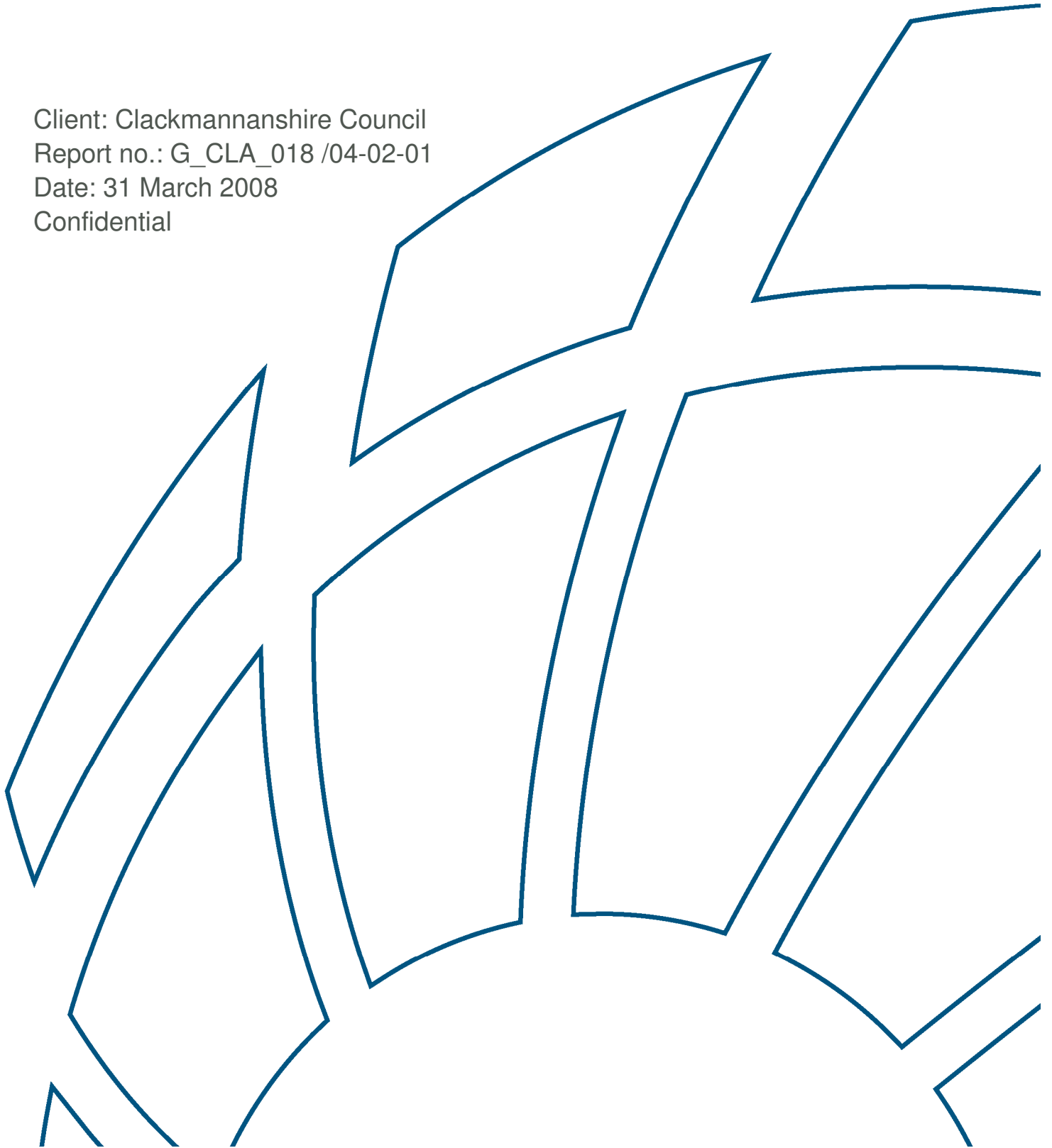


LAQM Progress Report 2008



Client: Clackmannanshire Council
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Clackmannanshire Council

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CONTENTS

1	INTRODUCTION	1
1.1	Review and Assessment process	1
1.2	Assessment criteria	2
1.3	Clackmannanshire Council	2
1.4	Previous air quality assessments	2
2	MONITORING DATA	4
2.1	Nitrogen dioxide monitoring results	4
2.1.1	Trends in NO ₂ concentrations	5
2.2	PM ₁₀ monitoring results	6
3	EMISSION SOURCES	9
3.1	Industrial emissions, quarries and other dusty processes	9
3.2	Planned developments and changes to commercial and domestic emissions	9
3.3	Road traffic	9
4	LOCAL STRATEGIES AND POLICIES	11
5	CONCLUSIONS	11

Table Contents List

Table 1: NAQS air pollutant objectives	3
Table 2: Monitoring locations within Clackmannanshire Council area	4
Table 3: NO ₂ diffusion tube monitoring results 2007	5
Table 4: PM ₁₀ monitoring results 2007	7
Table 5: Work within 250m of TEOM unit	7
Table 6: AADT road traffic counts in Clackmannanshire 2005 – 2007	10

Figure Contents List

Figure 1: Clackmannanshire Council area
Figure 2: Monitoring locations
Figure 3: Trends in NO ₂ concentrations 2002 - 2007
Figure 4: Trends in PM ₁₀ concentrations during 2007

Clackmannanshire Council

1 INTRODUCTION

BMT Cordah Limited has been commissioned by Clackmannanshire Council (the Council) to undertake their Local Air Quality Management (LAQM) Progress Report for 2008. The aim of the report is to provide an update on local air quality including information on recent air quality monitoring, changes in local policy towards air quality and changes in local sources of atmospheric emissions.

