

Air Quality Progress Report and Detailed Assessment for *Midlothian Council*

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

Completed July 2010

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Executive Summary

Midlothian Council has carried out a review of air quality within Midlothian which fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents.

The report sets out the results of air quality monitoring carried out by Midlothian Council and considers the potential impacts from a range of sources such as road traffic and other transport emissions, industrial processes, commercial and domestic fuel use and fugitive emission sources.

It was found that there were no new issues except the commissioning of a new small scale hazardous waste incinerator at Pentland Science Park, Moredun. The impact of this is not likely to be significant and will be considered and reported in Midlothian Council's 2011 Progress Report if necessary.

Some measurements of nitrogen dioxide were reported as being above the annual mean objective at locations adjacent to the A68 in Dalkeith in 2008. The A68 bypass opened in October 2008 and early indications reported in the Updating and Screening Assessment 2009 showed that nitrogen dioxide concentrations had decreased significantly. The full year's data up to end of 2009 confirms this trend.

In addition, some sites in Dalkeith were not representative of exposure locations. Midlothian Council implemented some changes to the existing nitrogen dioxide diffusion tube monitoring locations effective from the February 2009 monitoring period to take account of this issue.

The AQMA at Pathhead was declared based on a predicted exceedence of 2010 PM₁₀ levels at Pathhead. The annual mean concentration of PM₁₀ measured by the TEOM and Partisol during 2009 was 17.0 µg/m³ and 17.2 µg/m³ respectively. Both measurements indicate that the concentration of PM₁₀ within the Pathhead AQMA do not exceed the air quality objective. Should monitoring for the year 2010 demonstrate that PM₁₀ levels are stable or are continuing to fall then consideration will be given to revoking the AQMA at the end of 2010. On this basis, an Action Plan is not considered necessary for Pathhead at this stage. However, this will be reviewed at the end of 2010 in conjunction with the Scottish Government and SEPA. A Further Assessment is however required and will be submitted separately.

Bonnyrigg High Street had been identified as a busy narrow congested street in 2008. As a result, additional diffusion tubes were deployed in this area to investigate potentially high concentrations of nitrogen dioxide and to be reported in this Detailed Assessment. The results of the Detailed Assessment indicate that nitrogen dioxide levels at locations close to the road network in the centre of Bonnyrigg are within the air quality objective by some margin. No further assessment is required at this time.

The Further Assessment is currently being finalised by Midlothian Council in relation to the AQMA with regards to PM₁₀ levels at Pathhead. The information from the gravimetric monitoring system will help inform a decision as to whether the AQMA should be confirmed or revoked. As the measured levels from the TEOM remain close to the annual average air quality objective it is proposed to continue monitoring PM₁₀ levels at Pathhead.

The next course of action for Midlothian Council in the Review and Assessment process is summarised as:

- Submit a Progress Report by 30 April 2011

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1 Introduction

1.1 Description of Local Authority Area

Despite being relatively small in size, Midlothian occupies a key location on the southern boundary of Scotland's capital. All of Midlothian's main centres of population lie within 30 minutes drive from Edinburgh, while Dalkeith is only 6 miles from the city centre. Midlothian comprises a number of small and medium-sized towns, together with many villages and hamlets and it is not dominated by any single centre. Penicuik is the largest town with a population of around 17,000, followed in size by Bonnyrigg and Dalkeith with populations of about 14,000 and 11,000 respectively. Loanhead, Gorebridge, Mayfield and Newtongrange are smaller settlements. A schematic map of Midlothian showing villages, towns and roads within the district is shown in Figure 1.

Midlothian is largely a countryside setting. The area stretches from the Pentland Hills to the Moorfoots and Lammermuirs, and comprises a gently sloping plain, much of it intensively farmed, rising to moorland with upland country beyond. There are deeply incised river gorges of the Esk and Tyne with dense natural woodland. Much of this landscape is protected by policy designations such as the Green Belt.

There are no large industrial processes in Midlothian and the main issues with regards to air quality are due to road traffic emissions, particularly in the busy town and village centres where congestion occurs. Another main issue is domestic solid fuel combustion due to the rural setting of Midlothian and limited mains gas supply to many villages. There are also a number of open cast coal mining and landfill sites in Midlothian.

1.2 Purpose of 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 and provide information on new monitoring results and new developments which could affect air quality in the council area.

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.

This report also contains the results of the Detailed Assessment of nitrogen dioxide in Bonnyrigg.

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, 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			Date to be achieved by
	Concentration	Measured as	
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 mg/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 (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
	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	40 $\mu\text{g}/\text{m}^3$ 18 $\mu\text{g}/\text{m}^3$	Annual mean Annual mean	31.12.2004 31.12.2010
Sulphur dioxide	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
	266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

1.4.1 First Round of Review and Assessment, 1998 – 2001

The assessment of local air quality was undertaken initially as a three stage process using increasingly detailed levels of assessment. Midlothian Council has previously completed Stages 1 to 3 of the first round of the Review and Assessment process.

The Stage 1 report concluded that further assessment of nitrogen dioxide, PM₁₀, sulphur dioxide and lead was required due to emissions from traffic, industrial and domestic sources. The Stage 2 report concluded that no further assessment was required for PM₁₀, sulphur dioxide and lead. A more detailed assessment of nitrogen dioxide was recommended at Stage 3 for road traffic emissions in the centre of Dalkeith. On the basis of continuous analyser monitoring and dispersion modelling results, the Stage 3 report concluded that the air quality objectives for nitrogen dioxide were not at risk of being exceeded at sensitive receptor locations in Dalkeith centre and therefore the declaration of an air quality management area was not required.

1.4.2 Second Round of Review and Assessment, 2003 – 2005

Updating and Screening Assessment 2003

Following completion of reports for the first phase of Review and Assessment, there were potentially a number of issues that needed to be addressed in terms of changes to the sources and emissions of pollutants that may have affected ambient air quality in local authority areas. Furthermore, new policy developments and revisions to published guidance required consideration within the on-going assessment of air quality.

The updating and screening assessment was based on a checklist approach, whereby sources identified in the first round of Review and Assessment and any new or altered emissions sources were reviewed with regard to their current significance and any requirement for further, more detailed, assessment.

The Updating and Screening Assessment completed in early 2004 concluded that a Detailed Assessment was required for nitrogen dioxide and PM₁₀ levels due to road traffic emissions in Dalkeith centre. The screening assessment indicated that a survey of domestic fuel use was required for two villages in Midlothian; Cousland and Pathhead.

Detailed Assessment 2004

The Detailed Assessment report completed in 2005 by Midlothian Council concluded that PM₁₀ levels in Dalkeith centre would comply with the air quality objectives for the target years of 2004 and 2010. Nitrogen dioxide levels were also predicted not to exceed the relevant air quality objectives. However, further monitoring was recommended to provide more data of improved reliability. The updated results of this survey are set out in this report.

The survey of domestic fuel use in Cousland and Pathhead indicated a more detailed assessment of PM₁₀ and sulphur dioxide levels was required in Pathhead. Midlothian Council committed to carry out the monitoring in the winter period of September 2005 to March 2006. The results of the monitoring were incorporated into the next round (the third

round) of the review and assessment process (i.e. the Updating and Screening Assessment 2006).

Progress Report 2005

The Progress Report submitted in 2005, and updated in 2006, provided an update on local air quality issues in Midlothian and focused on the latest monitoring results and updates to industrial processes and developments. The report concluded that there were no areas of immediate concern. The proposed Dalkeith by-pass was anticipated to lead to a considerable decrease in pollution levels in the centre of Dalkeith. It was recommended that additional monitoring be undertaken to reinforce these findings in Dalkeith and also at the village of Pathhead following the recommendations in the Detailed Assessment 2004 report.

1.4.3 Third Round of Review and Assessment, 2006 – 2008

Updating and Screening Assessment 2006

The Updating and Screening Assessment completed in 2006 concluded that measured concentrations of PM₁₀ at Pathhead were above the 2010 annual mean objective value. As the monitoring period was less than one year, it was concluded that further monitoring be carried out and the results reported in a Detailed Assessment in 2007. Although it was concluded that there had been no significant changes with regards to emissions and measurements of all other substances, it was recommended that the existing monitoring programme be continued to confirm the trend in pollution levels.

Detailed Assessment 2007

The Detailed Assessment completed in 2007 focused on PM₁₀ levels in Pathhead due to domestic coal burning and road traffic emissions. The results of the monitoring campaign indicated that the levels of PM₁₀ are predicted to exceed the annual mean air quality objective by the target date of 2010. Further analysis was undertaken using dispersion modelling which confirmed the monitoring results. On this basis, Midlothian Council committed to declaring an AQMA in Pathhead.

The AQMA in Pathhead came into force on 30 April 2008 and covers the entire village as shown in Figure 2. Midlothian Council aims to carry out a Further Assessment to confirm the original assessment, calculate the improvement required and refine its knowledge of the sources of pollution. Midlothian Council is also committed to preparing an Air Quality Action Plan, as necessary, once the Further Assessment is completed.

Progress Report 2008

The Progress Report submitted in 2008, provided an update on local air quality issues in Midlothian and focused on the latest monitoring results and updates to industrial processes and developments. The monitoring data confirmed the declaration of the AQMA at Pathhead. Some diffusion tube measurements at locations in Dalkeith were above the annual mean nitrogen dioxide objective. However, these locations were not representative of long term human exposure locations. Midlothian Council committed to reviewing the diffusion tube monitoring locations and considering whether the survey also needs to be expanded to cover Loanhead and Bonnyrigg, where increased traffic congestion has occurred. Some minor changes to industrial processes and plans for developments such as Park and Rides, a new town and re-opening of a rail link were identified. It was concluded that a Detailed Assessment was not required.

1.4.4 Fourth Round of Review and Assessment, 2006 – 2008**Air Quality Update Screening and Assessment 2009**

The Updating and Screening Assessment completed in 2009 concluded that measured concentrations of PM₁₀ at Pathhead in 2008 complied with the annual mean and 24-hour mean air quality objectives for 2004 but the annual mean concentration of 19.6 µg/m³ was above the 2010 annual mean objective. When using the approach set out in Box 2.2 of LAQM.TG(09) (Ref.1) the predicted concentration for 2010 was 18.4 µg/m³ and therefore above the annual mean objective. The 2009 Updating and Screening Assessment concluded that the air quality objective for PM₁₀ was forecast to be exceeded by a small margin in 2010. A gravimetric Partisol sampler was installed at Pathhead in early 2009 and the gravimetric results would be used to confirm if the 2010 annual mean objective would be exceeded in Pathhead.

