2016 Air Quality Annual Progress Report for Clackmannanshire Council

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

October 2016

Clackmannanshire Council

www.clacksweb.org.uk

TSI Scotland

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Executive Summary: Air Quality in Our Area

Air Quality in Clackmannanshire

This progress report was undertaken in accordance with Local Air Quality Management Technical Guidance LAQM.TG (16).

- The Council continued to monitor emissions of NO_2 and PM_{10} to determine if any air quality objectives were exceeded during 2015. All concentrations were found to be below the permitted limits. Examination of the previous seven years of data show that there was no obvious trend in annual mean NO_2 concentrations across the diffusion tube network until 2014 when the concentrations showed a general decrease at the 5 comparable sites when compared with 2013. In 2015 there was a slight increase in NO_2 levels at some locations, particularly Clackmannan Road, Alloa. NO_2 diffusion tubes were introduced in Auld Brig Road in 2012, and have recorded levels ranging from 26.2 – 37.0 µg/m^3, with the lowest reading (26.2) being in 2015.

  Results from the FDMS monitor at the automatic monitoring station at King Street, Alloa and those from the previous TEOM sampler have shown the annual mean concentration of particulate matter $PM_{(10)}$ of 15 –17 µg/m^3 over the last seven years with an overall average of 16.2 µg/m^3.
- During 2015, an automatic NOx monitor was also installed at the King Street site, alongside the TEOM/FDMS. This was installed in February 2015, so there is only 10 months of data from this monitor available for this report.
- A review of planning applications submitted in 2015 showed there were no new developments likely to have a significant impact and result in any exceedances of the Air Quality Standard (AQS) objectives for any pollutant. Clackmannanshire Council Roads and Transportation confirmed there were no new roads constructed with the potential to result in an exceedance of the AQS objectives. Transport Planning officers have collated data from traffic count sites throughout the area in recent years which is detailed later in this report. Figures were also obtained for vehicular traffic from Transport Scotland for roads within Clackmannanshire in order to give an indication of the growth across the area.
- The unscheduled closure of the Forth Road Bridge in December 2015 led to temporary increases in traffic on many of the roads in Clackmannanshire as

drivers found diversion routes. The situation returned to normal as soon as the bridge reopened at the end of February 2016.

Actions to Improve Air Quality

There are currently no Air Quality Management Areas (AQMA's) or action plans in the Clackmannanshire area, however the annual progress report summarises potential increases in emissions which may adversely affect air quality (like new roads or commercial developments). Where potential air pollution 'hotspots' are considered likely, monitoring will be considered for those areas.

The Council continues to :

- monitor the concentration of pollutants in the area
- promote sustainable travel alternatives (walking, cycling, and car sharing) through the Local Active Travel Strategy , the creation of new cycle routes, and the introduction of travel plans and cycle/walk to work initiatives and investment in technology to allow video conferencing
- promote low emission transport (installation of electric charging points)
- review and develop policies which impact on air quality

Local Priorities and Challenges

The Council is committed to continuing the assessment and review of pollutants affecting the air quality in Clackmannanshire. The priority is to continue monitoring emissions primarily of NO_2 and PM_{10}, but sites will also be considered for $PM_{2.5}$ monitoring. There are plans to purchase monitoring equipment which could be converted to monitor NOx or particulate matter as required.

A screening assessment was carried out for Cambusview Poultry Farm located at Blackgrange, Alloa. The results obtained for potential PM_{10} levels are such that the Council are considering progressing to a 'Detailed Assessment'.

Roads and Transportation will continue with plans for the promotion of low emission transport and sustainable travel alternatives as identified in the Local Transport Strategy.

Continued consideration to be given to the 'Cleaner Air for Scotland Strategy' and the formation of an officer group to identify any required changes to policy and current working practices in relation to Air Quality across the Council.

How to Get Involved

Improving air quality in Clackmannanshire is not only the responsibility of the Council. There are many ways members of the public, local businesses, logistics companies and transport operators can get involved. Choosing to walk or cycle instead of using the car, car sharing, and buying 'hybrid' or lower emission vehicles will all play a part in reducing pollutant levels in the area. Careful consideration should also be given to the installation/use of biomass systems and domestic wood or multi-fuel stoves as they have the potential to contribute to increased concentrations of gases and particulate matter in the air. Further information on such appliances is available at http://www.clacksweb.org.uk/environment/woodburningstoves/

The public can engage with the Council's efforts by logging onto the Clacksweb.org.uk website and searching for air quality. Monitoring results for the Clackmannanshire area can be viewed by visiting www.scottishairquality.co.uk and typing in your postcode. On this website, there is also the option to register for air quality alerts using the 'Know and Respond' System.

Figure 1.1 - Public electric vehicle charging point

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1. Local Air Quality Management

This report provides an overview of air quality in Clackmannanshire during 2015. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV

of the Environment Act (1995) 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. (Objectives are detailed in Table 1.1). Where exceedances of the standards occur or are considered likely the local authority must 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. This Annual Progress Report (APR) summarises the work being undertaken by Clackmannanshire Council to improve air quality and any progress that has been made.

Table 1.1 – Summary of Air Quality Objectives in Scotland

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	**Measured as**	
Nitrogen dioxide (NO_2)	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
Particulate Matter (PM_{10})	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
Particulate Matter ($PM_{2.5}$)	10 µg/m^3	Annual mean	31.12.2020
Sulphur dioxide (SO_2)	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
Benzene	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	0.25 µg/m^3	Annual Mean	31.12.2008

2. Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12 months, setting out measures it intends to put in place in pursuit of the objectives. Clackmannanshire Council currently does not have any AQMAs. There are no recommendations in this year's report to declare any new AQMAs in the council area (see monitoring section page 10).

2.2 Progress and Impact of Measures to address Air Quality

Clackmannanshire Council has continued to monitor levels of pollutants related to emissions from transport in 2015, in pursuit of improving local air quality. From February 2015, the authority started to monitor NOx levels at its fixed monitoring site on King Street, Alloa. Going forward, this will provide more accurate data regarding the levels of NOx emissions from traffic, than the previous method of using a diffusion tube only. Within the wider council, other measures are being taken forward which will have an impact on air quality.

The Council has a Sustainability and Climate Change Strategy which includes actions to reduce environmental impacts including reducing car use. The Council has a legal obligation to carry out Strategic Environmental Assessment (SEA) of its plans, programmes and strategies. This should include air quality considerations where the plan is likely to have an impact. SEA was used in the production of the Local Development Plan and potential negative impacts on air quality were identified and either avoided, mitigated or flagged for consideration at the development management stage.

The Development Quality section of the Council are also required to consider the potential impact on Air Quality as part of Environmental Impact Assessments (EIA) where required for new developments. Where an EIA is not required and it is considered that a development has the potential to be detrimental to the environment Policy EA11 of the Local Development Plan is used by the Council to ensure a developer demonstrates to the satisfaction of the Council that all reasonable measures have been taken to minimise or mitigate any such impacts.

The Local Transport Strategy is currently being updated and this outlines plans for proposed roads and means of transportation within Clackmannanshire. It recognises the need to consider Air Quality and the health effects of emissions from transport. Public transport plays an important part in the Council's transport strategy. The Public Transport Unit operates jointly with Stirling Council and undertakes the assessment of need for public transport services and the provision of appropriate infrastructure. (Details of measures to address air quality and their status are set out in Table 2.1. and photographs of examples in Figures 2.1 & 2.2)

Figure 2.1. National Cycle route and walkway sign in Clackmannanshire

Figure 2.2 - Public electric vehicle charging bay in Greenside Street car park, Alloa

Table 2.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date
1	Control of new developments	Policy Guidance and development control	Continue to monitor concentrations of pollutants in the council area	Development and Environment	Ongoing	Ongoing	Monitored emissions	N/A, no AQMAs	Satisfactory	Ongoing New developments will continue to be monitored and where necessary action will be taken
2	New automatic NOx monitor at south ring road	Transport planning and infrastructure	NOx monitoring	Development and Environment	Feb 2015	Complete	None	N/A, no AQMAs	Ongoing	
3	Install a mobile emissions monitor at A908 Hallpark Road, Sauchie where it was identified that traffic levels have increased.	Transport planning and infrastructure	The authority proposes to monitor PM2.5 and NOx levels using this equipment.	Development and Environment	Funding has been awarded	Before April 2017.	None	N/A, no AQMAs	Solution identified	Before April 2017
4	Environmental Health are looking to work more closely with other departments of the council such as roads and transportation, fleet management, development planning, sustainability and planning policy	Policy guidance and development control	Advice set out in the Cleaner Air For Scotland strategy (CAFS)	Development and Environment	Ongoing	Ongoing	None	N/A, no AQMAs	Ongoing	None

