Annual Progress Report (APR)

2022 Air Quality Annual Progress Report (APR) for East Ayrshire Council

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

August 2022

East Ayrshire Council
Comhairle Siorrachd Àir an Ear

Information	East Ayrshire Council Details
Local Authority Officer	Sandy Loudon
Department	Economy and Skills
Address	Environmental Health and Trading Standards
Telephone	01563 576834
E-mail	sandy.loudon@east-ayrshire.gov.uk
Report Reference Number	EAC/AQ01/AUG22
Date	August 2022

Electric vehicle charging point and cycle parking in Foregate North Car Park

Executive Summary: Air Quality in Our Area

Air Quality in East Ayrshire Council

Air quality is important because poor air quality can lead to ill health and reduced life expectancy. The effects of poor air quality on ill health are now well documented and the Committee on the Medical Effects of Air Pollutants (COMEAP) (Reference 25) has reported, "Anthropogenic $PM_{2.5}$ ... is associated with an effect on mortality equivalent to nearly 29,000 deaths in 2008 in the UK and an associated loss of total population survival of 340,000 years". An estimate of local mortality burden in East Ayrshire equates to 45 attributable deaths (age 25+) with associated life years lost at 497 (2010). Recent research has shown that air pollution has been clearly linked to spikes in breathing problem-related admissions to hospitals and visits to GPs in a research project conducted at the University of Dundee (Reference 32). $PM_{2.5}$ has been associated with diseases of the respiratory and cardiovascular systems, with cardiovascular disease likely occurring through systemic inflammation and possibly translocation of particulate matter into the circulation. Indeed, ultrafine particles (<100 nanometers in diameter) have been found in the brain and heart. These mechanisms indicate that effects are not limited to respiratory and cardiovascular systems, but uncovering new … (Reference 33).

The provision of good air quality is important to East Ayrshire Council (EAC), where it is a material consideration in the planning process. Environmental Health is a consultee where air quality is of concern. Cleaner Air for Scotland Strategy (CAFS2) (Reference 30) is at the heart of reducing air pollution in Scotland and is referenced when important planning decisions are made.

A brief summary of Air Quality issues within the East Ayrshire Council area is included in the following section. For further details and the background to LAQM issues, reference should be made to previous Air Quality Reports submitted by East Ayrshire Council, in particular the 2010 to 2021 Reports and associated Detailed Assessments (Reference 19). The Reports give a background to Air Pollution throughout the East Ayrshire Council area, and the progress made.

Reasons for non-compliance with air quality objectives throughout Scotland include:

- The increase in the diesel fleet over the decade prior to 2016, although this is now reversed with a trend back to petrol passenger cars and a slower, but significant, move towards electric vehicles. Diesel sales decreased in the UK by 52.0% in 2021, marking the 57th month in a row of declining sales. Battery Electric Vehicles took a record 7.2% of the market share in 2021 (source SMMT). In 2021 diesel cars recorded an 11.0% market share, petrol at 49.4%, BEV at 7.2% and hybrids at 32.3%. Diesels accounted for 50% of new car sales at their peak (Source SMMT).

- An increase in the total number of vehicles since 2004;

- A disparity between laboratory and real world emissions from vehicle engines, although real driving conditions are now part of vehicle emission assessments;
- Topography and spatial planning of urban areas creating street canyons, which can trap air pollution close to ground level;
- Limited integration of air quality with other policies related to climate change and planning, although progress is being made;
- Transboundary emission sources

The main area of concern for local air quality within the East Ayrshire Council area is the issue associated with vehicular traffic tailpipe emissions (principally from older diesel engines), PM (particularly with regard to the fine PM fraction) and NO_x emissions in the following locations:-

1. Kilmarnock town centre, due to slow moving traffic in the one way system with associated canyon effect – PM and NO_x.

2. The Cross, Mauchline (town centre), due to slow moving and queuing traffic where the B743 Ayr to Sorn road intersects the A76 Kilmarnock Dumfries trunk road – NO_x.

3. A71 Kilmarnock to Edinburgh road at Loudoun Road, Newmilns, where a combination of vehicle numbers and narrowness of the road (canyon effect and interruption to traffic flow due to parked cars on both sides of the road allowing only one large vehicle to pass at a time with the resulting stationary vehicles) – NO_x.

4. Stewarton town centre where four-way traffic lights results in queuing stationary traffic NO_x.

As we move away from the internal combustion engine, tyre and brake dust (non-tailpipe emissions) will form an increasing proportion of total vehicular particulate emissions. Beyond this broad issue of resource use and material waste, tyres also sit uniquely at the intersection of air quality and microplastics. It 'emits' particles across a broad size spectrum, from coarse to fine to ultrafine to nanoscale. It may also emit other forms of aromatics such as benzopyrene and benzofluorene, the result of the incomplete combustion of organic matter resulting in evaporation of the volatile content of the tyres, which the EU has regulated to a degree.

The other potential area of concern is the possibility that increased biomass combustion may lead to a deterioration in localised air quality. East Ayrshire Council Environmental Health Officers are experiencing increasing numbers of complaints from members of the public with regard to biomass combustion from, principally, log burners and incorrectly operated biomass boilers. To date this is more of a nuisance problem rather than an overall air quality problem but the overall impact may need to be investigated and possibly assessed in the future.

East Ayrshire Council Environmental Health has a close working relationship with the Planning Department and, as air quality is a material consideration in the planning process, applicants have to ensure that developments or installations will either improve air quality, or, have a minimum impact on air quality. Our planning officers would, as a first step, ask any applicant to have pre-planning discussions with the Environmental Health Service. East

Ayrshire Council Environmental Health Service's preferred option is that biomass should not be used in urban areas connected to the gas grid. This follows Scottish Government guidance. In certain circumstances, a formal objection may be considered. Furthermore, Environmental Health are minded to object to installations, which in our opinion may lead to nuisance complaints. It is our experience that poorly sited log burners and certain types of biomass boilers will almost certainly lead to justified neighbour complaints. Applications for biomass boilers which replace oil or coal installations, and which may lead to an improvement in air quality, will be looked at favourably but will be screened using the biomass screening tool, and if necessary, the applicant will be required to carry out dispersion modelling as part of the application. A similar screening process would be required for new installations off the gas grid.

Updates of Planning Policy that relate to Air Quality

The local plan currently in force within the East Ayrshire unitary authority is the **East Ayrshire Council Local Development Plan (2017)** (Reference 11). It contains policies which are used to assess planning applications. These are summarised in **Section 2.2.1, Placemaking – Plans and Policies.**

These updated policies will ensure that developers will have to minimise the impact on air quality of any new development, and if necessary, enter into a legal agreement with East Ayrshire Council to ensure this is the case.

Other actions the local authority take to manage air quality are discussed in Section 2 and listed in **Table 2.2a and 2.2b, APR 2022 Annexe.**

As previously discussed Environmental Health work closely with our Planning Department with regard to air quality as well as a range of other environmental parameters, including noise. We also work with our colleagues in the Traffic section where changes in traffic flow are being considered and new developments are being planned, which may have a significant impact on air quality. Often improvements which are introduced by our Traffic Section can also result in improvements in air quality e.g. smart traffic lights etc. Environmental Health also work with our colleagues in SEPA and Transport Scotland and neighbouring authorities, where we are often joint consultees. Where air quality issues arise in the planning process, EAC Environmental Health Service has pre-planning discussions with SEPA, and then agree a response to the application. As an example in 2016, Environmental Health had discussions with SEPA about the planning application at Killoch, Ochiltree for an energy from waste plant regarding background monitoring of PM by the applicant. Environmental Health also participate in joint working on an ad hoc basis.

Conclusion

Air Quality in the East Ayrshire Council area is generally good with relatively low concentrations of PM_{10}, $PM_{2.5}$, NO_2 and other pollutants (Appendix A) that are subject to LAQM. The highest concentrations of PM_{10}, $PM_{2.5}$ and NO_2 arise at heavily trafficked locations in the more urban northern parts of the area, particularly within the congested areas in the centre of Kilmarnock. Road traffic and undefined "rural" sources are important sources of NO_2 in East Ayrshire, whereas PM_{10} and $PM_{2.5}$ are predominantly derived from

outside the local authority area. It is anticipated that the background concentrations of PM_{10}, $PM_{2.5}$ and NO_2 will decline slightly over the coming years as a result of reduced transport emissions due to technological improvements and alternative fuels, a continued decline in the use of coal for power generation within the UK (now only 1.6% of electricity generation in the UK (2020), down from 30% in 2014) and the move to renewable energy in general. Scotland closed its last coal-fired power station in 2016. Measures implemented by East Ayrshire Council will also improve air quality and these are listed in **Section 2, APR 2022 Annexe**. As of June 2020, surface coal mining has ceased within the East Ayrshire Council area (Figure G.3.a), with the only impact on air quality from these sites being due only to restoration activities and hence greatly reduced.

Actions to Improve Air Quality

As previously mentioned air quality issues for new developments are targeted at the planning stage, or ideally at the pre-planning stage. These actions allow applicants to mitigate air quality impacts before any development proceeds, preventing problems occurring later. Where developments include biomass, the proposals are screened (as previously mentioned) and if problems are identified the applicant is asked to carry out dispersion modelling to include flue height sensitivity. This has proved successful in minimising local air quality impacts. Micro location is also discussed, as Environmental Health is finding problems where biomass is situated, for example close to trees and ground hollows, which can lead to localised nuisance issues. Low flue height in urban areas is also leading to problems. We also require the applicant to include a statement of best practice operation as part of the planning process.

Free flowing traffic is essential to minimise pollutant emissions from road transport hence the upgrading of the SCOOT system in Kilmarnock and Cumnock. Actions to encourage and promote use of public transport, and in particular walking and cycling, are also important in reducing private car usage. The council is also in the process of replacing ageing vehicles with less polluting electric vehicles and dual fuel vehicles. Travel Plans are also important and are a requirement of any new sizable development.

Another positive development for air quality is the decision to use geothermal well and ground source heat technology in preference to biomass heating for the proposed mixed-use housing/retail/leisure development on the old Johnnie Walker whisky bottling plant in Kilmarnock. This can only be positive for local air quality (Section 5, Planning Applications).

Actions taken at local and national level are producing a steady improvement in local air quality within East Ayrshire (Appendix A, Figures A.1-A.9).

Local Priorities and Challenges

Challenges include squaring improvements in air quality with both climate change and economic development. The drive towards biomass based renewable technology to slow down climate change can lead to deteriorating air quality. Previous UK road taxation policy (biased towards climate change) has, in the recent past, encouraged the purchase of diesel cars over petrol cars and this has led to higher levels of PM and NO_x emissions. As previously mentioned diesel car numbers are now in rapid decline. Although this is largely

out with the control of local councils, procurement of the council vehicle fleet with the purchase of low emission vehicles can improve air quality and some large urban-based councils have differential parking charges to encourage cleaner fuels. East Ayrshire Council has introduced a charging system for employees in many town centre carparks to discourage car use and encourage use of alternative forms of transport such as cycling and public transport, and also encourage walking for short journeys **(Table 2.a and 2.b, APR 2022 Annexe)**.

How to Get Involved

The public can obtain further information on air quality from East Ayrshire Council (EAC) Environmental Health. The website (Reference 19) is currently being updated. The website will have links to websites with information on how the public can take steps to lessen their impact on air quality (e.g. Breathe Scotland) plus links to the Scottish Air Quality Database and access to all recent reports. Contact details of the officer responsible for air quality issues are also provided in the air quality report and this has led to direct contact from members of the public. The public can also obtain information on air quality from the Air Quality Scotland Website (Reference 27).

To summarise, the long term NO_2 levels in East Ayrshire (2007-2021) are showing a downward trend (Figures A.1-A.5) and all monitoring locations were well below 40 µg/m^3 annual mean Air Quality Objective in 2021 (Table A.3), with a maximum roadside level of 24.8 µg/m^3 (NO_2 diffusion tube) at 95/97 John Finnie St., Kilmarnock, and 20.3 µg/m^3 measured at the St. Marnock St., Kilmarnock automatic monitoring station. Monitored PM_{10} levels in Kilmarnock Town Centre were substantially below the 18 µg/m^3 annual mean Air Quality Objective during 2021, at 9.9 µg/m^3 (Table A.5), and have been consistently below the Objective since 2012 using preferred TEOM FDMS or FIDAS technology (Reference 19). Monitored annual mean levels of $PM_{2.5}$ were 7 µg/m^3 (annualised) during 2016 (6 µg/m^3 monitored level), 6 µg/m^3 during 2017 and 2018, 7 µg/m^3 during 2019, 6 µg/m^3 during 2020 and 5.2 µg/m^3 during 2021, substantially below the 10 µg/m^3 annual mean Air Quality Objective (Table A.7). It is worth noting the substantial drop in NO_2 during 2020 and 2021 were mainly due to Covid Lockdown Restrictions **(Refer to Figure A.10, APR 2022 Annexe and Reference 27)**.

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

This report provides an overview of air quality in East Ayrshire Council area during 2021. 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) summarises the work being undertaken by East Ayrshire 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 Concentration	Air Quality Objective Measured as	Date to be Achieved by
Nitrogen dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
Nitrogen dioxide (NO_2)	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
Particulate Matter (PM_{10})	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
Sulphur dioxide (SO_2)	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
Sulphur dioxide (SO_2)	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

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.

