2015 Updating and Screening Assessment for West Lothian Council

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

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Executive Summary

This report is the 2015 Updating and Screening Assessment undertaken in accordance with West Lothian Council's statutory obligation under the National Air Quality Strategy.

The report considers measured pollutant concentrations from within West Lothian for the calendar year 2014 and considers the potential for exceedences of Air Quality Objectives as a result of new or significantly changed local emission sources.

Measured NO_2 concentrations across the Council area in 2014 were typically lower than those measured in 2013. Measured PM_{10} concentrations at Newton have increased to further exceed the annual mean concentration objective while Linlithgow High Street has a PM_{10} annual mean concentration exactly equal to the objective level. The Detailed Assessment already started for Newton and Linlithgow will be completed during 2015. Measured PM_{10} within the Broxburn Air Quality Monitoring Area (AQMA) increased to just below the annual mean objective. The Broxburn AQMA action planning process will continue due to the degree of planned development in the area, traffic from which will directly affect the AQMA. .

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1 Introduction

1.1 Description of Local Authority Area

West Lothian is situated between Edinburgh and the Borders to the east, Falkirk, and North Lanarkshire to the west and South Lanarkshire to the south with the Firth of Forth to the north. The region rises from the lowlands in the north and northeast to the Pentland Hills in the southeast and moor land in the south and west. Its 428 sq. km (165 sq. miles) are mainly used for agriculture or urban development. The major source of air pollution is from road traffic with several main roads including the M8, M9, A89 and A71 passing east-west through the district. Industrial sources of air pollution in West Lothian are relatively scarce and are mostly situated in designated industrial areas away from relevant receptors.

1.2 Purpose of Report

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

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

1.3 Air Quality Objectives

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

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

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

1.4 Summary of Previous Review and Assessments

Report Type	Report Date	Outcomes
Review and Assessment Stages 1 and 2	October 2000	• Prescribed air quality objectives are all likely to be achieved. • Recommended that current air quality monitoring work in West Lothian be continued.
Updating and Screening Assessment	June 2003	• Objectives for both NO_2 and PM_{10} currently being met. To continue monitoring in worst-case situations including locations close to busy roads. • No need for Detailed Assessment of Benzene, however consideration to be given for monitoring at petrol stations at Deer Park and Lizzie Bryce roundabouts. • No need for further monitoring of 1,3-Butadiene and Lead. • No need for Detailed Assessment of CO or SO_2
Progress Report	2004	• No Detailed Assessments required for any pollutant. • Benzene to be monitored at Lizzie Bryce petrol station.
Progress Report	2005	• Groundhog moved to Cairnie Place, Whitburn from 31/01/2005 • NO_2 analyser problems, low data capture. • One exceedence of 24-hour mean PM_{10} due to elevated background. • No Detailed Assessments required for any pollutant.
Updating and Screening Assessment	July 2006	• No exceedences of any pollutant therefore no requirement to proceed to a Detailed Assessments for any pollutant.
Progress Report	April 2007	• No exceedences of any pollutant therefore no requirement to proceed to a Detailed Assessments for any pollutant. • Monitoring of Benzene to cease due to low measured concentrations. • PM_{10} very close to objective in Linlithgow. • Automatic monitoring of NO_2 proposed for

		Broxburn.
Progress Report	March 2008	• No exceedences of any pollutant therefore no requirement to proceed to a Detailed Assessments for any pollutant. • Automatic monitoring of NO_2 and PM_{10} proposed for Broxburn. • Upgrade to FDMS planned at Linlithgow
Updating and Screening Assessment	September 2009	• No exceedences of any of the pollutants objective values. • Real time monitoring to continue in Linlithgow and Broxburn. PM_{10} concentration at Linlithgow close to objective with elevated levels measured at Broxburn. • NO_2 diffusion tubes to be deployed in West Calder Main Street for Detailed Assessment. • A poultry farm was identified as requiring a Detailed Assessment. • Further traffic surveys required to assess identified busy roads/junctions using DMRB. • Mobile monitoring station (Groundhog) to be relocated to Uphall Station. • Osiris units measuring particulates to be deployed at various locations throughout West Lothian.
Progress Report	June 2010	• Poultry farm detailed assessment not required per Scottish Government advice. • Broxburn exceeded annual PM_{10} objective, detailed assessment to be undertaken
Progress Report	July 2011	• Groundhog relocated to Whitburn Cross providing data from 08/02/10. • Monitoring at Broxburn continued to exhibit an exceedence (21µg/m^3) of the PM_{10} annual objective. A Detailed Assessment (DA) was commissioned. • A diffusion tube survey was also undertaken in Broxburn in 2010 which highlighted elevated concentrations of NO_2 levels. Potential for an Air Quality Management Area (AQMA) to be declared for PM_{10} and potentially NO_2. • Monitoring at Linlithgow High Street in 2010 highlighted a reduction in PM_{10} concentrations, however poor data capture

		was experienced. Measured concentrations in Linlithgow identified to be close to exceedence of PM_{10} annual objective level, continuing trend. It was therefore considered that a DA should be undertaken. • A diffusion tube survey for NO_2 in West Calder was undertaken as recommended in the 2009 Progress Report. The levels of concentration were well below the annual objective level. The survey continued through 2011.
Updating and Screening Assessment	October 2012	• Monitoring at Broxburn continued to exhibit exceedences of both the PM_{10} and NO_2 annual objectives. • Broxburn DA recommended AQMA declaration for PM_{10} and NO_2 annual objectives. • Broxburn AQMA declared 29/03/11 • Linlithgow DA recommended AQMA for annual PM_{10} objective. Declaration to be postponed until analysers moved to worst case position.
Progress Report	March 2014 (2013 Report)	• Monitoring at Broxburn continued to exhibit exceedence of NO_2 annual objectives. The AQMA is to remain. • Diffusion tubes in Linlithgow High Street indicated NO_2 exceedence. To go to Detailed Assessment. • Automatic monitoring station in Linlithgow High Street moved to worst case (canyon) location (October 2013)
Progress Report	June 2014	• Linlithgow High Street 2 (new canyon site) showing elevated levels for 3 months in operation • Newton PM_{10} exceedence of annual objective • Linlithgow and Newton to proceed to Detailed Assessments • Broxburn below objective levels therefor AQMA to be reviewed in 2015 USA

Figure 1.1 Map(s) of AQMA Boundaries (if applicable)

Broxburn AQMA boundary is detailed in Figure 1.1 in Appendix B

2 New Monitoring Data

During 2014 West Lothian Council monitored both PM_{10} and NO_2 at several locations throughout the Council area using both automatic and passive sampling methods.

All automatic monitoring PM_{10} and NO_2 data have been fully ratified by Ricardo-AEA on behalf of the Scottish Government (detailed in Appendix A). Diffusion tube data have been corrected using the 2014 average bias adjustment factor for the laboratory and method used (detailed in Appendix C). Details of the quality control and data correction are reported in Appendix A.

2.1 Summary of Monitoring Undertaken

West Lothian Council monitor PM_{10} and NO_2 using a combination of automatic analysers and passive diffusion tubes (PDT). The automatic monitoring sites are presented in Table 2.1 and the details of non-automatic monitoring sites are presented in Table 2.2.

2.1.1 Automatic Monitoring Sites

During 2014 the Council operated three real time automatic analysers. The new unit installed in 2013 (Linlithgow High Street 2) continues to operate in a canyon area at the east end of Linlithgow High Street while the two other automatic analysers continued to operate at Broxburn East Main Street (CMC) and Newton Main Street (CMC).

Figure 2.1 Map of Automatic Monitoring Sites

All monitoring site locations are detailed in Figure 2.1 Appendix B

Table 2.1 Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	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?
CM1	Linlithgow High St 2	Roadside	300426	677172	PM_{10} NO_2	N	FDMS NO_x analyser	Y(4m)	1.3m	Y
CM2	Broxburn CMC	Roadside	308314	672231	PM_{10} NO_2	Y	FDMS NO_x analyser	Y(3.5m)	2m	Y
CM3	Newton CMC	Roadside	309258	677728	PM_{10} NO_2	N	FDMS NO_x analyser	Y(2.0m)	2.4m	Y

2.1.2 Non-Automatic Monitoring Sites

The Council continues to maintain its network of 42 diffusion tubes at 20 sites. The monitoring sites represent public exposure and areas of high pollution concentrations at a variety of roadside and urban background locations. There are 2 tubes at 18 sites and 3 tubes co-located with the real time analysers at Linlithgow High Street and Broxburn West Main Street. Diffusion tube data remains valuable and the Council is committed to making it publicly available. The Council has therefore continued to input data on the web based data entry system.