Although measurements of nitrogen dioxide were above the annual mean objective value at three locations in Dalkeith, the opening of the Dalkeith Bypass in September 2008 (during the measurement period) was expected to reduce nitrogen dioxide concentrations in future years to below the objective value. This was demonstrated by comparing the period of measurement subsequent to the bypass opening with the same period in previous years.

It was identified that concentrations of nitrogen dioxide in the High Street, Bonnyrigg required a Detailed Assessment due to the identification of a narrow congested street with more than 5,000 vehicles per day. Additional monitoring has been carried out during 2009 in Bonnyrigg to inform the Detailed Assessment.

No issues were identified with regard to the other aspects addressed in the Updating and Screening Assessment. Although it was concluded that there had been no significant changes with regards to emissions and measurements of all other substances, it was recommended that the existing monitoring programme be continued to confirm the trend in pollution levels.

Copies of the previous LAQM reports are available on request to Midlothian Council

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

Midlothian Council continues to measure levels of nitrogen dioxide, PM₁₀ and sulphur dioxide at the continuous monitoring station in Dalkeith centre and PM₁₀ and sulphur dioxide at the continuous monitoring station in Pathhead. Both of these monitoring stations are classified as roadside locations. The Dalkeith station is within 5m of the kerb of the High Street (A6094), close to the junction with South Street (A68). The Pathhead station is approximately 1 – 2m from the kerb of Main Street (A68). A Partisol gravimetric sampler was installed at the Pathhead monitoring station location in March 2009 and this was operated simultaneously with the existing TEOM analyser.

A summary of the Quality Assurance/Quality Control (QA/QC) procedures and the data management arrangements is provided in Appendix A.

The Council also measures nitrogen dioxide levels using passive diffusion tubes at several locations across Midlothian. These locations are in the towns of Dalkeith and Penicuik and the village of Pathhead. Monitoring was undertaken from 6 new sites in 2009, including two in Bonnyrigg and three in Loanhead. The location of the monitoring stations and diffusion tube measurements are shown in Figures 3 – 7.

No monitoring of other pollutants has been undertaken in Midlothian. The previous local air quality management reports showed that the air quality objectives for other specified pollutants are unlikely to be exceeded and on this basis no monitoring for other pollutants was considered necessary.

2.1.1 Automatic Monitoring Sites

Midlothian Council operates two automatic monitoring stations. One station is located in Dalkeith town centre and the other station is located in the centre of Pathhead village. Further details of the monitoring stations are provided in Table 2.1. The location of the Dalkeith Centre and Pathhead monitoring stations are shown in Figure 3 and 4, respectively.

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure?	Distance to kerb of nearest road	Worst-case location?
Dalkeith Centre	Roadside	X 333153 Y 667298	NO ₂ PM ₁₀ (TEOM) SO ₂	N	N (>10m)	3m	Y
Pathhead	Roadside	X 339585 Y 664203	PM ₁₀ (TEOM) PM ₁₀ (Grav.) SO ₂	Y *	Y (4m)	1m	Y

* AQMA declared for PM₁₀

The maintenance of the two monitoring stations at Dalkeith and Pathhead is carried out by Casella Monitor. This involves two routine services per year and also provision for emergency callouts. Casella Monitor also has the data management contract and collects all the raw data from each of the monitoring stations. The data are checked to ensure that the data is being recorded correctly, the analysers are stable and there are no faults with the

analysers. The data is then re-scaled by Casella Monitor using the results of calibration and span checks which are carried out by the analyser automatically or carried out manually by Midlothian Council every two weeks. The manual checks carried out by Midlothian Council include a span check in which a gas of known concentration is passed through the analysers and the measured concentrations and other operating parameters are recorded by the operator and sent to Casella Monitor. The raw and re-scaled data are sent by Casella Monitor to Midlothian Council at regular periods. The Partisol filter changes are carried out by Midlothian Council on a fortnightly basis and the analysis for weight gain is carried out by Environmental Scientifics Group.

Further work has also been carried out by AEA Technology with regards to the QA/QC procedures for the Dalkeith and Pathhead monitoring stations to satisfy the requirements in LAQM.TG(09) (Ref. 1) and include the stations on the Air Quality in Scotland website (www.scottishairquality.co.uk). The work includes 6-monthly audits and servicing, and data ratification. Audits of the monitoring site consisted of a number of performance checks to identify any faults with the equipment. The calibration cylinder was also checked against another gas standard in order to confirm the gas concentration. Any identified faults were forwarded on to the service unit for repair. The final stage of the QA/QC process was to ratify the data. During ratification, all calibration, audit and service data are collated and the data is appropriately scaled. Any suspect data identified are deleted therefore ensuring that the data are of a high quality.

PM₁₀ is measured at both monitoring stations using Tapered Element Oscillating Microbalance (TEOM) units. The concentrations recorded during 2009 from these analysers were corrected using the Volatile Correction Model (VCM) by AEA Technology as part of the data management for the Air Quality in Scotland Website (Ref. 2). The model allows TEOM measurements to be corrected for the loss of volatile components that occur due to the high sampling temperatures employed by the TEOM instrument. The corrected measurements are considered to be equivalent to the gravimetric reference equivalent for PM₁₀ measurements. This method was also utilised by Casella Monitor under the data management contract. However, the VCM data provided by AEA Technology was utilised for this report.

For TEOM measurements carried out before 2008 at Dalkeith and Pathhead, correction factors of 1.14 and 1.3 were utilised to modify the measured concentrations following Scottish Government guidance. This method was not considered to be equivalent to the gravimetric reference equivalent.

2.1.2 Non-Automatic Monitoring

Monitoring of nitrogen dioxide using passive diffusion tubes was undertaken at 14 separate locations in Midlothian until end January 2009 at which time the number of passive diffusion tubes increased to 20. The diffusion tube locations are shown in Figures 3 to 7. The diffusion tube locations are described in Table 2.2. As locations J2 and ED1 were not directly representative of relevant exposure locations, Midlothian Council committed to reviewing these monitoring locations by the end of 2008. It is confirmed that ED1 was moved in February 2009, as a result of the review, and measured concentrations reported for 2009 onwards are based on the updated locations. On further assessment a better location could not be found for J2 and therefore this tube location was not altered.

Table 2.2 Details of Nitrogen Dioxide Diffusion Tube Monitoring Locations

Site Name	Location	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA ?	Relevant Exposure?	Distance to kerb of nearest road	Worst-case Location ?
BR1	Bonnyrigg	Roadside	X 330890 Y 665222	NO ₂	N	Y (0m)	2.5 m	Y
BR2	Bonnyrigg	Roadside	X 330973 Y 665213	NO ₂	N	Y (0m)	2 m	Y
J1 (1, 2 and 3) *	Dalkeith	Roadside	X 333153 Y 667298	NO ₂	N	N (>10m)	3 m	N/A
J2	Dalkeith	Roadside	X 333180 Y 667283	NO ₂	N	N (>10m)	0.5 m	N/A
E1 *	Dalkeith	Urban Background	X 333374 Y 667222	NO ₂	N	Y (5m)	N/A	N/A
BD1	Dalkeith	Roadside	X 333049 Y 667177	NO ₂	N	Y (1m)	1 m	Y
ED1	Dalkeith	Roadside	X 333213 Y 667363	NO ₂	N	Y (1m)	1 m	Y
ED2	Dalkeith	Roadside	X 332995 Y 667118	NO ₂	N	Y (0.5m)	2 m	Y
X1	Dalkeith	Roadside	X 332963 Y 667389	NO ₂	N	Y (1.5m)	1.5 m	Y
HD1	Dalkeith	Roadside	X 333311 Y 667457	NO ₂	N	Y (2m)	1.5 m	Y
ND1	Dalkeith	Roadside	X 333409 Y 667057	NO ₂	N	Y (2m)	1.5 m	Y
DL1	Dalkeith	Roadside	X 333250 Y 667074	NO ₂	N	Y (0m)	2 m	Y
LH1	Loanhead	Roadside	X 328232 Y 665580	NO ₂	N	Y (1.5m)	0.5 m	Y
SN1	Loanhead	Roadside	X 327142 Y 666337	NO ₂	N	Y (3m)	0 m	Y
SN2	Loanhead	Roadside	X 327262 Y 666588	NO ₂	N	Y (0m)	3.5 m	Y
P1 *	Penicuik	Urban Background	X 323146 Y 659818	NO ₂	N	Y (0.5m)	N/A	N/A
P2 *	Penicuik	Roadside	X 323677 Y 661000	NO ₂	N	Y (2m)	2.5 m	Y
P3	Penicuik	Roadside	X 323551 Y 659725	NO ₂	N	Y (0.5m)	1.5 m	Y
PD1	Pathhead	Roadside	X 339601 Y 664172	NO ₂	Y	Y (3.5m)	1.5 m	Y
PD2	Pathhead	Roadside	X 339450 Y 664310	NO ₂	Y	Y (3.5m)	2 m	Y

* tube results sent monthly to Netcen as part of the Nitrogen Dioxide Diffusion Tube Network reporting

The nitrogen dioxide diffusion tubes are placed at each location by Midlothian Council for a period of approximately one month, based on a pre-arranged timetable provided by Netcen. At the end of each monitoring period, the exposed tubes are replaced with new tubes and the exposed tubes are sent to the laboratory for analysis. The analysis is carried out by Edinburgh Scientific Services (ESS), part of the City of Edinburgh Council. ESS has confirmed that the procedures set out in the Harmonisation Practical Guidance are followed during the analysis. The laboratory is UKAS accredited for the analysis and also participates in the Workplace Analysis Scheme for Proficiency (WASP) scheme. ESS has reported that the results from the WASP scheme confirm that the laboratory is performing satisfactorily and the bias has been close to zero for several years. The laboratory uses the 50% v/v

triethanolamine (TEA) in acetone method where the adsorbent pads are dipped into this solution, dried and then inserted into the acrylic diffusion tubes. All exposure times and dates are recorded by Midlothian Council and sent to the laboratory with the exposed tubes. Midlothian Council also sends one unexposed tube with each batch to check that there has been no contamination during the analysis.

2.2 Comparison of Monitoring Results with Air Quality Objectives

This section sets out the results of all the monitoring carried out by Midlothian Council in 2009 and, where relevant, provides results from previous years to identify any trends.

2.2.1 Nitrogen Dioxide

The results of the nitrogen dioxide monitoring at the automatic station in Dalkeith and diffusion tube locations across Midlothian are presented below.

