

1.4 Summary of Previous Review and Assessments

The first Review and Assessment of Air Quality in Highland was completed in 1998. The table below outlines the previous reports which have been published by the Highland Council as part of the Review and Assessment process.

The Local Air Quality Updating and Screening Assessment Report, 2003, identified that a Detailed Assessment would have to be carried out.

Detailed assessment was carried out for the following pollutants

Benzene. The screening assessment indicated that the running annual mean air quality objective for Benzene may be exceeded

(a) in the vicinity of petrol terminals at Inverness harbour, and

(b) near the Talisman Energy UK Ltd, Nigg Oil Terminal petroleum refining process at Nigg.

Sulphur Dioxide. The screening assessment indicated that:-

(a) there was a risk that the 15 minute mean air quality objective for SO2 could be exceeded in Castletown in Caithness as a result of the density of dwellings which burn solid fuel, and

(b) a Detailed Assessment would need to be carried out in respect of the ALCAN Aluminium Smelter in Fort William as the number of stacks which emit SO2 at that site, did not lend themselves to simple screening techniques.

Nitrogen dioxide. Both the Scottish Executive and the Scottish Environment Protection Agency voiced concern over levels of NO_2 in Inverness City Centre as measured by passive diffusion tube and so a Detailed Assessment was also undertaken for Nitrogen dioxide.

The Detailed Assessment Report, published in 2005, concluded that there was little likelihood of a failure to meet the objectives for these pollutants.

The 2008 Progress Report identified that the monitoring data generated by the Automatic Monitoring station at Telford Street, Inverness suggested a likely exceedence of the PM10 annual mean objective at this location. It was concluded that a detailed assessment for PM10 would be required although later amendments to the monitoring dataset suggest that this is no longer necessary.

The Updating and Screening Assessment of 2009 identified a requirement to progress to a detailed assessment for particles (PM10) and Nitrogen dioxide with respect to a biomass installation in Halkirk, Caithness.

Table 1.2 Summary of Previous Rounds of Review and Assessment

Report	Date	Outcome
Air Quality in The Highlands – First stage Review and Assessment	1998	No requirement to proceed to second stage review and assessment
Addendum to Air Quality in The Highlands	2001	
Updating and Screening Assessment	June 2003	Proceed to detailed assessment with respect to: Benzene in the vicinity of the fuel storage facilities at Nigg and Inverness; Sulphur dioxide in respect of areas with a high density of domestic solid fuel burning. Sulphur dioxide in the vicinity of the Alcan Site, Fort William. Nitrogen dioxide in Inverness City centre.
Progress Report	2005	Detailed Assessment not required.
Detailed Assessment	2005	Concluded: that there was no likelihood of the objective for benzene not to be met in the Highland Council Area; that the air quality objective for Sulphur dioxide is being met in the Highland Council area; that the air quality objectives for Nitrogen dioxide are being met in the Highland Council area; and that there is no requirement to declare a Local Air Quality Management Area in the Highland Council Area.
Updating and Screening Assessment	2006	Detailed Assessment not required.
Progress Report	2007	Detailed Assessment not required.
Progress Report	2008	Likely exceedence identified at Telford Street, Inverness for PM10. Detailed assessment required.
Updating and Screening Assessment	2009	Detailed Assessment required for NO_2 and PM10 in Halkirk, Caithness

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

There are three automatic monitoring sites in the Highland Council Area. Details of the sites are summarised in table 2.1 below. The sites are operated and maintained by contractors on behalf of DEFRA and a fully ratified dataset for each site is available for download from the internet.

The Telford Street site is on one of the busiest streets in Inverness. Fort William is in a suburban recreation area of the town. Strath Viach is located in a remote highland glen 5km from the nearest road, monitoring Ozone.

There has been no change in the pollutants monitored at any of the three sites since the last round of review and assessment.

Figure 2.1 shows the location of these sites within the highlands.