East Ayrshire Council currently does not have any AQMA's. Due to the improvement in air quality within the East Ayrshire Council area, East Ayrshire Council has no plans at present to declare an AQMA. Measures to improve air quality have been carried out over a number years and many of these measures have been expanded, with new measures continually being added **(Table 2.a and 2.b, APR 2022 Annexe)**. East Ayrshire Council Environmental Health now has increasing involvement in the planning process, which helps ensure air quality is one of the prime considerations when new developments are planned. We are confident this process is working and has led to improvements in air quality. East Ayrshire Council has two smoke control areas in operation, namely the Grange Estate, Kilmarnock and Crossdene Estate, Crosshouse, which has improved air quality in these areas (Figure C.9).

2.2 Cleaner Air for Scotland

Cleaner Air for Scotland 2 – Towards a Better Place for Everyone (CAFS2) is Scotland's second air quality strategy. CAFS2 sets out how the Scottish Government and its partner organisations propose to further reduce air pollution to protect human health and fulfil Scotland's legal responsibilities over the period 2021 – 2026. CAFS2 was published in July 2021 and replaces Cleaner Air for Scotland – The Road to a Healthier Future (CAFS), which was published in 2015. CAFS2 aims to achieve the ambitious vision for Scotland "to have the best air quality in Europe". A series of actions across a range of policy areas are outlined, a summary of which is available on the Scottish Government's website.

Progress by East Ayrshire Council against relevant actions for which local authorities are the lead delivery bodies within this strategy is demonstrated below.

2.2.1 Placemaking – Plans and Policies

Local authorities with support from the Scottish Government will assess how effectively air quality is embedded in plans, policies, City Deals and other initiatives, and more generally

in cross departmental working, identifying and addressing evidence, skills, awareness and operational gaps.

The air quality policies in the Proposed East Ayrshire Local Development Plan 2 are primarily informed by the wording of the Draft National Planning Framework 4, with which the LDP must be in compliance (NPF4 is presently at draft stage). In terms of an assessment of the effectiveness of how air quality is embedded in the Local Development Plan, the Proposed EALDP2 will be subject to Examination by a Scottish Ministers-appointed Reporter, whose role is to ensure that the Plan is in compliance with national policy. As part of Examination, the Reporter will provide recommendations to the Council on any changes that should be made to the Plan. The Council is largely bound to take on board these recommendations before proceeding to adopt the Plan. The current 2017-adopted Local Development Plan was subject to a similar process of scrutiny.

Air Quality is embedded in the present local plans and these are summarised below:

Updates of Planning Policy that relate to Air Quality

The local plan currently in force within the East Ayrshire unitary authority is the **East Ayrshire Council Local Development Plan (2017)** (Reference 11). It contains the following policies which are used to assess planning applications:-

Policy ENV12: Water, air, light and noise pollution. The part of the policy, which specifically refers to air quality, is as follows:-

Air

All developers will be required to ensure that their proposals have minimal adverse impact on air quality. Air quality assessments will be required for any proposed development which the Council considers may significantly impact upon air quality, either on its own, or cumulatively. Air quality mitigation measures may be required through planning conditions and/or Section 75 Obligations. Development that will have a significant adverse impact on air quality will not be supported. In terms of implementation, this policy will be implemented in an ongoing manner over the next 5 years (from 3rd April 2017).

On 13th January 2020 East Ayrshire Council adopted the Minerals Local Development Plan. There are various policies which relate to air quality:

Policy MIN SS9: Carbon Sequestration

Planning applications for carbon sequestration shall be assessed against the following criteria with regard to Air Quality:-

- Impacts in terms of dust and air quality;
- Impacts upon transport;
- The suitability of the restoration and aftercare proposals for the site; and

AIM: To protect the environment and residential amenity.

Policy MIN SS10: Construction Aggregates

The extraction of construction aggregates will be supported where there will be no unacceptable and significant adverse impact on local communities and the environment. The following criteria will be used to assess applications, and applicants should provide supporting information accordingly:

• Impacts in terms of dust and air quality;

• Impacts upon transport.

Policy MIN ENV10: Protection of Built and Natural Environment Resources

The Council recognise the importance of natural and built heritage assets in the assessment of development proposals. In particular, with regard to air quality, the Council will not support proposals where they would:

Adversely affect air quality or create air pollution issues.

AIM: To protect the built and natural environment.

Policy MIN PPL2: Protecting residential amenity

The Council will seek to ensure that all applications for mineral development will not create an unacceptable impact, with regard to air quality, through the generation of dust and air pollution particularly where they affect local communities and individual houses.

Applicants should submit supporting information with all minerals related applications which demonstrates that they have considered, minimised and if necessary mitigated:

Potential effects of the operational working of the site on existing residential properties and nearby communities, including dust;

AIM: To give appropriate weight to impacts on residential amenity in the determination of planning applications.

In terms of implementation, this policy will be implemented in an ongoing manner over the next 5 years (from 13th January 2020 or until it is superseded by a new Plan).

For all policies, category is Policy guidance and development control

Focus: Ensuring new developments do not cause adverse impacts upon air quality

Lead Authority: Planning & Economic Development

Planning Phase: July 2018-December 2019

Implementation Phase: 5 years from 13th January 2020

Key performance indicator: number of applications refused based on impacts upon air quality

Target pollution reduction: none – no worsening

Progress to date: no applications have failed in respect of air quality

Estimated completion date: December 2024

These updated policies will ensure that developers will have to minimise the impact on air quality of any new development, and if necessary, enter into a legal agreement with East Ayrshire Council to ensure this is the case.

In addition to the updated policies East Ayrshire Council produced supplementary planning guidance in 2017 for Renewable Heat Generation. The purpose of the guidance in line with the requirements of Scottish Planning Policy (SPP), sets out in detail the Council's approach to renewable heat generation and provides further information on the criteria which all renewable sources of heat generation will be assessed, underpinning Policy RE 2 of the LDP. This guidance does not direct renewable heat generation to specific locations but is intended to guide development as a starting point for investigating the potential for proposals in conjunction with Scotland's Heat Map. It is essential that background research is undertaken along with this guidance as renewable heat technology and legislation is continuously evolving. This guidance is aimed at;

(i) Developers exploring the feasibility of renewable energy as part of proposed or existing development in line with LDP policy
(ii) Developers exploring the feasibility of commercial projects and;
(iii) Community organisations considering the potential for renewable energy schemes.

2.2.2 Transport – Low Emission Zones and Avoiding Travel – T1

East Ayrshire Council does not at present have any Low Emission Zones. East Ayrshire Council does has an Active Travel Strategy, which consists of a series of travel plans and initiatives that have been implemented over the years. These have helped to decrease the number of car journeys within the East Ayrshire Council area with the benefit of reducing pollutants and improving air quality. These measures are wide and varied and include the establishment of an active travel hub to promote cycling and walking, park and ride facilities, promoting car sharing, quality bus corridors and priority for buses at traffic lights, school travel plans, travel plans for new development, promoting rail for passengers and freight etc. An Active Travel Strategy is also underway. These measures are included in the **Table 2.2a and 2.b, APR 2022 Annexe**.

2.2.3 Climate Change – Effective co-ordination of climate change and air quality policies to deliver co-benefits – CC2

East Ayrshire Council has an Energy Strategy and Carbon Management Programme (Reference 13). East Ayrshire Council has a recently updated Climate Change Strategy which is coordinated with Air Quality Policies and can be accessed at the following link:-

https://www.east-ayrshire.gov.uk/Clean-Green-East-Ayrshire/Climate-change-strategy/Climate-change-strategy.aspx

Air quality considerations form an integral part of any climate change policies. EAC complete regular sustainability reporting.

Vision Statement:

*"**East Ayrshire Council** is committed to reducing its **Carbon Emissions** and will put CO2 emissions reduction at the **core of its business activities**"*

The Council has produced a State of the Environment Report as part of its work for a new Minerals Development Plan. Its 10 detailed chapters considers geology and soils, landscape, ecology, **air quality**, water environment, climate change, cultural heritage population and human health, noise and material assets. The Minerals Plan includes significant proposals to help tackle the environmental damage caused by the liquidation of two open cast coal operators in 2013/14.

On 13th January 2020 East Ayrshire Council adopted the Minerals Local Development Plan – Refer to **2.2a and 2.2b, APR 2022 Annexe**.

Air quality concerns are addressed at the planning stage but sometimes a balance has to be struck between measures that are seen as having a positive effect with regards to climate change, but a negative effect with regards to air quality. Biomass combustion is one particularly difficult area and Environmental Health's preference is to follow Scottish Governments advice in that biomass should not be used in urban areas where mains gas is available. Our aim is to achieve a common goal.

2.3 Progress and Impacts of Measures to address Air Quality in East Ayrshire Council

East Ayrshire Council has taken forward a number of measures, during the current reporting year of 2021, in pursuit of improving local air quality. Details of all measures completed, in progress or planned, are set out in detail in **Table 2.2a and 2.2b, APR 2022** Annexe. More detail on these measures can be found in the East Ayrshire Transport Strategy (Reference 12). The Local Transport Strategy is being updated and will include reference to Transport Scotland's National Transport Strategy and Regional Transport Strategies. The most recent measures in progress are provided in Table 2.2b, with Table 2.2a listing previous and ongoing initiatives. The numbering system in **Table 2.2b corresponds with Table 2.2a**.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives

3.1 Summary of Monitoring Undertaken

Maps showing the location of the monitoring sites are provided in Figures C.4-C.8. Monitoring data is provided in Appendix A, Tables A.1-A.8 and Appendix B and any trends in Figures A.1-A.9. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C. Please note automatic monitoring data and NO_2 diffusion data is given to one decimal place.

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how local concentrations of the main air pollutants compare with the objectives.
East Ayrshire Council undertook automatic (continuous) monitoring at two sites during 2021. Appendix A shows the details of the sites. National monitoring results are available at http://www.scottishairquality.co.uk/. 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

East Ayrshire Council undertook non - automatic (passive) monitoring of NO_2 at 22 sites during 2021. Appendix A shows the details of these sites.

Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C and Appendix D.

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 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 40 µg/m^3. For diffusion tubes, the full 2021 dataset of monthly mean values is provided in Appendix B. All concentrations were under 62% of the annual air quality objective so no 'fall-off in NO_2 Concentrations with Distance from Road' calculations were required.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the Air Quality Objective of 200µg/m^3, not to be exceeded more than 18 times per year.

No exceedances of the annual mean or the hourly mean Air Quality Objectives for NO_2 occurred at any location where monitoring was undertaken within the East Ayrshire Council area during 2021. Indeed no annual mean NO_2 exceedance has occurred since 2010 (Reference 19). Automatic monitoring at St. Marnock Street indicated an annual mean of 20.3 µg/m^3 and the maximum NO_2 level recorded at any NO_2 diffusion tube site was 24.8 µg/m^3 at 95/97 John Finnie street, Kilmarnock, both well within the annual mean Air Quality Objective of 40 µg/m^3 (Table A.3). No exceedences of the NO_2 hourly mean occured at the St. Marnock St. automatic monitoring station during 2021 (Table A.4) and since no roadside located NO_2 tubes exceeded 24.8 µg/m^3 it is highly unlikely that any location within the East Ayrshire Council area would have exceeded the hourly mean, since only annual means greater than 60 µg/m^3 are likely to indicate exceedance of the hourly mean (Reference 6). No hourly mean NO_2 exceedances have occurred since 2014 (Reference 19).

NO_2 Monitoring at Schools and Colleges

Concerns have been raised by parents and local residents regarding air quality around schools and colleges adjacent to roads. To this end, Environmental Health had placed NO_2 diffusion tubes, during 2017, close to Ayrshire College, Kilmarnock Campus, Hill St., Kilmarnock, William McIlvanney Campus, Sutherland Drive Kilmarnock and the Barony Campus, Cumnock with the latest at Burns Bairns Nursery School at Mauchline Cross.

The NO_2 diffusion tube monitoring at the Ayrshire College, Kilmarnock Campus and William McIlvanney have been discontinued, since roadside NO_2 levels monitored were well below the 40 µg/m^3 (< 19 µg/m^3) annual mean Air Quality Objective. The actual levels within the school/college grounds would be considerably lower. Long-term trends also indicate a downward movement in NO_2 levels. Four NO_2 tubes were placed around the new entrances to the Barony Campus, Cumnock to gauge NO_2 emissions prior to, during construction, and post construction of the new campus. 2018 and 2019 results indicate NO_2 levels at between 10 and 17 µg/m^3, with NO_2 levels in 2020/21 at between 7.9 and 13.2 µg/m^3. These have since been removed due to low levels of NO_2. An AQ Mesh gas and particulate monitor was located in early 2019, in a residential area close to the Barony Campus (Table A.1), A4 Monitor location, to gauge pollutant levels, particularly due to concerns by local residents from emissions from the school biomass boiler. 2019 results indicate roadside NO_2 levels at 14 µg/m^3, similar to the NO_2 diffusion tube results with 2020 NO_2 levels at 16 µg/m^3 and January - March 2021 period mean levels (not annualised since less than 3 months data) at 19 µg/m^3. It should be noted the monitor at New Cumnock is an AQ Mesh, which is a screening monitor, and regarded as less accurate than traditional automatic monitors which have gained equivalence status. The monitor had significant reliability issues and with the resultant poor data capture, results should be regarded as indicative only. The results will be discussed in more detail in future reports after a period of occupation at the new school campus. The monitor was moved to within the Barony Campus Grounds in late October 2021, with October to December NO_2 period mean levels at 12 µg/m^3. The automatic results will be discussed in more detail in future reports after a period of occupation at the new school campus.