Automatic Monitoring Data

The results of the automatic monitoring are set out in Table 2.3a and Table 2.3b.

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

Site ID	Location	Within AQMA?	Data capture	Annual mean concentration 2009 ($\mu\text{g}/\text{m}^3$)
Dalkeith Centre	Dalkeith	N	99.1%	21.4

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

Site ID	Location	Within AQMA?	Data capture	Number of exceedences of hourly mean 2009 ($200 \mu\text{g}/\text{m}^3$)
Dalkeith Centre	Dalkeith	N	99.1%	0

The annual mean concentrations and hourly exceedences recorded by the continuous monitoring station from 2004 – 2009 are shown in Table 2.3c.

Table 2.3c Results of Automatic Monitoring for Nitrogen Dioxide at Dalkeith Centre 2004 – 2009

Parameter	Unit	Value					
		2004	2005	2006	2007	2008	2009
Annual Mean	$\mu\text{g}/\text{m}^3$	24	26	26	26	28	21
Number of exceedences of hourly mean ($200 \mu\text{g}/\text{m}^3$)	Days	0	0	0	0	0	0

The results presented in Table 2.3c indicate that, at the monitoring station, the annual mean concentrations of nitrogen dioxide show an increasing trend since 2004 and a sharp decrease in 2009. This increase from 2004 – 2008 is consistent with the trend recorded at the Edinburgh St Leonards monitoring station (the closest station with available data) over the same period. The drop in 2009 is attributed to the opening of the Dalkeith Bypass.

Diffusion Tube Monitoring Data

The diffusion tube method is open to a degree of uncertainty in the method and, as such, the results of the survey should be treated with some caution and used as indicators of nitrogen dioxide levels only. Bias correction methods have been developed to reduce the error in the results of the diffusion tube survey. The most robust of these methods is co-location of

diffusion tubes with a continuous monitor to calculate the tube bias. For this purpose, Midlothian Council has co-located triplicate diffusion tubes at the Dalkeith Centre continuous monitoring station since 2005. The results of the co-location study in 2009 bias adjustment data and calculations are shown in Appendix A. The study resulted in a bias adjustment factor of 0.78. This means that the diffusion tube results are significantly higher than the continuous monitoring results. Overall, the tube precision for the co-location study was calculated as poor. The bias adjustment factor reported in the Spreadsheet of Bias Adjustment Factors (version 03/10) produced by Defra and the Devolved Administrations (Ref. 3) for this laboratory and analysis method is 0.93. This is based on a nearby co-location study undertaken by West Lothian Council at a roadside location measuring similar concentrations to those measured in Dalkeith. The precision of this survey was reported as good. As Midlothian's bias adjustment factor was significantly lower than this nearby bias adjustment factor and the tube precision was poor, it was decided to use the bias adjustment factor from the West Lothian study of 0.93.

The bias adjustment factor was applied to the diffusion tube results situated at roadside locations only as the co-location study is based on roadside measurements. Diffusion tubes located at urban background locations were not adjusted.

Table 2.4a Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture	Annual mean concentration 2009 ($\mu\text{g}/\text{m}^3$) Adjusted for bias *
J2	Dalkeith	N	92%	34.2
E1	Dalkeith	N	100%	13.3
BD1	Dalkeith	N	100%	33.9
ED1	Dalkeith	N	92%	37.1
ED2	Dalkeith	N	100%	27.8
X1	Dalkeith	N	83%	23.8
HD1	Dalkeith	N	100%	18.1
ND1	Dalkeith	N	83%	31.0
DL1	Dalkeith	N	83%	35.7
P1	Penicuik	N	100%	6.7
P2	Penicuik	N	100%	25.5
P3	Penicuik	N	100%	14.7
PD1	Pathhead	Y	100%	19.8
PD2	Pathhead	Y	100%	20.1
BR1	Bonnyrigg	N	92%	25.7
BR2	Bonnyrigg	N	92%	23.5
LH1	Loanhead	N	83%	25.2
SN1	Loanhead	N	67%	27.6
SN2	Loanhead	N	92%	28.2

* Bias adjustment factor of 0.93 applied to Roadside measurements

The results set out in Table 2.4a indicate that the measured concentrations of nitrogen dioxide are within the annual mean air quality objective.

The measured nitrogen dioxide concentrations reported in the 2009 Update and Screening Assessment were above the annual mean air quality objective of $40\mu\text{g}/\text{m}^3$ at three diffusion tube locations (ND1, J2 and ED1). All these tube locations are located adjacent to the A68 in Dalkeith and measured increasing concentrations of nitrogen dioxide since 2005 (see

Table 2.4b). The Dalkeith Bypass opened in September 2008 resulting in reduced numbers of vehicles travelling through Dalkeith town centre. Consequently, measured concentrations of nitrogen dioxide within Dalkeith town centre have significantly decreased as a result. All three locations meet the annual mean air quality objective based on the 2009 measurements.

Measurements of nitrogen dioxide will continue as normal to fully evaluate the effects of the Dalkeith Bypass, the new locations and wider trends in nitrogen dioxide concentrations. The annual mean concentrations will be assessed through the LAQM process. Further details on the trends and likely impact of the Dalkeith Bypass are set out in Table 2.4b.

Table 2.4b Results of Nitrogen Dioxide Diffusion Tubes 2004 – 2009

Site ID	Location	Annual mean concentration ($\mu\text{g}/\text{m}^3$)					
		Roadside measurements adjusted for bias					
		2004	2005	2006	2007	2008	2009
J2	Dalkeith	40.6	34.3	38.6	43.4	43.6	33.5
E1	Dalkeith	12.8	11.5	12.3	14.4	14.0	13.3
BD1	Dalkeith	38.1	30.3	41.0	40.8	37.6	33.9
ED1	Dalkeith	33.1	35.8	40.4	43.0	40.8	37.1*
ED2	Dalkeith	27.0	27.5	27.9	29.8	28.5	27.8
X1	Dalkeith	29.7	25.1	30.5	29.7	28.0	23.8
HD1	Dalkeith	18.2	16.4	17.9	19.8	18.2	18.1
ND1	Dalkeith	46.7	39.6	48.8	52.5	48.3	31.0
DL1	Dalkeith	N/A	N/A	N/A	N/A	N/A	35.7
P1	Penicuik	9.0	7.1	5.8	7.4	6.1	6.7
P2	Penicuik	22.3	22.6	28.6	27.0	23.8	25.5
P3	Penicuik	13.3	15.5	16.2	17.1	14.8	14.7
PD1	Pathhead	19.0	17.1	16.1	19.4	19.7	19.8
PD2	Pathhead	21.9	14.5	17.9	19.3	17.1	20.1
BR1	Bonnyrigg	N/A	N/A	N/A	N/A	N/A	25.7
BR2	Bonnyrigg	N/A	N/A	N/A	N/A	N/A	23.5
LH1	Loanhead	N/A	N/A	N/A	N/A	N/A	25.2
SN1	Loanhead	N/A	N/A	N/A	N/A	N/A	27.6
SN2	Loanhead	N/A	N/A	N/A	N/A	N/A	28.2

Sites marked N/A were new from February 2009

* diffusion tube location moved during 2009 (see Figure 3)

The results presented in Table 2.4b are presented graphically in Figure 8 to illustrate any trends. The results indicate that concentrations of nitrogen dioxide measured across Midlothian were either relatively constant or slightly increasing up to 2007 with a decrease in 2008 at most diffusion tube locations. The results set out in Table 2.4b indicate that there was a further decrease in concentrations in 2009 at diffusion tube locations in Dalkeith due to the opening of the Dalkeith Bypass.

The greatest reduction has been observed at diffusion tube location ND1 (where the highest concentration of nitrogen dioxide was previously recorded). This comparison is shown in Table 2.4c.

Table 2.4c Results of Nitrogen Dioxide Diffusion Tube ND1 for 2004 – 2009

Site ID	Location	Average concentration of NO ₂ (µg/m ³) Adjusted for bias					
		2004	2005	2006	2007	2008	2009
ND1	Dalkeith	46.7	39.6	48.8	52.5	48.3	31.0

2.2.2 PM₁₀

PM₁₀ levels are monitored at Dalkeith and Pathhead using a TEOM analyser. In March 2009, monitoring of PM₁₀ levels at Pathhead commenced using a Partisol gravimetric sampler. This allowed a more accurate determination of the PM₁₀ concentration for comparison to the air quality objectives which are based on a gravimetric technique. It also allowed additional analysis of the collected particulate material to provide information for source apportionment. The Partisol measurement results and additional analysis of the PM₁₀ fraction is reported in detail in the 2010 Further Assessment. Initial indications are that the Partisol concentration measured for the same period (March – December 2009) is similar to, but slightly higher than the TEOM concentration.

The results of the automatic monitoring using the TEOM analysers are set out in table 2.5a and Table 2.5b. The TEOM measurements were corrected by AEA Technology using the VCM correction method as discussed in Section 2.1.1.

Table 2.5a Results of PM₁₀ Automatic Monitoring: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for full calendar year 2009	Annual mean concentrations (µg/m ³)		
				2007	2008	2009
Dalkeith Centre	Dalkeith	N	94.6%	16.1	15.0	14.4
Pathhead	Pathhead	Y	99.3%	19.9	19.6	17.2

Table 2.5b Results of PM₁₀ Automatic Monitoring: Comparison with 24-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture for full calendar year 2009	Number of Exceedences of daily mean objective (50 µg/m ³)		
				2007	2008	2009
Dalkeith Centre	Dalkeith	N	95.1%	2	0	1
Pathhead	Pathhead	Y	99.5%	3	2	2

The results indicate that the measured concentrations of PM₁₀ at Dalkeith and Pathhead comply with the annual mean and 24-hour mean air quality objectives for 2004 and 2010.

The results from the Partisol gravimetric sampler are consistent with the TEOM results at Pathhead and if PM₁₀ levels stabilise or continue to fall it is unlikely that the 2010 annual mean objective will be exceeded at Pathhead. If a further years monitoring confirms this to be the case then the AQMA may need to be revoked.

2.2.3 Sulphur Dioxide

The results of the automatic monitoring are set out in Table 2.6.

Table 2.6 Results of SO₂ Automatic Monitoring: Comparison with Objectives

Site ID	Location	Within AQMA?	Data capture	Number of exceedences of		
				15-minute Objective (266 µg/m ³)	1-hour Objective (350 µg/m ³)	24-hour Objective (125 µg/m ³)
Dalkeith Centre	Dalkeith	N	96.5% - 98.9%	0	0	0
Pathhead	Pathhead	N	97.2% - 98.9%	0	0	0

The results indicate that the air quality objectives for sulphur dioxide are complied with at both monitoring stations.