Figure 2.1 Map of Automatic Monitoring Sites

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Telford Street	Roadside	265709	845670	NO_2	Chemi-luminescent	N	Y (2.5m)	4m	N
Telford Street	Roadside	265709	845670	$PM_{2.5}$ PM_{10}	Gravimetric	N	Y (2.5m)	4m	N
Fort William	Suburban	210857	774431	PM_{10} Ozone	Gravimetric	N	N	N/A	N
Strath Viach	Rural	234831	875029	Ozone		N	N/A	N/A	N

2.1.2 Non-Automatic Monitoring

The Highland Council continues to monitor Nitrogen dioxide at nine sites in Inverness and Dingwall using passive diffusion tubes. There are no changes to the detail of these sites since the last round of review and assessment. Diffusion tubes are supplied and analysed by Gradko International ltd. A full description of the method employed and QA/QC procedures is included in the appendices.

Figure 2.2 Contains maps showing the location of non-automatic monitoring sites.

Figure 2.2 Maps of Non-Automatic Monitoring Sites in Inverness and Dingwall.


Telford Street
Academy Street
Queensgate B
Queensgate A
Union Street
Friars' Bridge
Waterloo Bridge
Suspension Bridge (Foot)
Ness Bridge
Glebe
Burial Gd
Superstore
Car Park
Liby
School
Inverness High School
The Highland Council HQ
Eden Court Theatre
Castle Hill
Football Ground
Viaduct
Quay
Friars' Shot

Table 2.2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Telford Street, Inverness	Roadside	265710	845672	NO_2	N	Y (2.5m)	4m	N
Union Street, Inverness	Roadside	266675	845339	NO_2	N	1-hour only (0.5m)	3m	N
Academy Street	Roadside	266577	845538	NO_2	N	Y (5m) 1-hour (0.5m)	5m	N
Queensgate A, Inverness	Roadside	266599	845416	NO_2	N	1-hour only (0.5m)	3m	N
Queensgate B, Inverness	Roadside	266642	845424	NO_2	N	1-hour only (0.5m)	3m	N
Wyvis Terrace, Dingwall	Roadside	254430	858968	NO_2	N	Y (2.5m)	1m	Y
Station Road, Dingwall	Roadside	255200	858185	NO_2	N	Y (1m)	1m	Y
Kintail Place, Dingwall	Urban Background	255112	859866	NO_2	N	Y (2.5m)	1m	N/A
Burns Crescent, Dingwall	Urban Background	254420	859288	NO_2	N	Y (2.5m)	1m	N/A

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

The annual mean concentration did not exceed 40ug/m^3 at any site in 2009. None of the sites recorded more than 18 1-hour means above 200ug/m^3, or where appropriate the 99.8%ile of hourly means did not exceed 200ug/m^3. At none of the diffusion tube sites did the annual mean exceed 60 ug/m^3.

Automatic Monitoring Data

Results of the automatic Nitrogen dioxide monitoring are contained in Tables 2.3a and 2.3b below.

Nitrogen dioxide annual mean concentrations recorded at automatic monitoring sites were very similar to those recorded in 2008.

The Telford Street AUN site is 4 metres from the carriageway of the A82 (Telford Street). The majority of houses along the street are around 6 metres from the carriageway. There are, however, several houses which are only 2.5 metres from the kerb. The AUN site is therefore not representative of the closest receptors on the street.

The procedure described in LAQM.TG(09) has been followed to calculate an estimate of the Nitrogen dioxide annual mean concentration at the closest receptors to Telford Street. Distance corrected results are displayed in brackets alongside the actual measured results in Table 2.3a.

The annual mean concentration recorded at Fort William is very low, which is to be expected given the nature of the site. There is, however, no relevant exposure at the Fort William site in terms of the annual mean objective.

There is relevant exposure at both locations in terms of the 1-hour objective, however, there were no exceedences of the 200 ug/m3 1-hour mean objective. The highest 1-hour mean concentration recorded at the Telford Street site was 149 ug/m^3. The highest 1-hour mean concentration recorded at Fort William during the monitoring period was 107 ug/m^3.

Figure 2.3 demonstrates the trends in the Annual mean Nitrogen dioxide concentration at automatic monitoring locations. It can be seen that a slowly reducing trend has occurred at both sites over recent years.