An NO_2 diffusion tube (DT57) was placed at The Cross, Mauchline for 4 months at the end of 2021 due to concerns from parents with pupils at Burns Bairns Nursey School. The bias adjusted, annualised NO_2 Level was found to be 19.80 µg/m^3 and therefore around half the Scottish Annual Mean Objective at the roadside and lower than the nearby NO_2 diffusion tube in Earl Grey St.. The actual levels within the nursery grounds would be lower and at the nursery façade the distance corrected level was 12.50 µg/m^3 (calculation below). This information was relayed to the staff and as NO_2 levels are steadily decreasing, no major concerns are noted and the NO_2 diffusion tube monitoring has been discontinued at this location with the two long term A76 roadside NO_2 diffusion tubes continuing.

Kilmarnock Bus Station

Four NO_2 diffusion tubes were located within Kilmarnock bus station during 2017 as part of a project by an Environmental Health MSc. student. These have now all been removed due to reducing NO_2 levels with levels well below the Scottish Annual Mean Objective (Table A.3) and the downward trend as the bus fleet is electrified. As an example the Irvine Valley Run is now fully electrified.

Relevant Exposure

Diffusion tube monitoring can only give an estimate of the annual mean level of NO_2, therefore objectives should only apply at locations where members of the public might be regularly exposed such as building facades of residential properties, schools, hospitals, care homes etc. Tube locations are often limited by practical implications such as a suitable mounting point (e.g. lamp post etc.) and often they are nearer the kerb than would be ideal. Due to the low levels of NO_2, no 'fall-off in NO_2 Concentrations with Distance from Road' calculations were required. For information, NO2 Tube DT57 was distance corrected to give an indication of NO_2 levels at the nursery school façade (calculation below).

BUREAU VERITAS

Air Quality CONSULTANTS

Enter data into the red cells

Step 1	How far from the KERB was your measurement made (in metres)?	2.14	metres
Step 2	How far from the KERB is your receptor (in metres)?	16.14	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	4.645723	µg/m^3
	background concentrations as low as this are rare in the UK. This calculation will still work but please check your data		
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	19.8	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	12.5	µg/m^3

1-Hour Mean

Diffusion tubes can only be used to measure the annual mean NO_2 level. Previous research carried out on behalf of DEFRA and the Devolved Administration (Reference 5, Laxen D and Marener B (2003)) identified a relationship between the annual mean and the 1-hour objective, such that exceedances of the latter were considered unlikely where the annual mean was below 60 µg/m^3. An updated analysis (Reference 6, Cook A (2008)) has been carried out taking into account new monitoring data collected over the period 2003-2007. This new analysis has identified a number of exceedances of the 1-hour mean objective where annual mean were below 60 µg/m^3. The majority of these occurrences were recorded at kerbside and roadside sites, and were at sites within South-East England (and in particular within Greater London), but not exclusively so. A large number of these exceedances were associated with a regional pollution event that occurred over several days in December 2007. If these latter exceedances are excluded the number of exceedances of the 1-hour mean where annual mean are below 60 µg/m^3, is extremely limited. On the basis of this evidence, the guidance remains unchanged and authorities may assume that exceedances of the 1-hour mean objective are only likely to occur at locations where annual mean concentrations are 60 µg/m^3 and above. Annual mean levels of NO_2 are well below 60 µg/m^3 throughout all monitoring sites within East Ayrshire (Table A3) and we can therefore conclude no exceedances of the one hour mean objective are likely at locations of relevant public exposure (any outdoor location where members of the public might reasonably be expected to spend one hour or more e.g. pavements of busy shopping streets etc).

As previously noted, NO_2 levels at the building facade were at a maximum of 24.8 µg/m^3 during 2021 at 95/97 John Finnie St., significantly below the 40 µg/m^3 annual mean Air Quality Objective. The four long-term NO_2 diffusion tube monitoring sites (Figures A.3-A.4) indicate a significant downward trend from 2007 to 2021. Factors which may be contributing to this trend are:-

1/ Daily vehicle numbers have reduced from 17,000 in 2007 to around 14,000 in 2018 (Reference 36) in John Finnie Street due in part to the recession and the closure of the Johnnie Walker Whisky bottling plant. Volume of traffic was considerably lower in 2020 due to the covid pandemic, estimated by the DFT at around 11,000 (Reference 35).

2/ Measures introduced by East Ayrshire Council to Improve Air Quality - listed in **Table 2.1a and 2.1b, APR 2022 Annexe**, including smart traffic lights (SCOOT) installed in Kilmarnock town centre, active travel strategy etc.

3/ The possibility that stop start vehicle engine technology may be reducing emissions at traffic lights in the town centre where vehicles are stationary and often where diffusion tubes are located, although recent data has shown that in certain circumstances in older generation vehicles (Pre Euro 6), stop/starts can increase pollutants by allowing the catalytic converter to cool below optimum temperature. The more modern the car, the better this technology works.

4/ Improvements in vehicle emission technology, (Reference 21), particularly Euro 6 (VI) technology, is now finally providing a significant improvement, particularly since real world driving emissions checks have been introduced. The move towards zero emissions vehicles is also having a significant effect.

5/ Relatively mild winter weather patterns since the cold winters of 2009/10 and 2010/11 which resulted in raised levels of NO_2 and PM_{10}. It is worth noting that East Ayrshire experienced a relatively prolonged cold spell during the end of 2017 and continued into the spring of 2018. This led to a short-term rise in NO_2 concentrations. This is similar, but less pronounced than the cold winters of 2010/2011 with the proviso that the peaks are considerably lower due to the improving long-term trend.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the Scottish Air Quality Objective of 18µg/m^3.

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

No exceedances of the annual mean Air Quality Objective occurred at the St. Marnock St. monitoring site during 2021, with annual mean levels of 9.9 µg/m^3 using FIDAS technology, well below the 18 µg/m^3 Scottish Air Quality Objective. No exceedances of the daily mean Objective PM_{10} occurred in 2021.

No results were obtained for particulates at the A4, Cumnock monitoring site during 2021 due to technical issues with the AQ Mesh monitor. No exceedances of the annual mean Air Quality Objective occurred at the A5, Barony Campus Cumnock monitoring site during 2021 with period mean (October – December) levels of 12 µg/m^3 using AQ Mesh technology, well below the 18 µg/m^3 Scottish Air Quality Objective. No exceedances of the daily mean PM_{10} occurred in the October to December monitoring period during 2021. It should be noted the monitor at New Cumnock is an AQ Mesh, which is a screening monitor, and regarded as less accurate than automatic monitors which have gained equivalence status.

The periods in 2019 when PM_{10} exceeded 50 µg/m^3 were due to smoke particulates from wild forest fires in Russia and Eastern Europe being brought in by the easterly and north easterly winds in April. This occurred throughout Scotland. Some localised increase may also be due, in part, to wild fires in the vicinity of Loch Doon in the southern part of East Ayrshire. In fact the PM_{10} level recorded for the month of April at the St. Marnock St. Monitoring Station, at 23 µg/m^3 was more than double the annual average.

http://www.scottishairquality.scot/latest/site-info?site_id=MARN&view=statistics

Loch Doon Wild Fires 2019

Ten years of PM_{10} data are now available for the St. Marnock St. monitoring station and it can be clearly established that data obtained using the preferred PM_{10} TEOM FDMS or FIDAS technology indicate that recorded PM_{10} levels from 2014 to 2021 (Reference 19) at a maximum of 11 µg/m^3, is comfortably below the 18 µg/m^3 annual mean Air Quality Objective (Table A.5). Figures A.6 and A.7 indicates the PM_{10} trend between 2012 and 2021, measured at the Kilmarnock, St. Marnock Street Monitoring Station. Although the trend is noticeably downwards, it should be noted that a change of monitor occurred in August 2016 when the BAM 1020 was replaced with a Fidas monitor. Figure A.8 indicates the PM_{10} trend between 2016 and 2021 from data from the Fidas monitor only, with no discernible change noted between 2016 and 2019 with a small drop in levels during 2020 and 2021, the latter two years being influenced by the covid lockdowns. The PM_{10} levels at 11 µg/m^3 (2016-2019), 10 µg/m^3 in 2020 and 9.9 µg/m^3 in 2021 are well below the 18 µg/m^3 annual mean Air Quality Objective. The 1 µg/m^3 drop in PM_{10} levels during 2020 and 2021 are likely to be partly due to the reduction in traffic due to Covid restrictions.

3.2.3 Particulate Matter ($PM_{2.5}$)

Appendix A compares the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 6 years with the air quality objective of 10µg/m^3.

A $PM_{2.5}$ monitor was installed in St. Marnock St. during August 2016. Using a conservative factor of 0.7 (Reference 27) to estimate the $PM_{2.5}$ within the East Ayrshire Council area, an estimate was made of $PM_{2.5}$ levels within Kilmarnock. During 2015 PM_{10} annual mean readings of 11 µg/m^3 (TEOM FDMS) and 14 µg/m^3 (BAM) were recorded. Using the 0.7 factor results in an estimate of $PM_{2.5}$ between 7.7 µg/m^3 and 9.8 µg/m^3. Historical monitoring of PM_{10} from 2012 to 2015 using TEOM FDMS technology produced annual mean readings of between 10 µg/m^3 and 15 µg/m^3 giving estimated $PM_{2.5}$ levels of 7.0 µg/m^3 to 10.5 µg/m^3. Since the annual mean Air Quality Objective for $PM_{2.5}$ is 10 µg/m^3, potential estimates of $PM_{2.5}$ could lead to exceedance of the 10 µg/m^3 annual mean Air Quality Objective.

Monitoring is therefore essential to determine whether this is the case. Monitoring commenced in August 2016. No exceedances of the annual mean $PM_{2.5}$ Air Quality Objective occurred at the St. Marnock St. monitoring site during 2021 with annual mean levels of 5.2 µg/m^3 using FIDAS technology (Table A7). Indeed 6 years monitoring between 2016 and 2021 indicate levels at between 5.2 and 7 µg/m^3 are well below the air quality objective of 10 µg/m^3. Figure A.9 indicates the $PM_{2.5}$ trend between 2016 and 2021. The 1 µg/m^3 drop in $PM_{2.5}$ is likely to be partly due to the reduction in town centre traffic due to Covid restrictions.

3.2.4 Sulphur Dioxide (SO_2)

No Sulphur Dioxide monitoring was carried out in East Ayrshire during 2021. Monitoring was discontinued in 2005 due to the very low levels recorded. Previous monitoring of sulphur dioxide indicated that no exceedances of Air Quality Objectives were found or predicted. Previous assessment of sources of sulphur dioxide concluded that no exceedances of Air Quality Objectives were likely due to the reduction in domestic coal usage and industrial sources.

3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene

No other pollutants, included in the Regulations for the purpose of Local Air Quality Management in Scotland, were monitored by East Ayrshire Council in 2021 as previous monitoring or assessments concluded that no exceedances of Air Quality Objectives were found or predicted.

4 New Local Developments

One large-scale application has been submitted since 2021 APR, with the potential to affect air quality, namely the potential installation of a 35.5MW biomass combined heat and power plant at the chipboard plant at Egger Ltd, Barony Road, Auchinleck, to generate electricity and hot gas. This application is dealt with in Section 5. Planning Applications. One other Development, the Halo Development, Planning Application No: 17/0865/PPP has an Air Quality Impact Assessment outstanding and Environmental Health hope to receive this in due course and will be covered in the 2023 APR.

4.1 Road Traffic Sources

East Ayrshire Council confirms that there are no new or newly identified **Road Traffic Sources**, since the 2021 APR, which may have a **significant** impact on air quality within the Local Authority area.

4.2 Other Transport Sources

East Ayrshire Council confirms that there are no new or newly identified **Other Traffic Sources**, since the 2021 APR, which may have a **significant** impact on air quality within the Local Authority area.

4.3 Industrial Sources

East Ayrshire Council confirms that there are no new or newly identified **Industrial Sources**, since the 2021 APR, which may have a **significant** impact on air quality within the Local Authority area.

4.4 Commercial and Domestic Sources

East Ayrshire Council confirms that there are no new or newly identified **Commercial and Domestic Sources**, since the 2021 APR, which may have a **significant** impact on air quality within the Local Authority area.

4.5 New Developments with Fugitive or Uncontrolled Sources

East Ayrshire Council confirms that there is one **New Development with Fugitive or Uncontrolled Sources,** which has been submitted since the 2021 APR, with the potential to have a **significant** effect on air quality, namely the potential installation of a 35.5MW biomass combined heat and power plant at the chipboard plant at Egger Ltd, Barony Road, Auchinleck.

Environmental Health are dealing with a significant number of retrospective planning applications for mainly rural biomass boilers, mainly small scale for heating farmhouses, cottages and drying floors on farms. Generally these are either screened out using the biomass screening tool or are dealt with by requesting the flue heights are raised to ensure adequate dispersion. Most applications have capped flues and Environmental Health ask for these to be removed to allow adequate dispersion of flue gases and to prevent a potential build-up of gases within the appliance. This follows guidance from The Chartered Institution

of Building Services Engineers, Biomass Heating Document CIBSE AM15:2014. The following standard condition is added:-

'All cowls or top hats, if installed, should be removed from the flue terminals. This follows guidance from The Chartered Institution of Building Services Engineers, Biomass Heating Document CIBSE AM15:2014. The applicant should ensure adequate rainwater drainage from the flues'.