2.2.4 Summary of Compliance with Air Quality Objectives

Summary

The continuous monitoring indicates that the concentrations of nitrogen dioxide, PM₁₀ and sulphur dioxide are below the relevant air quality objectives and therefore there is no need to proceed to a Detailed Assessment.

Proposed Further Monitoring

Midlothian Council will continue to monitor nitrogen dioxide, PM₁₀ and sulphur dioxide as described above. This information will be fed into the Progress Report 2011.

The council has completed an initial programme of gravimetric PM₁₀ monitoring in Pathhead and will continue this monitoring in 2010 / early 2011.

2.3 Detailed Assessment 2010

The Updating and Screening Assessment 2009 identified the need for a Detailed Assessment of nitrogen dioxide at Bonnyrigg due to the identification of a narrow congested street with more than 5,000 vehicles per day. Additional diffusion tube monitoring at relevant roadside locations has been carried out during 2009 in Bonnyrigg to inform the Detailed Assessment. The results set out in Section 2.2 indicate that the measured concentrations are significantly below the annual mean air quality objective. On that basis, no further assessment is required of nitrogen dioxide concentrations in Bonnyrigg at this time. Diffusion tube measurements will continue in Bonnyrigg and will continue to be assessed in future LAQM reports.

3 New Developments

New developments have the potential to affect air quality in a number of ways. This can include direct emissions to atmosphere from new industrial processes; changes in traffic flow, compositions and speeds associated with new residential and commercial developments; and changes in traffic flow brought about by alterations to road layouts or addition of new roads.

Within Midlothian, there have been some changes to industrial processes and new or planned developments. These are described below.

3.1 Industrial Processes

Information on any new or proposed installations or installations with significant increases in emissions was obtained from SEPA. The list of permitted installations in Midlothian is provided in Appendix B.

3.1.1 New processes

There is one facility, operated by Moredun Group at the Pentland Science Park which was granted a permit by SEPA under the PPC Regulations in December 2009 to operate a relatively small hazardous waste incinerator. This is unlikely to have any significant impact on local air quality due to the relatively small size of the process.

There is a new concrete batching plant planned at Butterfield. The Scottish Coal Company Ltd planning application for the Airfield Farm opencast coal mining site, as described in the Progress Report 2008, is still going through the planning process.

3.1.2 Future or Potential New processes

Auchencorth Moss open cast mine was granted a permit, this borders the two council boundaries (Borders / Midlothian). This facility is not operating as yet as it is scheduled to take over in part from the Newbigging open cast coal mine which is in Midlothian but still operational at present.

3.1.3 Substantially Varied Processes

There are no substantially varied processes in Midlothian.

3.2 Commercial and Residential Developments

The Midlothian Council Planning Division was consulted regarding new developments in Midlothian. As reported previously, the planned new town of Shawfair on the northern edge of Midlothian is the main residential development. This has not yet commenced construction.

There are no new relatively large housing or commercial developments in Midlothian.

3.3 Road and Rail Infrastructure Developments

There are currently no new roads being planned in Midlothian. The Waverley line which was described in the Progress Report 2008 has not yet commenced construction.

3.4 Vehicle Emission Testing

Midlothian Council, in conjunction with other councils, has continued to carry out free roadside vehicle emissions tests during 2009. The aim of the scheme is to give feedback to motorists on whether or not their vehicles meet the required emission limits and to educate and inform motorists about the importance of ensuring the vehicles they drive are well maintained and produce the minimum amount of pollutants. Advising drivers on possible causes for failing the test will allow them to have the necessary repairs and maintenance carried out which would potentially improve their vehicle's emissions of combustion products such as nitrogen dioxide and PM₁₀.

4 Conclusions and Proposed Actions

The conclusions and proposed actions from this Progress Report and Detailed Assessment are set out below:-

4.1 Progress Report

Monitoring inside the Pathhead AQMA

Monitoring of PM₁₀ was carried out in 2009 by the Pathhead automatic monitoring station. The results are below the 2010 annual mean objective value.

As part of the Further Assessment work carried out subsequent to the declaration of the AQMA, Midlothian Council installed a Partisol gravimetric sampler in early 2009 at Pathhead to enable a direct comparison of the measured concentrations to the 2010 objective. The results of this monitoring are reported in the Further Assessment.

The measured PM₁₀ concentration remains close to the 2010 objective and therefore it is proposed to retain the AQMA and continue to monitor trends throughout 2010 as this should provide further information as to whether this is part of a downward trend in PM₁₀ levels in Pathhead. This is discussed in more detail in the Further Assessment.

Monitoring of sulphur dioxide was also carried out by the Pathhead automatic monitoring station. The results are well below the air quality objective values. However, the measured concentrations were higher than those recorded in Dalkeith, indicating that domestic solid fuel combustion is contributing to sulphur dioxide (and PM₁₀) concentrations at the monitoring station location. On this basis, measurements of sulphur dioxide will continue to input into the LAQM assessment process although no detailed assessment is required.

Monitoring outside the Pathhead AQMA

Monitoring of nitrogen dioxide, PM₁₀ and sulphur dioxide was carried out at the Dalkeith Centre automatic monitoring station. The results were all within the relevant air quality objectives.

Monitoring of nitrogen dioxide was carried out at several locations across Midlothian using diffusion tubes. The results indicated that concentrations measured adjacent to busy roads at all locations are within the annual mean air quality objective. The results indicate that there has been a measurable decrease in nitrogen dioxide concentrations at some of the locations within Dalkeith adjacent to the A68. Measured concentrations at some of these locations in 2008 were above the annual mean objective. The decrease is due to the opening of the Dalkeith Bypass which is diverting traffic around the centre of Dalkeith. Some other changes to the existing nitrogen dioxide diffusion tube monitoring survey were implemented by Midlothian Council for the 2009 monitoring period.

New Developments

No significant issues were identified in relation to industrial sources or commercial/residential developments.

4.2 Detailed Assessment

The results of the Detailed Assessment indicate that nitrogen dioxide levels at locations close to the road network in the centre of Bonnyrigg are within the air quality objective by some margin. No further assessment is required at this time.

4.4 Proposed Actions

The Further Assessment is currently being finalised by Midlothian Council in relation to the AQMA with regards to PM₁₀ levels at Pathhead. The information from the gravimetric monitoring system will help inform a decision as to whether the AQMA should be confirmed or revoked. As the measured levels from the TEOM remain close to the annual average air quality objective it is proposed to continue monitoring PM₁₀ levels at Pathhead.

The next course of action for Midlothian Council in the Review and Assessment process is summarised as:

- Submit Progress Report by the end of April 2011.

5 References

1. Defra and the Devolved Administrations, Local Air Quality Management, Technical Guidance LAQM.TG(09), February 2009.
2. Defra and the Devolved Administrations, Volatile Correction Model, July 2008, correction on 2009 data carried out by AEA Technology under data management contract to the Scottish Government, 2010.
3. Defra and the Devolved Administrations, Spreadsheet of Bias Adjustment Factors, version 03/010, accessed at www.uwe.ac.uk/aqm, May 2010.

Appendices

Appendix A: QA/QC Data

Appendix B: Industrial Processes in Midlothian

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

The diffusion tubes are analysed by Edinburgh Scientific Services using the 50% triethanolamine (TEA) in acetone method. The bias adjustment factor for this laboratory and method for the year 2009 listed in the Spreadsheet of Bias Adjustment Factors v.03/10 (Ref. 3) is 0.93. This is based on a co-location study at a Roadside site carried out by West Lothian Council.

Factor from Local Co-location Studies (if available)

A local co-location study was carried out by Midlothian Council. Three diffusion tubes are located adjacent to the inlet of the Dalkeith Centre automatic monitoring station – tubes J1 (1, 2 and 3) as detailed in Table 2.2. The bias adjustment factor for 2009 was calculated as 0.78 using this study. The bias adjustment calculations are shown below.

Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	07/01/2009	04/02/2009	32.0	26.0	35.0	31	4.6	15	11.4
2	04/02/2009	04/03/2009	33.0	28.0	31.0	31	2.5	8	6.3
3	04/03/2009	01/04/2009	11.0	24.0	16.0	17	6.6	39	16.3
4	01/04/2009	29/04/2009	23.0	26.0	31.0	27	4.0	15	10.0
5	29/04/2009	03/06/2009	27.4	22.5	29.3	26	3.5	13	8.7
6	03/06/2009	01/07/2009	21.6	29.8	25.5	26	4.1	16	10.2
7	01/07/2009	29/07/2009	24.2	20.7	23.5	23	1.9	8	4.6
8	29/07/2009	02/09/2009	20.1	18.2	17.7	19	1.3	7	3.1
9	02/09/2009	30/09/2009	20.8	28.5	17.5	22	5.6	25	14.0
10	30/09/2009	04/11/2009	32.9	27.7	31.0	31	2.6	9	6.5
11	04/11/2009	02/12/2009	28.8	31.6	50.0	37	11.5	31	28.6
12	02/12/2009	30/12/2009	39.5	35.2	39.9	38	2.6	7	6.5
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
27	100	Good	Good
27.5	100	Good	Good
21.3	99	Poor Precision	Good
23.2	100	Good	Good
15	97	Good	Good
17	99	Good	Good
16	98	Good	Good
13	99	Good	Good
16	99	Poor Precision	Good
23	99	Good	Good
24	100	Poor Precision	Good
33.4	99	Good	Good

Overall survey -->

Poor precision	Good Overall DC
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(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	

Precision		9 out of 12 periods have a CV smaller than 20%	
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Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 9 periods of data	
Bias factor A	0.78 (0.7 - 0.89)
Bias B	28% (13% - 44%)
Diffusion Tubes Mean:	28 μgm^{-3}
Mean CV (Precision):	11 caution
Automatic Mean:	22 μgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	22 (19 - 25) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.78 (0.7 - 0.9)
Bias B	27% (11% - 44%)
Diffusion Tubes Mean:	27 μgm^{-3}
Mean CV (Precision):	16 caution
Automatic Mean:	21 μgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	21 (19 - 24) μgm^{-3}

B

Bias factor A

Without CV>20% With all data

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Version 03 - November 2006

Discussion of Choice of Factor to Use

The results of the diffusion tube measurements were adjusted using the bias adjustment factor derived from the nearby west Lothian study (the factor of 0.93). This was chosen as the calculated bias from Midlothian Council's own co-location was significantly lower than this nearby study and the diffusion tube precision from the Midlothian study was poor.