Figure 2.2 Map of Non-Automatic Monitoring Sites

All monitoring site locations are detailed in Figure 2.1 in Appendix B

Table 2.2 Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Does this location represent worst-case exposure?
DT1	Newton	Roadside	309223	677711	NO_2	N	N	Y(3m)	2m	Y
DT2	Broxburn WMS	Roadside	308165	672222	NO_2	Y	N	Y(Façade)	3m	Y
DT3	Broxburn EMS	Roadside	308426	672233	NO_2	Y	N	Y(1.5m)	4m	Y
DT4	Broxburn CMC	Roadside	308314	672231	NO_2	Y	Y	Y(3m)	2m	Y
DT5	Broxburn E Mains	Roadside	309368	672213	NO_2	Y	N	Y(4m)	2m	Y
DT6	Dedridge Cedric Rise	Urban Background	306403	666341	NO_2	N	N	Y(4m)	3m	N
DT7	West Calder	Roadside	301758	663158	NO_2	N	N	Y(2m)	2m	Y
DT8	Whitburn Cross	Roadside	294687	665030	NO_2	N	N	Y(Façade)	3m	Y
DT9	Armadale Cross	Roadside	293842	668588	NO_2	N	N	Y(2m)	2m	Y
DT10	Bathgate S Bridge	Roadside	297401	668772	NO_2	N	N	Y(Façade)	3m	Y
DT11	Bathgate Steelyard	Roadside	297467	668734	NO_2	N	N	Y(12m)	4m	Y

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Does this location represent worst-case exposure?
DT12	Bathgate King St	Roadside	297570	668586	NO_2	N	N	Y(5m)	4m	Y
DT13	Bathgate High St	Urban Background	297656	669298	NO_2	N	N	Y(3m)	10m	N
DT14	Linlithgow High St 2	Roadside	300426	677172	NO_2	N	Y	Y(4m)	1.3m	Y
DT15	Linlithgow H St NW	Roadside	299930	677070	NO_2	N	N	Y(Façade)	1.4m	Y
DT16	Linlithgow H St SW	Roadside	299911	677052	NO_2	N	N	Y(2m)	2.9m	Y
DT17	Linlithgow H St NE	Roadside	300479	677148	NO_2	N	N	Y(3.4)	2m	Y
DT18	Linlithgow H St SE	Roadside	300485	677125	NO_2	N	N	Y(7.5m)	2.2m	Y
DT19	Linlithgow H St N	Roadside	300398	677132	NO_2	N	N	Y(Façade)	2.4m	Y
DT20	Linlithgow H St S	Roadside	300405	677118	NO_2	N	N	Y(Façade)	3m	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

The following section considers measured PM_{10} and NO_2 concentrations and compares the monitoring results with the relevant air quality objective.

2.2.1 Nitrogen Dioxide

During 2014 the Council monitored NO_2 using three real time automatic analysers. Linlithgow High Street 2 has operated in a canyon area at the east end of Linlithgow High Street since 30/10/13. The two other automatic analysers continued to operate at Broxburn East Main Street (CMC) and Newton Main Street.

Automatic Monitoring Data

The annual mean and 1-hour mean NO_2 automatic monitoring data for 2014 and previous years are presented in **Tables 2.3** and **2.4**. Trends in the annual mean NO_2 concentrations measured at automatic monitoring sites are illustrated in **Figure 2.3**. Measured exceedences of National Air Quality Strategy objectives are highlighted in bold.

Data capture at Broxburn and Newton, both being above 90%, was considered good. The Linlithgow High Street 2 NO_2 analyser suffered operational faults which resulted in data capture of 52.5%. This site's data required annualisation.

Measured concentrations are considerably below the annual mean objective level of 40µg/m^3 at Broxburn and Newton. At Linlithgow the measured concentration of 39µg/m^3 is just below the objective level but after annualisation this becomes 32.4 µg/m^3.

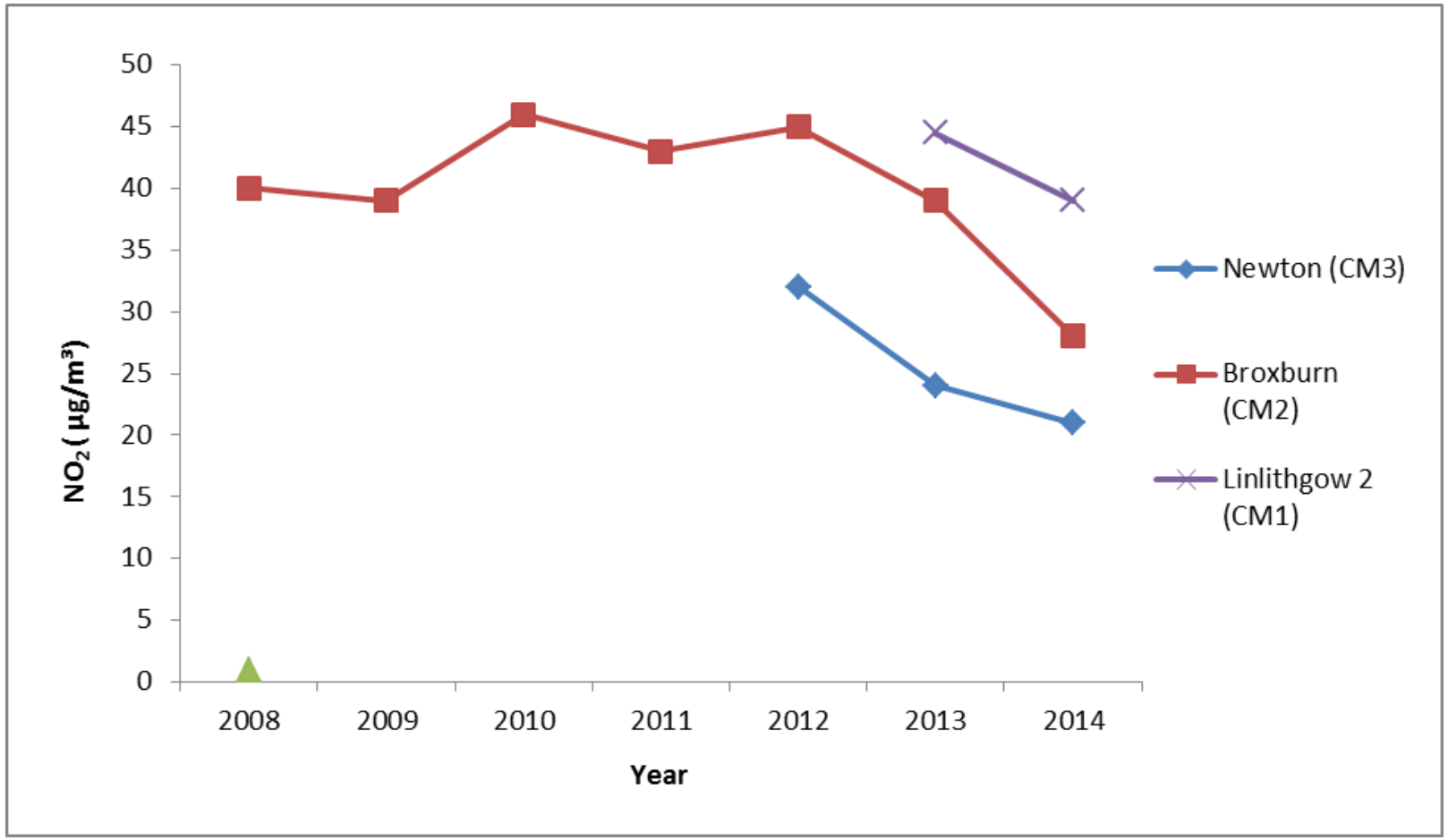
There were no measured exceedences of the 1-hour objective for NO_2.

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

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %[a]	Valid Data Capture 2014 % [b]	Annual Mean Concentration μg/m^3				
					2010* [c]	2011* [c]	2012* [c]	2013* [c]	2014 [c]
CM1	Roadside	N	52.5	52.5	N/A	N/A	N/A	**44.5**(36) [c]	32.4 [c]
CM2	Roadside	Y	90.2	90.2	**46** (38)	**43** (36)	**45** (38)	39	28
CM3	Roadside	N	92.1	92.1	N/A	N/A	32 [c]	24	21

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).
[c] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.
*Annual mean concentrations for previous years are optional.

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Automatic Monitoring Sites



The three automatic sites all show a reduction in NO_2 concentration from the previous year with all remaining below objective levels.

Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %[a]	Valid Data Capture 2014 % [b]	Number of Exceedences of Hourly Mean (200 μg/m^3)				
					2010* [c]	2011* [c]	2012* [c]	2013* [c]	2014 [c]
CM1	Roadside	N	52.5	52.5	N/A	N/A	N/A	0 (101)	0 (118)
CM2	Roadside	Y	90.2	90.2	0	0	0	0	0
CM3	Roadside	N	92.1	92.1	N/A	N/A	0 (147)	0 (141)	0

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).
[c] If the period of valid data is less than 90%, include the 99.8th percentile of hourly means in brackets
*Number of exceedences for previous years are optional.

Diffusion Tube Monitoring Data

The NO_2 diffusion tube monitoring data for 2014 and previous years are presented in **Tables 2.5** and **2.6** respectively. At diffusion tube locations where data capture is less than 75% it has been necessary to annualise measured concentrations.