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

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture for full calendar year 2009 [b] %	Annual mean concentrations (μg/m^3)		
					2007	2008	2009
IV3	Telford Street	N	96.4	96.4	22.3(23.7)	20.6(24.1)	20.7(22.5)
	Fort William	N	87.9	87.9	9.32[1]	10.5[2]	9.35

[1] only 84.8% data was captured from the Fort William site in 2007.
[2] only 88% data was captured from the Fort William site in 2008.

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Automatic Monitoring Sites.

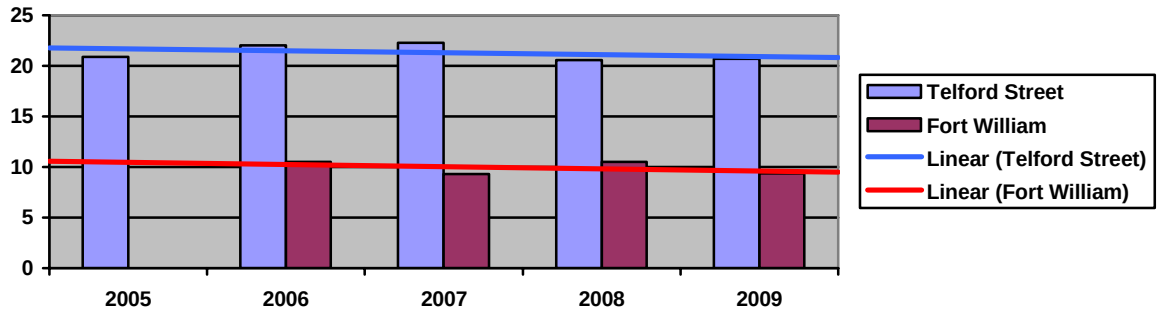


Table 2.3b Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period %	Data Capture for full calendar year 2009 %	Number of Exceedences of hourly mean (200 μg/m^3)		
					2007 [1]	2008 [2]	2009
	Telford Street	N	96.4	96.4	0	0	0
	Fort William	N	87.9	87.9	0 (53)	0(59)	0(73)

[1] only 84.8% data was captured from the Fort William site in 2007.
[2] only 88% data was captured from the Fort William site in 2008.

Diffusion Tube Monitoring Data

Results of the Nitrogen dioxide diffusion tube monitoring at sites within Highland are contained in Table 2.4 below.

Some of the sites reported here are on busy shopping streets where kerbside locations might be considered to be relevant exposure in terms of the 1-hour objective. The current guidance to local authorities is that exceedences of the 1-hour mean objective for NO_2 are only likely to occur where annual mean concentrations are 60 ug/m3 or above. At appropriate sites the annual mean has been corrected to estimate annual mean concentration at 0.5 metres from the kerb. For none of the sites does this result in an annual mean concentration of 60 ug/m^3 or more.

Site IV4, is a collocation study at the site of the AUN (automatic urban network). The annual mean for this site noted in Table 2.4 is an average of the results for the triplicate tubes exposed at the location. The results were bias adjusted using a locally obtained bias adjustment factor derived using the tool "Checking Precision and Accuracy of Triplicate tubes" provided by AEA Energy and Environment. It was noted that the collocation study was assessed by the tool as having poor overall precision.

A full year of data for the remaining sites was not available for the 2009 calendar year. The annual mean concentration for the these sites was therefore determined from a short term measurement using the method described in Box 3.2 of LAQM.TG(09). The results are bias adjusted using a combined bias adjustment factor. A full description of the method undertaken is described in the Appendices.

Relevant Exposure at Diffusion Tube Monitoring Sites

Site IV4, Telford Street, is 4 metres from the kerb. The nearest relevant exposure to this street is 2.5 metres from the kerb. It has therefore been necessary to correct the recorded annual mean concentrations at this site to reflect the distance from the kerb of the nearest relevant exposure.

Sites IV1, IV2, IV3a and IV3b are in the Old Town of Inverness. These are busy shopping streets where kerbside sites might be considered relevant exposure in terms of the 1-hour mean objective. There is no relevant exposure at sites IV2, IV3a and IV3b in terms of the annual mean objective. Site IV1 is considered to be representative of relevant exposure in terms of the annual mean objective. However relevant exposure in terms of the 1-hour objective could be considered to be much closer to the kerb than the measurement location at any of these four sites.