In any case, there is no real impact of using the local bias factor as the corrected bias results are below the air quality objective for all monitoring sites in Midlothian for either bias correction although the results would be lower if the Midlothian co-location derived bias adjustment factor was applied.

PM₁₀ Monitoring Adjustment

The TEOM PM₁₀ measurements for the Dalkeith Centre and Pathhead automatic monitoring stations were adjusted using the Volatile Correction Method (VCM) as recommended in LAQM.TG(09). These adjustments were carried out by AEA Technology.

A description of the data correction method used by AEA Technology for the 2009 data period was provided by AEA Technology and is set out below.

Introduction

AEA has been funded by The Scottish Government to provide Volatile Correction Model (VCM) corrected TEOM (Tapered Element Oscillating Microbalance) data to Local Authorities under the Scottish Air Quality Database and Website (SAQD) project.

The VCM uses purge (volatile) particulate matter measurements provided by FDMS (Filter Dynamics Measurement System) instruments located within 130 km of the TEOM in question to assess the loss of particulate matter (PM₁₀) from the TEOM. The TEOM measurements are then corrected to ambient pressure and temperature using meteorological data from met monitoring sites within 260 km of the TEOM. The volatile fraction is then added back onto the TEOM measurements to give Gravimetric Equivalent mass concentrations.

This is a short summary outlining the method used by AEA for correcting the 2009 Scottish TEOM data in the Scottish database.

Method

The following data have been used as inputs to the VCM:

- Hourly average temperatures (°C)
- Hourly average pressures (mbar)
- Hourly average TEOM concentrations ($\mu\text{g m}^{-3}$)
- Hourly average FDMS purge concentrations ($\mu\text{g m}^{-3}$)

Hourly average temperatures from Edinburgh Airport and pressures measurements from Edinburgh Gogarbank meteorological monitoring stations were used in the model. These sites were selected as a good representation the weather in the central belt of Scotland and are also located approximately 150 km from Aberdeen, which is within the specified 260 km limit.

Hourly average purge measurements from all Scottish FDMS monitoring sites within the Scottish Government-run network (SAQD) and the national network (AURN) were used for the correction. Table 1 lists the sites used for correcting hourly TEOM data from Central Scotland and Aberdeen. A total of 4 FDMS sites were used for correcting Aberdeen TEOM data and 24 FDMS sites used for correcting data from TEOM sites located in the central belt of Scotland.

Any outliers in the FDMS purge measurements were identified using Grubbs' Test¹ on daily average data. All hourly data within a day identified as an outlier were then removed from the data set and the average of each hourly purge measurement from the FDMS sites was calculated and used in the VCM calculations.

¹ Grubbs' Test is a statistical method for identifying outliers within a dataset. For more information visit the Engineering Statistics Handbook at:

<http://www.itl.nist.gov/div898/handbook/eda/section3/eda35h.htm>

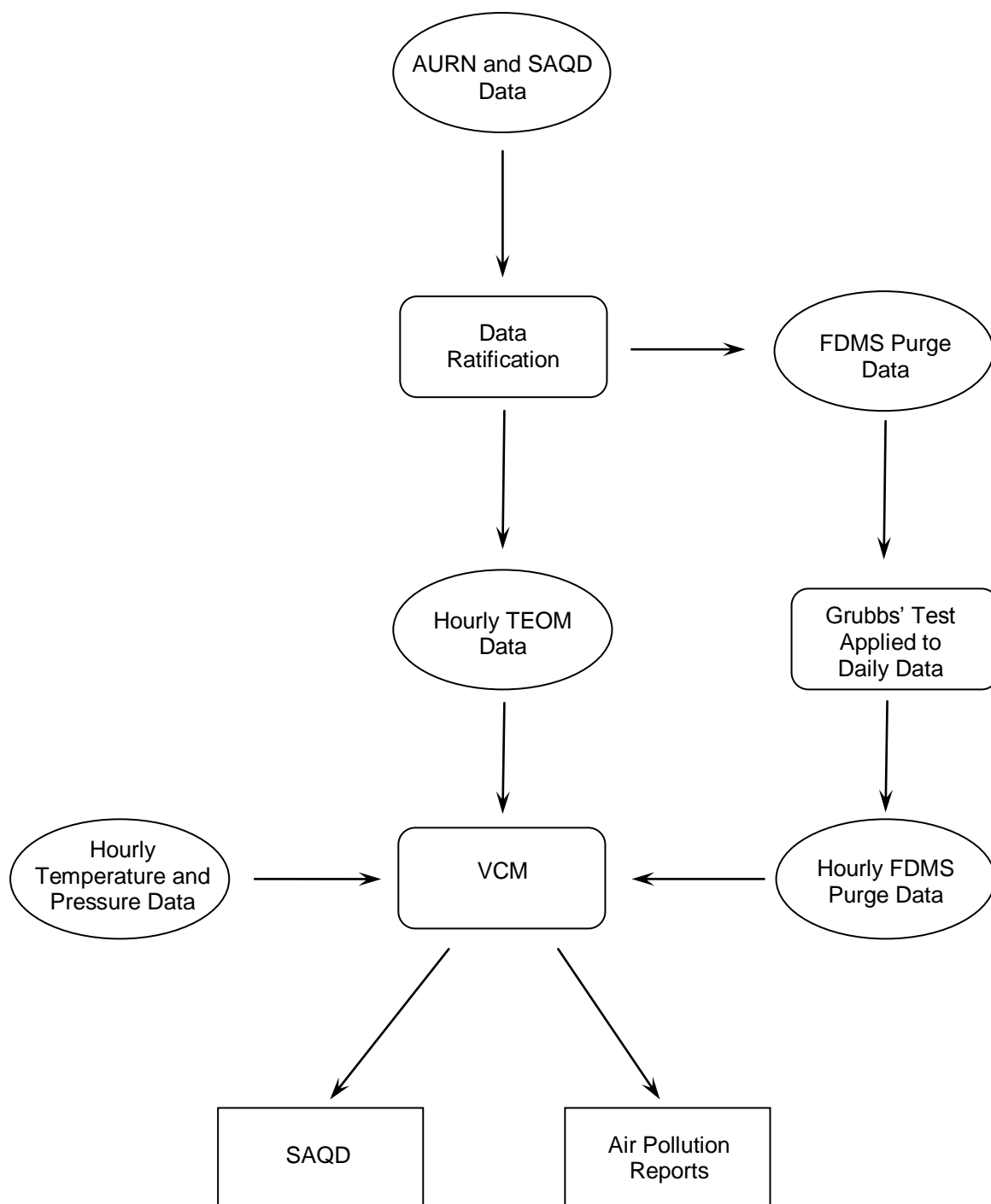
Table 1 FDMS Monitoring Sites used in VCM Correcting TEOM Data from Aberdeen and Central Scotland Monitoring Sites

TEOM Locations	FDMS Sites used in VCM	Monitoring Network
Aberdeen	Aberdeen PM ₁₀	AURN
	Aberdeen PM _{2.5}	AURN
	Angus Forfar	SAQD
	Fife Cupar	SAQD
Central Scotland	Angus Forfar	SAQD
	Auchencorth Moss PM ₁₀	AURN
	Auchencorth Moss PM _{2.5}	AURN
	East Dunbartonshire Kirkintilloch	SAQD
	East Renfrewshire Sheddens	SAQD
	Edinburgh PM ₁₀	AURN
	Edinburgh PM _{2.5}	AURN
	Fife Cupar	SAQD
	Fife Rosyth	SAQD
	Glasgow Abercromby	SAQD
	Glasgow Broomhill	SAQD
	Glasgow Centre PM ₁₀	AURN
	Glasgow Centre PM _{2.5}	AURN
	Glasgow Kerbside PM ₁₀	AURN
	Glasgow Kerbside PM _{2.5}	AURN
	Glasgow Nithsdale Road	SAQD
	Grangemouth PM ₁₀	AURN
	Grangemouth PM _{2.5}	AURN
	Paisley Gordon St	SAQD
	S. Lanarkshire East Kilbride	SAQD
	W. Dunbartonshire Clydebank	SAQD
	W. Lothian Broxburn	SAQD
	W. Lothian Linlithgow	SAQD
	W. Lothian Uphall	SAQD

VCM and the SAQD

All VCM corrected data have been made available on the SAQD website via an additional selection option in the data download pages. The Air Pollution reports provided to all Local Authorities now include VCM corrected PM₁₀ statistics. If a PM₁₀ analyser has been upgraded to an FDMS from a TEOM during 2009, the statistics quoted are calculated using the combination of VCM corrected data and FDMS data.

A flow chart showing the overall process employed for VCM correcting 2009 SAQD TEOM data is shown in Figure 1.

Figure 1 **Process used for VCM Correcting SAQD TEOM Data**

Short-term to Long-term Data adjustment

No adjustment for short-term to long-term measured concentrations was required for this study as all measurements covered the full period of 2009.

QA/QC of automatic monitoring

Details of the QA/QC of automatic monitoring are provided in Chapter 2.

QA/QC of diffusion tube monitoring

Details of the QA/QC of diffusion tube monitoring are provided in Chapter 2.