The diffusion tube monitoring results have been adjusted for laboratory bias and where appropriate corrected for distance. Details of bias adjustment factors are explained in Appendix A. Trends in the annual mean NO_2 concentrations measured at roadside diffusion tube sites with historic data are illustrated in **Figure 2.4**.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2014

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.81) 2014 (μg/m^3)
DT1	Newton	Roadside	N	N	12	N	N	24
DT2	Broxburn WMS	Roadside	Y	N	12	N	N	28
DT3	Broxburn EMS	Roadside	Y	N	11	N	N	26
DT4	Broxburn CMC	Roadside	Y	Triplicate and Co-located	12	N	N	32
DT5	Broxburn E Mains	Roadside	Y	N	12	N	N	28
DT6	Dedridge Cedric Rise	Urban Background	N	N	10	N	N	15
DT7	West Calder	Roadside	N	N	12	N	N	23
DT8	Whitburn Cross	Roadside	N	N	12	N	N	24
DT9	Armadale Cross	Roadside	N	N	12	N	N	26
DT10	Bathgate S Bridge	Roadside	N	N	12	N	N	18
DT11	Bathgate Steelyard	Roadside	N	N	12	N	N	29

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.81) 2014 (μg/m^3)
DT12	Bathgate King Street	Roadside	N	N	11	N	N	31
DT13	Bathgate High St	Urban Background	N	N	12	N	N	12
DT14	Linlithgow High St 2	Roadside	N	Triplicate and Co-located	12	N	N	33
DT15	Linlithgow H St NW	Roadside	N	N	12	N	N	30
DT16	Linlithgow H St SW	Roadside	N	N	12	N	N	35
DT17	Linlithgow H St NE	Roadside	N	N	12	N	N	25
DT18	Linlithgow H St SE	Roadside	N	N	12	N	N	31
DT19	Linlithgow H St N	Roadside	N	N	12	N	N	28
DT20	Linlithgow H St S	Roadside	N	N	12	N	N	33

In bold, exceedence of the NO_2 annual mean AQS objective of 40μg/m^3

Underlined, annual mean > 60μg/m^3, indicating a potential exceedence of the NO_2 hourly mean AQS objective

[a] Means should be “annualised” as in Box 3.2 of TG(09)(http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38), if full calendar year data capture is less than 75%

[b] If an exceedence is measured at a monitoring site not representative of public exposure, NO_2 concentration at the nearest relevant exposure should be estimated based on the “NO_2 fall-off with distance” calculator (http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html), and results should be discussed in a specific section. The procedure is also explained in Box 2.3 of Technical Guidance LAQM.TG(09) (http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=30).

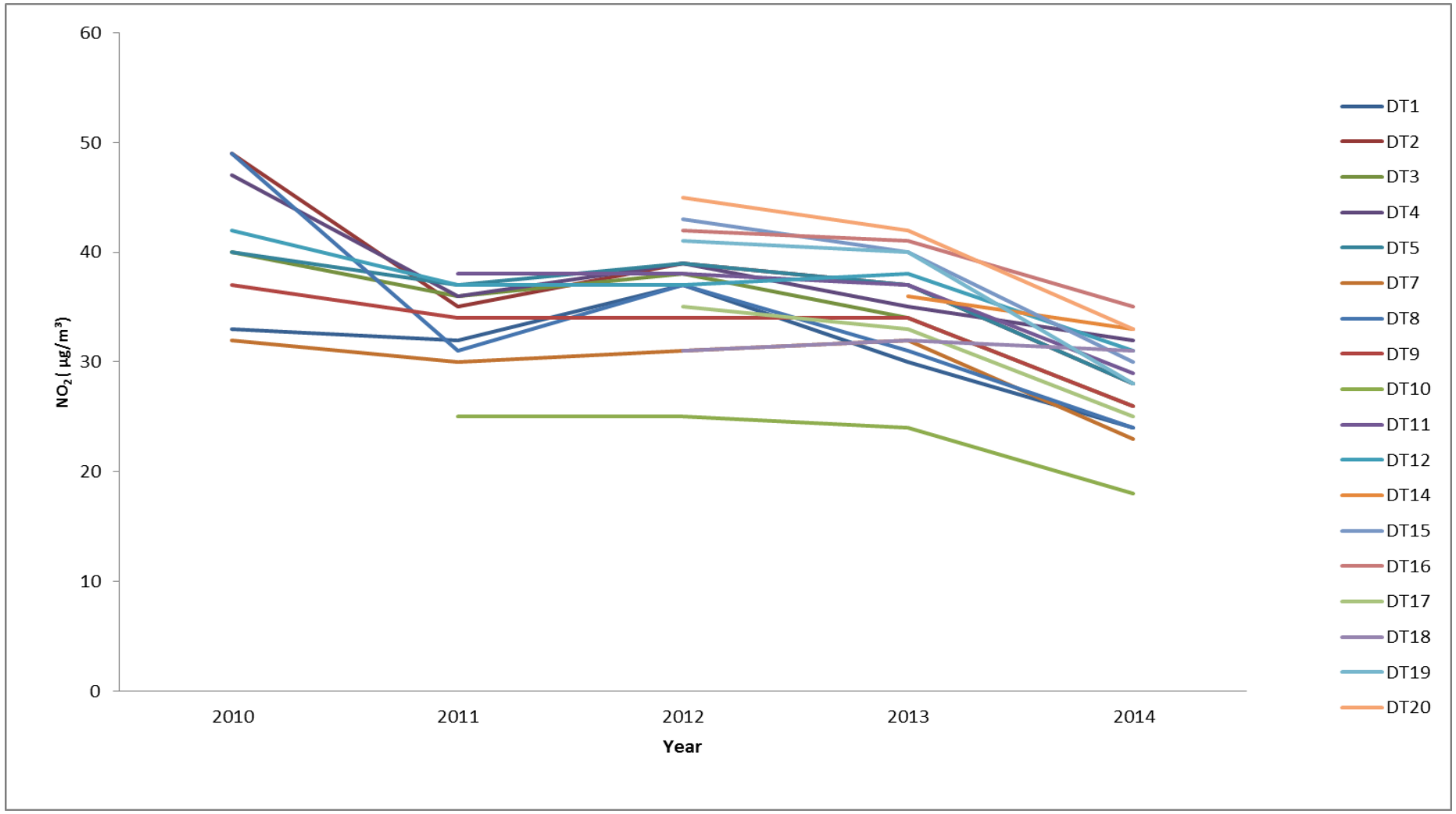
Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2010 to 2014)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) μg/m^3				
			2010* (Bias Adjustment Factor = 1.08)	2011* (Bias Adjustment Factor = 1.04)	2012* (Bias Adjustment Factor = 1.09)	2013* (Bias Adjustment Factor = 1.02)	2014 (Bias Adjustment Factor = 0.81)
DT1	Roadside	N	33	32	37	30	24
DT2	Roadside	Y	**49**	35	39	37	28
DT3	Roadside	Y	**40**	36	38	34	26
DT4	Roadside	Y	**47**	36[b]	39[b]	35[b]	32
DT5	Roadside	Y	**40**	37	39	37	28
DT6	Urban Background	N	21	17	19	18	15
DT7	Roadside	N	32	30	31	32	23
DT8	Roadside	N	49	31	37	31	24
DT9	Roadside	N	37	34	34	34	26
DT10	Roadside	N	N/A	25	25	24	18
DT11	Roadside	N	N/A	38	38	37	29
DT12	Roadside	N	**42**	37	37	38	31

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) μg/m^3				
			2010* (Bias Adjustment Factor = 1.08)	**2011* (Bias Adjustment Factor = 1.04)**	**2012* (Bias Adjustment Factor = 1.09)**	**2013* (Bias Adjustment Factor = 1.02)**	**2014 (Bias Adjustment Factor = 0.81)**
DT13	Urban Background	N	18	15	15	14	12
DT14	Roadside	N	N/A	N/A	N/A	36[ab]	33
DT15	Roadside	N	N/A	N/A	**43**[b]	40	30
DT16	Roadside	N	N/A	N/A	**42**[b]	**41**[b]	35
DT17	Roadside	N	N/A	N/A	35	33	25
DT18	Roadside	N	N/A	N/A	31[b]	32[b]	31
DT19	Roadside	N	N/A	N/A	**41**[a]	40	28
DT20	Roadside	N	N/A	N/A	**45**[a]	**42**	33

*Optional

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites



NO_2 annual mean diffusion tube results at roadside locations over the past 5 years are illustrated in Figure 2.4 above. The general trend shows a decrease in NO_2 concentration from to 2010 to 2014 at most roadside sites.

2.2.2 PM_{10}

During 2014 the Council monitored PM_{10} using three real time automatic analysers. Linlithgow High Street 2 has continued to operate in a canyon area at the east end of Linlithgow High Street since 30/10/13. The two other automatic analysers continued to operate at Broxburn East Main Street (CMC) and Newton Main Street.

The measured annual mean and 24-hour mean PM_{10} concentrations for 2014 and previous years are presented in **Tables 2.7** and **2.8** respectively.

