Annual Progress Report (APR)

2016 Air Quality Annual Progress Report (APR) for
Angus Council

In fulfilment of Part IV of the
Environment Act 1995

Local Air Quality Management

August, 2016

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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
Euro	European exhaust emissions standard
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
TEA	Triethanolamine

Executive Summary: Air Quality in Our Area

Air Quality in Angus Council

The APR has not identified any significant changes in emissions sources within the Angus Council area.

Previous Review and Assessments have concluded that concentrations of carbon monoxide, benzene, 1,3-butadiene, lead, sulphur dioxide, PM_{10} and nitrogen dioxide are compliant with the relevant objectives, and no Air Quality Management Areas (AQMAs) have been declared.

Monitoring data for 2015 confirms that the annual mean nitrogen dioxide objective is unlikely to be exceeded at any location, with measured concentrations well below the objective. Measured PM_{10} concentrations also meet the annual mean objective, and, as the monitor is located at the kerbside, it is considered unlikely that the objective will be exceeded at residential properties. This status report has not identified any significant new emissions sources within the Angus Council area.

Actions to Improve Air Quality

Angus Council is addressing Air Quality through local policies and plans and works to manage local air quality through an extensive monitoring network within the council area.

The campaign *'Angus on the Go'* is helping local residents and visitors to Angus to choose healthy, low cost travel options for their regular journeys. The campaign is part of a range of activities to increase the use of active and sustainable transport in the region. Angus Council, bus operators, Tactran and others are working to provide good quality infrastructure and transport services. However, it's up to everyone who travels in and around Angus to do their bit.

Local Priorities and Challenges

Angus Council will continue monitoring at the existing diffusion tube sites and continuous monitoring in the Borough to identify future changes in pollutant concentrations.

How to Get Involved

As the majority of air pollution is associated with traffic, consider alternatives to using your car; public transport, walking or cycling will help reduce emissions.

To plan a public transport journey from door to door visit www.travelinescotland.com or call 0871 200 22 33[1].

To compare door to door journey choices using different transport modes visit www.GoToo.com.

Get in touch with Angus Council's ACCESSline via www.angus.gov.uk or call 08452 777 778 if you want to discuss your own journey choices.

If you have any concern or require further information on air quality, please contact Environmental Health.

[1] Calls cost 10p/min from BT landlines. Charges from other providers or mobiles may vary

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1. Local Air Quality Management

This report provides an overview of air quality in Angus Council 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. Where an exceedance is 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 in pursuit of the objectives. This Annual Progress Report (APR) is summarises the work being undertaken by Angus 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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
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

Angus Council is addressing Air Quality through local policies and plans.

During preparation of the Angus Local Development Plan, all land allocations and policies were assessed in terms of impact in air quality and other environmental factors for the purposes of the Strategic Environmental Assessment (SEA). Policy DS4 in the emerging Angus Local Development Plan makes specific reference that all development proposals must have regard to maintaining and improving environmental quality. The impacts of development will be considered on a number of environmental factors, including air quality.

Policy DS4 Amenity states:

All proposed development must have full regard to opportunities for maintaining and improving environmental quality. Development will not be permitted where there is an unacceptable adverse impact on the surrounding area or the environment or amenity of existing or future occupiers of adjoining or nearby properties.

Angus Council will consider the impacts of development on:

- *Air quality;*
- *Noise and vibration levels and times when such disturbances are likely to occur;*
- *Levels of light pollution;*
- *Levels of odours, fumes and dust;*
- *Suitable provision for refuse collection / storage and recycling;*

• *The effect and timing of traffic movement to, from and within the site, car parking and impacts on highway safety; and*

• *Residential amenity in relation to overlooking and loss of privacy, outlook, sunlight, daylight and overshadowing.*

Angus Council may support development which is considered to have an impact on such considerations, if the use of conditions or planning obligations will ensure that appropriate mitigation and / or compensatory measures are secured.

Angus Council's Economic Development Team has been working in partnership with other North East Councils, Aberdeenshire, Aberdeen City and Moray, in developing a joint North East Scotland Sustainable Energy Action Plan (NE SEAP). This will function for the North East as a whole as well as an individual Sustainable Energy Action Plan (SEAP) at local authority level. This would create a high level strategic document which covers all areas of sustainable energy across business and commercial, domestic and transport including certain aspects of land use and fuel supply. It will provide a baseline for the area in terms of Carbon emissions and provide an action plan to meet emission reduction targets whilst providing opportunities for sustainable economic growth.

The purpose of the plan would be to coordinate, enable, align and prioritise sustainable energy implementation which will place Angus and the North East Region at the forefront of Scotland's transition to a resilient low carbon economy with the associated economic, environmental and social benefits. It is anticipated that the SEAP would cover a time period from 2016-2030 and would allow the participants and the region to move towards the emissions reduction target set for 2050.