Appendix B: List of Industrial Processes

License Number	Operator	Site	Regulation Category	Schedule 1 Activity	Section
PPC/E/0020007	Waste Recycling Group Ltd	Drummond Moor (No2) Landfill Site, Penicuik	Part A	Chapter 5: Waste Management	5.2.a
PPC/E/0020034	Interflex Ltd	Peggy's Mill, Edinburgh	Part A	Chapter 6: Other Activities	6.4.b
PPC/E/0020057	Waste Recycling Group Ltd	Oatslie Sandpit Landfill Site, Roslin	Part A	Chapter 5: Waste Management	5.2.a
PPC/E/0020082	Deans Foods	Loanhead Processing Plant	Part A	Chapter 6: Other Activities	6.8.d.(i)
PPC/B/1003133	N.C.R.C Heggie (Edinburgh) Ltd	Unit C, Pentland Industrial Estate	Part B	Chapter 6: Other Activities	6.4.b
PPC/B/1003236	Brand and Rae Ltd	Bonnyrigg Ready Mix Concrete Plant, Bonnyrigg	Part B	Chapter 3: Mineral Industries	3.1.a.(ii)
PPC/B/1004347	Scottish Coal	Millerhill Disposal Point, Edinburgh	Part B	Chapter 3: Mineral Industries	3.5.b.(i)
PPC/B/1004359	Hanson Premix	Nivensknowe Rd, Loanhead	Part B	Chapter 3: Mineral Industries	3.1.a.(ii)
PPC/B/1009121	Tarmac Northern	Old Pentland, Midlothian	Part B	Chapter 3: Mineral Industries	3.5.e
PPC/B/1010425	W & J Short	Dalkeith	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/B/1010428	Sainsbury's	Petrol filling station	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/B/1010582	Esso	Fordel Service Station, Lauder Road, Dalkeith	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/B/1010585	Hay's of Penicuik	Penicuik	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/B/1012932	Johnsons	Sainsburys Loanhead	Part B	Chapter 7: SED Activities	Chapter 7: SED Activities
PPC/B/1013309	Shell	Newtonloan	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/B/1014758	Crawford Drycleaning Services	Bonnyrigg	Part B	Chapter 7: SED Activities	Chapter 7: SED Activities
PPC/B/1014928	Drycleaning & Laundry Services	Dalkeith	Part B	Chapter 7: SED Activities	Chapter 7: SED Activities
PPC/B/1015551	RFA-em Co. Ltd	Bilston Glen, Loanhead	Part B	Chapter 7: SED Activities	Chapter 7: SED Activities
PPC/B/1016238	Leiths (Scotland) Ltd		Part B	Chapter 3: Mineral Industries	3.5.e
PPC/B/1016238	Leiths (Scotland) Ltd		Part B	Chapter 3: Mineral Industries	3.1.a.(ii)
PPC/B/1018366	Q4 Drycleaning	Penicuik	Part B	Chapter 7: SED Activities	Chapter 7: SED Activities

Table of industrial processes (continued)

License Number	Operator	Site	Regulation Category	Activity	Section
PPC/E/0030016	Esso	Lothianburn Service Station	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/E/0030019	Shell	Easthouses	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/E/0030068	Tarmac Northern Ltd	Catewell Quarry - Dalkeith	Part B	Chapter 3: Mineral Industries	3.1.a.(ii)
PPC/E/0030073	Howie Minerals Ltd	Middleton Limeworks	Part B	Chapter 3: Mineral Industries	3.5.a
PPC/E/0030122	Scottish Coal Company Ltd	Newbigging OCCS - Rosewell	Part B	Chapter 3: Mineral Industries	3.5.b.(ii)
PPC/E/0030122	Scottish Coal Company Ltd	Newbigging OCCS - Rosewell	Part B	Chapter 3: Mineral Industries	3.5.b.(i)
PPC/E/0030122	Scottish Coal Company Ltd	Newbigging OCCS - Rosewell	Part B	Chapter 3: Mineral Industries	3.5.b.(iii)
PPC/E/0030147	Tesco	Tesco Filling Station	Part B	Chapter 1: Energy Industries	1.2.c.(ii)
PPC/E/0030154	The Moredun Foundation	Pentlands Science Park, Penicuik	Part B	Chapter 5: Waste Management	5.1.a
PPC/E/0030156	<i>The Edinburgh Crystal Glass Company Ltd *</i>	<i>Loanhead</i>	<i>Part B</i>	<i>Chapter 3: Mineral Industries</i>	<i>3.3.d</i>
PPC/B/1033591	Scottish Coal Company Ltd.	Auchencorth OCCS - Harlawmuir, NR Penicuik	<i>Part B</i>	Chapter 3: Mineral Industries	3.5.b.(ii)

* permit likely to be revoked as company ceased trading

Figures

- Figure 1 Schematic showing boundary of Midlothian, including towns, villages and significant roads
- Figure 2 Air Quality Management Area, Pathhead
- Figure 3 Location of automatic monitoring station and passive diffusion tubes in Dalkeith
- Figure 4 Location of automatic monitoring station and passive diffusion tubes in Pathhead
- Figure 5 Location of passive diffusion tubes in Penicuik
- Figure 6 Location of passive diffusion tubes in Bonnyrigg
- Figure 7 Location of passive diffusion tubes in Loanhead
- Figure 8 Annual mean nitrogen dioxide diffusion tube concentrations in Midlothian 2003 – 2009

Figure 1 - Schematic showing boundary of Midlothian, including towns, villages and significant roads