Table 2.7 Results of Automatic Monitoring of PM_{10}: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %[a]	Valid Data Capture 2014 %[b]	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration μg/m^3				
						2010* [c]	2011* [c]	2012* [c]	2013* [c]	2014 [c]
CM1	Roadside	N	99.4	99.4	Y	N/A	N/A	N/A	18 [c]	18
CM2	Roadside	Y	80.7	80.7	Y	**21**	18	16	16	17
CM3	Roadside	N	97.4	97.4	Y	N/A	N/A	14.7 [c]	**19**	**22**

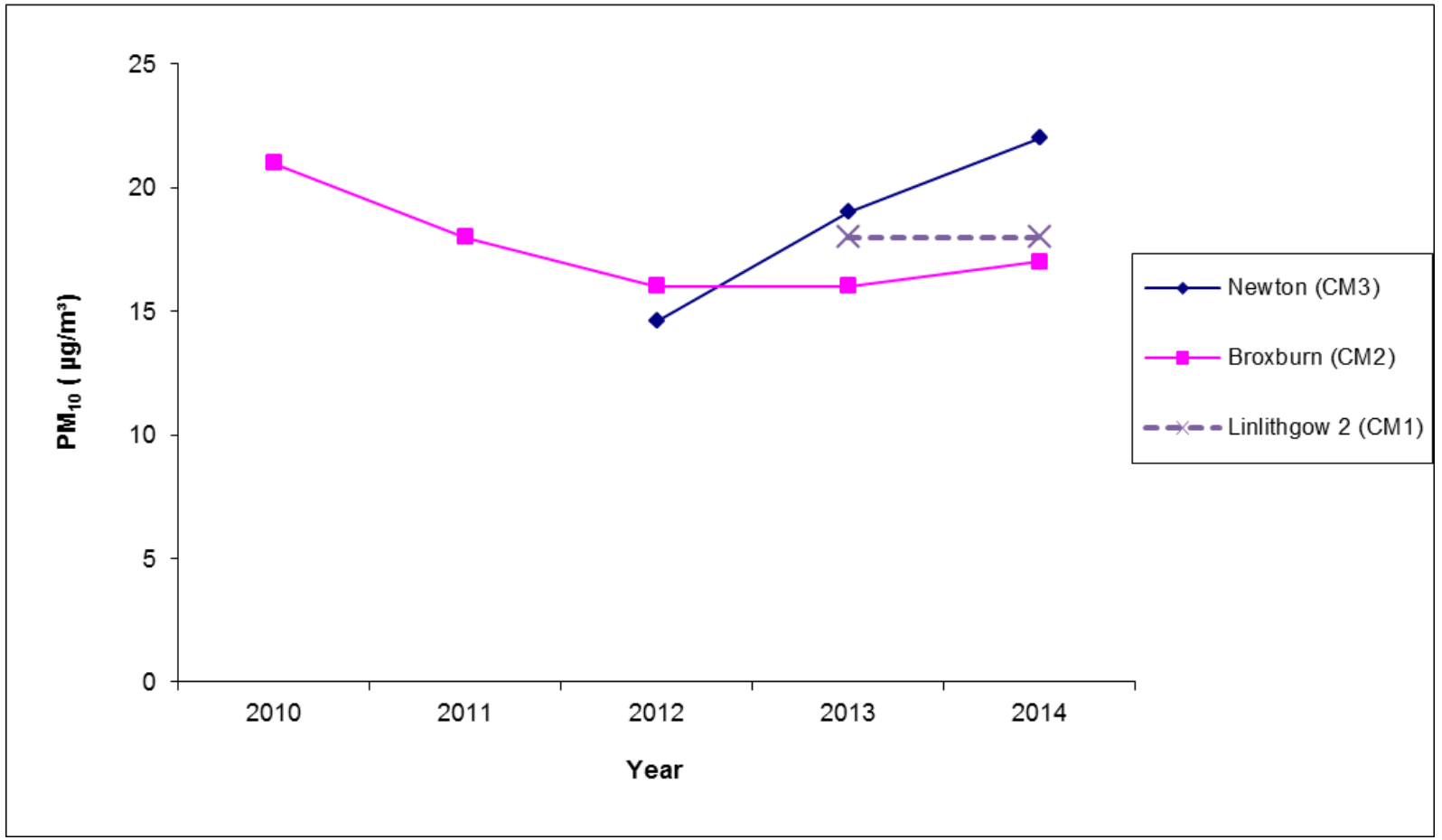
[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).
[c] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.
* Optional

Table 2.8 Results of Automatic Monitoring for PM_{10}: Comparison with 24-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %[a]	Valid Data Capture 2014 %[b]	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 μg/m^3)				
						2010* [c]	2011* [c]	2012* [c]	2013* [c]	2014 [c]
CM1	Roadside	N	99.4	99.4	Y	N/A	N/A	N/A	0 (35)	1
CM2	Roadside	Y	80.7	80.7	Y	4	3	2	0 (33)	2 (29)
CM3	Roadside	N	97.4	97.4	Y	N/A	N/A	0 (25)	4	1

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).
[c] if data capture is less than 90%, include the 90th percentile of 24-hour means in brackets
* Optional

Figure 2.5 Trends in Annual Mean PM_{10} Concentrations



PM_{10} annual mean results over the past 5 years are illustrated in Figure 2.5 above. Newton (CM3) showed an increase in measured PM_{10} concentration to 22µg/m^3 which exceeds the AQS objective of 18µg/m^3. Broxburn (CM2) PM_{10} concentration increased from the 2013 level of 16µg/m^3 to 17µg/m^3 while Linlithgow (CM1) remained at the AQS objective of 18µg/m^3.

2.2.3 Sulphur Dioxide

No SO_2 monitoring was undertaken in 2014

2.2.4 Benzene

No Benzene monitoring was undertaken in 2014

2.2.5 Other pollutants monitored

No other pollutant monitoring was undertaken in 2014

2.2.6 Summary of Compliance with AQS Objectives

West Lothian Council has measured concentrations of PM_{10} above the annual mean objective at a relevant location and **is proceeding with a Detailed Assessment**, for Newton Main Street.

At Linlithgow High Street measured concentrations of PM_{10} are equal to the AQS objective and with NO_2 concentrations measured close to the AQS objective this **is proceeding with a Detailed Assessment**.

Within the existing Broxburn AQMA measured concentrations of PM_{10} and NO_2 remain below the AQS objectives.

3 Road Traffic Sources

In the absence of road traffic count data this section has been completed based on best available information and local knowledge.

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

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

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

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

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

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

3.4 Junctions

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

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

The ongoing construction of the Forth Replacement Crossing will have an impact on vehicle traffic on the local road network, particularly at Newton village and Winchburgh. The main street in Newton is already subject to an ongoing Detailed Assessment for PM_{10} which will report in 2015.

New distributor roads are proposed associated with Core Development and other development areas.

West Lothian Cuncil has assessed new/proposed roads meeting the criteria in Section A.5 of Box 5.3 in TG(09), and concluded that it will not be necessary to proceed to a Detailed Assessment.

3.6 Roads with Significantly Changed Traffic Flows

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

3.7 Bus and Coach Stations

West Lothian Council confirms that there are no relevant bus stations in the Local Authority area.

4 Other Transport Sources

4.1 Airports

West Lothian Council confirms that there are no airports in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

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

4.2.2 Moving Trains

The Edinburgh to Glasgow line passes through Linlithgow and there is relevant exposure within 30m at some locations. Screening assessment in line with LAQM technical guidance however identified that the estimated background annual mean NO_2 concentration is not greater than 25 µg/m^3, thus the potential for exceedences of the objectives is limited and there is no requirement to proceed to a Detailed Assessment. This line is now subject to an ongoing electrification programme.

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

4.3 Ports (Shipping)

West Lothian Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

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

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

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

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

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

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

5.2 Major Fuel (Petrol) Storage Depots

West Lothian Council confirms that there are no major fuel (petrol) storage depots within the Local Authority area.

5.3 Petrol Stations

West Lothian Council confirms that there are no petrol stations meeting the specified criteria**.**

5.4 Poultry Farms

West Lothian Council confirms that there are no additional poultry farms meeting the specified criteria. However, the Clapperton Complex Poultry Farm (identified in Section 5.4 of the 2009 Update and Screening Assessment still exists. However, the Scottish Government confirmed in 2010 that it did not require a Detailed Assessment to be carried out.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

No new commercial biomass combustion sources were identified. No new areas of domestic fuel burning were identified.

West Lothian Council confirms that there are no known new biomass combustion plant in the Local Authority area.

6.2 Biomass Combustion – Combined Impacts

West Lothian Council confirms that there are no known new biomass combustion plant in the Local Authority area.

6.3 Domestic Solid-Fuel Burning

While small domestic solid fuel burning stoves are becoming more popular there are no areas where this has been identified as relevant.

West Lothian Council confirms that in general there are no areas of significant domestic fuel use in the Local Authority area. However, the Detailed Assessment currently being carried out for Newton village includes a domestic fuel survey to establish whether the PM10 levels are principally or significantly influenced by domestic solid fuel burning.