Quarries

For all quarry or construction developments, Environmental Health request a standard condition that a Dust Management Plan (DMP), referring to IAQM guidance, is submitted and approved by the Local Authority prior to commencement of operation.

One new quarry has been given planning permission in 2021, namely Dareduff Quarry, Neilston Road, Uplawmoor, 19/0262/PP. A pre-planning discussion took place between the applicant's agent and Environmental Health and the methodology for an Air Quality Assessment was agreed. The AQ Assessment concluded that the potential dust impact on receptors would be negligible and that fine particulate matter is not significant and the air quality objectives will not be exceeded. To ensure this is the case, the applicant submitted an updated DMP.

An extension to an existing quarry, Garpel Quarry, Sorn Road, Muirkirk (20/496/PP) was approved in 2021. The AQ issues were addressed at the original planning application and covered in previous AQ Reports and found that any AQ impacts were not significant. The extension was covered in the original AQ Assessment.

5 Planning Applications

Environmental Health refer to various guidance when assessing Air Quality Impacts from planning applications, including the following guidance, which was produced by EPS and RTPI Scotland and is based upon a revision of the EPUK/IAQM guidance on Planning & Air Quality published in 2015.

DELIVERING CLEANER AIR FOR SCOTLAND

Development Planning & Development Management

Guidance from Environmental Protection Scotland and the Royal Town Planning Institute Scotland

January 2017

One large-scale application has been submitted since 2021 APR, with the potential to affect air quality, namely the potential installation of a 35.5MW biomass combined heat and power plant at the chipboard plant at Egger Ltd, Barony Road, Auchinleck, to generate electricity and hot gas. Environmental Health consulted with SEPA and provide the following planning consultation response.

APPLICATION NO:	**21/0616/PP**
PROPOSAL:	**Erection of a building to house a combined heat and power plant using biomass**
ADDRESS:	**Egger Ltd Barony Road Auchinleck Cumnock**

'Local Air Quality Management comes under the responsibility of Environmental Health and as such any development which may have an effect on local air quality has to be assessed for impact on local air quality. Due to the size of the Combined Heat and Power Plant (CHP Plant) (>20MW) the biomass boiler falls under the remit of SEPA and will be assessed as a PPC Permit Variation Application (PPC Part A).

SEPA PPC Permit Variation Application

To operate the proposed CHP plant the operator must apply for a variation of the permit to include the operation of the CHP Plant. In doing so they must demonstrate to SEPA's satisfaction that the activities carried out will be operated in such a way that all the appropriate preventative measures are taken against pollution, in particular through application of the best available techniques, and that no significant pollution is caused. This includes meeting the stringent emission limits set under European legislation, which must be adhered to. In addition, the application must demonstrate, with detailed modelling, that there will be no significant impact on the environment or on human health. This will result in a more technical and comprehensive submission than that provided at the planning stage. Given the size of the proposed CHP plant it will also require to comply with the requirements of the Medium Combustion Plant Directive.

Where SEPA determines at planning that a development is potentially consentable or where planning permission is granted, this does not guarantee that a PPC Permit will be varied to include the new activity. SEPA's subsequent determination of the variation

application is to a greater depth and cannot be started until such time that a valid PPC application has been received. SEPA will, therefore, only comment in general terms on generic topics at the planning stage rather than provide specific comments on any aspect of the proposed development. Also, the details of the installation, as well as the regulation and guidance governing such installations, may be subject to changes between the planning application and the PPC Permit application.

Upon receipt of a valid PPC application by SEPA, there will be a process of statutory consultation, and East Ayrshire Council will be further consulted at this point.

Environmental Health have, therefore, no objection in principle to the application and will consult with SEPA at the time when Egger applies for a variation of their present permit to include the CHP Plant. Also, in general terms, this permission does not exempt the applicant, or those responsible for the future management of this facility, from the powers of nuisance control currently available to the local authority under sections 79 and section 80 of the Environmental Protection Act 1990. All users of the development should take the best practicable means at all times to minimise pollution being emitted from the development and impacting adversely on nearby properties or receptors.'

An air quality modelling statement will be expected to be submitted in advance of any modelling work being carried out as part of an AQIA to support a planning application, detailing relevant modelling parameters to be agreed by Environmental Health and SEPA.

It is also worth noting that a previous planning application at Egger **(APPLICATION NO: 21/0137/PP)** for a new emissions stack, new extraction and cleaning process, would lead to reduced overall emissions from the plant.

A similar response was submitted for an application for a crematorium incinerator at the Meadows, Galston.

APPLICATION NO: 21/0721/PPP PROPOSAL: Erection of a crematorium building, with associated car parking, internal roads, new access junction and new emergency access/egress

ADDRESS: The Meadows A71 Hoodston Bridge To Barrwood Gate Galston East Ayrshire

East Ayrshire Local Air Quality Management (LAQM) comes under the responsibility of Environmental Health and as such any development which may have an effect on local air quality has to be assessed for impact on local air quality. Crematorium Incinerators fall under the remit of SEPA and will require a Part B PPC Permit. SEPA PPC Permit Application to operate the proposed Crematorium Incinerator the operator must apply for a Part B permit. In doing so they must demonstrate to SEPA's satisfaction that the activities carried out will be operated in such a way that all the appropriate preventative measures are taken against pollution, in particular through application of the best available techniques and that no significant pollution is caused. This includes meeting the stringent emission limits set under European legislation, which must be adhered to. In addition, the application must demonstrate, with detailed modelling, that there will be no significant impact on the environment or on human health. This will result in a more technical and comprehensive submission than that provided at the planning stage. Environmental Health will require an

air quality assessment to be carried out to ensure there are no issues with public health and all Local Air Quality Objectives are met. This assessment can be carried out in conjunction with the assessment required by SEPA and the applicant should consult with both SEPA and Environmental Health. Subject to a satisfactory air quality assessment, Environmental Health would have no objection to the Incinerator with regards to LAQM. Also, in general terms, this permission does not exempt the applicant, or those responsible for the future management of this facility, from the powers of nuisance control currently available to the local authority under sections 79 and section 80 of the Environmental Protection Act 1990. All users of the development should take the best practicable means at all times to minimise pollution being emitted from the development and impacting adversely on nearby properties or receptors. Please note this response purely deals with LAQM and is in addition to the previous responses from my other colleague in Environmental Health.

Other planning applications have included retrospective planning applications for installation of biomass boilers, mainly in rural areas, or edge of town developments, with negligible effect on LAQM.

6 Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

New monitoring has not identified any new exceedances of the objectives for any pollutant.

Both automatic and passive monitoring for NO_2 carried out during 2021 resulted in no exceedances of the annual mean Air Quality Objective at all monitoring locations within East Ayrshire (Tables A.1-A.4) where LAQM applies. All LAQM diffusion tube monitoring sites were at 24.8 µg/m^3 or below during 2021. All sites were therefore comfortably below the 40 µg/m^3 annual mean Air Quality Objective. The automatic monitor recorded an annual mean NO_2 level of 20.3 µg/m^3 which is the 9th consecutive year at or below 30 µg/m^3. Similarly, no hourly means > 200 µg/m^3 were recorded for the seventh year in succession. As mentioned previously, it is worth noting that Scotland experienced a relatively prolonged cold spell during the end of 2017 which continued into the spring of 2018. This had led to a short term rise in NO_2 concentrations. This is similar but less pronounced than the cold winters of 2009/2010 and 2010/2011 with the proviso that the peaks are considerably lower due to the improving long term trend. I am confident, even with a prolonged cold winter annual mean NO_2 levels will remain below the Air Quality Objective in any given year due to the substantial drop in NO_2 levels over recent years.

Automatic monitoring of PM_{10} at the St. Marnock Street monitoring site using FIDAS technology during 2021 (Tables A.5 and A.6) indicated an annual mean level of 9.9 µg/m^3, significantly below the 18 µg/m^3 annual mean Air Quality Objective. This is now the seventh year in succession recorded annual mean PM_{10} levels have been well below the annual mean Objective. Only two exceedances of the daily 50 µg/m^3 PM_{10} Mean at Kilmarnock and one exceedance at Cumnock have occurred since 2014, and these were due to forest fires in Russia and Eastern Europe.

$PM_{2.5}$ monitoring commenced at the St. Marnock St., Kilmarnock monitoring site in August 2016. Recorded levels during 2021 indicated an annual mean of 5.2 µg/m^3, significantly below the 10 µg/m^3 annual mean Air Quality Objective (Table A7). $PM_{2.5}$ levels have been between 5.2 µg/m^3 and 7 µg/m^3 from 2016 to 2021 substantially below the 10 µg/m^3 Scottish Air Quality Objective.

There has been a significant downward trend in diffusion tube measured NO_2 annual mean (Tables A.3, Figures A.3 and A.4, long term monitoring sites) since 2007 with no exceedances of the annual mean since 2010. The annual mean PM_{10} levels measured in Kilmarnock (Table A.5), have been consistently below the annual mean objective since 2013 when measured using TEOM FDMS and FIDAS technology (2015 when measured using BAM 1020 instruments) (Reference 19).

Since PM_{10} and NO_2 annual mean levels have exceeded the objective levels in past years, further monitoring is necessary to determine whether the downward trend is consistent and air quality objectives are being met, although this would seem to be the case. As mentioned in Section 3, $PM_{2.5}$ levels will be monitored to ascertain actual levels as predicted levels, using the conservative 0.7 factor, suggest levels may be close to the annual mean Air

Quality Objective, although monitoring over the last few years suggest levels are well within the limits (Table A.7).

6.2 Conclusions relating to New Local Developments

There are only one new local developments (since the submission of the 2021 APR) which has the potential to have a **significant** impact on air quality within the East Ayrshire Council area, namely the proposed CHP at Egger, Auchinleck. The application is summarised in Section 5. Planning Applications. The air quality impact from the developments will be covered when the relevant air quality modelling is submitted.

All the following have been considered for any proposed development:

- **Road traffic sources**
- **Other transport sources**
- **Industrial sources**
- **Commercial and domestic sources**
- **New developments with fugitive or uncontrolled sources.**

All planning applications with sources which have the potential to impact on air quality will first of all be screened using appropriate guidance, including LAQM (TG16), EPUK and the Royal Town Planning Institute Scotland guidance, and if this indicates significant potential air quality issues the applicant will be asked to submit a detailed assessment.

6.3 Proposed Actions

New monitoring has not identified any new exceedances of the objectives for any pollutant.

Further automatic monitoring for NO_2 will continue within Kilmarnock Town Centre to ascertain whether the downward trend in NO_2 is continuing and Air Quality Objectives continue to be met and also to provide a spread of regional data for Scottish Statistics. Further automatic monitoring for PM_{10} and $PM_{2.5}$ will also continue within Kilmarnock Town Centre to ascertain whether Air Quality Objectives continue to be met, and to determine future trends and also to provide a spread of regional data for Scottish Statistics.

Diffusion tube monitoring for NO_2 will also continue throughout East Ayrshire where it is deemed likely that levels are sufficiently high to warrant this (Table A.3). In this respect, monitoring is likely to be concentrated within Kilmarnock Town Centre, Loudoun Road, Newmilns, around Mauchline Cross and Stewarton Town Centre. Other sites are likely to be de-commissioned where several years monitoring has indicated levels of NO_2 well below Air Quality Objectives.

In the future if any location is subject to substantial change, e.g. substantial change in traffic flow etc., NO_2 diffusion tubes will be used as a screening tool to back up any air quality assessment. With regard to the aforementioned Barony Campus, NO_2 tubes were located to ascertain NO_2 levels pre and post development. Due to concerns from local residents, an AQ Mesh gas/particulate monitor has also been commissioned in a residential estate to the north west of the Barony Campus. This is to determine pollutant levels due to the construction of the new school campus with associated biomass boiler. The AQ Mesh being relatively mobile, will be used in the future to ascertain potential areas where pollutant levels may be of concern.

Two funding claims submitted to the Scottish Government in March 2021 were successful and East Ayrshire Council were awarded £65k from the 'Clean Air Grant' and £95k through the 'Switched on Fleets' towards Air Quality Action Plan Initiatives.

East Ayrshire Council will continue to monitor PM_{10} and $PM_{2.5}$ to ensure compliance with the Scottish Air Quality Objectives and ascertain whether downward trends are continuing.