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implemen-tation Phase	Key Perform-ance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date
5	Council provides 10 electric pool cars for use by staff	Promoting low emission transport	Electric car charging points	Development and Environment	Complete	Complete	None	N/A, no AQMAs	Complete	Complete
6	Council provides 9 electric charging bays throughout Clackmannan-shire for use by the public.	Promoting low emission transport	Electric car charging points located at Kilncraigs, Greenside Street, Alloa, Dumyat Centre, Menstrie, Murray Square, Tillicoultry, Dollar Community Access Point Office, Dollar, Tron Court, Tullibody.	Development and Environment	Complete	Complete	None	N/A, no AQMAs	Complete	Complete
7	Promotion of walking and cycling. Part of this is the Smarter Choices, Smaller Places initiative which is promoted to the public	Alternative to Private vehicle use	Local Active Travel strategy	Development and Environment	Ongoing	Ongoing	None	N/A, no AQMAs	Ongoing	Ongoing
8	Council utilises a TripShare Clacks website which aims to reduce congestion and pollution by encouraging staff to car share on journeys to and from work;	Promoting travel alternatives	Car sharing	Development and Environment	Ongoing	Ongoing	None	N/A, no AQMAs	Ongoing	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implemen-tation Phase	Key Perform-ance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date
9	New cycle routes and paths have been created/ upgraded	Promoting travel alternatives	Routes created on a number of routes, for example the NCN 767 from Alloa to Tillicoultry, which provides safe off road routes for cycling as an alternative to car use	Development and Environment	Ongoing	Ongoing	None	N/A, no AQMAs	Ongoing	Ongoing
10	Council has invested in technology in an effort to reduce car journeys for meetings	Promoting travel alternatives	Video and telephone conferencing	Information Technology	Ongoing	Ongoing	None	N/A, no AQMAs	Ongoing	Ongoing
11	Cycle to work scheme for staff is promoted by the council	Promoting travel alternatives	Cycle to work scheme	Development and Environment (Transportation)	Ongoing	Ongoing	None	N/A, no AQMAs	Ongoing	Ongoing
12.	Council explored options to start up an EcoStars scheme within the area, however, resources are not available at this time	Promoting Low Emission transport	Ecostar options	Development and Environment	Under consideration	Under consideration	None	None	None	Ongoing

3. Air Quality Monitoring Data and Comparison with Air Quality Objectives

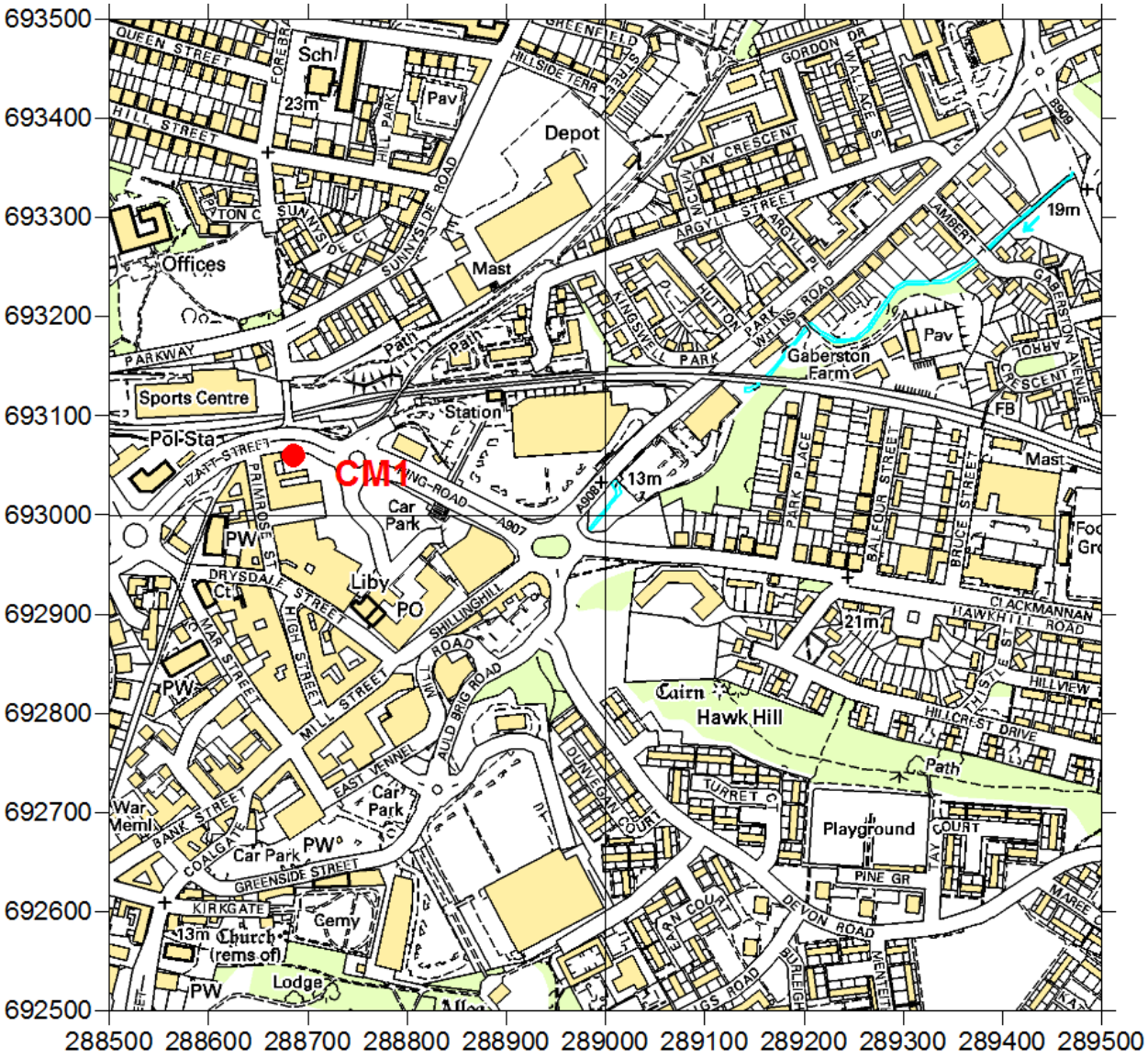
3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Automatic monitoring is carried out for NO_2 and PM_{10} in Clackmannanshire. From February 2015, the Council has been monitoring NO_2 levels at King Street, Alloa alongside the TEOM/FDMS monitor which continues to measure PM_{10} levels. The monitoring station is located on the pavement outside a car park immediately adjacent to King Street, Alloa. It is a busy road with a pedestrian crossing and housing nearby. The location is classified as a "roadside" site. A photograph of the unit and a map showing the location of the monitoring site are shown in Figures 3.1 and 3.2. (The details of the site are shown in Appendix A, Table A.1). The data capture for the site in 2015 was 91.3% for PM_{10} and for NO_2 was 81.6%. Routine calibrations are carried out by Clackmannanshire Council staff and six-monthly site audits are carried out by Ricardo. The audit report is reproduced in Appendix A.