7 Fugitive or Uncontrolled Sources

Follow the procedure set out in Box E of chapter 5, TG(09). The assessment needs to consider PM_{10}. Only locations not covered by previous rounds of review and assessment (including any with substantial changes), or where there is new relevant exposure, should be covered in this section. In the case of proposed new sources, only consider them if planning approval has been granted.

Please write your assessment below this box, and select one of the green or yellow boxes to highlight the outcome. If there are no sources that may need consideration, please complete the green box below, AND LEAVE IN THE FINISHED REPORT.

DELETE THIS INSTRUCTION BOX BEFORE SUBMITTING THE REPORT.

Development of large scale housing may result in release of fugitive emissions during construction, but no new long term sources exist.

West Lothian Council confirms that there are no new potential sources of fugitive particulate matter emissions in the Local Authority area.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

The measured annual mean NO_2 concentration within the Broxburn AQMA in 2014 remains below the annual mean objective level. Measured concentrations at diffusion tube locations within the AQMA were below the annual mean objective level after bias adjustment. Although Broxburn NO_2 concentration is below objective levels the AQMA will remain due to the planned extensive residential development (CDA) in the Broxburn area. This, plus the large CDA at Winchburgh could significantly alter traffic volumes within the AQMA

There were no measured exceedences of the 1-hour objective for NO_2 at any automatic site.

No exceedences of NO_2 objectives were measured at all other automatic monitoring stations. Furthermore, there were no measured exceedences of the annual mean NO_2 objective at diffusion tube monitoring sites after bias adjustment.

Measured NO_2 concentrations in 2014 were generally lower than in 2013.

Measured PM_{10} concentration at Newton exceeded the annual mean objective. A Detailed Assessment is currently being carried out here. Measured PM_{10} concentration at Broxburn increased to just below the AQO level but it was decided not to revoke the AQMA due to the extensive planned CDA domestic housing development in the area. Linlithgow PM_{10} annual mean remains at the AQO level and this is currently undergoing a Detailed Assessment.

Exceedences of the daily mean PM_{10} objective level were measured all 3 sites but the numbers of measured exceedences were below the levels permitted under the NAQS objective level at each site.

8.2 Conclusions from Assessment of Sources

The West Lothian Local Plan (2009) identifies core development (CDA) areas as the focus of growth beyond 2015. This includes considerable planned residential development with some associated road and rail transport development. Air Quality is an ongoing consideration as CDA development progresses.

8.3 Proposed Actions

Detailed Assessments for Linlithgow High Street and Newton will be completed and reviewed regarding possible AQMA declaration.

The Council should continue to monitor both NO_2 and PM_{10} within the Broxburn AQMA and continue the Action Planning process. Broxburn AQMA status will remain due to the extensive CDA domestic housing development progressing in the Broxburn area.

The Council should prepare a Progress Report on monitored pollutant concentrations and progress with the Broxburn Action Plan in 2015.

9 References

1. AEA/ENV/R/2504-Issue 1a – Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance
2. 2011 Air Quality Progress Report for West Lothian Council
3. 2012 Air Quality Updating and Screening Assessment for West Lothian Council
4. 2013 Air Quality Progress Report for West Lothian Council
5. 2014 Air Quality Progress Report for West Lothian Council
6. Local Air Quality Technical Guidance LAQM.TG(09)
7. West Lothian Local Plan 2009

Appendices

Appendix A: QA/QC Data

Appendix B: Maps

Appendix C: Diffusion Tube co-location sites bias calculations

Appendix A: QA/QC Data

Factor from Local Co-location Studies (if available)

Three diffusion tubes have been located adjacent to the inlet of the automatic monitoring stations at 2 roadside sites, West Main Street, Broxburn (CM2) and Linlithgow High Street 2 (CM1). The results from the diffusion tubes were compared to the results over the same periods from the co-located Thermo 42i NOx analysers.

The results were analysed using the Ricardo-AEA spreadsheet to determine precision, accuracy and to calculate a locally derived bias correction factor as detailed in Appendix C (DT4 and DT14).

Diffusion Tube Bias Adjustment Factors

Diffusion tubes were supplied and analysed by ESG Didcot using 50% TEA in acetone. The LAQM national bias database for this analyst calculates a bias adjustment factor for 2014 of 0.81.

Discussion of Choice of Factor to Use

The local bias adjustment factors were calculated for the two co-location sites of Linlithgow and Broxburn. The two sites gave quite different factors of 0.87 and 0.71 therefore the LAQM national bias database average for this analyst of 0.81 was used as being more representative of all sites.

PM Monitoring Adjustment

All PM monitoring data was from FDMS therefore no adjustments were made.

Short-term to Long-term Data Adjustment

Short-Term to Long-Term Monitoring Data Adjustment Linlithgow High St 2 (CM1) NO_2

Site	**Site Type**	**Annual Mean**	**Period Mean** (01/01/14 to 30/04/14 and 01/10/14 to 31/12/14)	**Ratio**
Bush Estate	Rural	6.6	7.5	0.880
Eskdalemuir	Rural	2.3	3	0.778
Edinburgh Currie	Suburban	7	7.7	0.909
Peebles	Suburban	6	7.9	0.759
			Average	0.832

QA/QC of Automatic Monitoring

The automatic monitoring sites at Linlithgow, Broxburn and Newton were subject to site audits including calibration checks every 6 months. These were carried out by Ricardo-AEA.

Data validation and ratification was carried out by Ricardo-AEA as summarised in the Air Pollution Reports at the end of this Appendix.

Analyser Maintenance and Calibration

Air Monitors Ltd continues to service and provide engineer call-outs to all automatic monitoring sites. Servicing of analysers at all sites is carried out every six months with engineer maintenance visits made as required. Additional regular site visits are made to check analyser operation and site condition and to change analyser filters. All TEOM/FDMS filters are changed before the filters reach 90%. The TEOM head is cleaned at each filter change.

All automatic monitoring stations use an Air Monitors web logger. Auto calibrations are run daily at each site for NO_x analysers. Calibration data is monitored using Envirologger Site Manager.

Data Acquisition, Security and Dissemination

All sites incorporate a web logger allowing data to be viewed, downloaded and reviewed using the associated software, Envirologger Site Manager.

All West Lothian Council automatic monitoring site data can be accessed via the Scottish Government Air Quality website at www.scottishairquality.co.uk. Ricardo-AEA validated historic data is available from this site.

QA/QC of Diffusion Tube Monitoring

- West Lothian Council diffusion tubes were supplied and analysed by ESG Didcot.
- ESG Didcot used 50% v/v Triethanolanine (TEA) in acetone for the absorbant in which grids are dipped then allowed to dry before being inserted into acrylic tubes.
- Harmonisation Practical Guidance procedures are followed by this laboratory.
- West Lothian has compared diffusion tube results with that of an automatic NOx analyser in co-location studies at the Broxburn and Linlithgow roadside sites (see above).
- The bias adjustment factor applied to diffusion tube annual means is 0.81 being the LAQM national bias database average for this analyst.
- The ESG Didcot laboratory participated in the Workplace Analysis Scheme for Proficiency (WASP) and achieved 100% satisfactory for rounds 124 and AR001 to AR004 (January 2014 –November 2014).
- Precision studies for this analyst showed 13 good precision and 9 bad precision results in 2014

West Lothian Council deploys diffusion tubes according to the procedure detailed in guidance document AEA/ENV/R/2504[2] – Issue 1a. Diffusion tubes are exposed on the 4/5 week cycle specified in the Ricardo-AEA calendar and are stored in a sealed container in a refrigerator until being returned to the laboratory. Travel blank diffusion tubes are carried throughout the deployment and analysis procedure.

SEPA has accepted that a national bias correction factor has been used to correct the passive diffusion tube data. The national bias correction factor of 0.80 is lower than the local bias correction factor of 1.02 used in 2013 and therefore may not be representative of local conditions. Therefore this does not mean that there has been a significant reduction in the concentrations of nitrogen dioxide across West Lothian.