The assessment uses current monitoring data and information on industrial, transport, commercial and domestic atmospheric emissions to identify if there is potential for exceeding the air quality objectives for pollutants contained within the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 (NAQS)¹.

The report follows guidance set out in LAQM.TG(03) technical guidance², LAQM.PRG(03) progress report guidance³, LAQM.PG(03) policy guidance⁴ and subsequent guidance amendments⁵.

1.1 Review and Assessment process

The Environment Act 1995 and subsequent regulations require local authorities to assess compliance of air quality in their area with the standards and objectives set out in the NAQS. For local authorities within Scotland further regulations are set out in the Air Quality (Scotland) Regulations 2000 and Air Quality (Scotland) Amendment Regulations 2002.

The LAQM framework requires that local authorities carry out regular reviews of air quality. This 'Review and Assessment' process comprises two phases. The first phase of the Review and Assessment is an Update and Screening Assessment (U&SA) which is undertaken every three years. The U&SA considers any changes that have occurred in pollutant emissions and sources since the last round of Review and Assessment that may affect air quality. The second phase is either a Detailed Assessment or a Progress Report depending upon the outcome of the U&SA.

If the U&SA identifies a risk of exceeding an air quality objective at a location of relevant public exposure a Detailed Assessment is required. The Detailed Assessment considers the risk of exceeding an objective to greater depth in order to determine whether it is necessary to declare an

¹ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Defra, July 2007.

² Part IV of the Environment Act 1995, Local air quality management technical guidance, LAQM.TG(03), Defra et al, January 2003.

³ Part IV of the Environment Act 1995, Local air quality management progress report guidance, LAQM.PRG(03), Defra et al, January 2003

⁴ Part IV of the Environment Act 1995, Local air quality management policy guidance, LAQM.PG(03), Defra et al, January 2003.

⁵ Part IV of the Environment Act 1995, Local air quality management technical guidance update, LAQM.TG(03) – update: January 2006, Defra et al and Local air quality management policy guidance: Addendum, LAQM.PGA(05), Defra et al, January 2005

Air Quality Management Area (AQMA). Declaration of an AQMA is necessary where an air quality objective is predicted to be exceeded.

If the U&SA does not identify any risk of exceeding air quality objectives, a Progress Report is prepared annually in the intervening years between U&SAs. The aim of the Progress Report is to provide an update on pollutant monitoring data, air quality policy and new developments which will have an impact on local air quality. The Progress Report aims to provide continuity in the LAQM process by ensuring that any potential changes in local circumstances which may affect air quality are identified at the earliest opportunity.

1.2 Assessment criteria

Assessment criteria, or objectives, in the form of atmospheric concentration levels for eight pollutants are detailed in the National Air Quality Strategy (NAQS). Of these eight pollutants, seven are assessed by local authorities. The eighth pollutant, ozone, is assessed at a national level due to its transboundary nature. The seven pollutants that are assessed and the objectives that apply in Scotland are presented in Table 1.

1.3 Clackmannanshire Council

Clackmannanshire Council is the smallest mainland local authority in Scotland, with a population of around 50,000. It is bounded by the River Forth to the south and the Ochil Hills to the north. Neighbouring local authorities are Fife Council to the east, Stirling Council to the west, Perth and Kinross Council to the north and Falkirk Council to the south.

The main town is Alloa where around half the Clackmannanshire population resides. The majority of industrial and commercial activities in the area are also within Alloa. The remainder of Clackmannanshire is rural, with several towns known as the Hillfoot towns located south of the Ochils. The Council area is shown in Figure 1.

1.4 Previous air quality assessments

Clackmannanshire Council completed an Updating and Screening Assessment⁶ in 2006 which concluded that there were no exceedences of air quality objectives for any of the NAQS pollutants.

The Progress Report⁷ completed in 2007 looked at the most recent monitoring data for NO₂ and PM₁₀. The report concluded that there was no risk of exceeding NO₂ air quality objectives. PM₁₀ concentrations were shown to be at risk of exceeding the 2010 annual mean objective; however, the higher measured PM₁₀ concentrations during 2006 were attributed to major construction works in the vicinity of the monitoring site and the report concluded that a detailed assessment was not required.

⁶ Local Air Quality Management Updating and Screening Assessment, 2006. Clackmannanshire Council, November 2006.

⁷ Local Air Quality Management Progress Report, 2007. Clackmannanshire Council, May 2007.