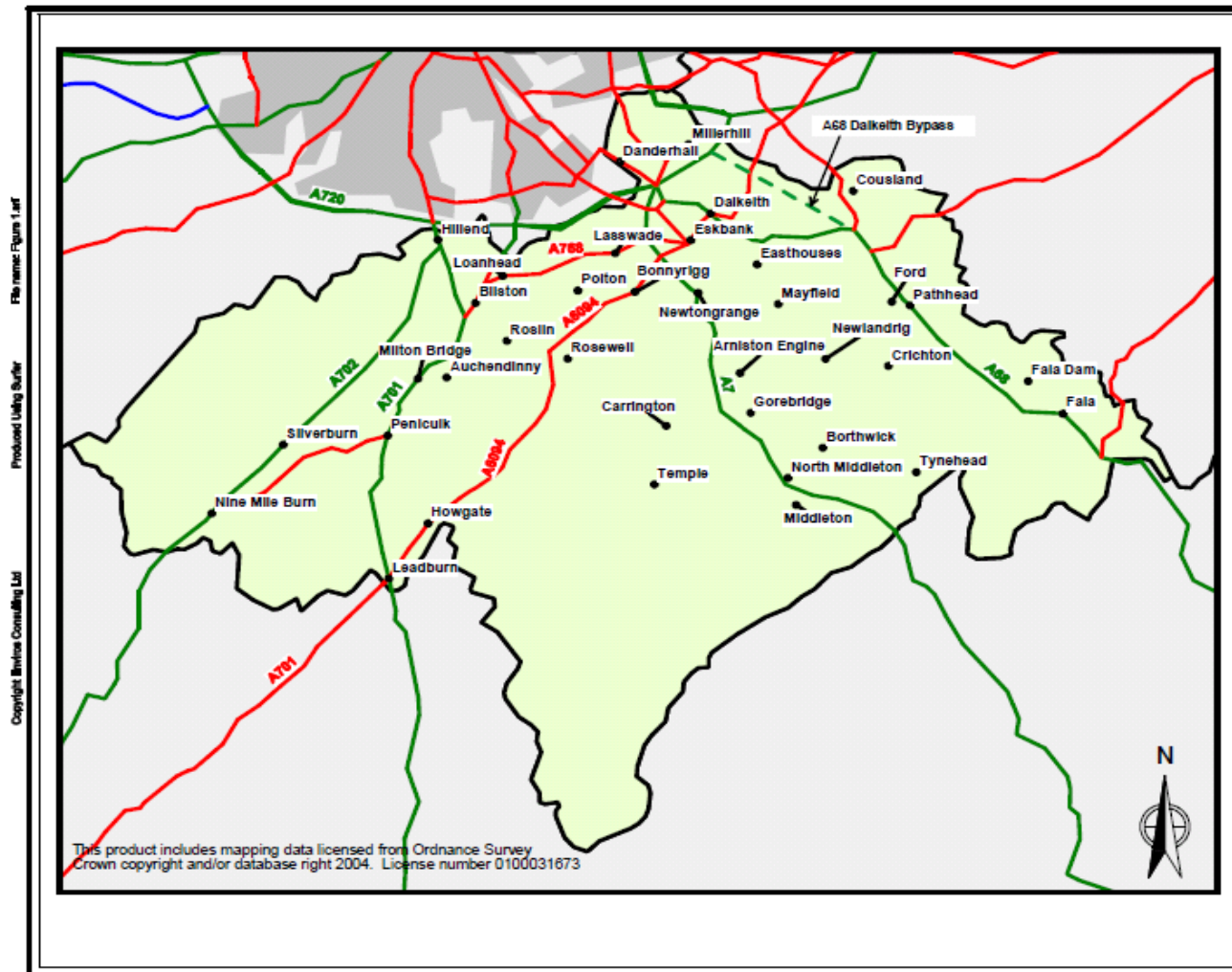


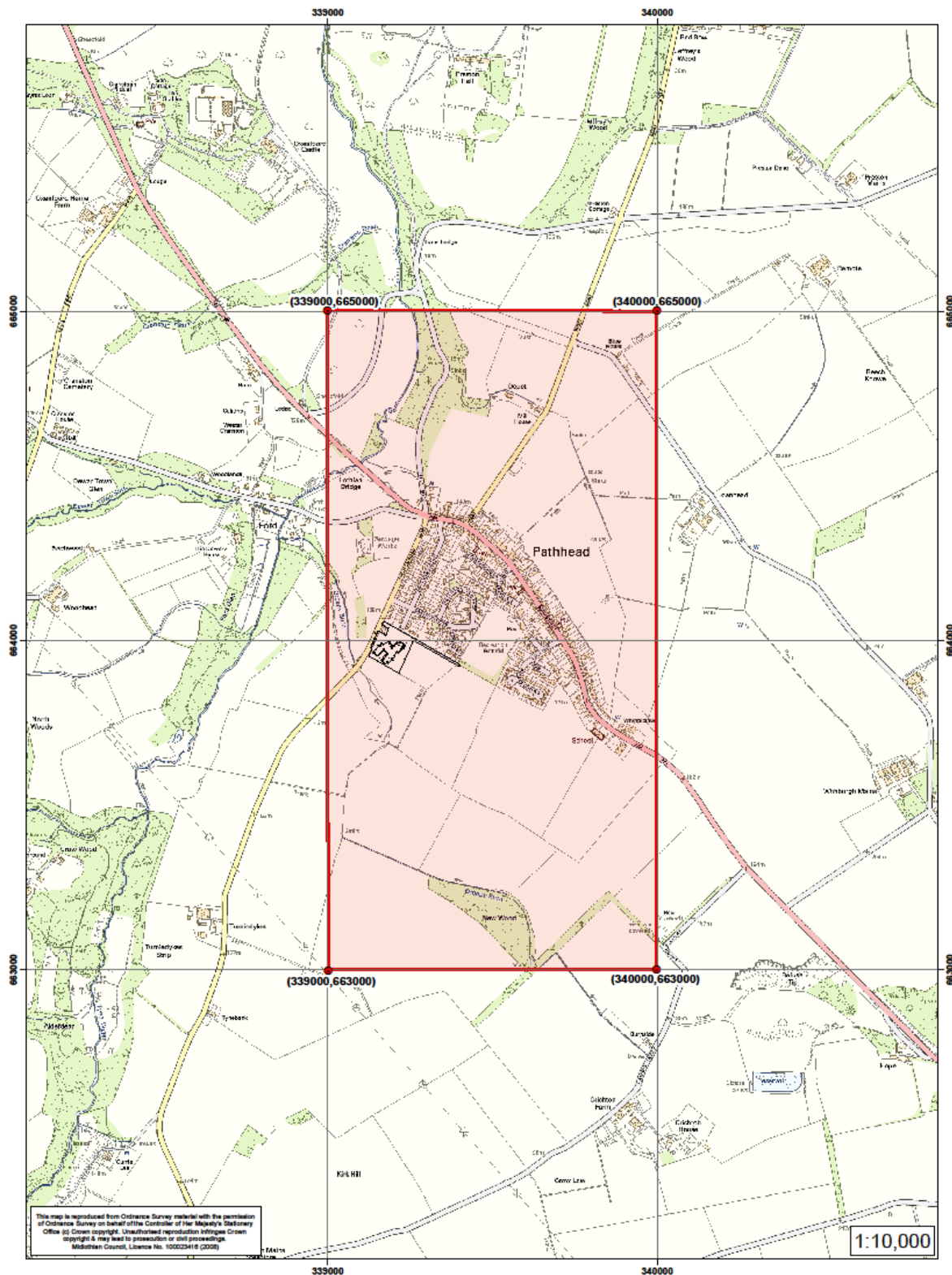
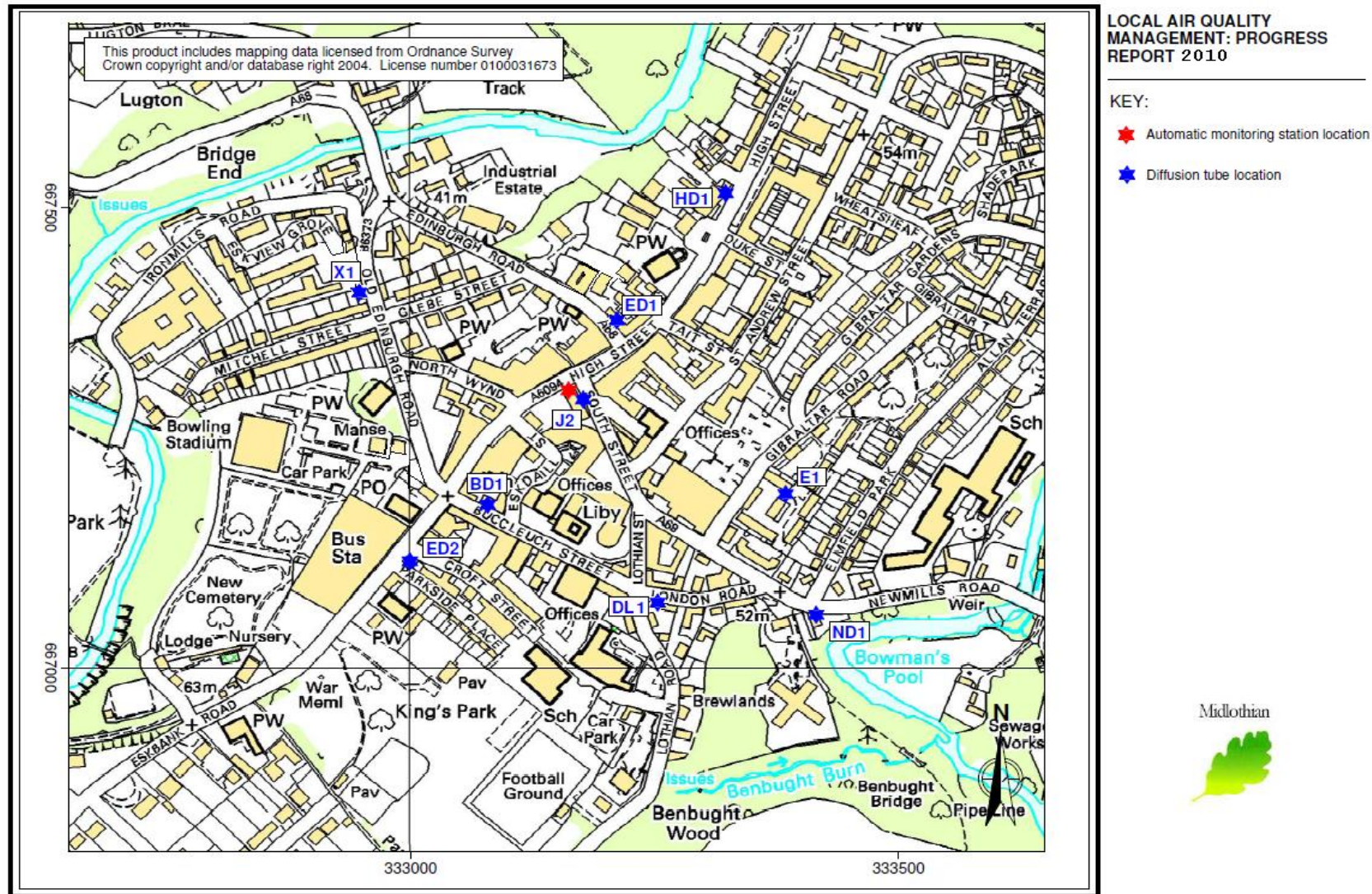
Figure 2 Air Quality Management Area, Pathhead

Figure 3 Location of automatic monitoring station and passive diffusion tubes in Dalkeith



July 2010

Midlothian Council

Figure 4 Location of automatic monitoring station and passive diffusion tubes in Pathhead

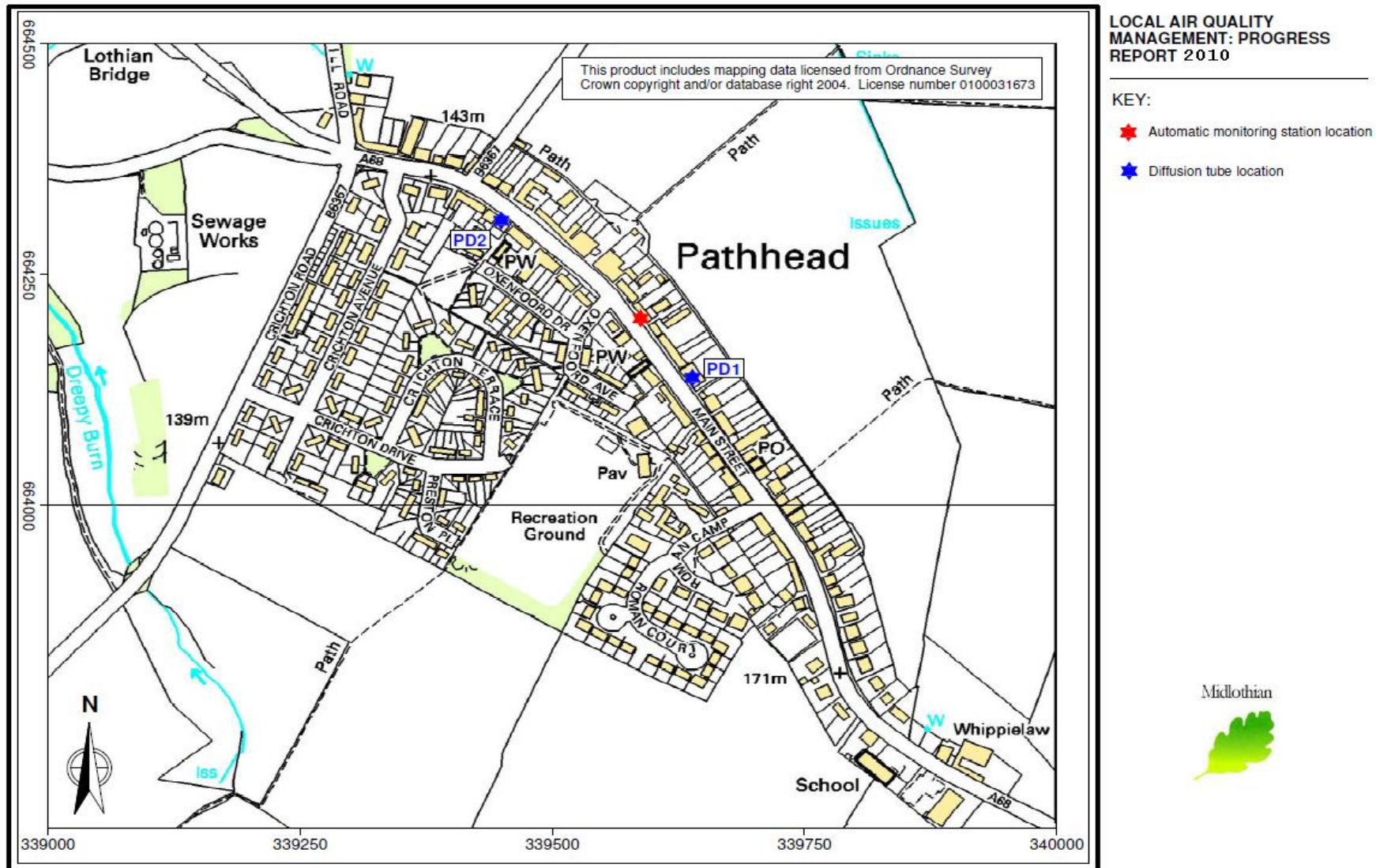
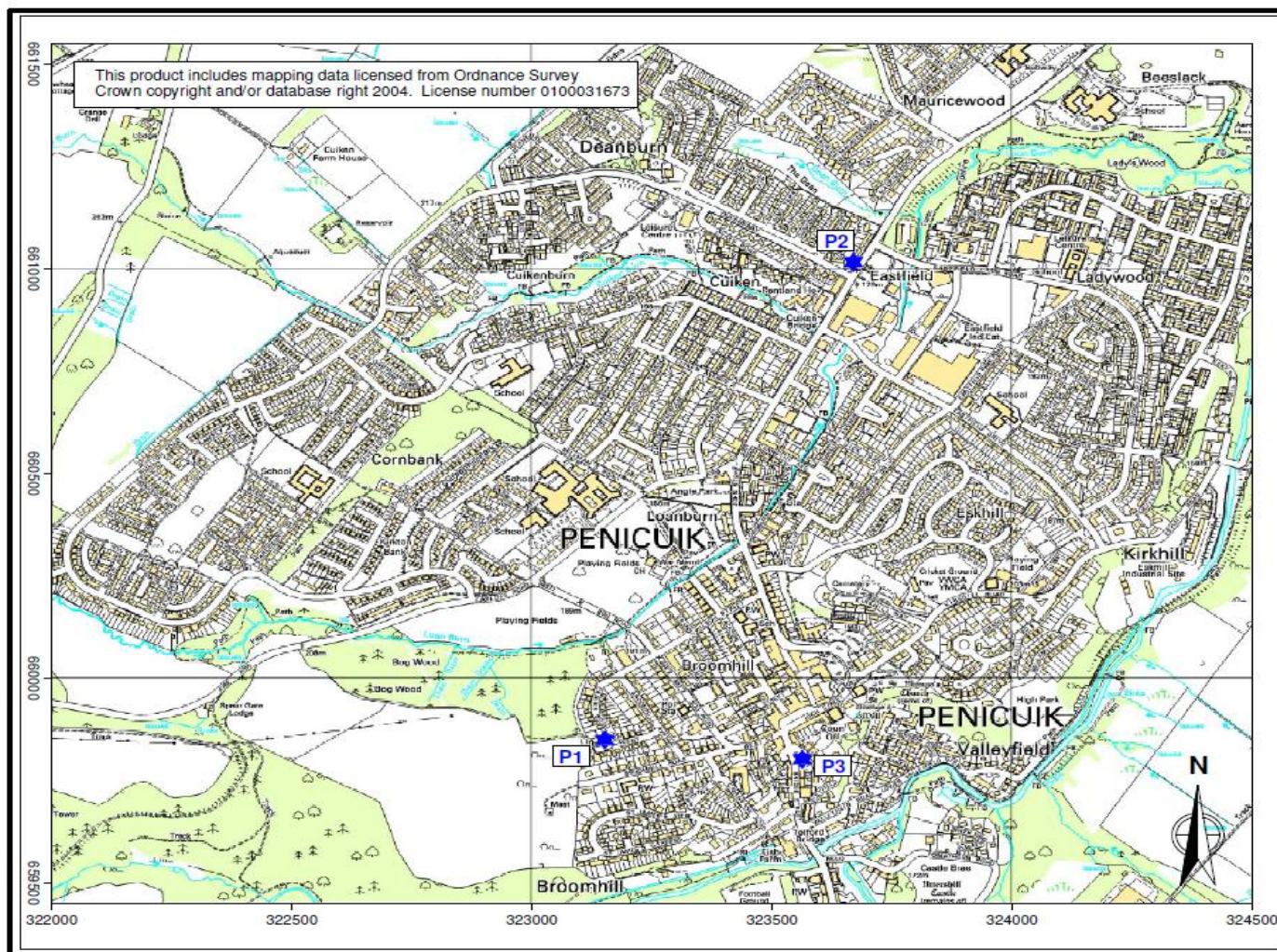