Produced by RICARDO-AEA on behalf of the Scottish Government

WEST LOTHIAN BROXBURN
1st January to 31st December 2014

These data have been fully ratified by RICARDO-AEA

POLLUTANT	NO_2	NO_X	PM_{10}+
Maximum hourly mean	136 µg m^{-3}	752 µg m^{-3}	200 µg m^{-3}
Maximum daily mean	70 µg m^{-3}	303 µg m^{-3}	60 µg m^{-3}
98th percentile of hourly means			52 µg m^{-3}
99.7th percentile of hourly means			69 µg m^{-3}
99.8th percentile of hourly means			71 µg m^{-3}
90th percentile of daily means			29 µg m^{-3}
98.08th percentile of daily means			43 µg m^{-3}
99.2nd percentile of daily means			49 µg m^{-3}
Average	28 µg m^{-3}	83 µg m^{-3}	17 µg m^{-3}
Data capture	90.2 %	90.2 %	80.7 %

+ PM10 instruments:
FDMS using a gravimetric factor of 1 from 1st January 2014

All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.
NO_X mass units are NO_X as NO_2 µg m^{-3}

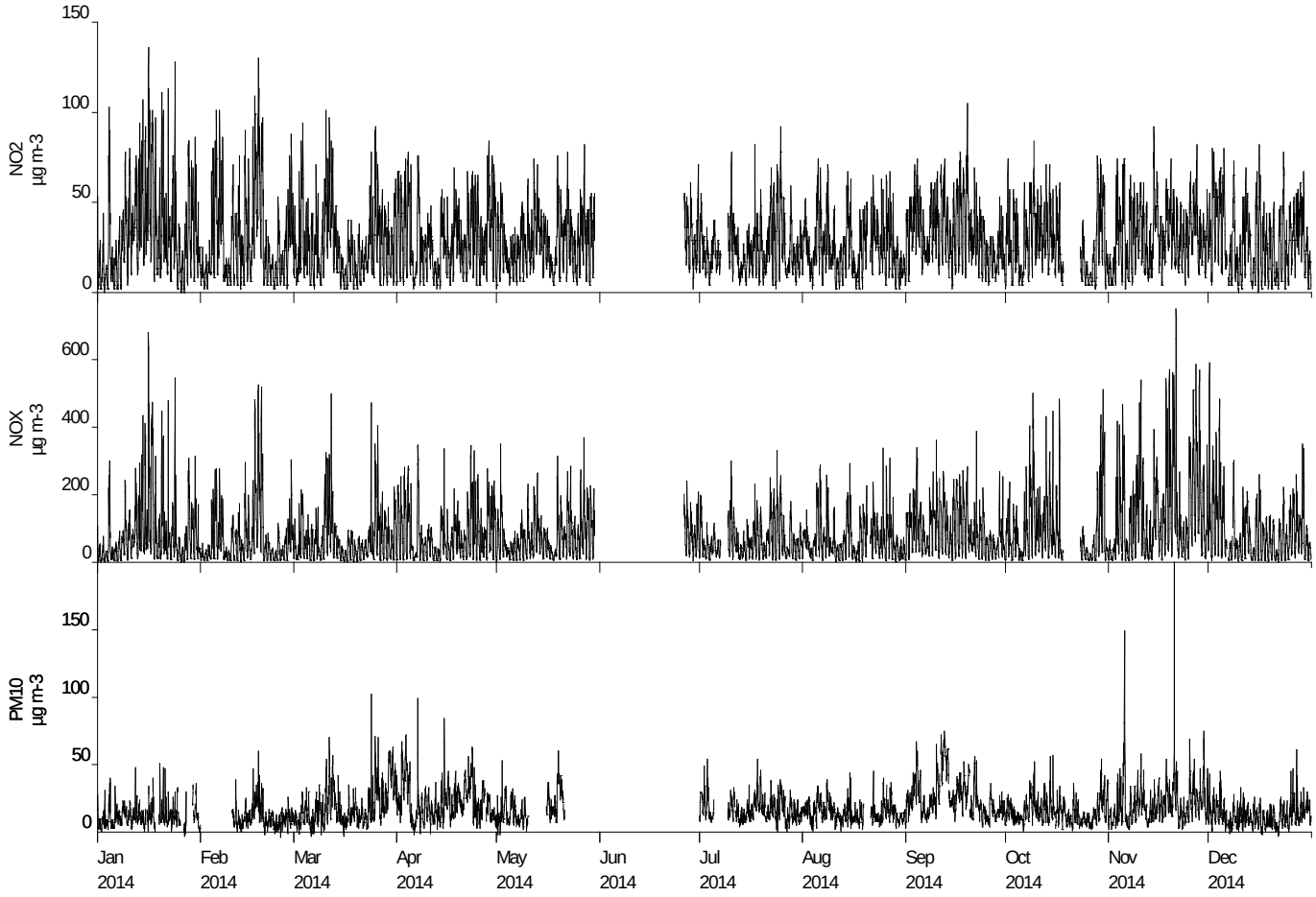
Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	2	2
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	0	-

Note: For a strict comparison against the objectives there must be a data capture of >90% throughout the calendar year

West Lothian Council

Produced by RICARDO-AEA on behalf of the Scottish Government

West Lothian Broxburn
Hourly Mean Data for 1st January to 31st December 2014



Produced by RICARDO-AEA on behalf of the Scottish Government

WEST LOTHIAN LINLITHGOW HIGH ST 2
1st January to 31st December 2014

These data have been fully ratified by RICARDO-AEA

POLLUTANT	NO_2	NO_X	PM_{10}+
Maximum hourly mean	139 µg m^{-3}	961 µg m^{-3}	83 µg m^{-3}
Maximum daily mean	75 µg m^{-3}	326 µg m^{-3}	52 µg m^{-3}
98th percentile of hourly means	97 µg m^{-3}	451 µg m^{-3}	
99.7th percentile of hourly means	117 µg m^{-3}	647 µg m^{-3}	
99.8th percentile of hourly means	118 µg m^{-3}	670 µg m^{-3}	
90th percentile of daily means	60 µg m^{-3}	211 µg m^{-3}	
98.08th percentile of daily means	71 µg m^{-3}	275 µg m^{-3}	
99.2nd percentile of daily means	72 µg m^{-3}	279 µg m^{-3}	
Average	39 µg m^{-3}	113 µg m^{-3}	18 µg m^{-3}
Data capture	52.5 %	52.5 %	99.4 %

+ PM10 instruments:
FDMS using a gravimetric factor of 1

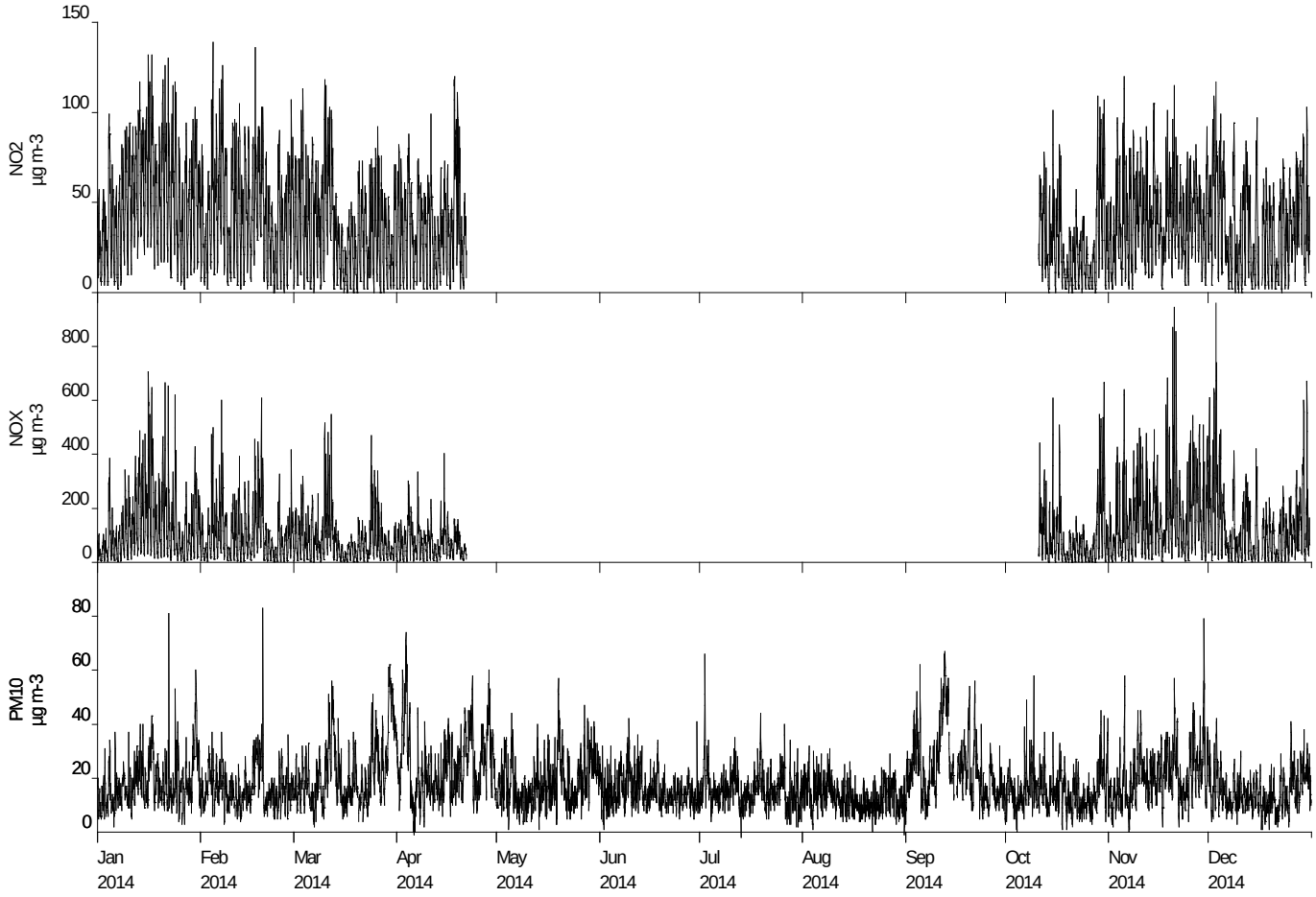
All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.
NO_X mass units are NO_X as NO_2 µg m^{-3}