Table 1: NAQS air pollutant objectives

Pollutant	Air quality objective			
	Concentration	Measured as	Equivalent percentile	Date to be achieved by
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 (CO)	10 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 (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times per year	1-hour mean	99.79 th percentile of 1-hour mean concentrations	31/12/2005
	40 µg/m ³	annual mean	-	31/12/2005
Particulate (PM ₁₀)	50 µg/m ³ not to be exceeded more than 35 times a year	24-hour mean	90.4 th percentile of 24-hour mean concentrations	31/12/2004
	40 µg/m ³	annual mean	-	31/12/2004
	50 µg/m ³ not to be exceeded more than 7 times a year	24-hour mean	98 th percentile of 24-hour-mean concentrations	31/12/2010
	18 µg/m ³	annual mean	-	31/12/2010
Sulphur dioxide (SO ₂)	125 µg/m ³ not to be exceeded more than 3 times a year	24-hour mean	99 th percentile of 24-hour mean concentrations	31/12/2004
	350 µg/m ³ not to be exceeded more than 24 times a year	1-hour mean	99.7 th percentile of 1-hour mean concentrations	31/12/2004
	266 µg/m ³ not to be exceeded more than 35 times a year	15-minute mean	99.9 th percentile of 15-minute mean concentrations	31/12/2005

2 MONITORING DATA

Clackmannanshire Council currently monitor NO₂ and PM₁₀ concentrations within the Council area. The monitoring locations are presented in Table 2 and Figure 2. Clackmannanshire Council previously monitored SO₂ using an 8-port bubbler. Due to recurring low measured SO₂ concentrations, the bubbler was decommissioned in 2006. Clackmannanshire Council do not monitor any other pollutants within their area.

Table 2: Monitoring locations within Clackmannanshire Council area

Site name	Location (NGR)	Pollutant monitored	Site classification
Norwood Avenue	NS 876 936	NO ₂	Kerbside
Shaftesbury Street	NS 884 935	NO ₂	Kerbside
Stirling Road, Tullibody	NS 860 951	NO ₂	Urban Background
Clackmannan Road	NS 893 929	NO ₂	Kerbside
High Street, Tillicoultry	NS 915 971	NO ₂	Kerbside
Bus Station Tillicoultry	NS 920 969	NO ₂	Kerbside
Glasshouse Loan, Alloa,	NS 882 926	NO ₂	Kerbside/industrial
Bus Station, Alloa	NS 888 929	NO ₂	Kerbside
Shillinghill/Bridge Terrace, Alloa	NS 888 929	NO ₂	Kerbside
South Ring Road, Alloa	NS 887 931	NO ₂ , PM ₁₀	Kerbside

2.1 Nitrogen dioxide monitoring results

Clackmannanshire Council currently monitor NO₂ concentrations at 10 locations throughout the Council area using passive diffusion tubes. The monitoring results for 2007 are presented in Table 3.

The NO₂ diffusion tubes used by Clackmannanshire council are prepared and analysed by Glasgow Scientific Services using the 20% triethanolamine (TEA) in water method. It is recommended in the LAQM Technical Guidance that diffusion tubes are co-located with a continuous chemiluminescence monitoring site in order to validate the performance of the diffusion tubes and the laboratory analysis technique. A bias correction factor is then calculated based on the difference between results from the chemiluminescence analyser and the co-located diffusion tubes. This factor can then be applied to the results from all diffusion tubes across the Council area.

Clackmannanshire Council has not undertaken a local co-location study; therefore, the results from the NO₂ diffusion tubes have been corrected using a bias factor provided by the laboratory. Co-location studies carried out in nearby local authorities are used by the laboratory to determine an

annual bias correction factor. The bias correction factor of 1.087 for 2007 for Glasgow Scientific Services was obtained from the review and assessment helpdesk⁸.

The monitoring results in Table 3 indicate that all sites had a data capture rate suitable for use in screening assessments (>70%). The results demonstrate that there have been no exceedences of the annual mean NO₂ air quality objective within the Clackmannanshire Council area in 2007.