Figure 5 Location of passive diffusion tubes in Penicuik

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KEY:

★ Diffusion tube location

Midlothian



Figure 6 Location of passive diffusion tubes in Bonnyrigg

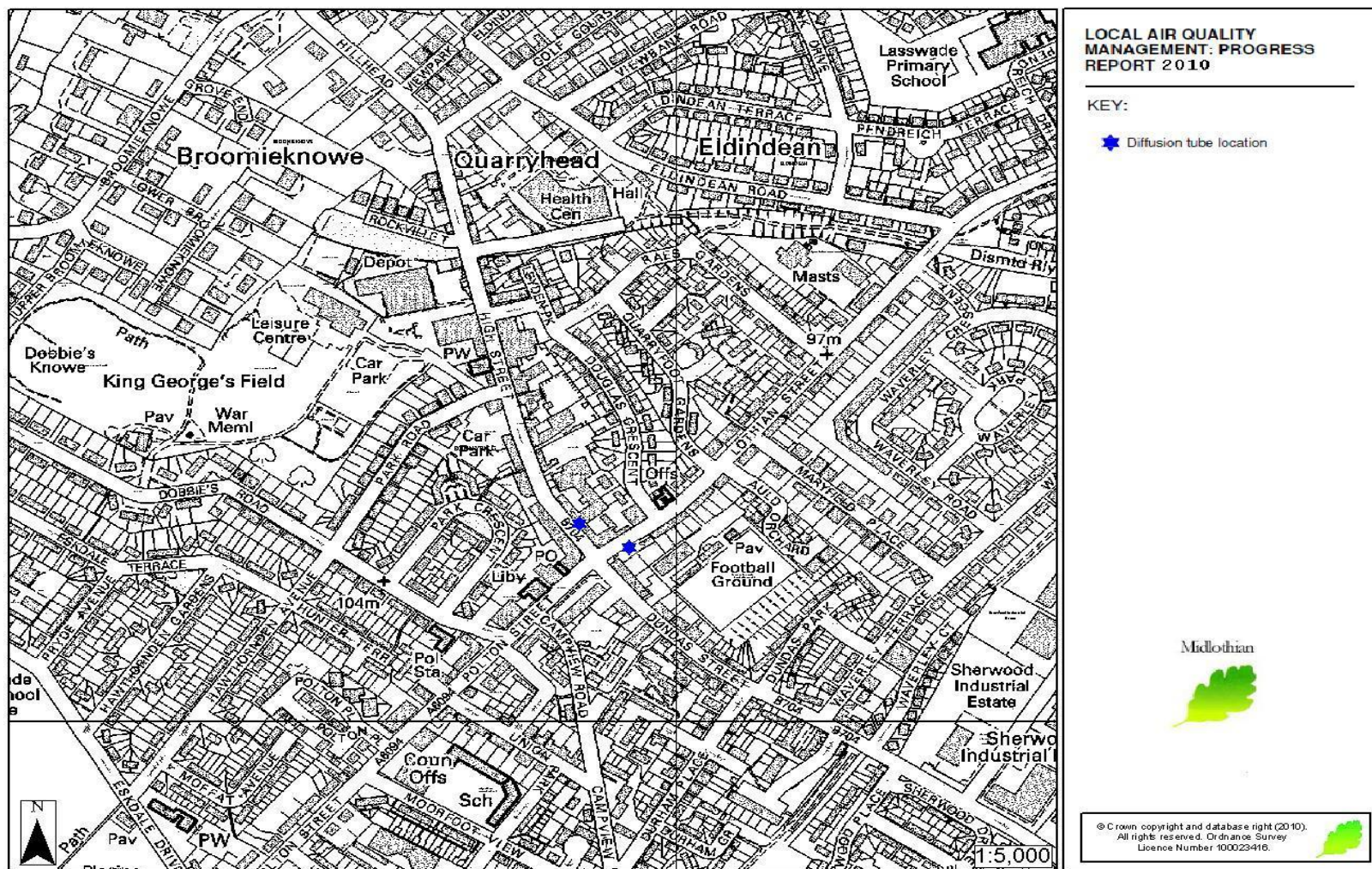


Figure 7 Location of passive diffusion tubes in Loanhead

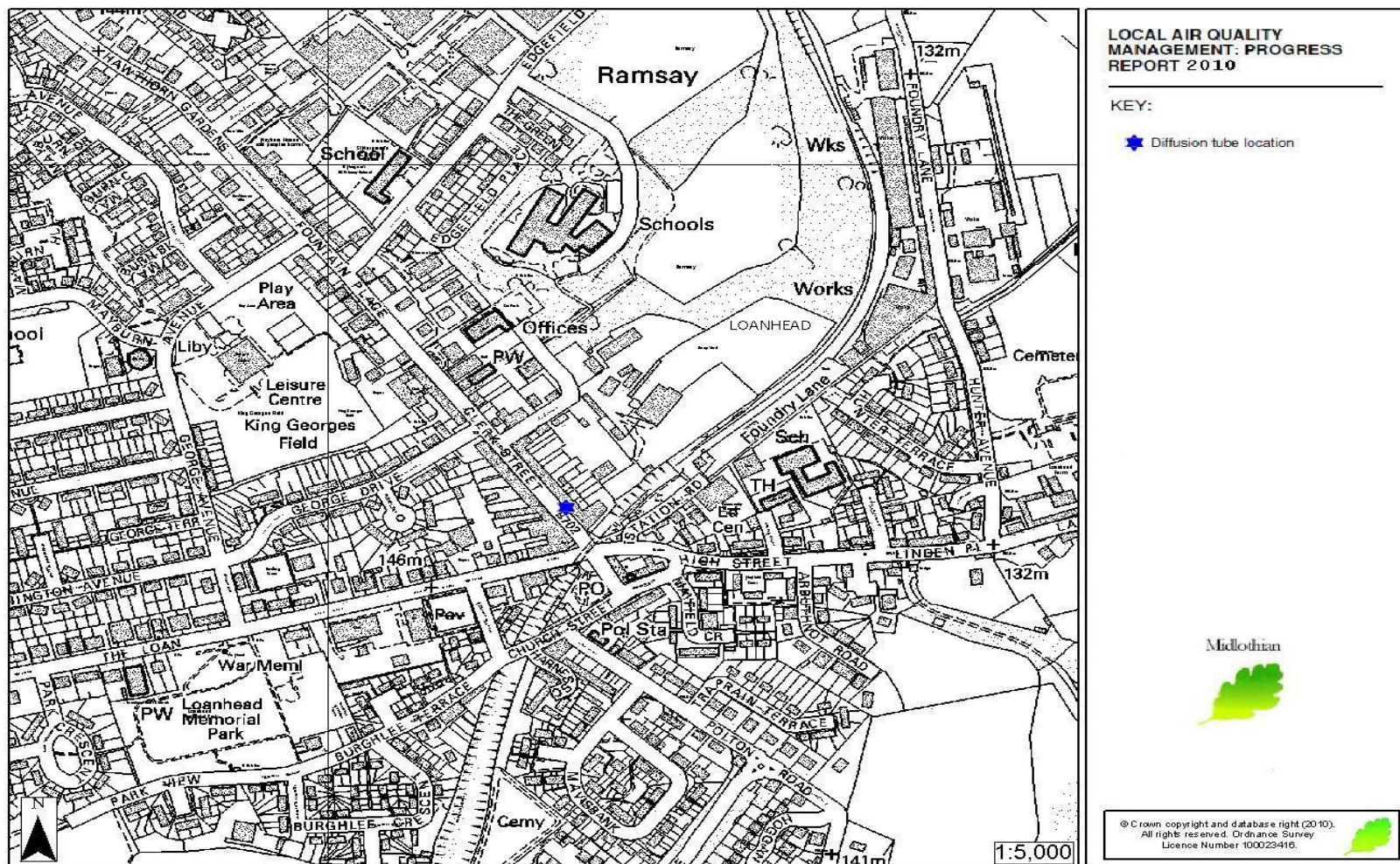


Figure 8 Annual mean nitrogen dioxide diffusion tube concentrations in Midlothian 2003 – 2009