The next course of action for East Ayrshire Council will therefore be the submission of the 2023 Annual Progress Report, continuation of NO_2 and particulate monitoring, implementation of measures in progress (Table 2.2a and 2.2b, APR 2022 Annexe) and the further introduction of new measures to reduce pollutant levels.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
A3	Kilmarnock, St. Marnock St. Monitoring Station	Roadside	242742	637705	NO_2; PM_{10}; $PM_{2.5}$	NO	Chemiluminescent; BAM(2016) FIDAS(Aug 2016 on)	0	3.18; 3.54	2.13; 2.30
A4	Cumnock, Holmhead Rd.	Roadside	256229	620539	NO_2; PM_{10}	NO	AQ Mesh	0	1.40	2.50; 2.50
A5	Cumnock, Barony Campus	Other	256096	6209502	NO_2; PM_{10}	No	AQ Mesh	0	N/A	2.50; 2.50

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

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? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT1	Fowlds Street/King Street Junction, Kilmarnock	Kerbside	242805	637620	NO_2	NO	2.57	0.43	N	2.95
DT2	8 John Finnie Street., Kilmarnock	Roadside	242715	638135	NO_2	NO	0.21	3.37	N	2.95
DT3	23 Lainshaw Street, Stewarton	Roadside	241901	645818	NO_2	NO	2.35	0.70	N	2.95
DT4	40 Main Street, Newmilns	Roadside	253601	637310	NO_2	NO	0.60	2.50	N	2.95
DT6	8A Kilmarnock Road, Mauchline	Roadside	249826	627335	NO_2	NO	2.32	0.36	N	2.95
DT11	96 John Finnie Street, Kilmarnock	Roadside	242656	637874	NO_2	NO	3.73	0.47	N	2.95
DT12	74 John Finnie Street, Kilmarnock	Roadside	242668	637929	NO_2	NO	3.03	0.67	N	2.95
DT14	95/97 John Finnie Street, Kilmarnock	Roadside	242619	637773	NO_2	NO	0.63	2.99	N	2.95

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT15	16 West George Street, Kilmarnock	Roadside	242776	638159	NO_2	NO	0.87	1.58	N	2.95
DT17	23/25 Loudoun Road, Newmilns	Roadside	253204	637237	NO_2	NO	0.46	1.48	N	2.95
DT24	5/7 Earl Grey Street, Mauchline	Roadside	249894	627233	NO_2	NO	0.67	3.60	N	2.95
DT27	Junction King Street/St. Marnock Street, Kilmarnock	Kerbside	242771	637714	NO_2	NO	2.11	0.45	N	2.95
DT32	Kay Park, Kilmarnock	Urban Background	243302	638259	NO_2	NO	N/A	N/A	N	2.95
DT33	Howard Park, Kilmarnock	Urban Background	242581	637409	NO_2	NO	N/A	N/A	N	2.95
DT44A	Kilmarnock, St. Marnock Street Monitoring Station	Roadside	242742	637705	NO_2	NO	0	3.18	Y	2.13
DT44B	Kilmarnock, St. Marnock Street Monitoring Station	Roadside	242742	637705	NO_2	NO	0	3.18	Y	2.13
DT44C	Kilmarnock, St. Marnock Street Monitoring Station	Roadside	242742	637705	NO_2	NO	0	3.18	Y	2.13

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT45	Kilmarnock Bus Station, Stance 2	N/A	242941	638030	NO_2	NO	N/A	N/A	N	2.95
DT46	Kilmarnock Bus Station, Stance 6	N/A	242957	638052	NO_2	NO	N/A	N/A	N	2.95
DT52	Knockroon Learning Campus, Ayr Road Entrance West	Roadside	256367	619894	NO_2	NO	0.24	1.86	N	2.95
DT53	Knockroon Learning Campus, Ayr Road Entrance East	Roadside	256427	619897	NO_2	NO	0.23	1.85	N	2.95
DT54	Knockroon Learning Campus, Auchinleck Road Entrance North	Roadside	256144	620585	NO_2	NO	0.21	1.37	N	2.95
DT55	Knockroon Learning Campus, Auchinleck Road Entrance South	Roadside	256197	620525	NO_2	NO	0.30	1.70	N	2.95
DT57	The Cross, Mauchline	Roadside	249887	627251	NO_2	NO	14	2.140	N	2.95

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results ($\mu g/m^3$)

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
A3	Roadside	Automatic	N/A	97.8	29	30	24	19	20.3
A4	Roadside	Automatic	68	16.8			14	16	19.0 (3)
A5	Other	Automatic	96.8	16.7					12.0 (4)
DT1	Kerbside	Diffusion Tube	N/A	83.3	29.0	24.1	23.9	14.5	20.4
DT2	Roadside	Diffusion Tube	N/A	100	29.3	23.0	26.5	15.6	18.6
DT3	Roadside	Diffusion Tube	N/A	100	25.9	21.4	22.8	15.1	17.9
DT4	Roadside	Diffusion Tube	N/A	100	25.6	21.0	21.2	15.4	15.7
DT6	Roadside	Diffusion Tube	N/A	100	22.8	19.4	21.7	13.5	14.8
DT11	Roadside	Diffusion Tube	N/A	100	26.4	22.7	22.3	15.3	17.2
DT12	Roadside	Diffusion Tube	N/A	91.7	27.0	24.3	25.5	18.8	20.3
DT14	Roadside	Diffusion Tube	N/A	91.7	32.4	25.6	28.0	20.5	24.8
DT15	Roadside	Diffusion Tube	N/A	91.7	33.7	25.1	25.7	19.9	23.1
DT17	Roadside	Diffusion Tube	N/A	100	26.0	22.4	21.3	14.8	17.4
DT24	Roadside	Diffusion Tube	N/A	83.3	28.5	22.3	23.7	15.7	21.6
DT27	Kerbside	Diffusion Tube	N/A	83.3	29.8	24.3	25.8	15.8	23.0
DT32	Urban Background	Diffusion Tube	N/A	100	10.9	9.8	11.3	8.0	8.7
DT33	Urban Background	Diffusion Tube	N/A	91.7	10.9	10.8	13.2	8.2	9.0
DT44A	Roadside	Diffusion Tube	N/A	91.7	26.2	20.8	21.6	16.8	19.3
DT44B	Roadside	Diffusion Tube	N/A	100	24.3	21.6	22.4	16.7	20.5
DT44C	Roadside	Diffusion Tube	N/A	83.3	28.4	21.1	22.0	17.0	19.4
DT44A-C Average	Roadside	Diffusion Tube	N/A		26.3	21.2	22.0	16.8	19.8
DT45	N/A	Diffusion Tube	N/A	100	53.8	26.3	24.6	16.9	22.1
DT46	N/A	Diffusion Tube	N/A	100	55.8	32.1	25.4	17.3	24.2
DT52	Roadside	Diffusion Tube	N/A	91.7	15.2	10.0	14.5	8.5	8.7
DT53	Roadside	Diffusion Tube	N/A	91.7	14.0	11.5	13.4	9.6	9.7
DT54	Roadside	Diffusion Tube	N/A	83.3	11.5	11.3	10.3	7.9	9.4
DT55	Roadside	Diffusion Tube	N/A	91.7	10.0	10.4	11.4	11.3	13.2
DT57	Roadside	Diffusion Tube	100	33.3					19.80

Notes:

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

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

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

(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) Due to the short period of monitoring and poor data capture (< 25%), no annualisation was carried out at this site and the results are indicative only.

(4) Due the short monitoring period (< 25%), no annualisation was carried out at this site and the results are indicative only.

Table A.4 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
A3	Roadside	Automatic	N/A	97.8	0	0	0	0	0
A4	Roadside	Automatic	68	16.8			0	0	0 (56 µg/m^3)
A5	Other	Automatic	96.8	16.7					0 (72 µg/m^3)

Notes:

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

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

(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%).

Figure A.1 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Kilmarnock St. Marnock Street Automatic Monitor 2012-2021

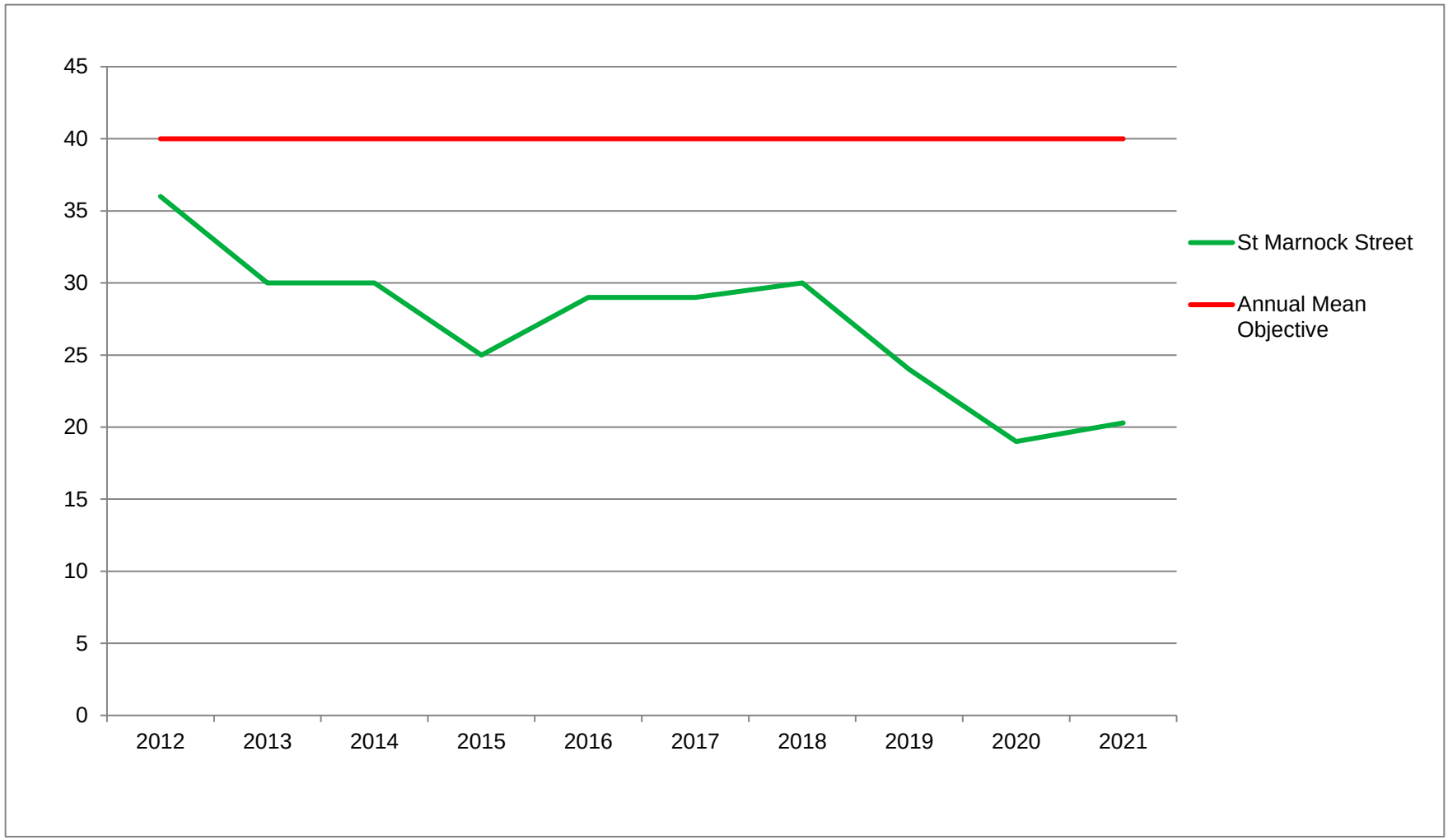


Figure A.2 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Kilmarnock St. Marnock Street Automatic Monitor Linear 2012-2021

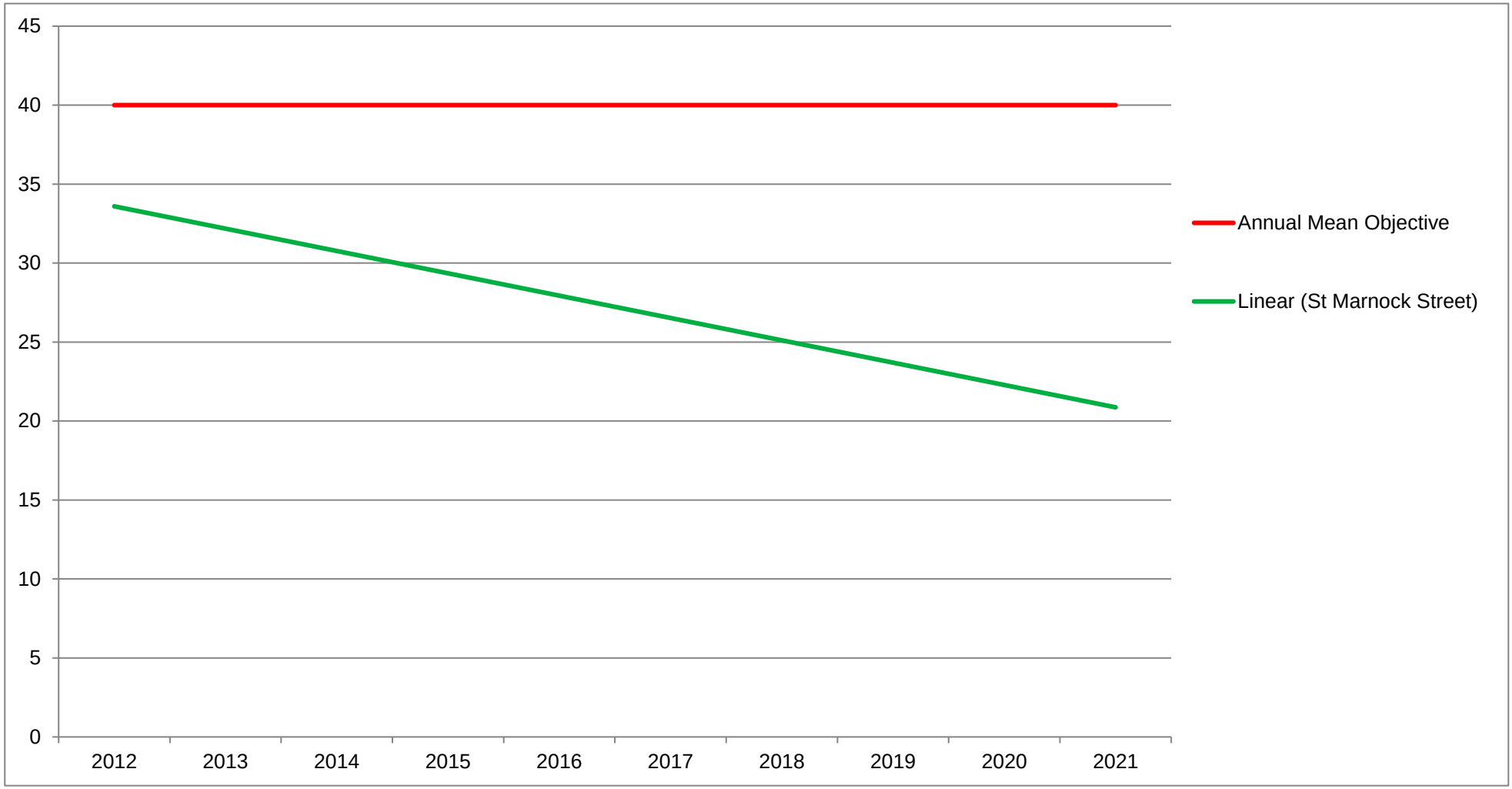


Figure A.3 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Long Term Diffusion Tube Monitoring Sites 2007-2021