Figure 3.1 – Automatic Monitoring Site - King Street, Alloa

Figure 3.2 - Location Map of Automatic Monitor - King Street, Alloa



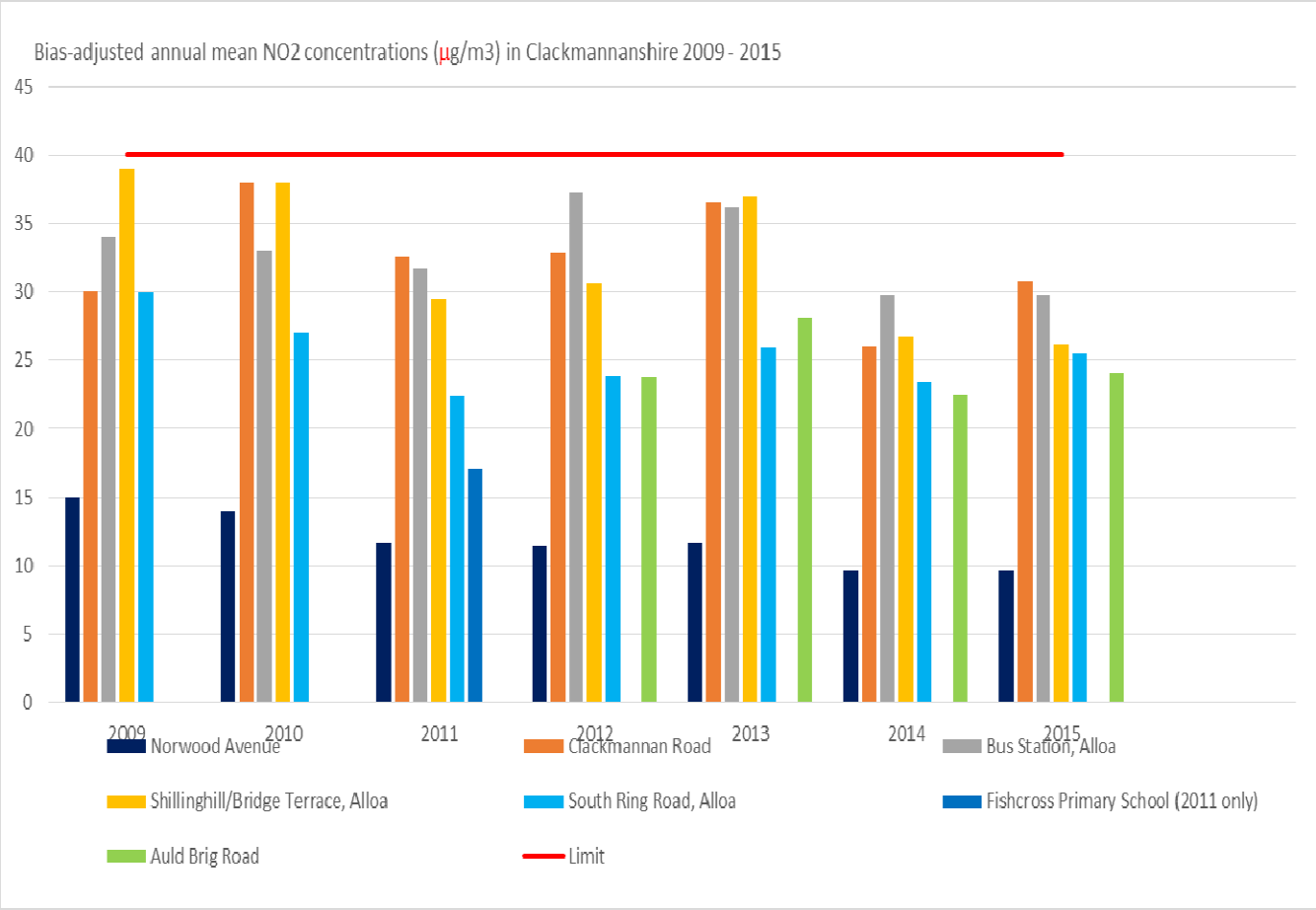
3.1.2 Non-Automatic Monitoring Sites

Non-automatic NOx monitoring is carried out using diffusion tubes mounted at six locations in the council area.

These locations are given in Appendix A, Table A.2. Data capture for NOx (average for all sites) was 90.2%.

Appendix A, Table A.3 shows monitoring results for the NOx diffusion tubes and compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3. Trends in annual mean Nitrogen Dioxide Concentrations are shown in Figure 3.3 below.

Figure 3.3 Trends in annual mean Nitrogen Dioxide Concentrations measured at diffusion tube monitoring sites in Clackmannanshire



3.2. Individual pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for annualisation and bias. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

A new NOx monitor was added to the existing automatic monitoring site in King Street, Alloa, in February 2015 and started recording NO_2 from then on. As only 10 months' data is available, the data capture rate was 81.6%. The annual mean recorded for 2015 was 28 µg/m^3. The AQS limit is 40 µg/m^3. (See Appendix A, Table A.3).

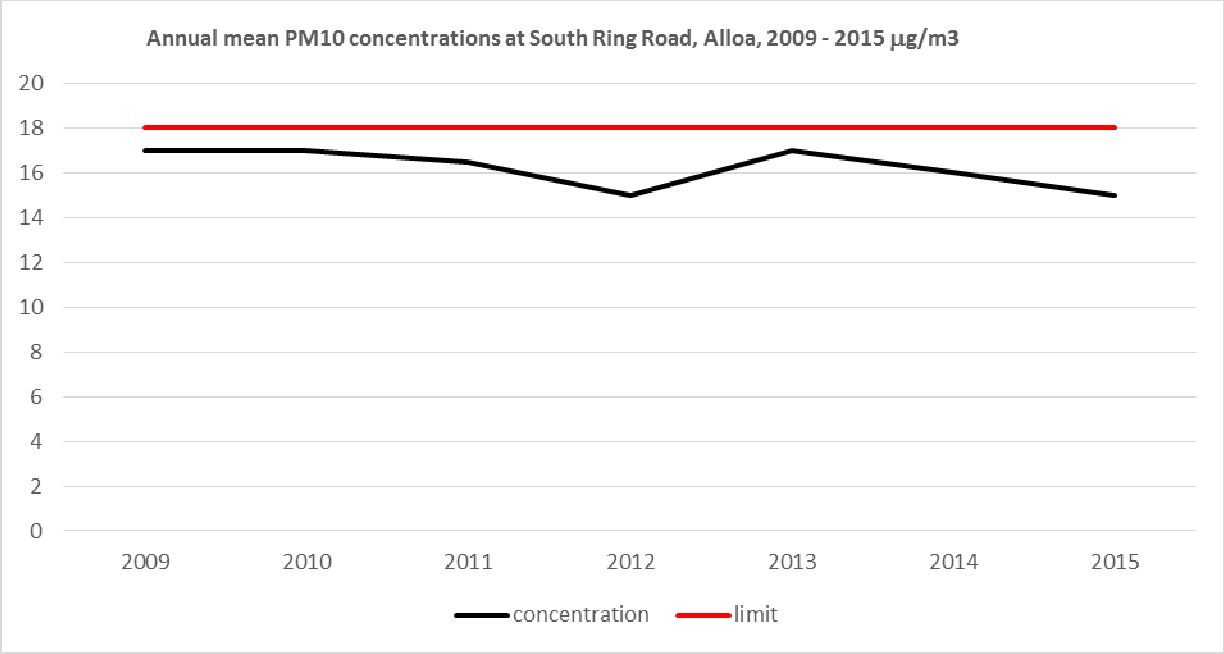
For diffusion tubes, the full 2015 dataset of monthly mean values is provided in Appendix A. Figures A.1 & A.2 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for 2015 with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year. There are no annual means greater than 40ug/m^3, which would indicate that an exceedance of the 1 hour mean objective is unlikely at these sites. **No Air Quality Management Area requires to be declared with regard to NO_2 levels in Clackmannanshire.**

3.2.2 Particulate Matter (PM_{10})

Automatic Monitoring Data

A summary of the ratified monitoring date for PM_{10} at the automatic monitoring site at King Street, Alloa is shown in Appendix A, Table A.7. The annual mean concentration of PM_{10} over the period 2009 to 2015 lies between 15 and 17 µg/m^3 with an average of 16.2 µg/m^3. A trend graph is shown in Figure 3.4 below.