Table 3: NO₂ diffusion tube monitoring results 2007

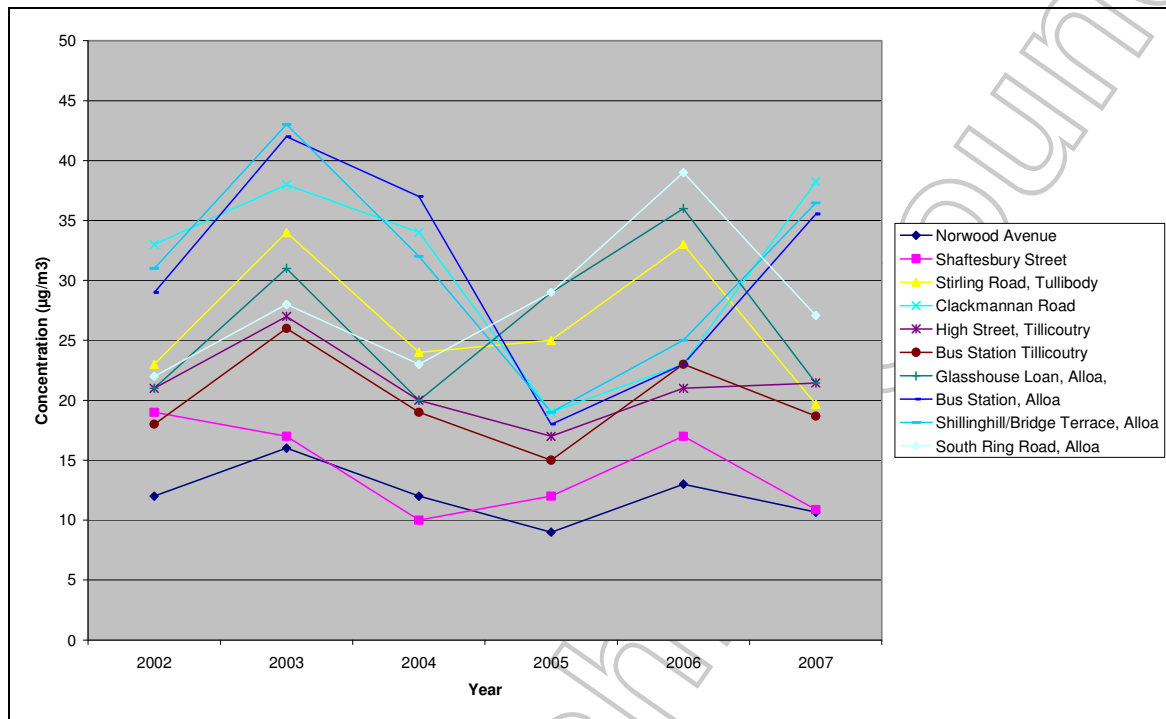
Site name	2007 raw data	2007 corrected for bias (1.087)	Data capture rate (%)
Norwood Avenue	9.8	10.7	92
Shaftesbury Street	10.0	10.9	92
Stirling Road, Tullibody	18.1	19.7	92
Clackmannan Road	35.2	38.2	92
High Street, Tillicoultry	19.7	21.4	92
Bus Station Tillicoultry	17.2	18.7	92
Glasshouse Loan, Alloa,	19.7	21.4	92
Bus Station, Alloa	32.7	35.5	83
Shillinghill/Bridge Terrace, Alloa	33.5	36.5	92
South Ring Road, Alloa	24.9	27.1	92

2.1.1 Trends in NO₂ concentrations

The graph in Figure 3 presents the trends in NO₂ concentrations between 2002 and 2007. The graph indicates that concentrations have been variable at most sites with no clear trend apparent over the five years. Between 2006 and 2007, seven sites recorded decreased concentrations and three recorded increased concentrations. The three sites demonstrating increased concentrations are; Clackmannan Road; Bus Station, Alloa; and Shillinghill/Bridge Terrace, Alloa. These three sites have demonstrated an upward trend in concentrations since 2005 and it is recommended that these locations should continue to be monitored closely as a continuing upward trend may present air quality problems in future.

⁸ Nitrogen dioxide bias adjustment, <http://www.uwe.ac.uk/aqm/review/>, Accessed 12/03/08.

Figure 3: Trends in NO2 concentrations 2002-2007



2.2 PM₁₀ monitoring results

The PM₁₀ monitoring results for 2007 are presented in Table 4. Clackmannanshire Council currently monitor PM₁₀ concentrations using a Tapered Element Oscillating Microbalance (TEOM) analyser. The TEOM is serviced and maintained to the schedule recommended by the supplier. The PM₁₀ air quality objectives are based on the use of the European transfer reference sampler which is a gravimetric sampler. The gravimetric sampler uses a filter held at ambient temperature whereas the TEOM analyser uses a filter held at a temperature of 50°C. The TEOM analyser can, therefore, underestimate PM₁₀ concentrations because of the potential loss of some more volatile particles. To account for the loss of any volatile particles, the Technical Guidance recommends that monitoring results from TEOM analysers are factored by 1.3 to account for any potential underestimation. The (then) Scottish Executive⁹ issued further advice in 2005 on the adjustment factor based on a co-location study carried out by Edinburgh City Council which obtained a factor of 1.14. In light of the co-location study, the advice stated that the monitoring results should be factored by both the 1.3 and 1.14 factors for the annual mean objective only. In the situation where use of both factors results in measured concentrations in excess of the annual mean objective, a Detailed Assessment should be conducted.

⁹ Scottish Executive, April 2005. Local Air Quality Management, Update on particles.