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	1	1
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	0	-

Note: For a strict comparison against the objectives there must be a data capture of >90% throughout the calendar year

Produced by RICARDO-AEA on behalf of the Scottish Government

West Lothian Linlithgow High St 2
Hourly Mean Data for 1st January to 31st December 2014



Date Created: 13/04/2015

Produced by Ricardo-AEA on behalf of the Scottish Government

WEST LOTHIAN NEWTON
1st January to 31st December 2014

These data have been fully ratified by Ricardo-AEA

POLLUTANT	NO_2	NO_X	PM_{10}+
Maximum hourly mean	140 µg m^{-3}	375 µg m^{-3}	215 µg m^{-3}
Maximum daily mean	66 µg m^{-3}	169 µg m^{-3}	53 µg m^{-3}
Average	21 µg m^{-3}	43 µg m^{-3}	22 µg m^{-3}
Data capture	92.1 %	92.1 %	97.4 %

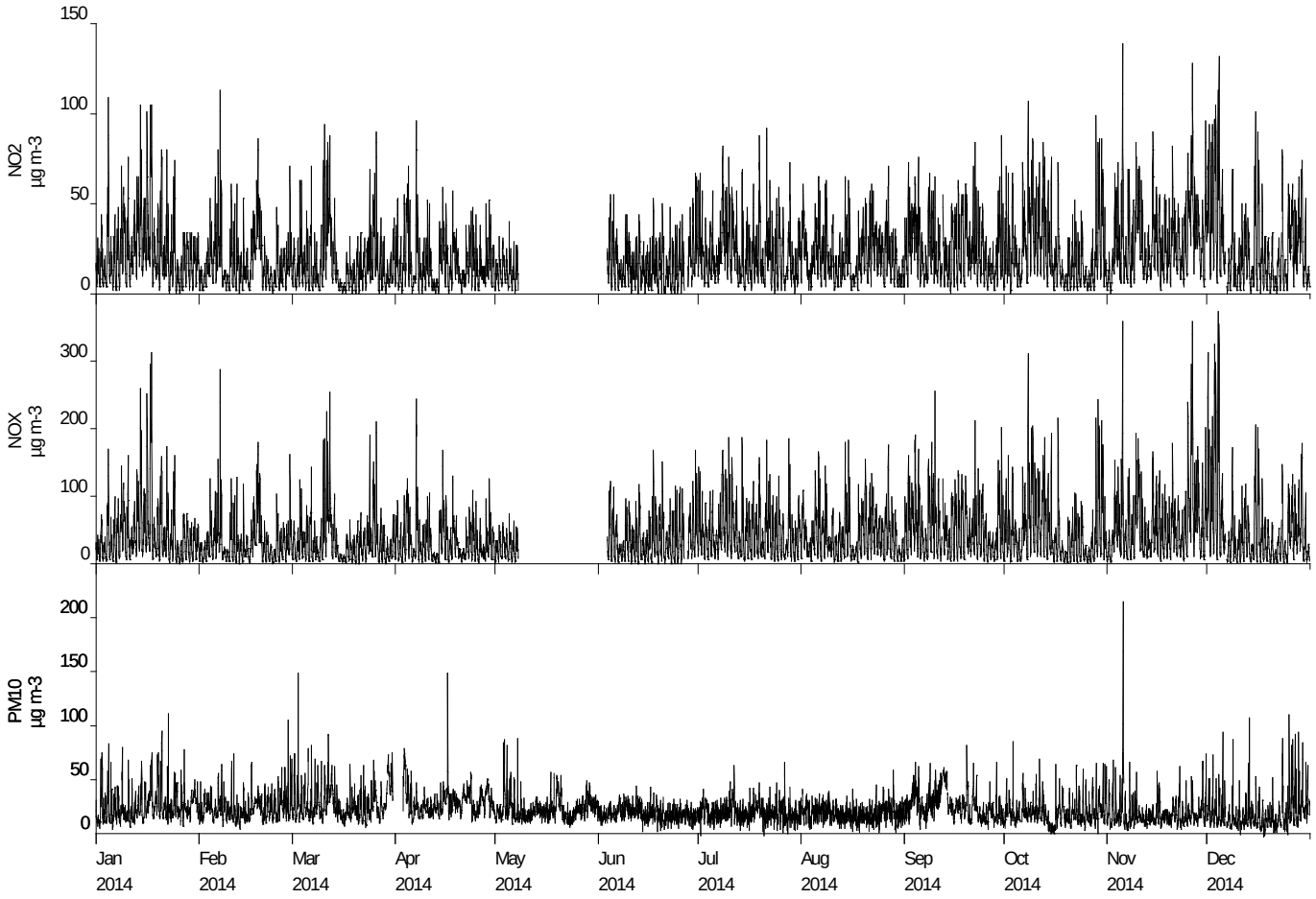
+ PM10 as measured by a FDMS using a gravimetric factor of 1
All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.

NO_X mass units are NO_X as NO_2 µg m^{-3}

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	1	1
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	1	-

Note: For a strict comparison against the objectives there must be a data capture of >90% throughout the calendar year

Produced by Ricardo-AEA on behalf of the Scottish Government
West Lothian Newton
Hourly Mean Data for 1st January to 31st December 2014



Date Created: 13/04/2015

Appendix B: Maps

Figure 1.1 Broxburn AQMA Boundary

Figure 2.1 LAQM Monitoring Locations

Figure 1.1

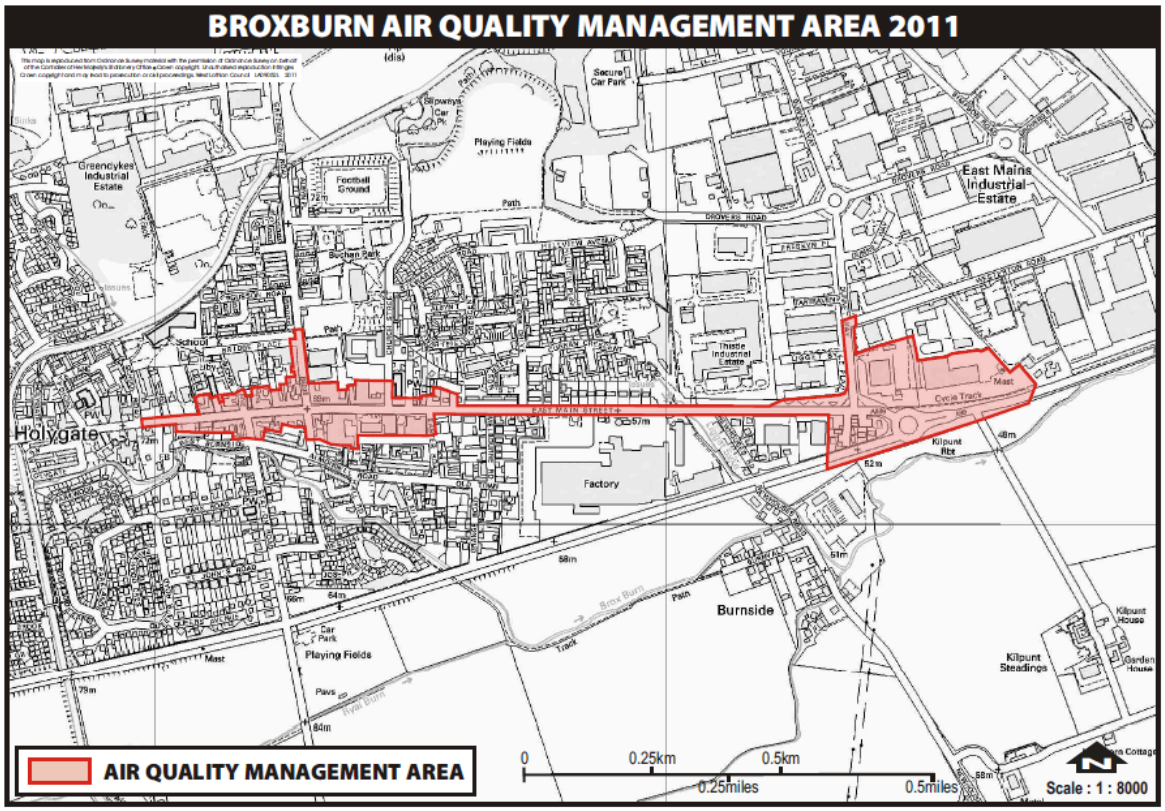
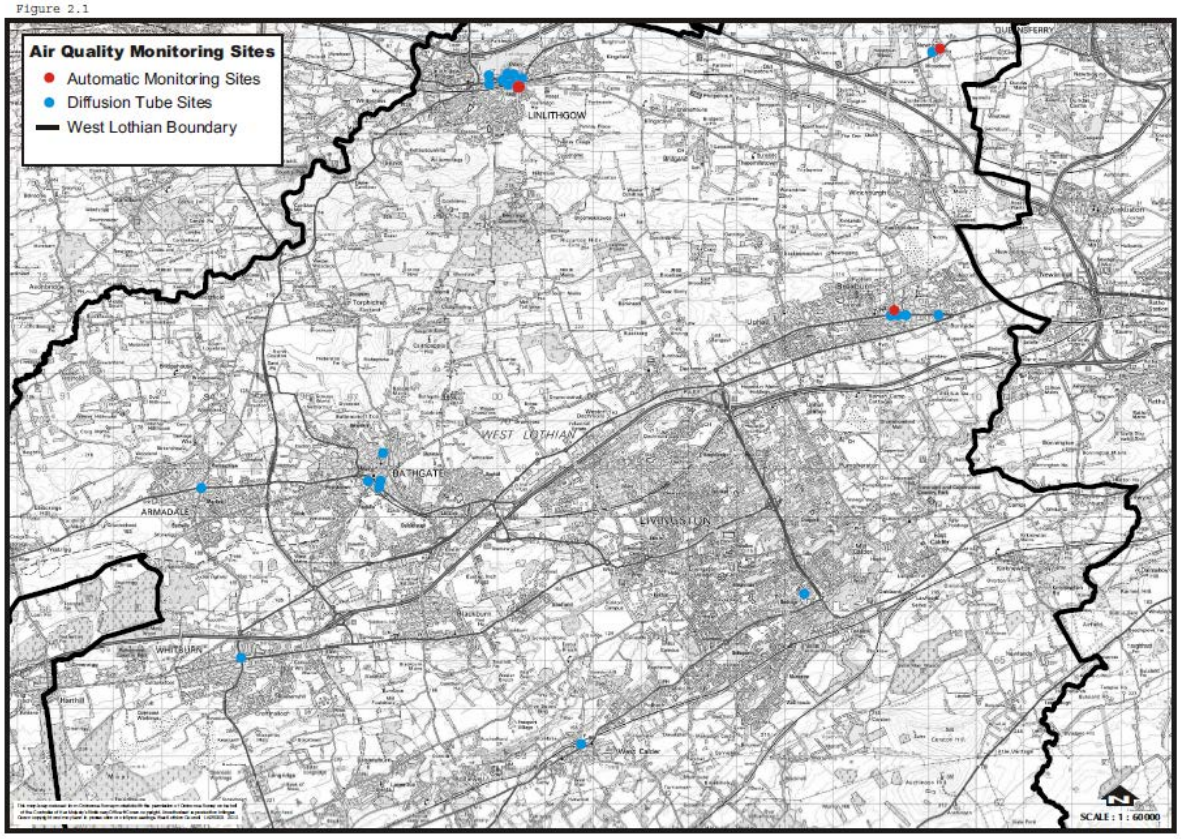