Figure 3.4 - Trends in annual PM_{10} Concentration



It is noted that there were two exceedances over 50 µg/m$^{3.}$ These were in mid-February 2015 and early November 2015. These were likely to have been caused respectively by closure of the Forth Road Bridge during early 2015 and in November, by calm, damp weather which could have allowed PM_{10} concentrations to

accumulate. **No Air Quality Management Area requires to be declared with regard to PM_{10} levels in Clackmannanshire.**

3.2.3 Particulate Matter ($PM_{2.5}$)

Concentrations of $PM_{2.5s}$ are not monitored in the Clackmannanshire Council area. There are plans to purchase a portable monitor which could be set up to monitor $PM_{2.5}$. Initially, this would be set up on the A908, Hallpark Road, Alloa where increased traffic levels have been detected. **No Air Quality Management Area currently requires to be declared with regard to $PM_{2.5}$ levels in Clackmannanshire.**

3.2.4 Sulphur Dioxide (SO_2)

Concentrations of SO_2 are not monitored in the Clackmannanshire Council area and there are no immediate plans to do so. **No Air Quality Management Area currrently requires to be declared with regard to SO_2 levels in Clackmannanshire.**

3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene

Concentrations of carbon monoxide, lead and 1,3-Butadiene are not monitored in the Clackmannanshire Council area and there are no immediate plans to do so. **No Air Quality Management Area currently requires to be declared with regard to Carbon Monoxide, Lead and 1, 3-Butadiene in Clackmannanshire.**

4 New Local Developments.

There are no new developments within the Clackmannanshire area that have the potential to effect air quality.

4.1 Road Traffic Sources

The Transport Planning Department of Clackmannanshire Council was consulted in order to check if there were any new potential road traffic sources or significantly changed traffic sources within the Council area that could result in exceedances of air quality standards.

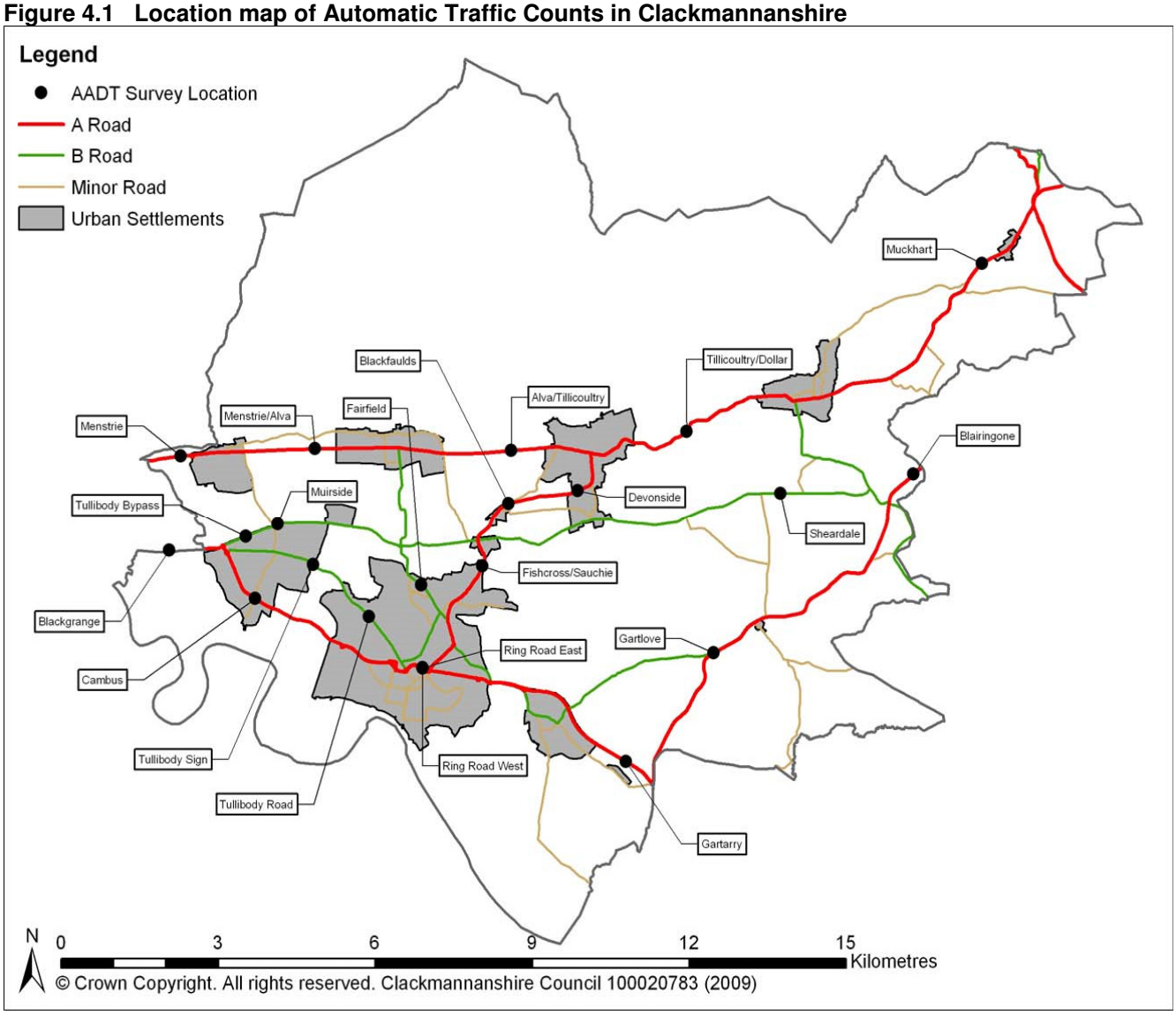
The Council operate a number of traffic counters throughout the area. In the network of counters operated by the Council, nine sites showed an increase in vehicle movements, and fifteen a decrease or no change. Five of the increased traffic flows were less than 10%.

Those with an increase greater than 10% were the A907 (Cambus), A91 Tillicoultry and Muckart, and the B9140 Sheardale. The A907, and the two locations on the A91 show higher traffic counts during December 2015. This is likely to have been caused by the temporary closure of the Forth Road Bridge due to a structural defect. Much of the traffic which normally crossed the Forth Road Bridge had to divert via the Clackmannanshire and Kincardine Bridge, which led to increased traffic flows through Clackmannanshire for a temporary period which ended on 23 December 2015 for smaller vehicles, however the bridge remained closed to heavier goods vehicles until February 2016. Figures for 2009 – 2015 are summarised in Table 4.1. A location map of the monitoring sites showing 2015 AADT counts is shown in Figure 4.1.

Table 4.1 Summary of Traffic Survey Data 2009 – 2015

Link	Description	Speed limit (mph)	Annual Average Daily traffic (vehicles per day)							
			2009	2010	2011	2012	2013	2014	2015	% change 2014-2015
49	A977 Gartlove	60	5949	5437	5603	6334	6139	6706	7358	9.7
287	A907 Blackgrange	60	20678	20407	20036	19945	19478	19522	21238	8.8
288	A907 Cambus	40	9027	8869	8548	n/a	7750	6851	7993	16.7
289	A907 Redwell Primary School								8527	-
299	A908 Hallpark Road								17088	-
292	A907 Ring Road Westbound	30	11915	11416	11151	n/a	9768	11503	11341	-0.14
295	A907 Clackmannanshire bypass	60	14395	13302	14672	14617	15050	15024	14820	-0.13
300	A908 Fishcross Primary School	30	12341	12889	12452	12326	11657	11693	12569	7.5
301	A908 Blackfaulds	40	9061	9167	9074	8886	9069	9059	-	-
302	A908 Devonside	30	7388	7649	7612	7481	6809	7336	7220	-0.16
309	A91 Menstrie Mains	60	9758	9121	8815	8457	8205	8102	8469	4.5
311	A91 Menstrie/Alva	60	9760	9252	9016	8362	8599	8140	8871	9.0
314	A91 Tillicoultry	30	7725	6513	6734	n/a	n/a	6095	6889	13.0
321	A91 Muckhart	60	3545	3346	3098	3123	3267	3014	3334	10.6
50	A977 Blairingone	60	5355	3957	4904	4759	-	-	5693	-
581	B908 Fairfield	30	6178	6341	6368	6547	6696	6834	7384	8.0
586	B909 Hilton Road			9983					10811	-
589	B9096 Tullibody sign	30	9517	9407	9459	9185	9126	9449	9334	-1.2
590	B9096 Tullibody Road	30	10746	10702	10343	10086	10131	10337	8636	-16.4
625	B9096 Tullibody bypass	60	7567	7668	7789	7815	8668	8310	8191	-1.4
626	B9140 Muirside	60	7739	8155	8267	n/a	8487	8821	8278	-6.1
634	B9140 Sheardale	60	1639	1677	1492	n/a	1520	1438	1636	13.8
317	A91 Taits Tomb	60	5652	5508	5163	n/a	5178	5429	5444	0.3
292	A907 Ring Road Eastbound			9810					9794	-

Figure 4.1 Location map of Automatic Traffic Counts in Clackmannanshire



On consideration of the information relating to traffic count data and from discussions with the roads and transportation department at the Council, it can be confirmed that;

- There are no new narrow congested streets with residential properties close to the kerb;
- There are no new busy streets where people may spend one hour or more close to traffic;
- There are no new roads with a high flow of buses and/or HGV's;
- There are no new junctions;
- There are no new roads constructed or proposed;
- There are no new roads with significantly changed traffic flows. However, it has been established that a new traffic counter was installed at the A908 Hallpark Road during 2015. This showed significant traffic levels and anecdotal evidence from staff states that traffic flow is often poor at peak times. As such, funding has been applied for and it is hoped that a mobile type monitor can be installed along this road. The route is busy with pedestrians and also has some residential properties along one side;
- There are no new bus or coach stations.