Table 4: PM₁₀ monitoring results 2007

Site	South Ring Road, Alloa
Annual data capture rate (%)	97%
Annual mean concentration ($\mu\text{g}/\text{m}^3$)	16.9
Adjusted annual mean concentration ($\mu\text{g}/\text{m}^3$) for 1.3 factor	22.0
Adjusted annual mean concentration ($\mu\text{g}/\text{m}^3$) for 1.14 factor	19.3
98 th percentile of 24-hour mean concentrations ($\mu\text{g}/\text{m}^3$)	39.1
Adjusted 98th percentile concentration ($\mu\text{g}/\text{m}^3$) for 1.3 factor	50.9
90.4 th percentile of 24-hour mean concentrations ($\mu\text{g}/\text{m}^3$)	26.9
Adjusted 90.4th percentile concentration ($\mu\text{g}/\text{m}^3$) for 1.3 factor	35.0
No. of exceedences of the 24-hour mean objective concentration of $50\mu\text{g}/\text{m}^3$	2
No. of exceedences of the 24-hour mean objective concentration of $50\mu\text{g}/\text{m}^3$ for 1.3 factor	9
Projected 2010 annual mean concentrations ($\mu\text{g}/\text{m}^3$) for raw data	16.5
Adjusted projected 2010 annual mean concentrations ($\mu\text{g}/\text{m}^3$) for 1.3 factor	21.3
Adjusted projected 2010 annual mean concentrations ($\mu\text{g}/\text{m}^3$) for 1.14 factor	18.7

The raw measured annual mean PM₁₀ concentration in 2007 was $16.9\mu\text{g}/\text{m}^3$. The concentrations with the 1.14 and 1.3 factors applied are $19.3\mu\text{g}/\text{m}^3$ and $22.0\mu\text{g}/\text{m}^3$ respectively. The previous Progress Report in 2006 identified that PM₁₀ concentrations were at risk of exceeding the 2010 objective; however, this was attributed to construction works being undertaken close to the monitoring site and a decision on the requirement for a Detailed Assessment was postponed. The construction works consisted of a new roundabout, a new Asda store and a new railway station, plus associated car parks. The site is situated approximately 250m to the north east of the TEOM analyser. A summary of the work carried out with 250 metres of the TEOM is included in Table 5.

Table 5: Work within 250m of TEOM unit

Work	Date
Construction of Asda (with associated car parks and Petrol Filling Station)	Mostly 2006, but with minor works in spring of 2007.
Railway Tracks	Most work in 2006.
Railway Station and associated car park	Spring 2007. Some minor works to be completed.
New roundabout on A907 adjoining TEOM	February to June 2007

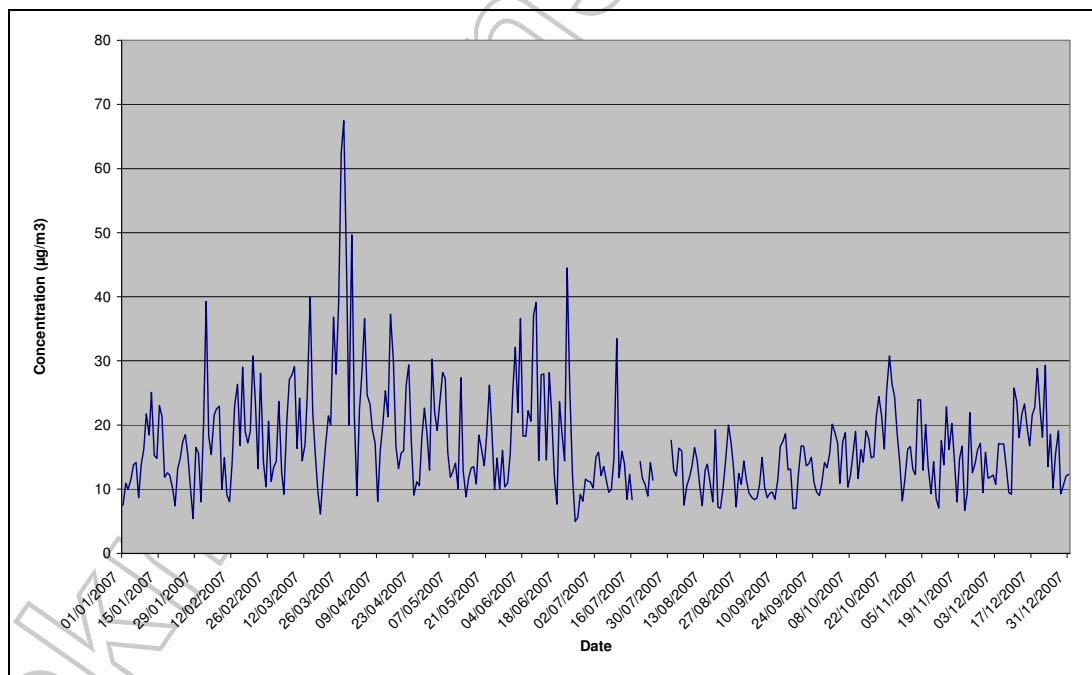
The Asda store opened in spring 2007 and although there were residual construction works at the site at the beginning of 2007, the main bulk of any work on the site was internal and any impact on air quality from the development is likely to be minimal. The new roundabout is situated adjacent to the TEOM monitor and was under construction from the beginning of February until the end of June 2008. The railway station was initially due to open in 2007; however, technical delays have

postponed opening until summer 2008. The remaining work to be carried out on the railway station is minor re-fitting works and decoration which is unlikely to impact on air quality. In addition, a car park at the railway station was constructed which consisted of resurfacing a disused area. There were no further works to the railway line during 2007.