The SEAP will work alongside Angus Council's Climate Strategy & Action Plan, but in order to achieve these benefits it is important that the all public and private sectors work jointly across the County to exploit opportunities more effectively, taking into account that policies and actions in relation to Carbon management should consider the potential impacts on air quality, such as emissions of particles and nitrogen dioxides.

2.2 Progress and Impact of Measures to address Air Quality in Angus Council

Angus Council has taken forward a number of measures during the current reporting year of 2015 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

Table 2.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Comments
1	'Smarter Choices Smarter Places' 'Angus on the Go' campaign	Promoting low emission transport Public information Promoting Travel altrernatives	Grant funding used for active and sustainable travel.	Angus Council	2015	2015-2016	• Promotional events to launch 'Angus on the Go' hand • Promotion of bus travel with on-bus adverts and roadside display in shelters • Angus on the Go Leaflet for Brechin Community Campus showing bus routes, walking routes and cycling • Distribution of Leaflet door to door in Brechin together with bus timetables for the local services • Provision of cycle racks and cycle training in schools • Provision of active travel training in schools • Promotional events to promote public transport use and cycle provision on bus service X7 Aberdeen to Perth • Funding of the Cycle Hub (a social enterprise) for refurbishment of bikes and doctor bike sessions • Providing folders with public transport, liftshare, cycling and walking information for all the Angus Council hospitals	
2	New bus services introduced	Transport planning and infrastructure	Grant funding used for active and sustainable travel.	Angus Council	2014	January 2015	• New service introduced between Dundee – Forfar – Brechin – Stracathro Hospital and Edzell to provide, for the first time, direct journeys on this corridor. • Marketing to promote the service	This service was aimed at tackling modal shift.

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Comments
							• Quality contract with vehicles with Euro 5 or better engines scoring higher	
3	Hybrid Buses	Transport planning and infrastructure	• 18 hybrid buses on the Arbroath to Dundee (Tayway corridor) • Environmentally friendly vehicles on the X7 Aberdeen to Perth corridor	Bus company Stagecoach	2014	2015	For approximately 25% of the Stagecoach fleet in Angus and Dundee • Stagecoach fuel consumption was down (due to replacement of Euro 5 by Euro 6) • CO_2 reduction by 16% • Hydrocarbons have reduced by at least 72% • NO_X had reduced by 80 % • Particulates have reduced by 50% • Over 35% fuel burn emission reduction	Part of the funding coming from the Scottish Government Green Bus Fund
4	Multi-operator smart ticketing scheme	Transport planning and infrastructure Vehicle fleet efficiency	• Allow passengers to travel on different operators services with the same ticket. • Offer travel at much reduced fares for passengers previously having to buy tickets separately from each operator		2015	August 2016	• Implementing initially on a zone covering Monifieth, Monikie, Tealing, Muirhead and Liff • Extend the scheme in due course across Angus	
5	Smarter Choices Smarter Places' funding	Promoting low emission transport; Public information	Extended Grant funding to continue with work from 2015-2016	Angus Council	2016-2017	2016-2017	• Producing a leaflet of how to get to the new Forfar Community Campus (distributed door to door),	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Comments
		Promoting Travel altrernatives					carrying on with active travel training in schools in Forfar, Arbroath and Brechin predominantly	
6	Angus Council has signed up to North East Scotland Sustainable Energy action Plan	Policy guidance and development control	North East Scotland Sustainable Energy Action Plan	North East Councils	2016-2030	Ongoing	• Produce a strategic document which covers all areas of sustainable energy across business and commercial, domestic and transport including certain aspects of land use and fuel supply.	

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

3.1 Summary of Monitoring Undertaken

This section sets out what monitoring has taken place and how local concentrations of the main air pollutants compare with the objectives.

3.1.1 Automatic Monitoring Sites

Angus Council undertook automatic (continuous) monitoring of PM_{10} at two locations during 2015. Gravimetric Partisol sampler located at Burnside Drive, Arbroath. FDMS TEOM analyser was placed at a new site in Forfar on 23rd October 2015. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at http://www.scottishairquality.co.uk/.

Automatic monitoring of PM_{10} concentrations has previously been carried out at three other locations. Gravimetric Partisol samplers located at Chapelpark Primary School, Forfar, and Peel Park Primary School, Glenisla, with an FDMS TEOM analyser co-located at the Forfar site. The monitoring at these locations ceased in 2012.

A map showing the locations of the monitoring sites is provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Angus Council undertook non-automatic (passive) monitoring of NO_2 at 12 sites during 2015. Table A.2 in Appendix A shows the details of the sites.

A map showing the locations of the monitoring sites is provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

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)

Table A.3 and Figure 1 in Appendix A 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.

For diffusion tubes, the full 2015 dataset of monthly mean values is provided in Appendix B. Monitoring at site F2 ceased at the end of February 2013.