The four sites in Dingwall are representative of relevant exposure in terms of both objectives

The procedure described in LAQM.TG(09) has been followed to calculate an estimate of the Nitrogen dioxide concentrations at the closest relevant exposure where this is not represented by the monitoring location. Annual mean concentrations corrected for distance are displayed in brackets beside the measured annual mean, where appropriate.

Diffusion Tube Monitoring Trends

Figure 2.4 represents the trends that are evident in the diffusion tube monitoring results. The trends are demonstrated for the average results over three distinct site groups.

Firstly the four sites in the Inverness Old Town Area. Although the trend in the graph indicates an increase in concentration over the years this is skewed by the higher concentrations experienced in 2007 during the old town improvement project when there were major works in the area. Apart from in 2007 Nitrogen dioxide concentrations in the area have remained roughly the same.

The two roadside sites in Dingwall have demonstrated a steady increase in concentration over the last six years.

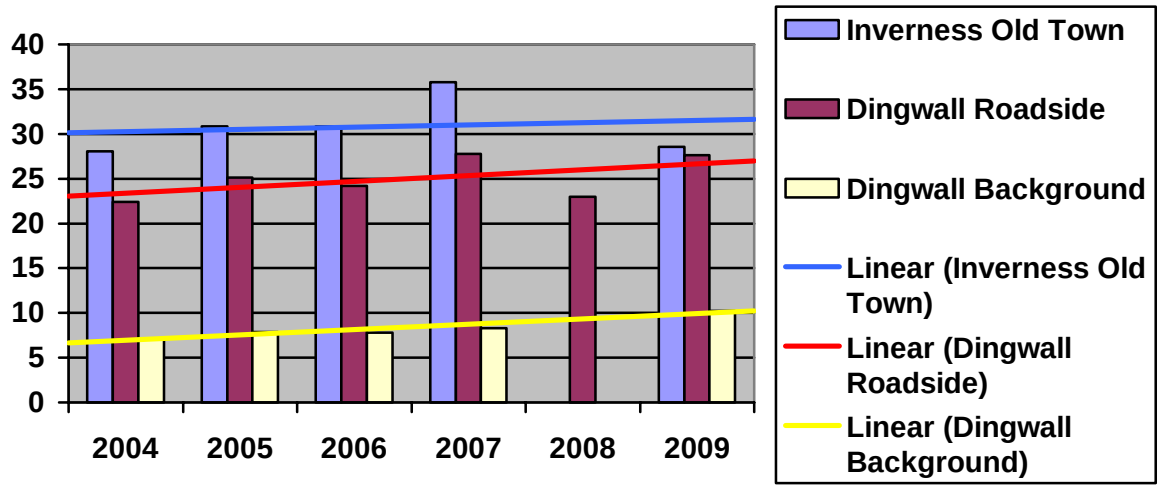
The two background sites in Dingwall have also shown a steady increase over the period.

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture for monitoring period %	Data Capture for full calendar year 2009 %	Annual mean concentrations (μg/m^3)		
					2007	2008	2009
IV4	Telford Street, Inverness	N	100	100	22.3	20(22)	20.8(22.6)
IV1	Union Street, Inverness	N	100	33.3	30.2		22.3(29[a])
IV2	Academy Street, Inverness	N	100	33.3	25.9		25.8(37.3[b])
IV3a	Queensgate, Inverness	N	100	33.3	46.5		35.5(48.2[c])
IV3b	Queensgate, Inverness	N	100	33.3	40.4		30.6(41.1[d])
RC1	Wyvis Terrace, Dingwall	N	100	41.7	19.4	18.9	22.9
RC2	Station Road, Dingwall	N	100	41.7	36.1	27	32.3
RC3	Kintail Place, Dingwall	N	100	41.7	7.6		8.8
RC4	Burns Crescent, Dingwall	N	100	41.7	9		11.7

[a,b,c,d] Corrected annual mean concentrations relate to kerbside exposure and are only relevant for comparison with the 60 ug/m^3 indicator of likely compliance with the 1-hour objective.