Any impact on local PM₁₀ concentrations as a result of the construction works would, therefore, have been limited to the first half of the year and would most likely to be due to construction of the roundabout. The graph in Figure 4 shows the trend in raw measured PM₁₀ concentrations throughout 2007. The graph clearly shows elevated PM₁₀ concentrations during the first half of 2007 with reduced concentrations during the second half. The six month averages from 1st January to 30th June and from 1st July to 31st December were 19.2µg/m³ and 14.6µg/m³ respectively. This demonstrates that concentrations were approximately 24% higher during the first six months of the year. It is possible therefore, that the construction works occurring at the roundabout have had some affect on measured PM₁₀ concentrations.

Annual mean PM₁₀ concentrations in 2007 were projected forward to 2010 using the method outlined in the LAQM Technical Guidance. The results of this projection are presented in Table 4 and suggest that based on monitored concentrations at the site in 2007 there remains at risk of exceeding the 2010 annual mean objective.

Figure 4: Trends in PM₁₀ concentrations during 2007



3 EMISSION SOURCES

The purpose of the Progress Report is to identify any recent changes to local emissions sources which may affect air quality and result in a potential exceedence of air quality objectives. This section, therefore, identifies if there have been any changes to industrial emissions, quarries and other dusty processes, road traffic emissions, changes to commercial and domestic emissions or if there are any new planned developments.

3.1 Industrial emissions, quarries and other dusty processes

The Scottish Environment Protection Agency (SEPA) were consulted to determine if there were any new industrial process commissioned since April 2007 or if there were any significant changes to existing industrial processes. Since the 2007 Progress Report, no new industrial processes have commenced operation in the Clackmannanshire Council area. There have been no significant changes to emissions from existing installations resulting in an increase in emissions.

One industrial site reported decreased emissions, namely the O I Manufacturing UK factory (previously United Glass) in Alloa. They have recently installed a dry electrostatic precipitator (DESP) to treat emissions from three furnaces which should significantly improve emissions from this plant, particularly particulate emissions. A further DESP at a fourth furnace is scheduled to be installed some time in 2008 which should reduce emissions further.

SEPA also confirmed that since the 2007 Progress Report, no new quarries have commenced operation and there have been no significant changes to emissions from existing quarries.

3.2 Planned developments and changes to commercial and domestic emissions

There are several new housing developments which have been granted planning permission within the Clackmannanshire Council area. The housing developments are concentrated in Tullibody, Menstrie and Alloa. Clackmannanshire Council considered each development during the planning process and it was considered that none of the planned current housing developments were large enough to have a significant impact on local air quality on an individual basis. However, many of the planning applications were for smaller housing developments located on or near the same site and, therefore, the cumulative impact of the total number of houses may not have been considered.

3.3 Road traffic

During 2007 one new road opened in the Clackmannanshire Council area, namely, the Alloa Eastern Relief road (B909). The new relief road replaces access to the A907 which was previously provided by Hilton Road. Hilton Road closed following construction of the new railway line.

The Alloa Eastern Relief road should have had a beneficial effect on the receptors on Hilton Road due to the fact that road traffic has been diverted from Hilton Road to the Relief Road. The LAQM Technical Guidance requires new roads to be assessed only if they have a traffic flow of greater than 10,000 vehicles a day and if there is relevant public exposure within 10m of the road. The new road has no relevant public exposure within 10m of it and does not, therefore, require assessment.

Annual average daily traffic (AADT) data for 2007 were obtained from Clackmannanshire Council for a number of roads within the Council area. The AADT for 2005, 2006 and 2007 along with the percentage increase in vehicles between 2006 and 2007 is presented in Table 6. The LAQM Technical Guidance states that roads should be assessed when there are more than 10,000 vehicles per day which have experienced a large (>25%) increase in traffic. The results indicated that there were no roads within the Council area meeting the criteria for assessment.

Table 6: AADT road traffic counts in Clackmannanshire 2005 – 2007

Monitoring location	2005	2006	2007	% change between 2006 and 2007
Alva/Tullicoultry	7934	7972	7891	-1.0%
Blackfaulds	8867	8772	8790	0.2%
Blackgrange	22229	22223	23914	7.6%
Blairingone	-	-	5281	-
Cambus	9922	10097	10235	1.4%
Fairfield	5609	5321	6354	19.4%
Fishcross/Sauchie	11888	12930	12280	-5.0%
Gartarry	12109	12356	11617	-6.0%
Gartlove	5815	5886	5948	1.1%
Menstrie	10940	10936	11011	0.7%
Menstrie/alva	11002	10894	10901	0.1%
Muckhart	3731	3537	3597	1.7%
Muirside	7611	7572	8502	12.3%
Ring Road	21778	21710	-	-
Sheardale	-	-	1900	-
Tillicoultry/Dollar	-	-	6323	-
Tullibody bypass	7388	7581	8506	12.2%
Tullibody Road	10257	10653	10990	3.2%
Tullibody sign	9667	9795	10250	4.7%

Three new road traffic monitoring locations were added to the network in 2007, namely Blairingone, Sheardale and Tillicoultry/Dollar. Measured vehicle numbers on all three roads were below the criteria outlined in the LAQM Technical Guidance for assessment.