Figure 2.1


Air Quality Monitoring Sites
Automatic Monitoring Sites
Diffusion Tube Sites
West Lothian Boundary
LINLITHGOW
QUEENSFERRY
WEST LOTHIAN
BATHGATE
ARMADALE
LIVINGSTON
WHITBURN
SCALE : 1 : 60000

Appendix C: Diffusion tubes co-location sites bias calculation

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
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	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	08/01/2014	05/02/2014	46.4	47.1	38.2	44	4.9	11	12.3	34.7	100	Good	Good
2	05/02/2014	07/03/2014	36.2	39.7	40.9	39	2.4	6	6.1	29.5	99.6	Good	Good
3	07/03/2014	02/04/2014	33.3	34.4	43.5	37	5.6	15	13.9	26.7	100	Good	Good
4	02/04/2014	30/04/2014	38.2	45.7	48.8	44	5.5	12	13.5	28.2	100	Good	Good
5	30/04/2014	28/05/2014	37.8	33.1	41.2	37	4.1	11	10.1	27	100	Good	Good
6	28/05/2014	04/07/2014	38.1	35.4	31.2	35	3.5	10	8.6	28	27.5	Good	or Data Captu
7	04/07/2014	31/07/2014	23.6	39.3	30.7	31	7.9	25	19.5	25	92	Poor Precision	Good
8	31/07/2014	27/08/2014	31.1	37.5	32.2	34	3.4	10	8.5	26	96.9	Good	Good
9	27/08/2014	01/10/2014	43.5	42.2	45.1	44	1.5	3	3.6	30	99.3	Good	Good
10	01/10/2014	29/10/2014	39.9	31.1	40.6	37	5.3	14	13.2	27	81.4	Good	Good
11	29/10/2014	03/12/2014	48.2	49.3	56.7	51	4.6	9	11.5	31.7	99.9	Good	Good
12	03/12/2014	07/01/2015	38.9	36.6	36.9	37	1.3	3	3.1	25.5	98.9	Good	Good
13													
										Overall survey -->		Good precision	Good Overall DC

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

Site Name/ ID:	DT4 Broxburn CNC

Precision: 11 out of 12 periods have a CV smaller than 20%

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval) without periods with CV larger than 20%

Bias calculated using 10 periods of data

Bias factor A: 0.71 (0.67 - 0.75)

Bias B: 42% (34% - 50%)

Diffusion Tubes Mean: 40 µgm^{-3}

Mean CV (Precision): 10

Automatic Mean: 29 µgm^{-3}

Data Capture for periods used: 98%

Adjusted Tubes Mean: 29 (27 - 30) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA

Bias calculated using 11 periods of data

Bias factor A: 0.71 (0.67 - 0.76)

Bias B: 40% (32% - 49%)

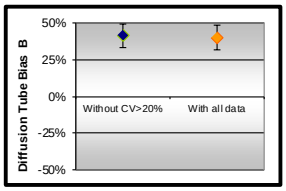
Diffusion Tubes Mean: 40 µgm^{-3}

Mean CV (Precision): 11 caution

Automatic Mean: 28 µgm^{-3}

Data Capture for periods used: 97%

Adjusted Tubes Mean: 28 (27 - 30) µgm^{-3}



Jaume Targa, for AEA

Version 04 - February 2011

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
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	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	08/01/2014	05/02/2014	51.1	59.0	52.6	54	4.2	8	10.4	54.4	100	Good	Good
2	05/02/2014	07/03/2014	44.6	47.0	50.2	47	2.8	6	7.0	44.5	97.7	Good	Good
3	07/03/2014	02/04/2014	39.3	41.2	26.1	36	8.2	23	20.4	34.4	100	Poor Precision	Good
4	02/04/2014	30/04/2014	43.6	43.5	37.4	42	3.6	9	8.8	35.2	69.9	Good	or Data Captu
5	30/04/2014	28/05/2014	36.3	38.7	38.3	38	1.3	3	3.2			Good	
6	28/05/2014	04/07/2014	32.5	26.3	33.1	31	3.8	12	9.4			Good	
7	04/07/2014	31/07/2014	23.5	24.8	27.8	25	2.2	9	5.5			Good	
8	31/07/2014	27/08/2014	33.9	36.5	37.3	36	1.8	5	4.4			Good	
9	27/08/2014	01/10/2014	36.1	45.3	45.9	42	5.5	13	13.6			Good	
10	01/10/2014	29/10/2014	37.1	43.5	38.7	40	3.3	8	8.3	24	66.2	Good	or Data Captu
11	29/10/2014	03/12/2014	50.0	52.7	63.0	55	6.9	12	17.0	41.6	99.9	Good	Good
12	03/12/2014	07/01/2015	47.4	46.3	50.9	48	2.4	5	6.0	34.9	99.6	Good	Good
13													
										Overall survey -->		Good precision	Good Overall DC

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

Site Name/ ID:	DT14 Linlithgow High Street 2

Precision: 11 out of 12 periods have a CV smaller than 20%

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval) without periods with CV larger than 20%

Bias calculated using 4 periods of data

Bias factor A: 0.86 (0.68 - 1.14)

Bias B: 17% (-12% - 46%)

Diffusion Tubes Mean: 51 µgm^{-3}

Mean CV (Precision): 8

Automatic Mean: 44 µgm^{-3}

Data Capture for periods used: 99%

Adjusted Tubes Mean: 44 (35 - 58) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA

Bias calculated using 5 periods of data

Bias factor A: 0.87 (0.74 - 1.07)

Bias B: 15% (-6% - 35%)

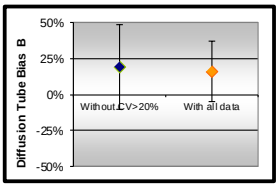
Diffusion Tubes Mean: 48 µgm^{-3}

Mean CV (Precision): 11 caution

Automatic Mean: 42 µgm^{-3}

Data Capture for periods used: 99%

Adjusted Tubes Mean: 42 (36 - 51) µgm^{-3}



Jaume Targa, for AEA

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