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Diffusion Tube Monitoring Sites.



2.2.2 PM_{10}

PM10 Annual mean concentrations at Telford Street are significantly below the 2010 annual mean objective and continue to be the subject of a reducing trend.

There were no exceedences of the 24 hour mean objective at Telford Street.

The monitoring location at Telford Street is 4 metres from the kerb. While the majority of the dwellings on the street are this distance or greater from the kerb, there are a small number of dwellings which are 2.5 metres from the kerb. However PM_{10} concentrations at the monitoring position are such that it is most unlikely that concentrations, even at the closest receptors, are in excess of the objectives.

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

Site ID	Location	Within AQMA?	Data Capture for monitoring period %	Data Capture for full calendar year 2009 %	Annual mean concentrations ($\mu g/m^3$)		
					2007	2008	2009
	Telford Street, Inverness	N	93.4	93.4	13.5	12.5	11.7

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

Site ID	Location	Within AQMA?	Data Capture for monitoring period %	Data Capture 2009 %	Number of Exceedences of daily mean objective (50 μg/m^3)		
					2007	2008	2009
	Telford Street, Inverness	N	93.4	93.4	0(24)[a]	0	0

[a] Data capture in 2007 was less than 90%. Figure in brackets is the 90th percentile of daily means.

2.2.3 Sulphur Dioxide

There was no Sulphur dioxide monitoring carried out in The Highland Council area in 2009.

2.2.4 Benzene

There was no monitoring for Benzene carried out in The Highland Council area in 2009.

2.2.5 Other pollutants monitored

$PM_{2.5}$ and Ozone

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007 identified UK Air Quality Objectives for the protection of human health. Some of these objectives, including those for $PM_{2.5}$ and Ozone are not included in the regulations at present. The objectives for these two pollutants are described in Table 2.6 below.

Table 2.6 UK Air Quality Strategy Objectives for protection of human health, July 2007

Pollutant	Air Quality Objective		To be achieved by
	Concentration	Measured as	
Particles ($PM_{2.5}$) (gravimetric)	12ug m^{-3} (limit)	Annual mean	2010
Ozone	100ug m^{-3} not to be exceeded more than 10 times a year	8 hourly running mean or hourly mean	31st December 2005

In 2009 the 8 hourly running mean Ozone concentration was greater than 100 ug^{m-3} on four occasions at Strath Viach and ten occasions at Fort William. The objective was therefore achieved for this pollutant at both locations.

The Annual mean $PM_{2.5}$ concentration at Telford Street, Inverness was 6 ug^{m-3} in 2009. This is less than the limit set by the objective to be achieved by 2010 for the pollutant in Scotland.

Summary of Compliance with AQS Objectives

The Highland Council has examined the results from monitoring in the Highlands. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

3.1 Road Traffic Sources

There are no new road traffic sources identified in the Highland Council Area since the last round of Review and Assessment.

3.2 Other Transport Sources

There are no new Airports; Locations where diesel or stream trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15 metres; Locations with a large number of movements of diesel locomotives, and potential long term relevant exposure within 30 metres; or ports for shipping identified in the Highland Council Area since the last round of Review and Assessment.

3.3 Industrial Sources

There are no new industrial sources identified since the last round of review and assessment.

3.4 Commercial and Domestic Sources

Table 3.1 lists the individual biomass combustion plant that have been identified since the last round of review and assessment. These installations shall be investigated further at the next round of updating and screening assessments.

Table 3.1 New Biomass Combustion Plant

Installation	Location
Lochbroom House	Ullapool, Wester Ross

There are no new areas identified where the combined impact of several biomass combustion sources, or domestic solid fuel burning may be relevant.

Geddes Windows, Halkirk

During the previous round of review and assessment The Highland Council identified the biomass boiler serving Geddes Windows, Halkirk, Caithness, as requiring detailed assessment in terms of the PM10 and NO2 objectives.