There is no automatic NO_2 monitoring carried out within the Angus Council area, and therefore there is no co-location study carried out with which to calculate a local bias adjustment factor; the national bias adjustment factor has therefore been applied to the data. The diffusion tubes are prepared and analysed by Tayside Scientific Services (TSS) using the 20% TEA in water method. Tubes are changed on a monthly basis. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

Concentrations at all 12 sites were well below the annual mean objective in 2015; the highest concentration was 21.3µg/m^3 measured at monitoring site F1 located on the St James Road, Forfar. Measured concentrations in 2015 were relatively similar to those measured in 2014 with a slight decrease at seven monitoring locations.

3.2.2 Particulate Matter (PM_{10})

Monitoring was carried out at the Arbroath Partisol analyser in 2015. Due to technical issues, data capture at the Arbroath site was low, with no data collected from the 9th September.

Table A.4 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 18µg/m^3.

Table A.5 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 7 times per year.

The annual mean concentration measured at the Burnside Drive, Arbroath, and Glamis Road, Forfar, monitoring sites was below the annual mean objective in 2015. The monitoring sites are located closer to the road than nearby residential properties, and therefore an exceedence at residential properties is unlikely.

Annual mean concentrations measured with the Arbroath Partisol reduced in 2015.

3.2.3 Particulate Matter ($PM_{2.5}$)

$PM_{2.5}$ is not monitored within Angus Council area.

3.2.4 Sulphur Dioxide (SO_2)

Sulphur dioxide is not monitored within the Angus Council area.

3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene

Carbon monoxide, lead and 1,3-butadiene are not monitored within the Angus Council area.

4. New Local Developments

4.1 Commercial and Domestic Sources

Since the 2015 USA Report was completed, six new biomass boilers and one Combined Heat and Power (CHP) have been proposed, or have been granted permission, within the Angus Council Area.

The biomass calculator and CHP Screening Tool[2] were used to calculate the target emission rates and process contribution for each boiler. The boilers data used are represented in Table 4.1, whilst the calculated Target Emission Rates are presented in Table 4.2 to 4.4.

Table 4.1 – Boiler Data used in the Screening Assessments

Boiler Location	Type	Building height (m)	Stack Diameter (m)	Stack Height (m)	Background (µg/m^3)		Emission Rates (g/s)	
					PM_{10}	NO_2	PM_{10}	NO_2
East Denside	CHP	3	0.15	10	N/A	5.27	N/A	0.52
Windyhills 4	Biomass	8	0.5	10	13.99	4.31	0.004	0.034
Windyhills 5	Biomass	8	0.5	10	13.99	4.31	0.004	0.034
Windyhills 6	Biomass	8	0.5	10	13.99	4.31	0.004	0.034
Panmure Golf Club 1	Biomass	8	0.2	5.8	10.32	6.75	0.0014	0.008
Panmure Golf Club 2	Biomass	8	0.2	5.8	10.32	6.75	0.0014	0.008
GSK	Biomass	23	0.4	18	10.42	9.04	0.05	0.4

The CHP Annual Average Process Contribution for NO_2 does not exceed the annual mean objective for NO_2, and therefore no potential issue was identified and no further actions are required.

[2] Available at: http://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html

Table 4.2 – Annual Average Process Contribution

Boiler location	Type	PM_{10} Annual Mean ($\mu g/m^3$)			NO_2 Annual Mean Annual Mean ($\mu g/m^3$)			NO_2 hourly mean ($\mu g/m^3$)		
		PC	PEC	Further actions required	PC	PEC	Further actions required	PC	PEC	Further actions required
East Denside	CHP	N/A	N/A	No	7.89	13.16	No	N/A	N/A	No

PC =Process contribution; PEC= Predicted environmental concentration= background +PC

None of the boilers emission rates exceed the Target Emission Rates for nitrogen dioxide or PM_{10}, and therefore no further actions are required. Nonetheless, for Windyhills development a cumulative assessment was carried out taking into account all the six boilers now proposed.

Table 4.3 – Target Emission Rates from Biomass Calculator

Boiler Location	Type	PM_{10} Annual Mean		NO_2 Annual Mean		NO_2 Hourly Mean	
		Target emission rate (g/s)	Further actions required	Target emission rate (g/s)	Further actions required	Target emission rate (g/s)	Further actions required
Windyhills 4*1	Biomass	0.0228	Yes	0.2033	No	0.2971	No
Windyhills 5*1	Biomass	0.0228	No	0.2033	No	0.2971	No
Windyhills 6*1	Biomass	0.0228	No	0.2033	No	0.2971	No

NOTE*1 Cumulative assessment has also been carried out taking into account all 6 boilers now proposed at Windyhills.

Although the process contribution for Panmure Golf Club 1 and GSK boilers is below the Air Quality Strategy objectives a detailed Assessment was necessary because the stack height was below the height of adjacent buildings.