It is concluded that there have been no significant changes to road traffic emissions during 2007 which are likely to impact negatively on local air quality.

4 LOCAL STRATEGIES AND POLICIES

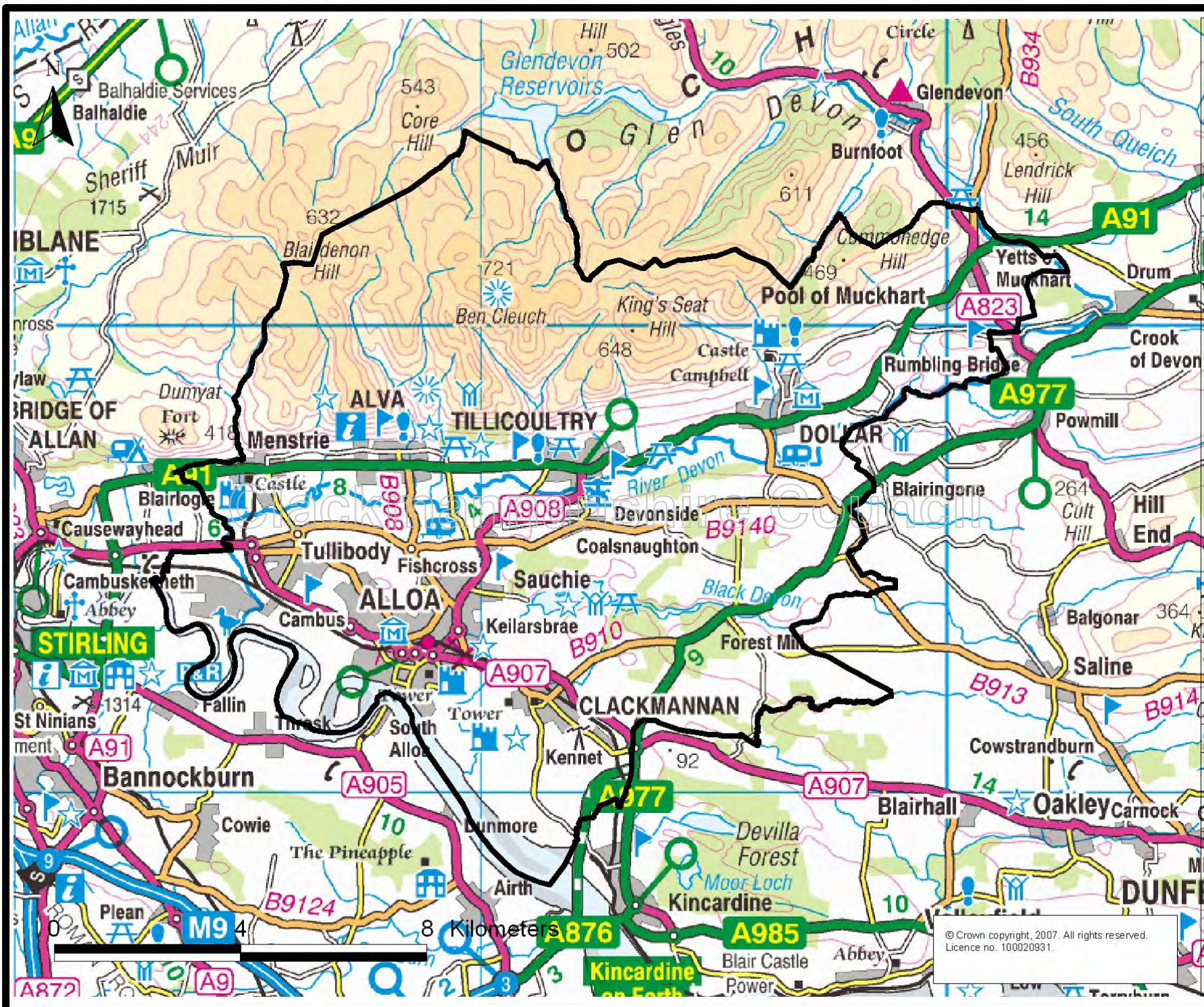
There have been no new or significant changes to local policies and strategies relating to local air quality that have been implemented by Clackmannanshire Council.

5 CONCLUSIONS

Clackmannanshire Council currently monitor NO₂ and PM₁₀ concentrations within their area. Based on the 2007 monitoring data and updated information of residential, commercial and industrial emissions sources, it is considered unlikely that the nitrogen dioxide air quality objectives will be exceeded in the Clackmannanshire Council area.

It is however, considered likely that the PM₁₀ annual mean objective is at risk of being exceeded at the South Ring Road monitoring location in Alloa. The elevated PM₁₀ concentrations during 2007 may, however, be attributed to the construction of a new roundabout within the vicinity of the TEOM monitor. The monitoring period during the construction of the roundabout clearly shows elevated measured concentrations in comparison to the later half of the year. It is therefore recommended to postpone a Detailed Assessment until a full year of monitoring in the absence of any construction activity has been undertaken.