4.2 Other Transport Sources

There is one train station within the Clackmannanshire Council area at Alloa which has been assessed in previous rounds of Review and Assessment for the potential impact from stationary trains. There has been no increase in the number of stationary trains with engines running within relevant exposure. No further assessment has been undertaken.

During 2015, there was no change in the number of diesel passenger trains on the main train lines throughout the Clackmannanshire Council area since the last round of Review and Assessment. No further assessment was therefore undertaken. The line also handled freight trains delivering coal to Longannet Power Station (and sometimes from it). Since the closure of Longannet Power Station in early 2016, this line does not currently handle regular freight trains.

It can be confirmed that there are no new;

- airports;
- locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m;
- locations with a large number of movements of diesel locomotives and potential long-term exposure within 30m; and
- ports for shipping

within Clackmannanshire.

4.3 Industrial Sources

The Scottish Environment Protection Agency, (SEPA) was contacted to obtain up-to-date information on regulated industrial processes within the Clackmannanshire Council area. They were unaware of any applications or plans for new or increased sources of atmospheric emissions in the Council area.

With regard to existing industrial sources, SEPA has previously confirmed to the Council that there are 2 Poultry Farms within the area which could have the potential for fugitive emissions of particulate matter;

- Cambusview Poultry Farm
- Helensfield Poultry Farm.

Cambusview Poultry Farm (see location map at Figure 4.2) is a Part A process regulated by SEPA under the Pollution Prevention and Control (Scotland) Regulations 2012 (PPC) (permit ref: PPC/A/1016782).

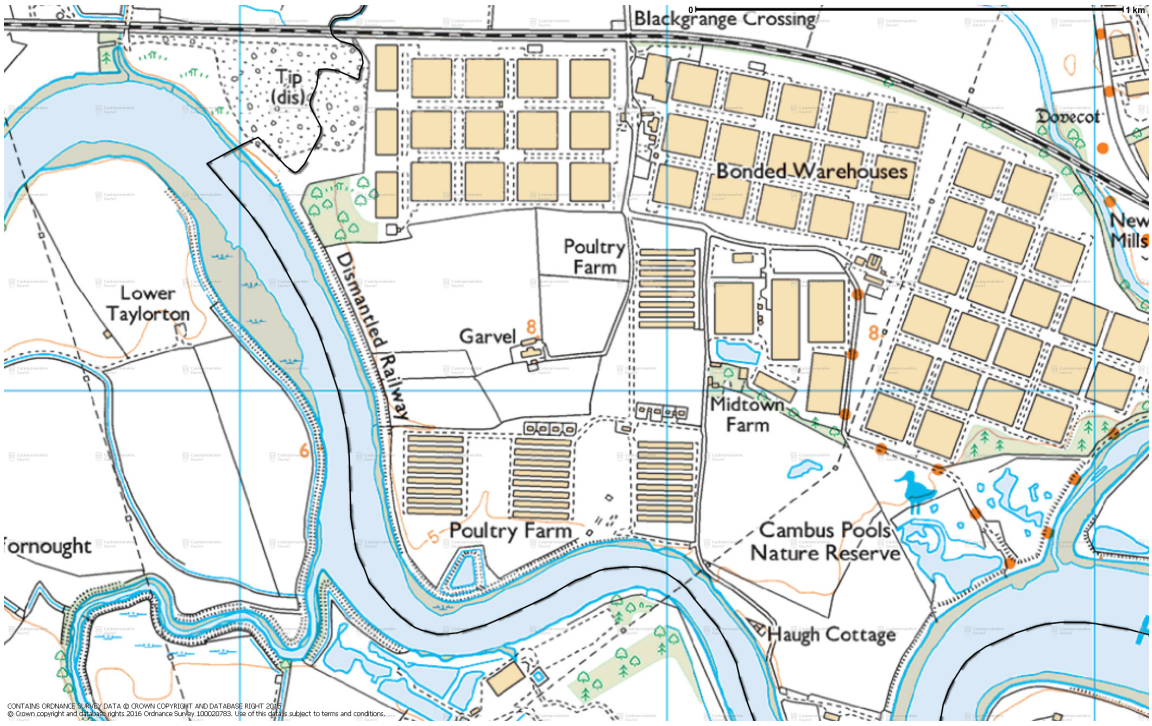
It has been identified in previous air quality assessments as having the potential to cause an adverse impact on air quality at a number of residential properties, some occupied by the poultry farm workers, close to the units. There is no record of any complaints from local residents in relation to air quality in the vicinity of the site. The other poultry farm within the Council area (Helensfield Poultry Farm (permit ref: PPC/A/1017511)) is located near to the town of Clackmannan.

According to the guidance in LAQM TG-(16), poultry farms which house in excess of 400,000 birds (if mechanically ventilated) and in excess of 200,000 (if naturally ventilated) are required to be considered in a screening assessment.

The permit issued for Cambusview allows the housing of 1,200,000 birds. Appendix D provides details of the initial screening assessment which has been carried out regarding this poultry farm. The initial screening assessment for Cambusview indicated a figure of 190.5 $\mu g/m^3$ for this site, which is well above the 24 hour mean PM_{10} objective limit value of 50 $\mu g/m^3$. It is therefore recommended that SEPA are contacted to discuss a way forward with this matter. It is likely that a Detailed Assessment will be required, using real data to determine the actual extent of the issue.

The Council intends to further investigate the poultry farm in Helensfield to determine the number of birds present and the type of ventilation in use and to establish whether an initial screening assessment is required.

Figure 4.2 – Map showing the location of Cambusview Poultry Farm



4.4 Commercial and Domestic Sources

There are two existing biomass installations within the Clackmannanshire Council area. One is at Redwell Primary School and the other at Muckhart Golf Club. The school boiler is rated at 220kW and at the golf club the installed capacity is 70kW. Both of these are small in terms of output when compared to other sources of emissions. At this size they are at the bottom end of the range considered by TG(16) (is this still the same as is stated in TG16) which only gives a methodology for calculating absolute values rather than specific volumes. Development planning advised that there were no biomass boiler applications in 2015. There are also no new Combined Heat and Power (CHP) plants.

Previous reports concluded that there were no areas of domestic solid fuel burning with a density greater than 100 houses within a 500 x 500m area. There have been no new areas of development with significant solid fuel burning and it is therefore not necessary to undertake any further assessment. The Council has previously received some complaints regarding smoke from small, domestic wood burning stoves which are investigated on a case-by-case basis. Such installations do not always require planning permission and it is therefore difficult to track their numbers within the Council area. However, it is the intention of Clackmannanshire Council to log all units as they become aware of them.

4.5 New Developments with Fugitive or Uncontrolled Sources

There are no new potential sources of fugitive emissions within the council area.

5 Planning Applications

The Development Quality section of the Council was consulted with regard to major planning applications during 2015 which might affect air quality. No new major developments were identified. Previous annual air quality reports have highlighted a proposed development at Forestmill which has the potential to have an impact on air quality within the area. Any further developments with this proposal will continue to be observed.

6 Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

During 2015, Clackmannanshire Council undertook monitoring of NO_2 and PM_{10} concentrations at locations detailed in the report. The results indicate that the air quality limits for both pollutants were complied with during 2015 at all monitoring locations. Two exceedence's of the 24-hour mean for PM_{10} were noted during 2015, one in February and one in November. The reasons for these were considered to be the closure of the Forth Road Bridge during early 2015 and a long spell of calm weather in November. There are no existing AQMAs within the Council area and based on the monitoring data obtained it is concluded that no air quality management areas are required to be declared.