Table 4.4 – Process Contribution

Boiler Location	Type	PM_{10} Annual Mean ($\mu g/m^3$)			NO_2 Annual Mean Annual Mean ($\mu g/m^3$)			NO_2 hourly mean ($\mu g/m^3$)		
		PC	PEC	PEC > AQS	PC	PEC	PEC > AQS	PC	PEC	PEC > AQS
Panmure Golf Club 1 and 2*2	Biomass	0.31	11.16	No	1.75	11.53	No	54.92	68.42	No
GSK*2	Biomass /CHP	0.5	10.9	No	9.8	18.9	No	43.1	62.2	No

PC =Process contribution; PEC= Predicted environmental concentration= background +PC. AQS = Air Quality Strategy Objective.

NOTE*2 Detailed assessment was necessary because the stack height was below the height of adjacent buildings. Figures quoted are for a cumulative assessment done to take account of other boilers and CHP plant.

Angus Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area and consideration has been given to:

- Road traffic sources
- Other transport sources
- Industrial sources
- New developments with fugitive or uncontrolled sources.

5. Planning Applications

Angus Council confirms that there have been no applications for developments which are likely to have a significant impact on air quality within the Angus Council Area.

6. Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

Monitoring data for 2015 confirms that the annual mean nitrogen dioxide objective is unlikely to be exceeded at any location, with measured concentrations well below the objective. Measured PM_{10} concentrations also meet the annual mean objective. It is concluded that a Detailed Assessment is not required.

6.2 Conclusions relating to New Local Developments

All new sources identified have been assessed and none have been found to require a further actions.

6.3 Proposed Actions

No exceedances of the objectives were identified for the monitored pollutants therefore no changes to the existing monitoring programme or additional monitoring is proposed.

Proposed actions arising from the APR are as follows:

- Continue diffusion tube and continuous monitoring in the Borough to identify future changes in pollutant concentrations;
- Proceed to an Update Screening Assessment in 2017.

References

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Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m)	Distance to kerb of nearest road (m)	Inlet Height (m)
Burnside Drive, Arbroath	Kerbside	364169	740861	PM_{10}	N	Gravimetric	4	1	1.5
Glamis Road, Forfar	Roadside	345249	750386	PM_{10}	N	FDMS	N	10	1.5
Chapelpark Primary School, Forfar*	Roadside	345914	750612	PM_{10}	N	Gravimetric	0	5	1.5
Chapelpark Primary School, Forfar*	Roadside	345914	750613	PM_{10}	N	FDMS	0	6	1.5
Peel Park Primary School, Glenisla*	Rural Background	326515	754046	PM_{10}	N	Gravimetric	0	20	1.5

* Monitoring ceased in 2012.

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?
A1	Ethie Terrace, Arbroath	Urban Background	364585	742349	NO_2	N	0	1	N
A2	Inchcape Road, Arbroath	Urban Background	362987	740642	NO_2	N	0	2	N
A3	Abbey Path, Arbroath	Roadside	364299	741225	NO_2	N	1.5	<1	N
A4	22 Lordburn, Arbroath	Roadside	364158	741122	NO_2	N	3	<1	N
CAR	High St, Carnoustie	Kerbside	356243	734526	NO_2	N	3	2	N
M1	High St, Monifieth	Kerbside	349759	732549	NO_2	N	0	2	N
M2	High St, Montrose	Kerbside	371418	757767	NO_2	N	2	1	N
B1	High St, Brechin	Kerbside	359727	760170	NO_2	N	2	1	N
B2	Sacone 1, Brechin	Industrial	361216	759644	NO_2	N	NA	8	N

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?
FOR	High St, Forfar	Kerbside	345825	750674	NO_2	N	3	<1	N
KIR	Manse Close, Kirriemuir	Kerbside	338621	754032	NO_2	N	5	6	N
F1	St James Road, Forfar	Roadside	345628	750307	NO_2	N	<1	2	N
F2*	Dundee Loan, Forfar	Roadside	345342	750088	NO_2	N	<1	2	N

* Monitoring ceased end of February 2013.

Table A.3 – Annual Mean NO2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture 2015 (%)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (1)				
				2011	2012	2013	2014	2015
A1	Urban Background	Diffusion Tube	100	7.0	7.1	5.0	9.8	8.9
A2	Urban Background	Diffusion Tube	100	8.8	9.5	8.0	11.0	11.6
A3	Roadside	Diffusion Tube	100	17.7	15.6	15.0	18.5	19.6
A4	Roadside	Diffusion Tube	100	21.1	21.3	17.5	18.2	18.0
CAR	Kerbside	Diffusion Tube	100	20.3	20.1	16.8	22.9	15.6
M1	Kerbside	Diffusion Tube	100	23.4	23.3	19.4	17.4	14.6
M2	Kerbside	Diffusion Tube	100	23.8	26.1	21.7	21.0	20.1
B1	Kerbside	Diffusion Tube	75	14.8	16.8	14.0	15.0	13.5
B2	Industrial	Diffusion Tube	92	8.1	8.0	6.9	7.8	6.8
FOR	Kerbside	Diffusion Tube	100	17.0	17.0	15.8	16.1	16.3
KIR	Kerbside	Diffusion Tube	92	12.3	11.7	12.0	13.4	12.8
F1	Roadside	Diffusion Tube	100	-	23.0*	21.0	21.3	21.3
F2	Roadside	Diffusion Tube	-	-	21.1*	18.2*	-	-

Notes: (1) Diffusion tubes have been corrected for bias. See Appendix C for details.