No monitoring is currently undertaken for benzene, 1,3-butadiene, carbon monoxide, lead or sulphur dioxide within the Clackmannanshire Council area; however, based on the available evidence, it is not expected that there will be any exceedences of the relevant air quality objectives for these pollutants. A full assessment of all NAQS pollutants will be carried out in the 2009 Updating and Screening Assessment.



Legend
 Clackmannanshire Council boundary

Date	March 2008
Scale	1:110,000

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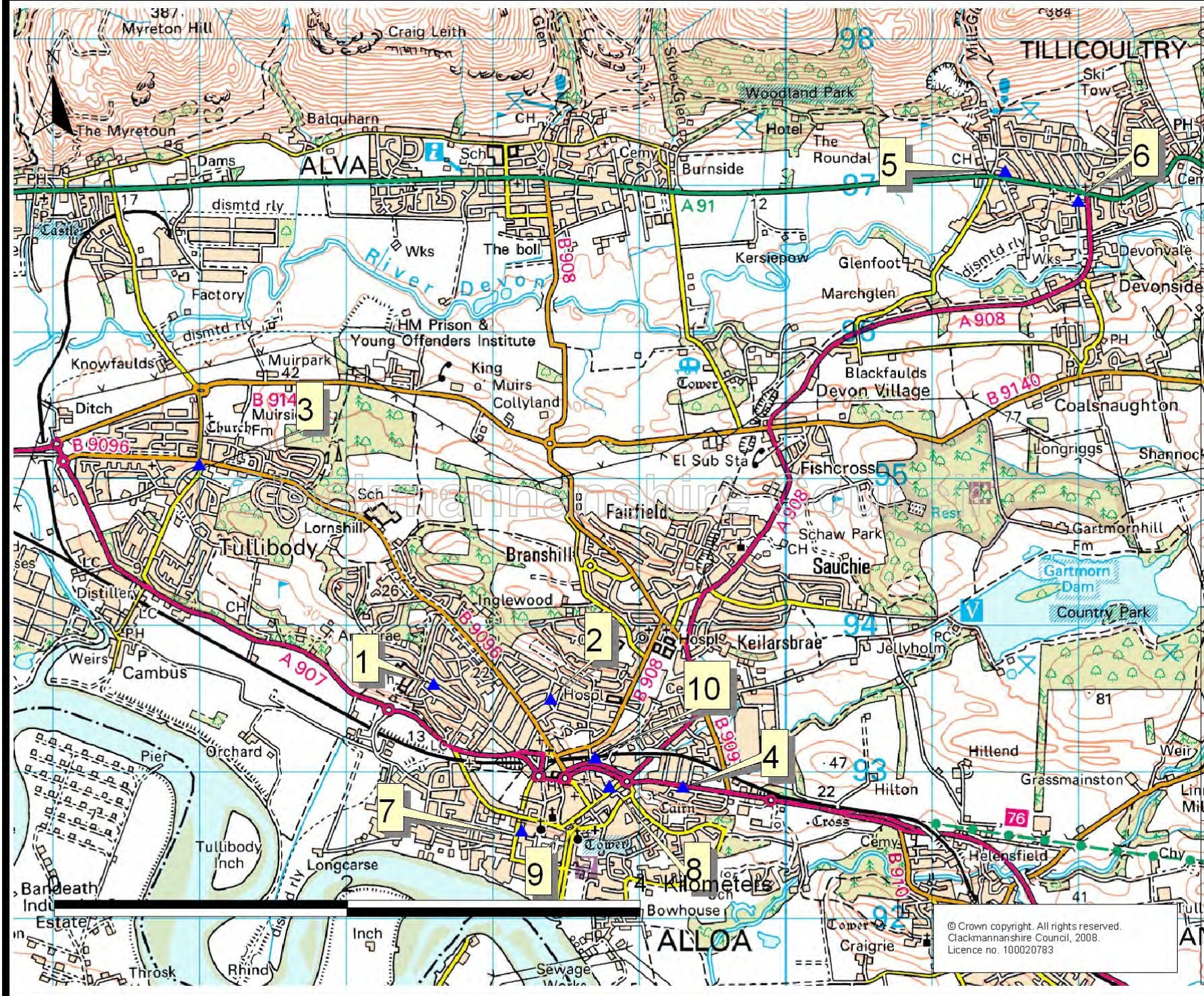
Figure Number: 1

Figure Title
 Clackmannanshire Council boundary



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- Legend
- ▲ Monitoring locations
 - 1. Norwood Avenue
 - 2. Shaftesbury Street
 - 3. Stirling Road, Tullibody
 - 4. Clackmannan Road
 - 5. High Street, Tillicoultry
 - 6. Bus station, Tillicoultry
 - 7. Glasshouse Loan, Alloa
 - 8. Bus station, Alloa
 - 9. Shillinghill/Bridge Terrace, Alloa
 - 10. South Ring Road, Alloa

Date: March 2008

Scale: 1:35,000

Project Title:
LAQM Progress Report 2008

Figure Number: 2

Figure Title
Monitoring locations in
Clackmannanshire Council area



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