6.2 Conclusions relating to New Local Developments

This assessment has been conducted in accordance with the TG(16) Technical Guidance. Updated information has been obtained on road, rail, industrial, domestic and fugitive emission sources and compared to criteria and conditions described in the Guidance. It was determined that there is no need to proceed to a detailed assessment for any of new or existing emissions sources with the exception of the Cambusview Poultry farm. As noted in the report, SEPA will be contacted initially to discuss the outcome of the screening assessment and the way forward with any detailed assessment.

6.3 Proposed Actions

Clackmannanshire Council plan to maintain the monitoring network throughout 2016. There are no planned changes to monitoring locations with the exception of

two new traffic monitoring locations at the A907 outside Redwell Primary School, Stirling Road Alloa and the A908 Hallpark Road, Alloa.

Funding has been granted to the Council, to allow the purchase of a portable type monitor which is to be installed on the A908 Hallpark Road and which will monitor NO_2 and $PM_{2.5}$. It is anticipated the installation work will take place during 2016-2017.

The Council also aim to gather further information on the poultry farm at Helensfield and carry out a screening assessment if required. Consideration will be given to progressing to detailed assessment for Cambusview poultry farm. It is hoped that this work will be completed by April 2017.

The 2014 Update and Screening Report highlighted an increase in traffic volume at Gartlove of 9.2%, and this trend has continued in the past year with a further increase of 9.7%. Whilst this and the increases shown on the A91 are likely to have been caused by the temporary closure of the Forth Road Bridge in December, a watching brief is recommended on these two sites now that the bridge is restored to full service.

The next report to be published is the 2016 Progress Report.

APPENDICES

Appendix A: Monitoring Results

Table A.1 Details of King Street, Alloa - Automatic Monitoring Site

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 worse case exposure?
King Street, Alloa	Roadside	288686	693056	PM_{10}	N	TEOM/FDMS	Y(8m)	3m	Y
King Street, Alloa	Roadside	288686	693056	NO2	N	Chemiluminescent Analyser	Y(8m)	3m	Y

Table A.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?	Distance to relevant exposure (m)	Distance to Kerb of nearest road (m)	Tube collocated with a continuous analyser?
DT 1	Norwood Avenue, Alloa	Kerbside	287600	693600	NO2	N	2m	1.7	N
DT 2	Clackmannan Road, Alloa	Kerbside	289300	692900	NO2	N	2m	2.0	N
DT 3	Bus Station, Alloa	Kerbside	288800	692900	NO2	N	2m	1.3	N
DT 4	Shillinghill/Bridge Terrace, Alloa	Kerbside	288900	692900	NO2	N	2m	1.4	N
DT 5	King Street, Alloa	Roadside	288686	693056	NO2	N	8m	2.0	Y
DT 6	Auld Brig Road, Alloa	Kerbside	288920	692880	NO2	N	3m	1.8	N

Table A.3 – Annual Mean NO_2 Monitoring Results (2009 – 2015)

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%)(1)	Valid Data Capture 2015(%) (2)	2011 µg/m^3	2012 µg/m^3	2013 µg/m^3	2014 µg/m^3	2015 µg/m^3
DT 1	Kerbside	Diffusion tube	-	91.7	11.7	11.4	11.7	9.7	9.7
DT 2	Kerbside	Diffusion tube	-	91.7	32.6	32.8	36.5	26.0	30.8
DT 3	Kerbside	Diffusion tube	-	91.7	31.7	37.3	36.2	29.8	29.8
DT 4	Kerbside	Diffusion tube	-	91.7	29.5	30.6	30.7	26.7	26.2
DT 5	Roadside	Diffusion tube	-	83.3	22.4	23.9	25.9	23.4	25.5
DT 6	Kerbside	Diffusion tube	-	91.7	-	-	28.1	22.5	24.1
CM 1	Roadside	Automatic	81.6	-	-	-	-	-	28

Notes: Exceedences of the NO_2 annual mean objective of 40 µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60 µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean are shown in bold and underlined.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year;

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%);

(3) Means for diffusion tubes have been corrected for bias. All means have been 'annualised' as per the LAQM. TG(16) if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	NO_2 1-Hour Means > 200 µg/m^3 (3)				
					2011	2012	2013	2014	2015
CM 1	Roadside	Automatic	81.6	-	-	-	-	-	0

Notes: Exceedences of the NO_2 1-hour mean objective (200 µg/m^3 not to be exceeded more than 18 times per year) are shown in bold.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year;

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%);

(3) If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM10 Annual Mean Concentration µg/m^3 (3)				
				2011	2012	2013	2014	2015
CM 1	Roadside	-	91.3	16.5	15	17	16	15

Notes: Exceedences of the PM_{10} annual mean objective of 18µg/m^3 are shown in **bold**.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year;

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%);

(3) All means have been 'annualised' as per the LAQM.TG(16), valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	PM10 24-Hour Means > 50 µg/m^3 (3)				
				2011	2012	2013	2014	2015
CM 1	Roadside	-	91.3	**2**	**1**	0	0	**2**

Notes: Exceedences of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 7 times per year) are shown in **bold**.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year;

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%);

(3) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Table A.7 – Ratified PM_{10} and NO_2 monitoring data from Ricardo Energy & Environment

ALLOA A907 – King Street
01 January to 31 December 2015

These data have been fully ratified by Ricardo Energy & Environment

POLLUTANT	PM_{10}*+	NO_2	NO_X
Maximum hourly mean	87 µg m^{-3}	105 µg m^{-3}	604 µg m^{-3}
Maximum daily mean	54 µg m^{-3}	64 µg m^{-3}	221 µg m^{-3}
99.8th percentile of hourly means	-	90 µg m^{-3}	-
Average	15 µg m^{-3}	28 µg m^{-3}	64 µg m^{-3}
Data capture	91.3 %	81.6 %	81.6 %

+ PM_{10} instruments:
FDMS using a gravimetric factor of 1 from 14 January 2015
All gaseous pollutant mass units are at 20℃ 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}

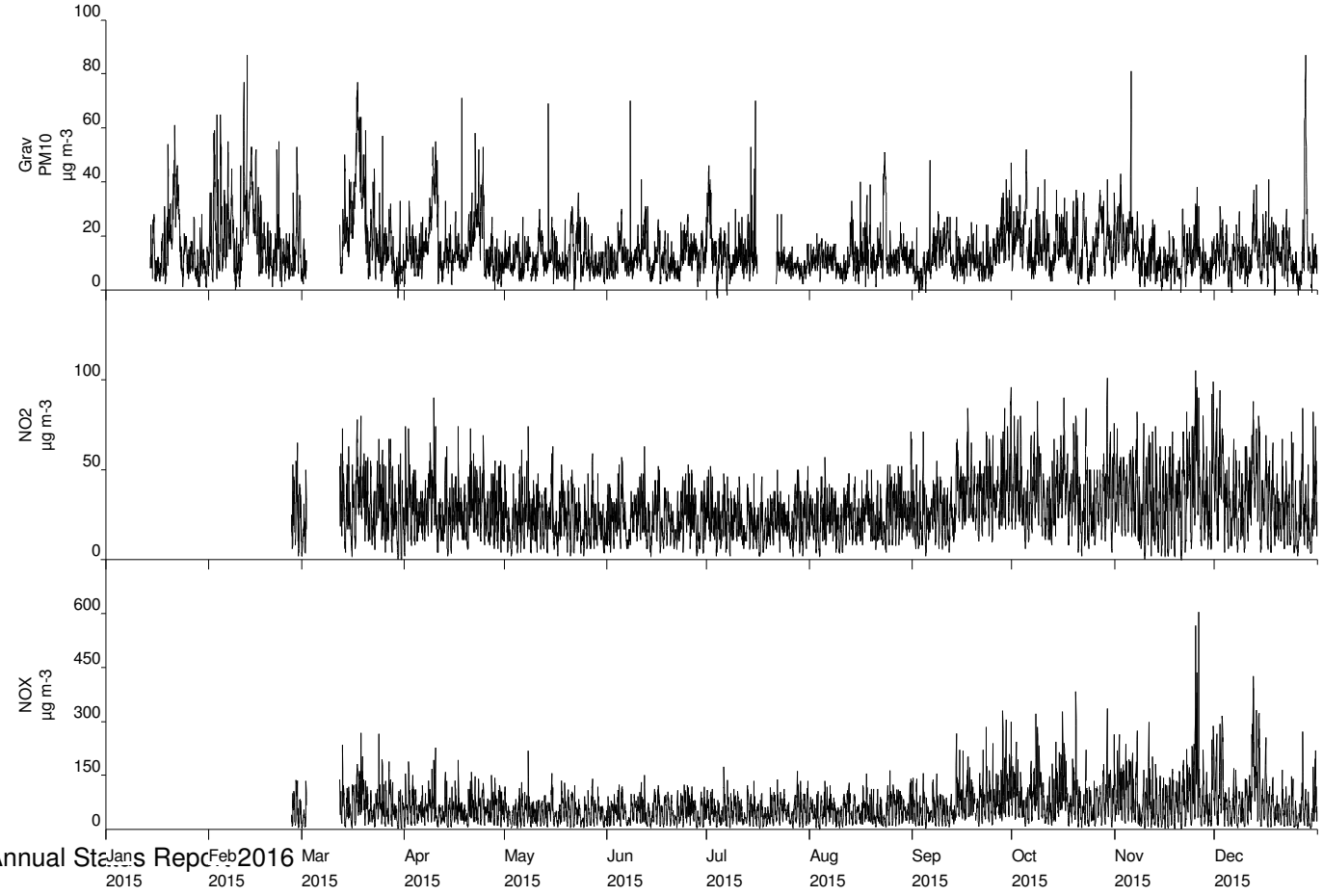
Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	2	2
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	0	-
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0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