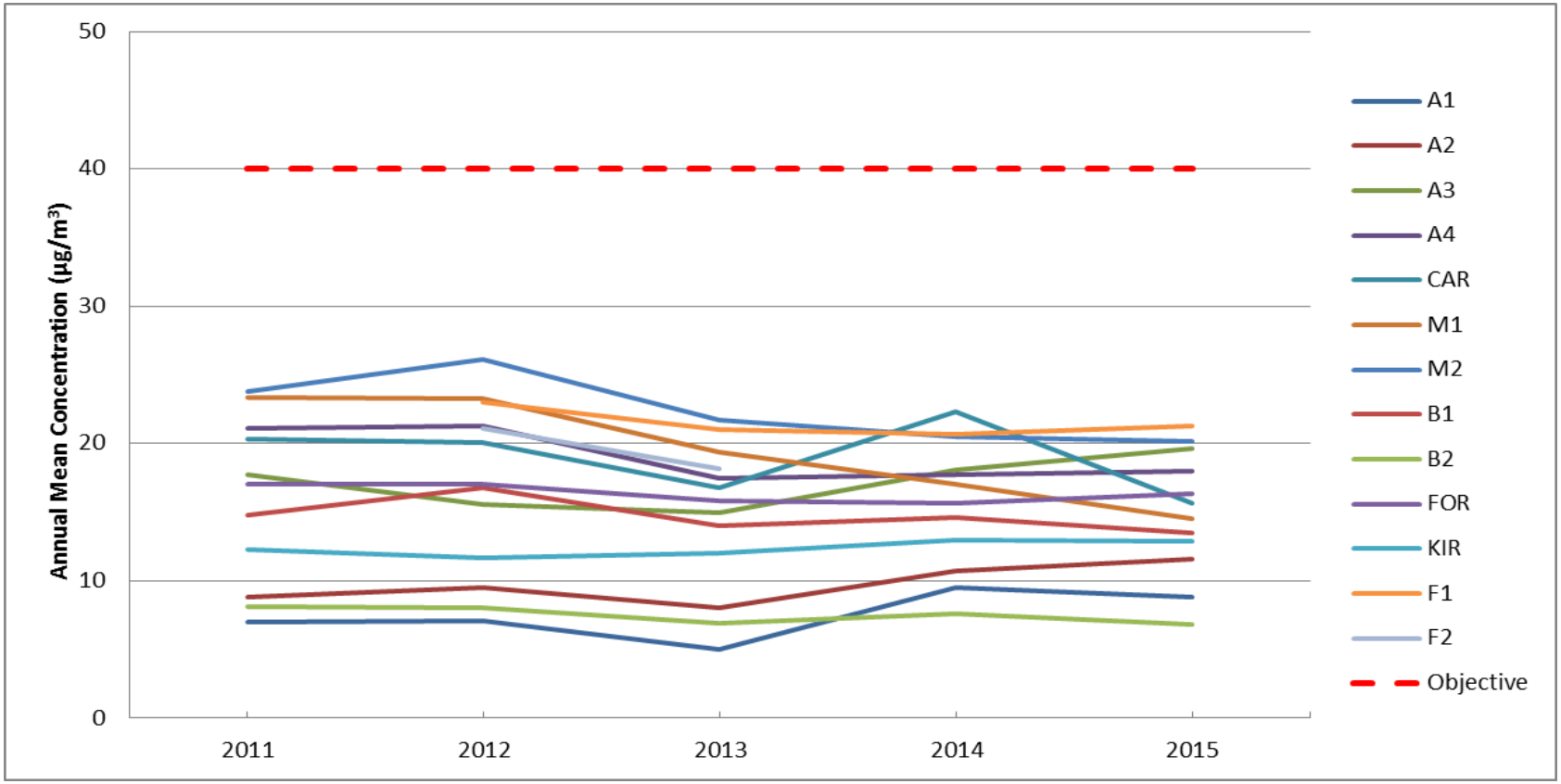

Figure A.1 - Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Sites in Angus Council

Table A.4 – Annual Mean PM10 Monitoring Results

Site ID	Site Type	Valid Data Capture 2015 (%)	PM_{10} Annual Mean Concentration (µg/m^3) (1)				
			2011	2012	2013	2014	2015
Burnside Drive, Arbroath	Kerbside	67	-	-	16.5	15.6	14.3
Glamis Road, Forfar	Kerbside	19	n/a	n/a	n/a	n/a	10.2
Chapelpark Primary School, Forfar	Roadside	-	18	17	n/a	n/a	n/a
Chapelpark Primary School, Forfar	Roadside	-	17.2	14.5	n/a	n/a	n/a
Peel Park Primary School, Glenisla	Rural Background	-	8.9	6.6	n/a	n/a	n/a

Notes: (1) Data annualised. See Appendix C for details.