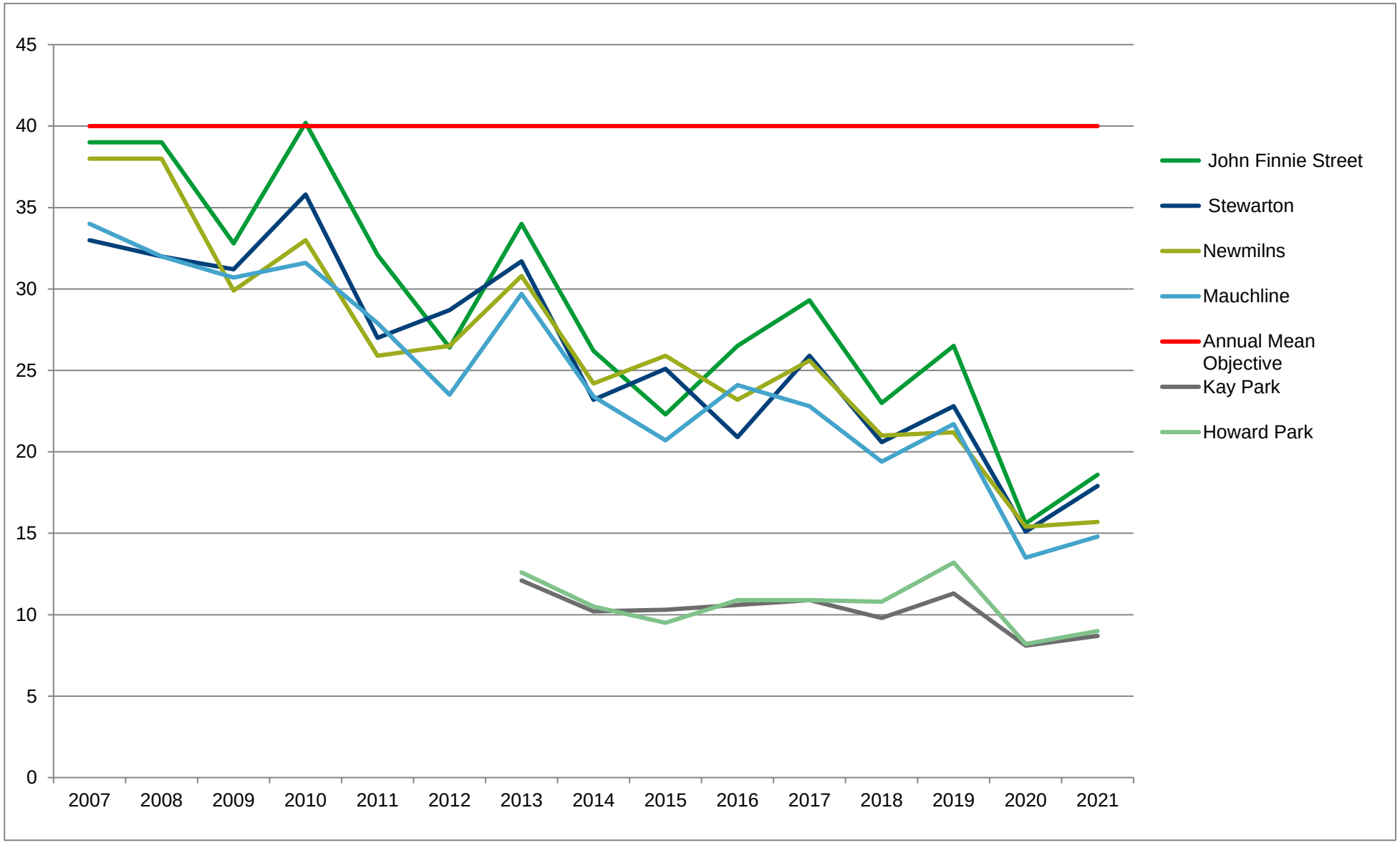


Figure A.4 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Long Term Diffusion Tube Monitoring Sites Linear 2007-2021

Figure A.5 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Long Term Diffusion Tube Monitoring Sites Linear 2013-2021

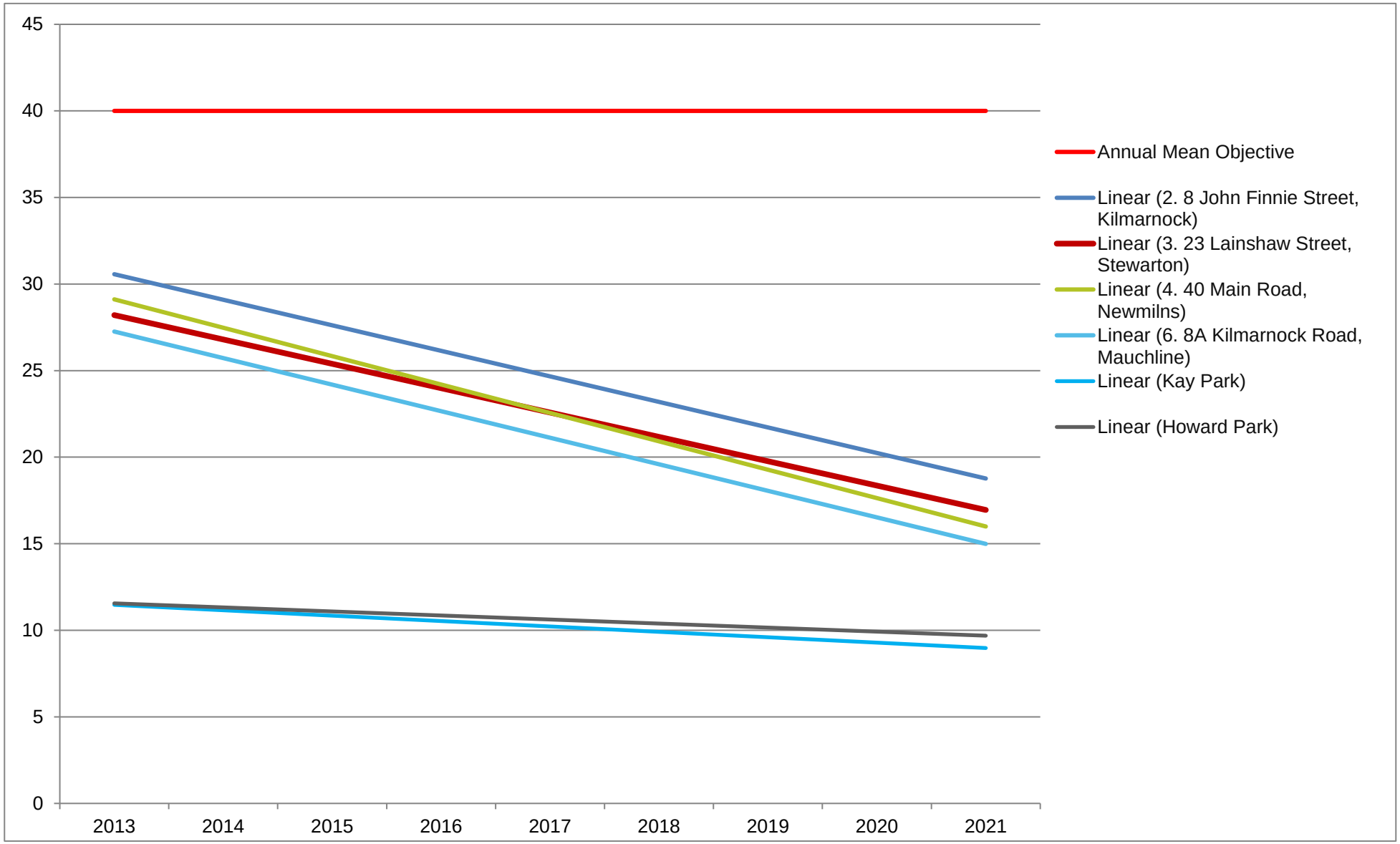


Table A.5 – Annual Mean PM_{10} Monitoring Results ($\mu g/m^3$)

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
A3 (FIDAS)	Roadside	N/A	82	11	11	11	10	9.9
A4	Roadside	N/A	N/A			9	9	N/A (3)
A5	Other	99.4	17.2					12.0 (4)

Notes:

Exceedances of the PM_{10} annual mean objective of 18 $\mu g/m^3$ are shown in **bold**.

All means have been "annualised" as per LAQM.TG(16), valid data capture for the full calendar year is less than 75% (shown in blue).

See Appendix C for details.

(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) Due to technical issues with the AQ Mesh Monitor no PM_{10} data was obtained for this site.

(4) Due to the short period of monitoring (< 25%), no annualisation was carried out at this site and the results are indicative only.

Table A.6 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
A3(FIDAS)	Roadside	N/A	82	0	0	2	0(25 µg/m^3)	0
A4	Roadside	N/A	N/A			1	0	N/A (3)
A5	Other	99.8	17.2					0 (36 µg/m^3) (4)

Notes:

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

If the period of valid data is less than 85%, the 98.1st percentile of 24-hour means is provided in brackets.

(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) Due to technical issues with the AQ Mesh Monitor no PM_{10} data was obtained for this site.

(4) Due to the short period of monitoring (< 25%), no annualisation was carried out at this site and the results are indicative only.

Table A.7 – Annual Mean $PM_{2.5}$ Monitoring Results (µg/m^3)

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
A3	Roadside	N/A	82	6	6	7	6	5.2
A4	Roadside	N/A	N/A			8	5	N/A (3)
A5	Other	99.8	17.2					5.0 (4)

Notes:

Exceedances of the $PM_{2.5}$ annual mean objective of 10 µg/m^3 are shown in **bold**.

All means have been "annualised" as per LAQM.TG(16), valid data capture for the full calendar year is less than 75% (shown in blue).

See Appendix C for details.

(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) Due to technical issues with the AQ Mesh Monitor no $PM_{2.5}$ data was obtained for this site.

(4) Due to the short monitoring period (< 25%), no annualisation was carried out at this site and the results are indicative only.

Figure A.6 Trends in Annual Mean PM_{10} Concentrations Measured at Kilmarnock St. Marnock Street Automatic 2012-2021