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

Figure A.1 – 1-Hour Mean NO_2 Monitoring Results

See graphed data for NOx below - Produced by Ricardo Energy and Environment on behalf of the Scottish Government

Alloa A907 Hourly Mean Data for 01 January to 31st December 2015



Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.2 – NO_2 Monthly Diffusion Tube Results for 2015

ID	Site	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN	Data Capture
1	Norwood Avenue	15.4	14.3	6.22	7.1	7.1	7.2	5.9	3.5	11	17.7	NR	13.8	9.9	91.7
2	Clackmannan Road	44.4	41.4	19.2	36.6	35.3	27.7	14.5	25.3	28	40.9	NR	32.1	31.4	91.7
3	Bus Station Alloa	40.2	42	15.8	25.5	33.6	30.1	22.5	21	28.5	43.4	NR	31.6	30.4	91.7
4	Shillinghill/Bridge Terrace, Alloa	33.2	31.8	17.6	20.3	27.7	25.6	18.4	27.2	26.9	33.3	NR	31.6	26.7	91.7
5	South Ring Road, Alloa	34.6	NR	15.7	17	26	26.9	22.6	22.3	24.9	35.4	NR	35.3	26.1	83.3
6	Auld Brig Road	32.3	37.2	12.9	26.5	21.5	20.4	13.5	22.1	23	33.2	NR	27.7	24.6	91.7

Appendix C – Calculations for Screening Assessment of Poultry Farms

PC (Percentile Contribution) (µg/m^3) of PM10 is calculated using the following;

PC = (a) x (-0.000161 ln (d) + 0.000793) x (b)

Where: a = 0.62 when calculating 90.4th percentile (England, Wales, Northern Ireland) and 0.83 when calculating 98th percentile (in Scotland)
d = distance (m) of receptor from poultry
b = number of birds. If turkeys, multiply number of birds by 1.5 to account for turkey's larger size.

Step 2: i) Add the PC value to the annual mean PM10 background concentration to calculate the total 90.4th percentile 24-hour mean concentration in England, Wales and Northern Ireland. ii) In Scotland, add the PC value to twice the annual mean PM10 background concentration to calculate the total 98th percentile 24-hour mean concentration.

Step 3: The total percentile 24-hour mean should then be compared against the relevant 24-hour PM10 air quality objective limit value.

PC = (0.83) x (-0.000161 ln (d) + 0.000793) x (b),

PC = (0.83) x (-0.000161 ln (50) + 0.000793) x (1,2000,000)

where d is 50m, the radius of interest, b the number of birds at Cambusview 1,200,000 and 0.83 is a regional adjustment factor for Scotland

PC = (0.83) x ($-6.3 \times 10^{-4} + 7.93 \times 10^{-4}$) x1.2 x$10^6$

= 162.5 µg/m^3

Background concentration of PM10 in the vicinity of Cambusview is 14 µg/m^3

The total percentile concentration predicted by the method is PC + 2 x background concentration

=162.5 + (2 x 14) = **190.5 µg/m^3**

Hence it can be seen that the 24-Hour Mean PM_{10} air quality objective of 50 µg/m^3 has been exceeded.

References for calculation method -

LAQM-TG16 – Box 7.2
https://ukair.defra.gov.uk/assets/documents/reports/cat07/15111444_AQ0926_Report_PM_Emissions_from_Poultry_Farms_BV_AECOM_Nov_2012.pdf

Appendix D: Supporting Technical Information / Air Quality Monitoring Data QA/QC

Factor from local Co-location Studies

There is no co-location study within Clackmannanshire Council

Diffusion Tube Bias Adjustment Figures

The National bias adjustment factor spreadsheet v03_15 was used to derive the national bias adjustment factor for diffusion tubes analysed by Glasgow Scientific Services during 2015. The factor was found to be 0.98. See Figure D.1 below.

PM Monitoring Adjustment

The following method was used to derive PM_{10} figures quoted in the report before 2014. Since 2014, an FDMS upgrage has been installed to the TEOM, so this method is no longer required. 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 Filter Dynamics Measurement System (FDMS) instruments located within 130km of the TEOM in question to assess the loss of particulate matter 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. Hourly average purge measurements from all Scottish FDMS monitoring sitesa within the Scottish Government – run network (SAQD) and the national network (AURN) were used for the correction.

The VCM method (Ref.xx) was used to correct data from the Alloa site and is ratified by AEA.

QA/QC of automatic monitoring

The automatic monitoring equipment is audited every 6 months by Ricardo AEA, 18, Blythswood Square, Glasgow, G2 4AD. It is serviced and calibrated by Air Monitors

Ltd., Unit 2 Bredon Court, Brockeridge Park, Twyning, Tewksbury, Gloucestershire, GL20 6FF. Available reports are shown below.

CERTIFICATE OF CALIBRATION

Ricardo Energy & Environment, 18 Blythswood Square, Glasgow, G2 4AD

Telephone 01235 753842

0401

Authorised Signatories: D Hector
S Stratton✓

Signed: Date of Issue: 18th April 2016

Certificate Number: 03307 Page 1 of 2

Customer Name and Address: Scottish Government
Water, Air, Soils and Flooding Division
Environmental Quality Directorate
Scottish Government
Victoria Quay
Edinburgh
EH6 6QQ

Description: Calibration factors for Clackmannanshire Council's Alloa A907 air monitoring station.

Ricardo Energy and Environment Calibration ID Number: ED57729/April 2016

Site / Date Test Carried Out	Species	Analyser Serial No.	Zero Response[1]	Uncertainties ppb	Calibration Factor[2]	Uncertainties %	Converter eff. (%)[3]
Alloa A907 13th August 2015	NO_x	1502764112	0.8	2.6	1.1766	3.9	98.7
	NO		0.3	2.6	1.1762	4.0	

Site / Date Test Carried Out	Species	Analyser Serial No.	Parameter	Specified Value	Measured Value	Deviation %
Alloa A907 13th August 2015	FDMS PM_{10}	12791	Main Flow [4]	3.00	2.98	-0.7
			Aux Flow [4]	13.67		
			Total Flow	16.67	16.24	-2.6
			Ito [5]	13244	13160	-0.6

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95% The uncertainty evaluation has been carried out in accordance with UKAS requirements.

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Certificate Number: 03307 Page 2 of 2

Ricardo Energy and Environment Calibration ID Number: ED57729/April 2016

The gaseous ambient analysers listed above have been tested for zero response, calibration factor, linearity and converter efficiency (NOx analysers only) by documented methods. The factors have been calculated using certified gas standards.

The particulate analysers listed above have been tested for sample flow rates and k0 (where appropriate) by documented methods. Note that the test results are valid on the day of test only, as analyser drift over time cannot be quantified. All results for gaseous species are given in ppb (parts per billion) mole fractions or ppm (parts per million) mole fractions.