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Table A.5 – 24-Hour Mean PM10 Monitoring Results

Site ID	Site Type	Valid Data Capture 2015 (%)	PM_{10} 24-Hour Means > 50µg/m^3 (1)				
			2011	2012	2013	2014	2015
Burnside Drive, Arbroath	Kerbside	67	-	-	5 (52.8)	0 (31.6)	1 (34.9)
Glamis Road, Forfar	Roadside	19	n/a	n/a	n/a	n/a	1 (32.0)
Chapelpark Primary School, Forfar	Roadside	-	0	2	n/a	n/a	n/a
Chapelpark Primary School, Forfar	Roadside	-	2	1 (38.4)	n/a	n/a	n/a
Peel Park Primary School, Glenisla	Rural Background	-	1	0 (19.0)	n/a	n/a	n/a

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

(1) If the period of valid data is less than 90%, the 98.1th percentile of 24-hour means is provided in brackets.

Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.1 – NO2 Monthly Diffusion Tube Results for 2015

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
A1	13.3	11.1	13.8	11	8.2	7.5	7.2	8.9	12	12.6	15.9	12.3	11.51	8.9
A2	17	17.6	15.4	14.7	11.9	11.2	9.4	11.7	15.9	18.7	18.2	16.1	15.00	11.6
A3	27	28.9	27.5	28.5	21.9	23	19.9	16.6	27.9	24.5	29.5	25.1	25.46	19.6
A4	30.7	25.7	24.3	23.6	17.9	18	16.2	18.2	22.5	26.4	30	20	23.42	18.0
CAR	26.1	23.1	20.6	20	15.1	16.3	13.5	16.6	17.6	22.6	27.2	19.5	20.32	15.6
M1	23.7	19.7	20.8	17.4	14.4	13.7	13.5	13.9	19	25.5	24.9	17.2	18.91	14.6
M2	28.6	30.9	26.7	25	24.7	20.4	20.8	26	24.5	26	26.3	26.4	26.15	20.1
B1	19.7	17.6	20	17.4	15.5	14.4	16.2	14.7	-	-	19.2	< 0.5	17.55	13.5
B2	11	10.9	8.9	8	6.9	6.3	5.3	6.7	8.5	12.6	11.8	< 0.5	8.87	6.8
FOR	26.9	25.1	22.2	21.5	18	14.4	12.7	16.2	18.1	23	23.5	24.8	21.18	16.3
KIR	21.1	-	16.7	16.4	14	12.6	11.1	13.9	17.1	16.6	19.5	17.2	16.68	12.8
F1	31.2	32.9	28.7	26.6	21.4	20.8	17	21.2	25.6	31.7	35.5	31.4	27.65	21.3

(1) See Appendix C for details on bias adjustment

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

Diffusion Tube QA/QC

Angus Council deploy diffusion tubes prepared and analysed by Tayside Scientific Services (TSS; 20% TEA in water method). Tubes are changed on a monthly basis.

Bias Adjustment Factors from Local Co-location Studies

Angus Council do not operate a chemiluminescent analyser, and therefore no co location study is carried out. It is therefore not possible to calculate a local bias adjustment factor.

National Bias Adjustment Factor

The national bias adjustment factor for TSS in 2015 is 0.77 (taken from spreadsheet v03/16, based on 5 studies; available at: http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html). This factor has been applied to all 2015 diffusion tube data.

WASP

Tayside Scientific Services take part in the Workplace Analysis Scheme for Proficiency (WASP), operated by the Health and Safety Laboratory (HSL). During 2015, 100% of samples were determined to have been satisfactory on the 1st quarter. No results were reported for the remaining quarters.

Short-term to Long-term Data Adjustment (Annualisation)

Due to technical problems, data capture at the Arbroath Partisol analyser was low in 2015. The data have therefore been adjusted to an annual mean, based on the ratio of concentrations during the short-term monitoring period to those over the 2015 calendar year. This has utilised data from two background sites operated as part of the Automatic Urban and Rural Network (AURN) where long-term PM_{10} data are available (with data capture >85%).

The annual mean PM_{10} concentrations and the period means for each of the monitoring sites from which adjustment factors have been calculated are presented in the tables below, along with the ratio applied.