It emerged that this process required authorisation by SEPA and the process of authorisation has now been completed. During the authorisation process SEPA

required the stack height of the installation to be increased. It is therefore necessary to reassess this installation in terms of LAQM.

The method of assessment suggested in LAQM.TG(09) compares background adjusted emission rate for the installation with a threshold emission rate, determined by the effective stack height and diameter of the installation. The LAQM Tools section of the government website www.airquality.co.uk provided a spreadsheet tool, which enables the Local Authority to calculate the threshold emission rate for an installation taking account of the stack dimensions and background pollutant levels. Provided that the actual maximum emission rate of the stack does not exceed this threshold there is no need to progress to a detailed assessment. This tool has been used to calculate the threshold emission rate for the Geddes Windows stack as authorised by SEPA.

Table 3.2 below details the stack as it has been authorised. The screening process for biomass installations now suggests that the installation is not likely to cause exceedences of the objectives.

The Highland Council believe that it is no longer necessary to proceed to detailed assessment in terms of PM10 or NO2 for Geddes Windows, Halkirk.

Table 3.2 Screening of Biomass Combustion Installation

Name	Description	Capacity	Maximum emission rate (PM10)	Threshold emission rate (PM10)
Geddes Windows, Halkirk	Advanced Automatic Boiler	1200 kW	0.0792	0.0864

Name	Description	Capacity	Maximum emission rate (NO2)	Threshold emission rate (NO2 annual mean objective)	Threshold emission rate (NO2 1-hour mean objective)
Geddes Windows, Halkirk	Advanced Automatic Boiler	1200 kW	0.18	0.1825	0.2372

3.5 New Developments with Fugitive or Uncontrolled Sources

There are no new developments with fugitive or uncontrolled sources identified since the last round of review and assessment.

The Highland Council has identified the following new or previously unidentified local developments which may impact on air quality in the Local Authority area.

Biomass Combustion Installation, Lochbroom House, Ullapool

These will be taken into consideration in the next Updating and Screening Assessment, scheduled for 2012.

4 Planning Applications

Since the last round of review and assessment The Highland Council received the following planning applications for which Air quality information was requested.

Table 4.1 Planning Applications

Development	Planning Status
Combined Heat & Power (Highlands) Ltd – Residual Waste to Energy Plant, Cromarty Firth Industrial Park, Invergordon	Pending
Northern Energy Develoments Ltd. – Biomass CHP plant, Invergarry	Pending

Air Quality modelling was undertaken and reported as part of the submitted planning application and indicated that neither development should result in exceedences of the air quality objectives.

Should these developments receive planning permission they will be considered in detail during the next updating and screening assessment, scheduled for 2012.

5 Conclusions and Proposed Actions

5.1 Conclusions from New Monitoring Data

New monitoring data has not identified any potential or actual exceedences at relevant locations.

5.2 Conclusions relating to New Local Developments

There are no new developments requiring detailed assessment.

Changes made to the biomass installation at Geddes Windows, Halkirk mean that the process is now unlikely to result in a breach of the air quality objectives.

5.3 Other Conclusions

This report identifies two developments which have yet to be given planning permission for which information on air quality has been requested. However it is not anticipated that either development would result in a failure to meet the requirements of the Air Quality Objectives.

5.4 Proposed Actions

There is no requirement for the Highland Council to proceed to a detailed assessment for any pollutant at this stage.

The next course of action for The Highland Council will be to submit the 2011 Progress Report

6 References

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8. The Highland Council, **Progress Report**, 2005
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17. http://www.airquality.co.uk/data_and_statistics_home.php
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20. AEA Energy and Environment on behalf of the Scottish Government, **Measurement and Modelling of Fine Particulate Emissions (PM10 and PM2.5) from Wood Burning Biomass Boilers**, 2008
21. AEA Technology, **QA/QC Data Ratification report for the Automatic Urban and Rural Network, October – December 2008 and Annual Review for 2008**, June 2009.
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23. AEA Energy and Environment, **Technical Guidance – Screening Assessment for Biomass Boilers**, 2008
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25. http://www.uwe.ac.uk/aqm/review/
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27. AEA Energy and Environment on behalf of DEFRA and the devolved administrations, **WASP - Annual Performance Criteria for NO2 Diffusion Tubes used in Local Air Quality Management (LAQM), 2008 onwards, and Summary of Laboratory Performance in Rounds 103-107.**

Appendices

Appendix A: QA/QC Data

Appendix B: Measured Data

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

Diffusion tubes used by The Highland Council are supplied and analysed by Gradko International Ltd. The preparation method is "20% TEA in Water". The bias adjustment factor recommended by the R&A Helpdesk Database is 0.90. This factor is derived from 33 co-location studies.