1The zero response is the zero reading on the data logging system of the analyser when audit zero gas was introduced to the analysers under test.

2The calibration factor is the multiplying factor required to scale the reading on the data logging system of the analyser into reported concentration units (ppb for NO, NOx, SO2, O3 and ppm for CO. Where 1 ppm = 1000 ppb). It should be used in conjunction with the zero response. A corrected concentration is calculated using the following equation:

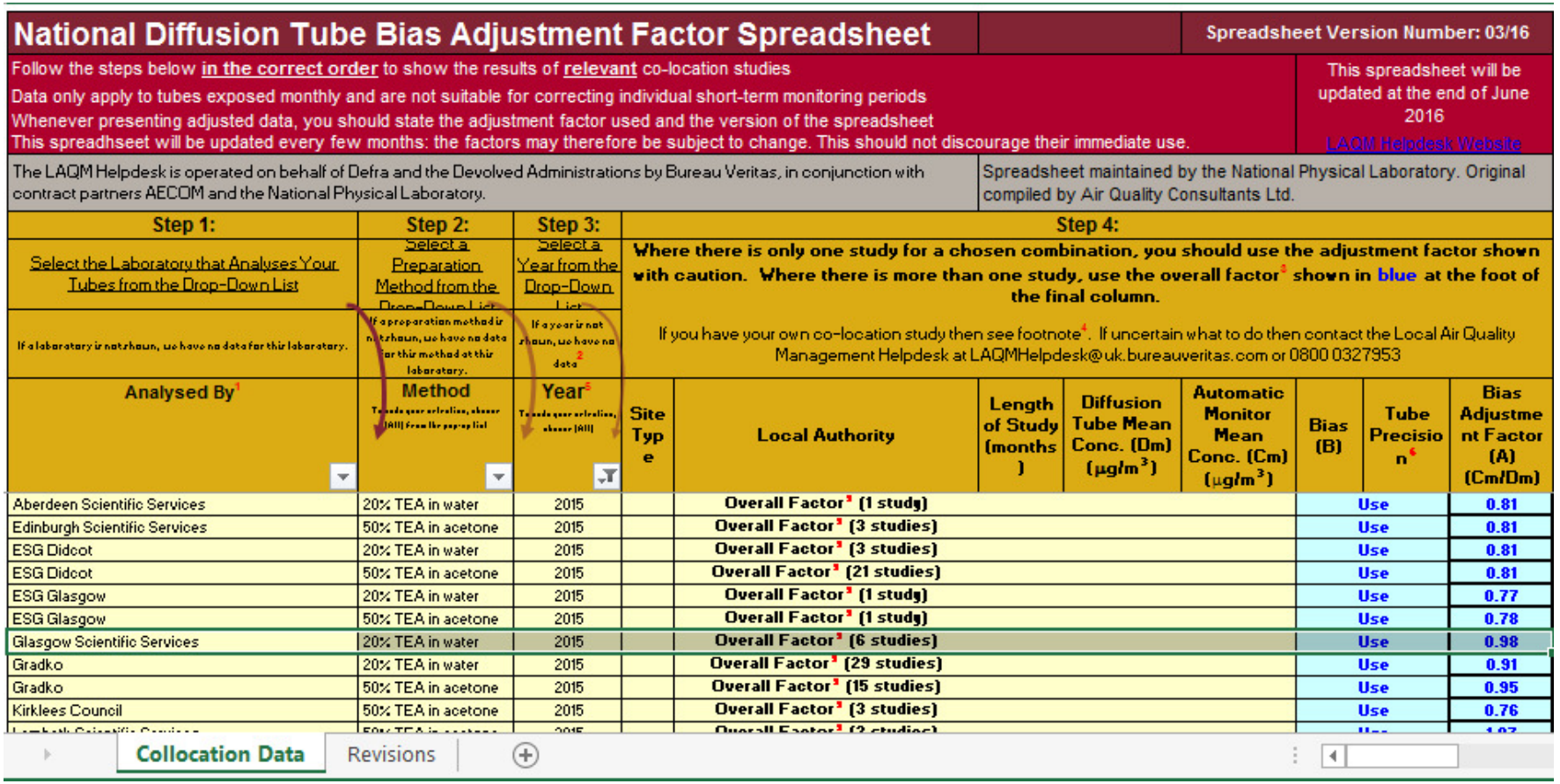
Concentration = F (Output - Zero Response)
Where F = Calibration Factor provided on this certificate
Output = Reading on the data logging system of the analyser
Zero Response = Zero Response provided on this certificate

3Converter eff. is the measured efficiency of the NO2 to NO converter within the oxides of nitrogen analyser under test.

4The measured main flow rate (where applicable) is the flow rate through the sensor unit of the TEOM particulate analyser under test. The measured aux flow rate (where applicable) is the flow rate through the bypass tubing of the TEOM particulate analyser under test. The measured total flow rate is the total flow rate through the particulate analyser under test. Units of flow are l.min-1. Where flow rates are highlighted in bold, it indicates that measurements were not made at the analyser sample inlet. These measurements therefore may not accurately reflect analyser performance in normal operation.

5The calculated k0 value (TEOM analysers only) is the calculated k0 spring constant based on tests undertaken with filters of known weight. The % deviation indicates the closeness of the calculated result to the manufacturer's specified k0 value.
The calibration results shaded are those that fall within our scope of accreditation, all other results on this certificate are not UKAS accredited, but have been included for completeness.

Figure D.1 – National Diffusion Tube Bias Adjustment Factor Spreadsheet



National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/16

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

This spreadsheet will be updated at the end of June 2016
LAQM Helpdesk Website

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

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

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List

If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List

If a year is not shown, we have no data [2]

Step 4:

Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor [3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote [4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By [1]	Method To make your selection, choose (All) from the pop-up list	Year [5] To make your selection, choose (All)	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision [6]	Bias Adjustment Factor (A) (Cm/Dm)
Aberdeen Scientific Services	20% TEA in water	2015		Overall Factor [3] (1 study)				Use		0.81
Edinburgh Scientific Services	50% TEA in acetone	2015		Overall Factor [3] (3 studies)				Use		0.81
ESG Didcot	20% TEA in water	2015		Overall Factor [3] (3 studies)				Use		0.81
ESG Didcot	50% TEA in acetone	2015		Overall Factor [3] (21 studies)				Use		0.81
ESG Glasgow	20% TEA in water	2015		Overall Factor [3] (1 study)				Use		0.77
ESG Glasgow	50% TEA in acetone	2015		Overall Factor [3] (1 study)				Use		0.78
Glasgow Scientific Services	20% TEA in water	2015		Overall Factor [3] (6 studies)				Use		0.98
Gradko	20% TEA in water	2015		Overall Factor [3] (29 studies)				Use		0.91
Gradko	50% TEA in acetone	2015		Overall Factor [3] (15 studies)				Use		0.95
Kirklees Council	50% TEA in acetone	2015		Overall Factor [3] (3 studies)				Use		0.76

Collocation Data | Revisions

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the LA intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
APR	Air quality Annual Progress Report
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

References

1. Local Air Quality Management Guidance LAQM.TG(16), Department for Environment, Food and Rural Affairs (DEFRA), 2009

2. 2015 LAQM Air Quality Updating and Screening Assessment, TSI Scotland Limited, TSI/CLA.006-04-04, 24 July 2015

3. 2014 Air Quality Progress Report for Clackmannanshire Council, TSI Scotland Limited, TSI/CLA.005-04-01, April 2014

4. 2013 Air Quality Progress Report for Clackmannanshire Council, TSI Scotland Limited, TSI/CLA.003-04-02, May 2013

5. 2012 LAQM Air Quality Updating and Screening Assessment, TSI Scotland Limited, TSI/CLA.003-04-02, 24 July 2012

6. 2011 Air Quality Progress Report for Clackmannanshire Council, TSI Scotland Limited, CLA-001-03-03, April 2011

7. LAQM TG(16), Page 7 to 14, Box 7.2

8. https://ukair.defra.gov.uk/assets/documents/reports/cat07/15111444_AQ0926_Report_PM_Emissions_from_Poultry_Farms_BV_AECOM_Nov_2012.pdf