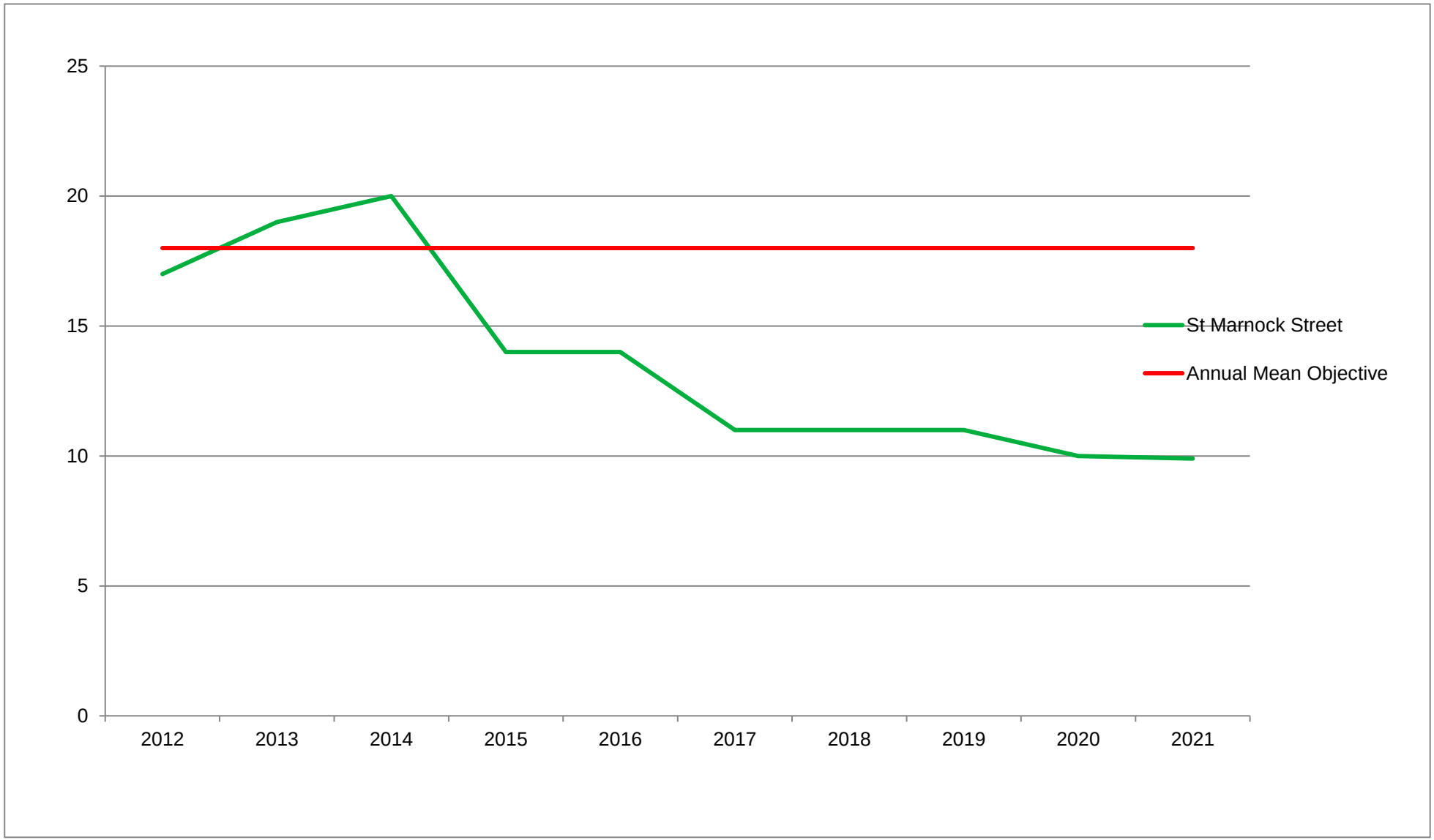


Figure A.7 Trends in Annual Mean PM_{10} Concentrations Measured at Kilmarnock St. Marnock Street Automatic Monitor – Linear 2012-2021

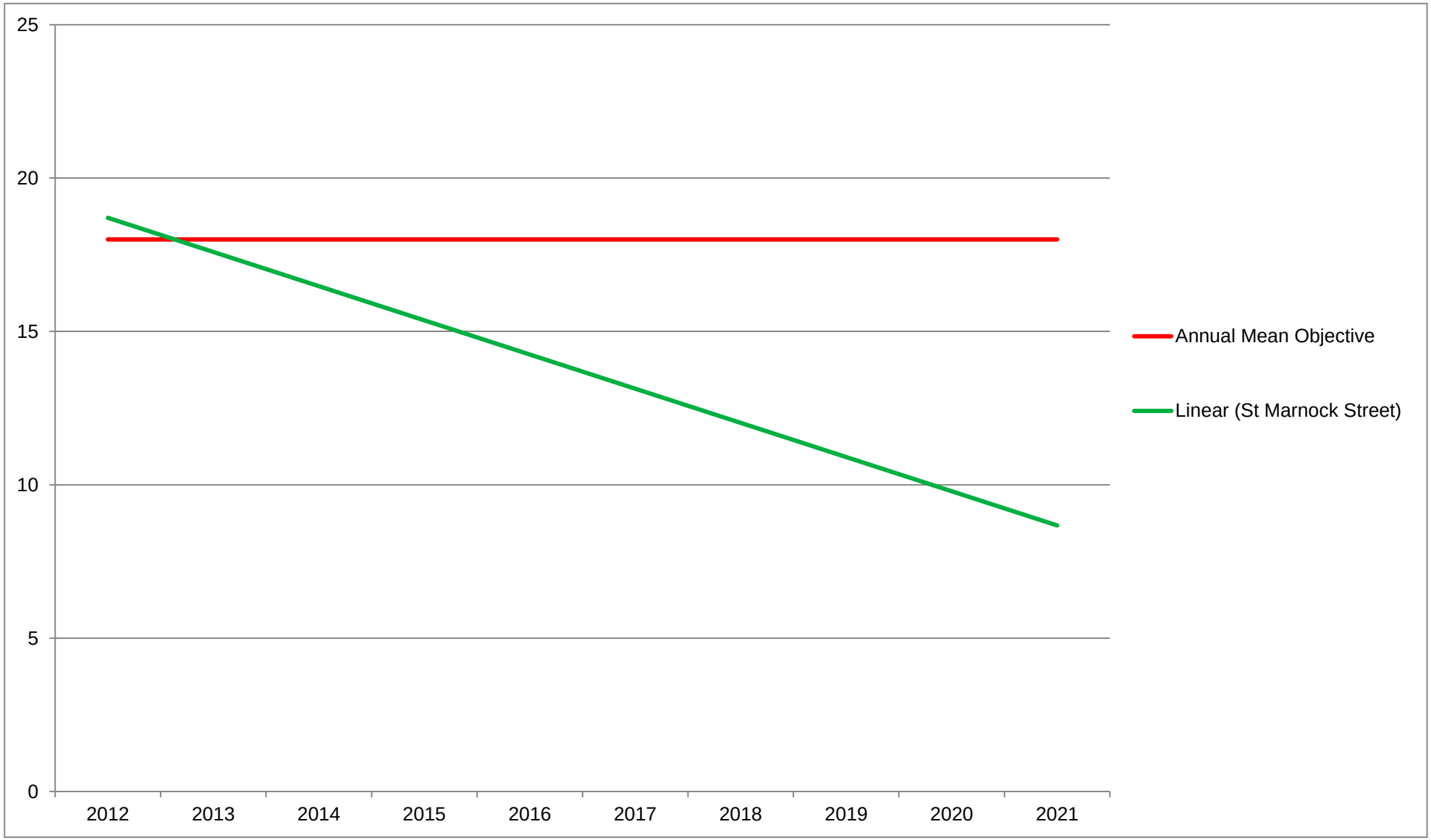


Figure A.8 Trends in Annual Mean PM_{10} Concentrations Measured at Kilmarnock St. Marnock Street Automatic Fidas Monitor – Linear 2016-2021

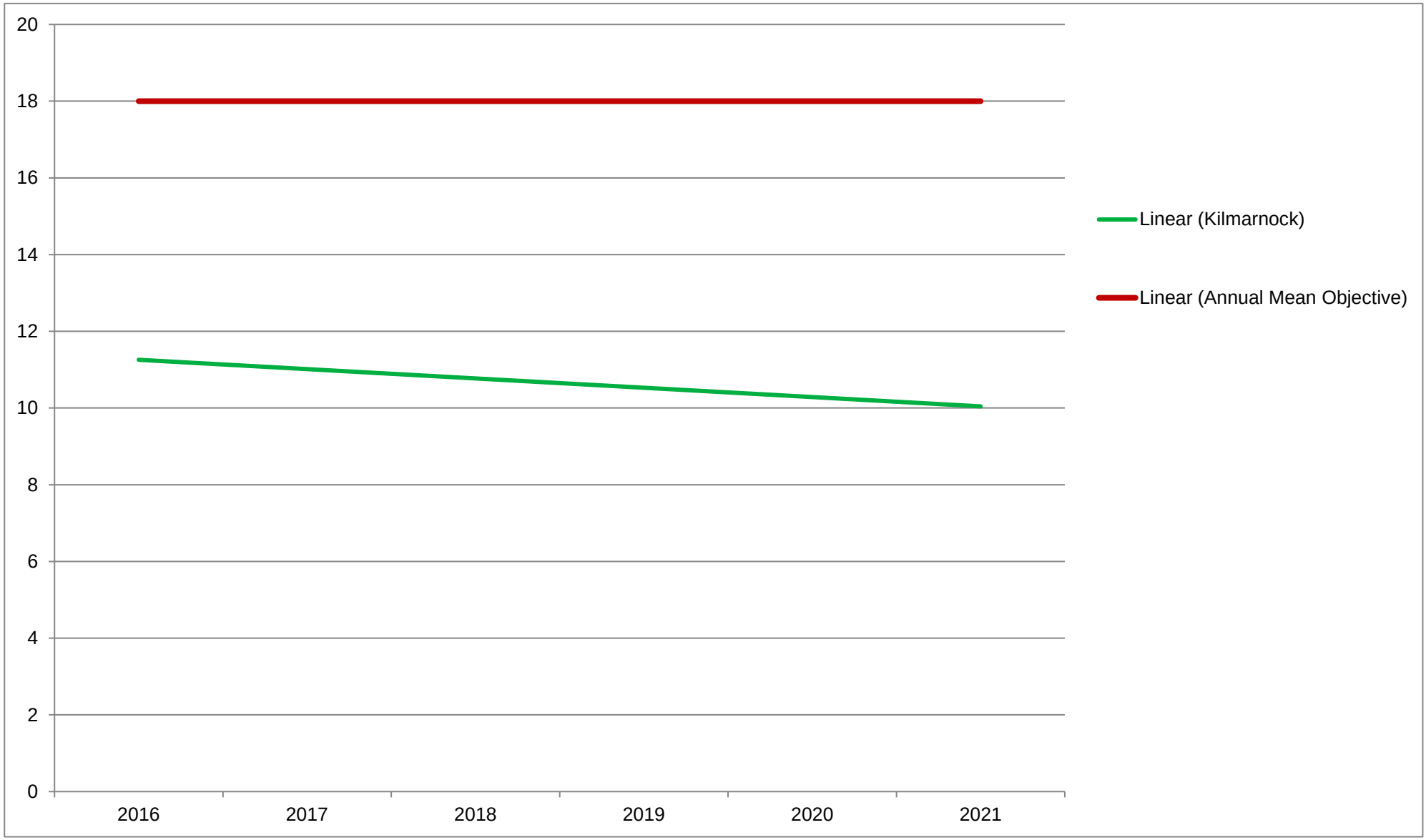
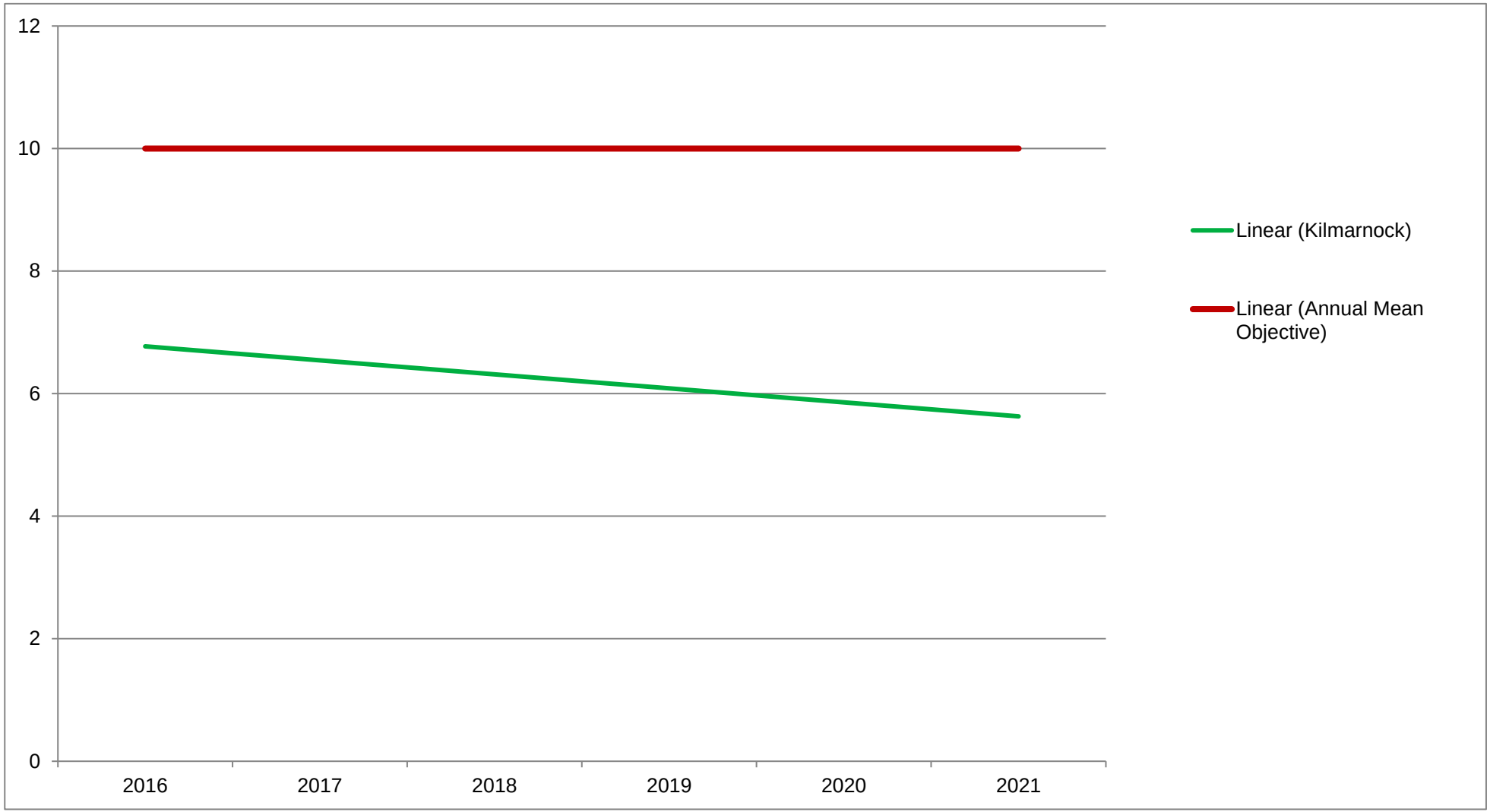