Factor from Local Co-location Studies (if available)

A diffusion tube co-location study has taken place at site IV4, a roadside site on Telford Street, Inverness. The tubes are co-located with the Telford Street AUN Station. AEA's DifTPAB spreadsheet tool has been used to determine the precision and accuracy of the diffusion tube co-location study. Overall data capture of the automatic monitor data was good although the data capture for month 12 was poor. Accuracy was therefore determined using 11 data periods only. The bias factor was determined to be 0.81. Overall precision of the diffusion tubes survey was poor. There were three periods of poor precision in the survey. The bias factor determined after excluding periods of poor precision (8 remaining periods) was 0.76.

Discussion of Choice of Factor to Use

A local bias adjustment factor has been used to adjust the results of the diffusion tube survey at site IV4, Telford Street, Inverness. The survey location is co-located with the automatic diffusion tube monitor. All other sites are adjusted with the combined bias adjustment factor. The table below shows raw annual mean data for all sites and data for each site adjusted with each of the bias factors discussed in the previous paragraph. The bias adjusted concentration that has been used is highlighted in bold text.

Site ID	Annual Mean (uncorrected)	Corrected Annual mean Local Factor (without periods with CV larger than 20%)	Corrected Annual Mean Local Factor (all data)	Corrected Annual Mean Combined Factor
IV1	29.21	22.2	23.7	**26.3**
IV2	33.7	25.6	27.3	**30.3**
IV3a	51.61	39.2	41.8	**46.4**
IV3b	40.06	30.4	32.4	**36**
IV4	25.7	**19.5**	20.8	23.1
RC1	27.31	20.7	22.1	**24.6**
RC2	38.55	29.3	31.2	**34.7**
RC3	10.48	8	8.5	**9.4**
RC4	13.98	10.6	11.3	**12.6**

PM Monitoring Adjustment

The method used for the measurement of PM10 at Telford Street, Inverness is considered to be equivalent to the reference method. No adjustment of the dataset has been necessary.

Short-term to Long-term Data adjustment

The data set for some of the diffusion tube sites was carried out over a short term monitoring period. The method described in Box 3.2 of LAQM.TG(09) has been used to annualise the mean concentration for these sites. Five sites were determined to be appropriate to determine the period mean adjustment factor. These were 2 sites in Stonehaven and 3 sites in Inverurie, Aberdeenshire. All five sites are Urban Background and had good data capture for the year 2009.

Sites IV1, IV2 and IV3b gathered data over four months commencing September 2009. The table below demonstrates the determination of the period adjustment factor applied to the data from these sites to estimate the annual mean NO2 concentration. The period adjustment factor for these sites was determined to be 0.850.

Site	Site Type	Annual Mean	Period Mean	Ratio
Stonehaven 3N	Urban Background	13.1	14.75	0.887
Stonehaven 6N	Urban Background	12.2	13.5	0.901
Inverurie 2N	Urban Background	12.9	15.5	0.833
Inverurie 3N	Urban Background	15.2	19.75	0.769
Inverurie 4N	Urban Background	12.9	15	0.861
			Average	0.850

Sites IV3a gathered data over three months commencing October 2009. The table below demonstrates the determination of the period adjustment factor applied to the data from this site to estimate the annual mean NO2 concentration. The period adjustment factor for this site was determined to be 0.765.