Burnside Drive, Arbroath, January – 9th September 2015

Site	Site Type	Data Capture	2015 Annual Mean	Period Mean	Ratio
Aberdeen	Urban Background	97%	11.7	11.3	1.039
Edinburgh St Leonards	Urban Background	45%	-	-	-
Auchencorth Mos	Rural Background	72%	-	-	-
Grangemouth	Industrial Background	67%	-	-	-
Glasgow Townhead	Urban Background	44%	-	-	-
Newcastle Centre	Urban Background	37%	-	-	-
Middlesbrough	Industrial Background	95%	16.6	16.4	1.009
				Average	1.018

Glamis Road, Forfar, 23rd October – December 2015

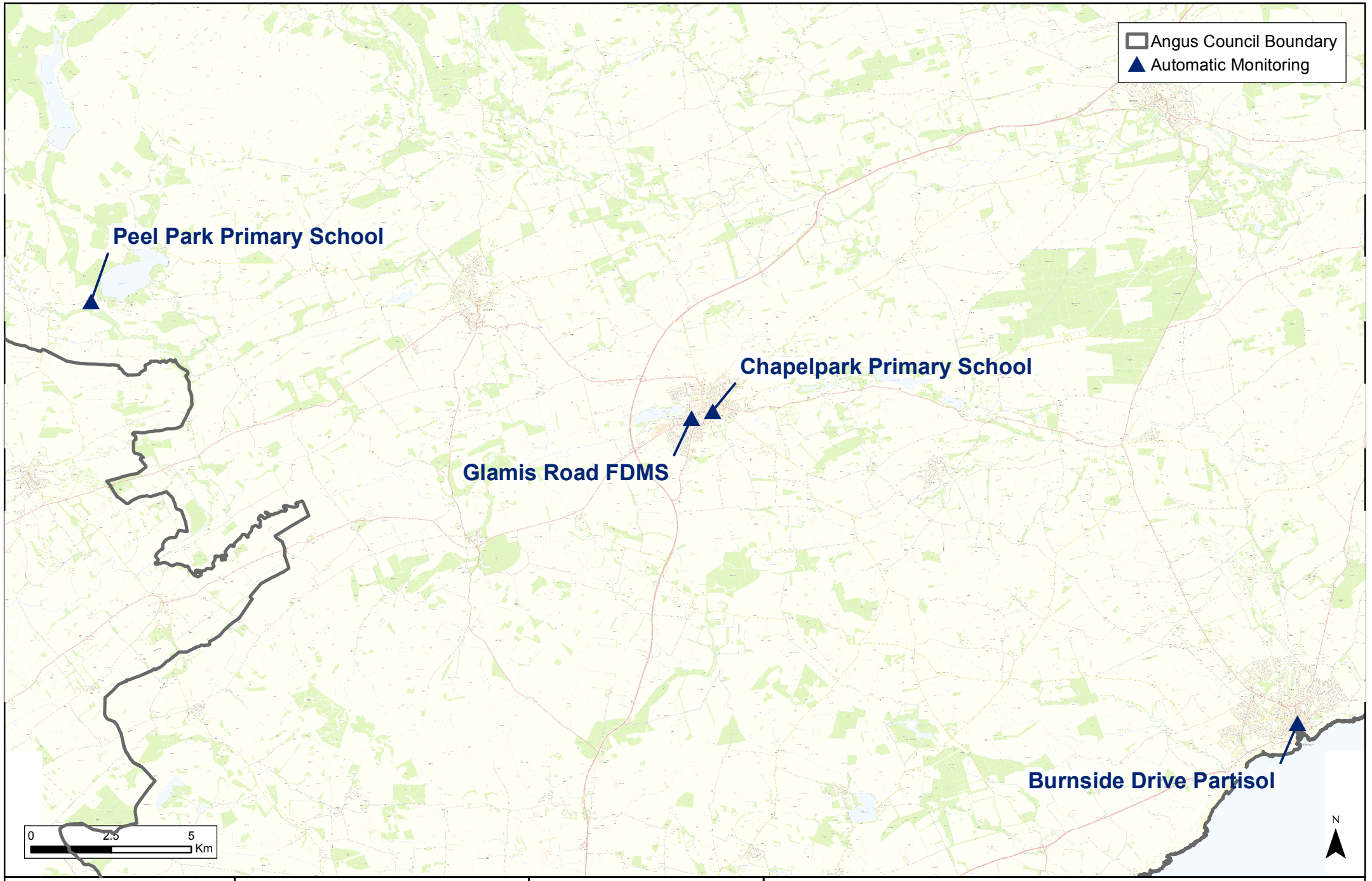
Site	Site Type	Data Capture	2015 Annual Mean	Period Mean	Ratio
Aberdeen	Urban Background	97%	11.7	12.3	0.948
Edinburgh St Leonards	Urban Background	45%	-	-	-
Auchencorth Mos	Rural Background	72%	-	-	-
Grangemouth	Industrial Background	67%	-	-	-
Glasgow Townhead	Urban Background	44%	-	-	-
Newcastle Centre	Urban Background	37%	-	-	-
Middlesbrough	Industrial Background	95%	16.6	16.4	1.008
				Average	1.020

Automatic Monitoring QA/QC

Angus Council change the Partisol filter cassettes on a two-weekly basis. The samplers are serviced bi-annually by Air Monitors Ltd.