Site	Site Type	Annual Mean	Period Mean	Ratio
Stonehaven 3N	Urban Background	13.1	16	0.818
Stonehaven 6N	Urban Background	12.2	15	0.811
Inverurie 2N	Urban Background	12.9	17.33	0.745
Inverurie 3N	Urban Background	15.2	23	0.660
Inverurie 4N	Urban Background	12.9	16.33	0.790
			Average	0.765

Sites RC1, RC2, RC3 and RC4 gathered data over five months commencing August 2009. The table below demonstrates the determination of the period adjustment factor applied to the data from this site to estimate the annual mean NO2 concentration. The period adjustment factor for this site was determined to be 0.932.

Site	Site Type	Annual Mean	Period Mean	Ratio
Stonehaven 3N	Urban Background	13.1	13.6	0.962
Stonehaven 6N	Urban Background	12.2	12.6	0.966
Inverurie 2N	Urban Background	12.9	14	0.922
Inverurie 3N	Urban Background	15.2	17.6	0.863
Inverurie 4N	Urban Background	12.9	13.6	0.949
			Average	0.932

QA/QC of automatic monitoring

The AURN sites in Highland are operated for DEFRA by Bureau Veritas with QA/QC provided by AEA.

QA/QC of diffusion tube monitoring

Gradko have supplied the following QA/QC statement:

Supply and Analysis of Nitrogen Dioxide (NO_2) Diffusion Tubes

Analysis of the NO_2 diffusion tubes is carried out using ion chromatography techniques in accordance with Gradko International Ltd U.K.A.S. accredited (ISO/IEC 17025) internal laboratory procedure GLM 7, which is a recommended UV spectrophotometric method.
Reporting of the NO_2 analysis results is sent to electronically to each authority in PDF format or if requested EXEL format. The report is issued within 10 working days from receipt of the exposed diffusion tubes to the Gradko Laboratory.

Quality Assurance: The laboratory has a fully documented Quality Management System, which has been assessed and accredited by U.K.A. S. (Accreditation No. 2187). A copy of the Quality Manual Contents Index is available on request.

Quality Control Procedures: All tube components are maintained in a high state of cleanliness. New absorbent is prepared by the Laboratory and checked for levels of nitrogen dioxide.
The diffusion tubes are prepared in a dedicated clean laboratory and stored under refrigerated conditions to maintain stability. A sample of each batch of tubes prepared is checked by the analyst for blank levels. If the tubes are stored for more than one week, a further sample is taken and checked for any increases in blank levels. If the levels reach a pre-determined value, the batch of tubes is discarded
Analytical Quality Control Procedures are implemented by the use of internal standards checks using certified standards from two different sources, and the use of external proficiency schemes such as WASP Inter- Comparison Project and NETCEN which are administered by the UK Health & Safety Laboratory.

Gradko performance on the WASP Inter-comparison Project Rounds 103-107 was described as "good".

Tube Exposure Procedure

The Highland Council exposes diffusion tubes according to the method described in "Passive Diffusion Air Monitors – Instruction Manual for Exposure and Location" by Gradko International Ltd. Guidance is also found in "Diffusion Tubes for Ambient NO2 Monitoring: Practical Guidance" by AEA for DEFRA.

Appendix B: Data

Nitrogen dioxide diffusion tube raw monthly data for all sites

Month	Site										
	IV1	IV2	IV3a	IV3b	IV4a	IV4b	IV4c	RC1	RC2	RC3	RC4
JAN					34.69	24.47	37.03				
FEB					24.75	34.11	14.57				
MAR					23.74	29.03	26.26				
APR					27.44	25.85	26.93				
MAY					23.97	21.61	20.25				
JUN					16.28	14.56	14.05				
JUL					20.27	17.72	16.49				
AUG					18.89	22.61	14.63	12.11	22.00	3.55	5.00
SEP	19.20	20.55		25.62	23.21	18.38	16.14	20.44	35.19	5.72	7.91
OCT	26.10	32.61	45.71	39.98	30.99	30.15	30.08	27.15	42.37	10.76	13.70
NOV	32.31	38.83	55.55	44.93	38.69	35.94	35.01	32.47	48.55	16.01	19.15
DEC	39.24	42.80	53.57	49.71	42.19	40.21	33.98	44.40	44.63	16.38	24.15