Data from the FDMS analyser is collected via automatic telemetry by Ricardo Energy & Environment. The analyser is also serviced on an annual basis and audited every six months. All data are ratified 6-monthly using procedures comparable to those used for national network monitoring data. Data are available on the Scottish air quality website www.scottishairquality.co.uk.

Appendix D: Maps of Monitoring Locations



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Automatic Monitoring Sites

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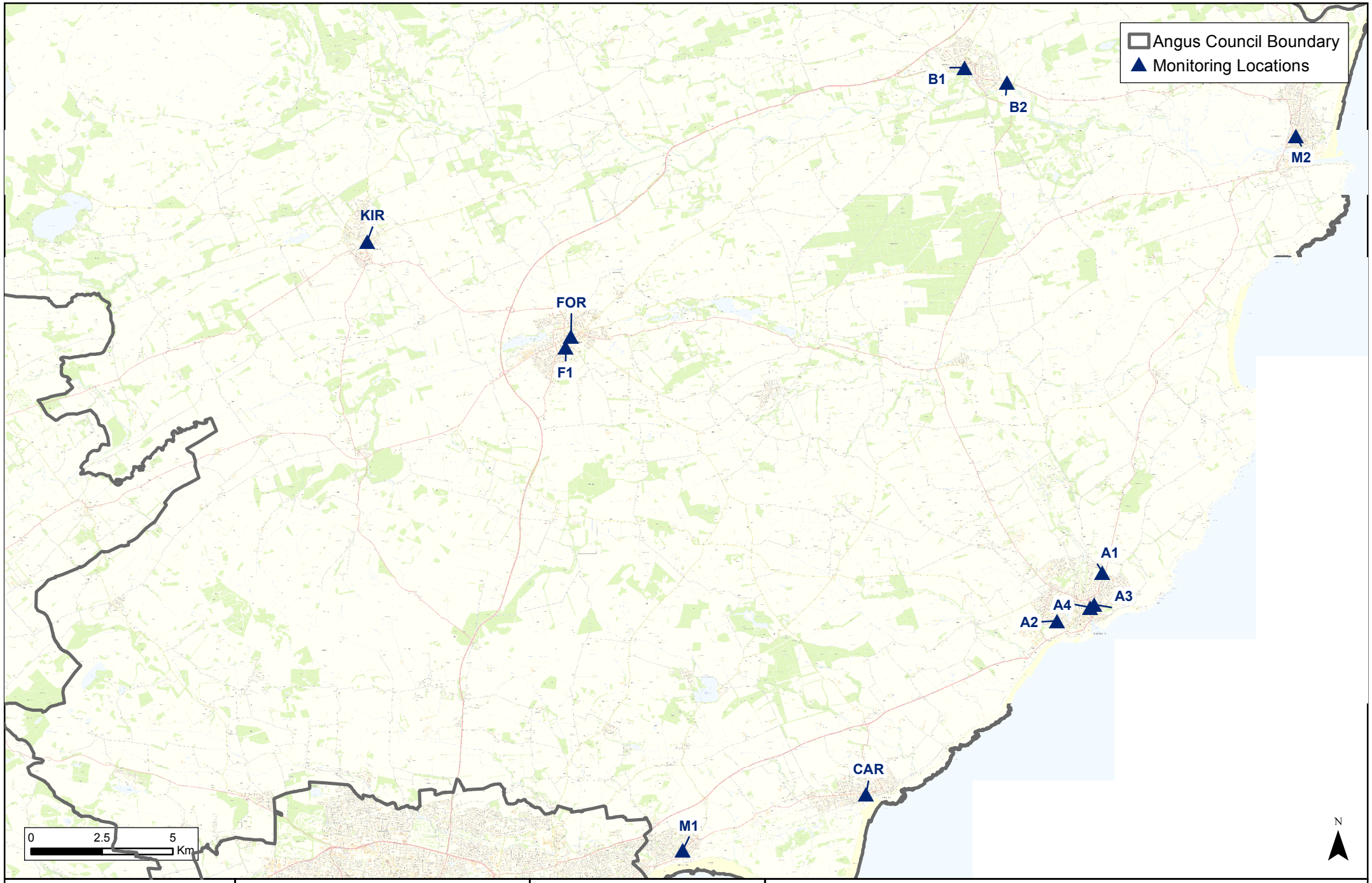

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Non-Automatic Monitoring Sites

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