Figure A.9 Trends in Annual Mean $PM_{2.5}$ Concentrations Measured at Kilmarnock St. Marnock Street Automatic Fidas Monitor – Linear 2016-2021



Appendix B: Full Monthly Diffusion NO2 Tube Results (µg/m3) for 2021

Table B.1 – NO_2 2020 Monthly Diffusion Tube Results (µg/m^3) – Local Bias Adjustment Factor 1.06

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		Raw Mean	Corrected Mean (Bias Factor)
Fowlds Street/King Street Junction, Kilmarnock	21	11.3	8.3		18.6	10.2		20.7	25.2	18.1	24.4	34.5	10	19.23	20.38
28 John Finnie Street, Kilmarnock	21.9	10.2	8.4	12.2	18.8	8.2	13.7	22.1	23.2	23.2	15.4	32.7	12	17.50	18.55
19 Lainshaw Street, Stewarton	23.9	12.1	8.5	11	15.9	6.2	15.9	21.9	20.3	19.5	21.5	25.9	12	16.88	17.90
40 Main Street, Newmilns	21.6	8.3	8.9	13	12.9	6	11.9	17.9	18.4	16.7	18.5	24.1	12	14.85	15.74
8A Kilmarnock Road, Mauchline	19.7	11.8	7.1	11.7	12.3	7.1	7	18.9	18	15.4	16.2	22.5	12	13.98	14.81
74 John Finnie Street, Kilmarnock	18.1	8.8	8.6	13.5	8.5	8.8	13.1	23.2	21.5	20.3	23.5	26.7	12	16.22	17.19
62 John Finnie Street Kilmarnock	18.7	8.6	8.6	14.7	17.8		25.2	21.5	23.4	24	21.1	26.9	11	19.14	20.28
95/97 John Finnie Street, Kilmarnock	27.3	10.4	13.5	16.5	20.9		19.3	28.9	27.4	28.1	30.3	34.8	11	23.40	24.80
16 West George Street, Kilmarnock	20.8	11.8	11.5	16.6	23.9	16.7		32.5	23.8	20.9	31	30.5	11	21.82	23.13
23/25 Loudoun Road, Newmilns	24.3	17.1	12.5	13.9	15.9	9.8	5.3	17	16.5	17	24.1	23.4	12	16.40	17.38
5/7 Earl Grey Street, Mauchline	26	22.9	9.8	14.2	24.1	12.8		22.9		22.1	22.1	27.1	10	20.40	21.62
Junction King St./St. Marnock St., Kilmarnock	21.5	19	13.3	14.7		15.3		29	24.6	24.2	27.1	28.4	10	21.71	23.01
Kay Park, Kilmarnock	15.3	6.6	7.4	3.5	6.3	3.3	5.1	9.1	7.8	9.8	11.5	12.8	12	8.21	8.70
Howard Park, Kilmarnock	15.1	6.6	5.3	4.4	8.9		5.7	9.2	8.4	7.9	7.6	14.2	11	8.48	8.99
St Marnock St Monitoring Site, Kilmarnock		11.3	17.6	12.1	23.3	16.1	15.2	17.3	20.2	20.9	22.5	24.1	11	18.24	19.33
St Marnock St Monitoring Site, Kilmarnock	25.2	12.3	15.2	17.8	22.6	12.6	16.4	23.5	18.5	20.6	22.4	25.4	12	19.38	20.54
St Marnock St Monitoring Site, Kilmarnock		14	16	15.4	22.9		9.3	23.8	18.9	19.3	21.5	22.2	10	18.33	19.43
Bus Station No 1	16.8	10.7	19.7	14.3	23.9	12.7	21.7	30.2	22.6	24.7	26.5	26.5	12	20.86	22.11
Bus Station No 2	9.3	9.9	24	19.5	29.8	13.5	24.8	34.8	24.6	27.7	24.2	32.2	12	22.86	24.23
Knockroon Learning Campus Ayr Rd Entrance West	10.3	3.9	6.3	6	8.9		6.1	9.6	7.9	9.4	10.2	11.8	11	8.22	8.71
Knockroon Learning Campus Ayr Rd Entrance East	13.2	2.1	6.2	8.3	7.4		7.9	12.6	8.9	9.7	10.5	14.2	11	9.18	9.73
Knockroon Learning Campus Underwood Rd Entrance North	11.6	3.1	13.4	7.7	7.6	7.8	6.8		8		11.6	11.4	10	8.90	9.43
Knockroon Learning Campus Underwood Rd Entrance South	17.9	12.1	9	7.9	12	5.1		11.1	12.1	14.7	12.7	22.1	11	12.43	13.17
The Cross, Mauchline									21.8	20.4	21.6	21.4	4	21.30	22.58

Notes:

(1) See Appendix C for details on bias adjustment

Table B.2 – NO_2 2020 Monthly Diffusion Tube Results (µg/m^3) – National Bias Adjustment Factor 1.11

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		Raw Mean	Corrected Mean (Bias Factor)
Fowlds Street/King Street Junction, Kilmarnock	21	11.3	8.3		18.6	10.2		20.7	25.2	18.1	24.4	34.5	10	19.23	21.35
28 John Finnie Street, Kilmarnock	21.9	10.2	8.4	12.2	18.8	8.2	13.7	22.1	23.2	23.2	15.4	32.7	12	17.50	19.43
19 Lainshaw Street, Stewarton	23.9	12.1	8.5	11	15.9	6.2	15.9	21.9	20.3	19.5	21.5	25.9	12	16.88	18.74
40 Main Street, Newmilns	21.6	8.3	8.9	13	12.9	6	11.9	17.9	18.4	16.7	18.5	24.1	12	14.85	16.48
8A Kilmarnock Road, Mauchline	19.7	11.8	7.1	11.7	12.3	7.1	7	18.9	18	15.4	16.2	22.5	12	13.98	15.51
74 John Finnie Street, Kilmarnock	18.1	8.8	8.6	13.5	8.5	8.8	13.1	23.2	21.5	20.3	23.5	26.7	12	16.22	18.00
62 John Finnie Street Kilmarnock	18.7	8.6	8.6	14.7	17.8		25.2	21.5	23.4	24	21.1	26.9	11	19.14	21.24
95/97 John Finnie Street, Kilmarnock	27.3	10.4	13.5	16.5	20.9		19.3	28.9	27.4	28.1	30.3	34.8	11	23.40	25.97
16 West George Street, Kilmarnock	20.8	11.8	11.5	16.6	23.9	16.7		32.5	23.8	20.9	31	30.5	11	21.82	24.22
23/25 Loudoun Road, Newmilns	24.3	17.1	12.5	13.9	15.9	9.8	5.3	17	16.5	17	24.1	23.4	12	16.40	18.20
5/7 Earl Grey Street, Mauchline	26	22.9	9.8	14.2	24.1	12.8		22.9		22.1	22.1	27.1	10	20.40	22.64
Junction King St./St. Marnock St., Kilmarnock	21.5	19	13.3	14.7		15.3		29	24.6	24.2	27.1	28.4	10	21.71	24.10
Kay Park, Kilmarnock	15.3	6.6	7.4	3.5	6.3	3.3	5.1	9.1	7.8	9.8	11.5	12.8	12	8.21	9.11
Howard Park, Kilmarnock	15.1	6.6	5.3	4.4	8.9		5.7	9.2	8.4	7.9	7.6	14.2	11	8.48	9.41
St Marnock St Monitoring Site, Kilmarnock		11.3	17.6	12.1	23.3	16.1	15.2	17.3	20.2	20.9	22.5	24.1	11	18.24	20.24
St Marnock St Monitoring Site, Kilmarnock	25.2	12.3	15.2	17.8	22.6	12.6	16.4	23.5	18.5	20.6	22.4	25.4	12	19.38	21.51
St Marnock St Monitoring Site, Kilmarnock		14	16	15.4	22.9		9.3	23.8	18.9	19.3	21.5	22.2	10	18.33	20.35
Bus Station No 1	16.8	10.7	19.7	14.3	23.9	12.7	21.7	30.2	22.6	24.7	26.5	26.5	12	20.86	23.15
Bus Station No 2	9.3	9.9	24	19.5	29.8	13.5	24.8	34.8	24.6	27.7	24.2	32.2	12	22.86	25.37
Knockroon Learning Campus Ayr Rd Entrance West	10.3	3.9	6.3	6	8.9		6.1	9.6	7.9	9.4	10.2	11.8	11	8.22	9.12
Knockroon Learning Campus Ayr Rd Entrance East	13.2	2.1	6.2	8.3	7.4		7.9	12.6	8.9	9.7	10.5	14.2	11	9.18	10.19
Knockroon Learning Campus Underwood Rd Entrance North	11.6	3.1	13.4	7.7	7.6	7.8	6.8		8		11.6	11.4	10	8.90	9.88
Knockroon Learning Campus Underwood Rd Entance South	17.9	12.1	9	7.9	12	5.1		11.1	12.1	14.7	12.7	22.1	11	12.43	13.79
The Cross, Mauchline									21.8	20.4	21.6	21.4	4	21.30	23.64

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

New or Changed Sources Identified Within East Ayrshire Council During 2021

As discussed in Section 4, New Local Developments and Section 5 Planning Applications, only one large-scale application has been submitted since 2021 APR, with the potential to affect air quality, namely the potential installation of a 35.5MW biomass combined heat and power plant at the chipboard plant at Egger Ltd, Barony Road, Auchinleck.

Additional Air Quality Works Undertaken by East Ayrshire Council During 2021

East Ayrshire Council located one additional nitrogen dioxide diffusion tube at The Cross, Mauchline due to concerns from parents of Burns Bairns Nursery about air quality due to traffic levels. The results are discussed in Section 3.

QA/QC of Diffusion Tube Monitoring

Nitrogen Dioxide Diffusion Tube Monitoring Procedure

East Ayrshire follows the procedures outlined in LAQM TG (16) 7.185 for deploying NO_2 diffusion tubes. Normally the deployment dates in the Diffusion Tube Monitoring Calendar are followed.

The nitrogen dioxide diffusion tubes are placed at each location by East Ayrshire Council to give 12 periods within the calendar year. All diffusion tubes are placed at a height of 2.95m to give a reasonable representation of the air people breathe, but at a height that limits vandalism. After either a four or a five-week period, the exposed tubes are replaced and sent to the laboratory for analysis. All exposure times and dates are recorded and sent to the laboratory with the exposed tubes. East Ayrshire Council also sends one unexposed tube with each batch to check that there has been no contamination while in transit or storage. Selection of diffusion tube sites and instructions for exposing diffusing tubes were carried out using the latest guidance issued by AEA from the work completed by the Working Group on Harmonisation of Diffusion Tubes (Reference 3). The supply of the tubes and analysis is undertaken by Glasgow Scientific Services (GSS) – part of Glasgow City Council. The laboratory is UKAS accredited for the analysis and also participates in two centralised QA/QC schemes; the Workplace Analysis Scheme for Proficiency (now the AIR NO2 Proficiency Testing Scheme)(Reference 4) and a monthly field inter-comparison exercise managed by Bureau Veritas, in which diffusion tubes are co-located with an automatic analyser. The AIR/WASP scheme is an independent analytical proficiency - testing scheme (PT), operated by the Health and Safety laboratory (HSL). For the 5 rounds reported from September 2020 to February 2022 GSS obtained 4 rounds at 100% and one round at 50%

giving a combined score of 90% which were subsequently determined to be **satisfactory** based on the z-score system (Reference 4). Over a rolling five round AIR/WASP window one would expect that 95% of laboratory results should be within the criteria set within the scheme. If this percentage is substantially lower than 95% for a particular laboratory, within this 5 round window, then one can conclude that the laboratory in question may have significant systemic sources of bias in their assay. It should be noted that GSS did not report any results during the September-October 2021 rounds due to pandemic issues. GSS follow the procedures set out in the Harmonisation Practical Guidance and prepares the Palmes-Type diffusion tubes using the 20% Triethanolamine (TEA) in water.

The diffusion tube method is open to a degree of uncertainty inherent in the method. To partially correct for this uncertainty, a bias adjustment factor is applied. To calculate bias adjustment, triplicate tubes from Glasgow Scientific Services are co-located with chemiluminecence automatic analysers at various locations throughout West Central Scotland, including the local site in Kilmarnock. The tubes are placed within 1m of the analyser inlet and 10cm apart. The co-located tubes are prepared, handled and analysed in exactly the same way as those from the other (non-co-located) monitoring sites in the survey. Co-location data questionnaires are completed and sent to The National Physical Laboratory, Teddington, London. GSS also participate in the Bureau Veritas Marylebone laboratory inter-comparison study (Reference 23). At the time of writing July 2022, 7 sites, including the Marylebone Road site in London, Glasgow City Council and East Ayrshire Council were present on the spreadsheet. A resultant bias adjustment is then computed for each site. A combined bias adjustment is then calculated from these 7 sites using orthogonal regression to allow for both the uncertainty in both the automatic monitor and the diffusion tubes. The uncertainty of the diffusion tube has been assumed to be double that of the automatic monitor. For 2021 the overall bias adjustment factor was computed at **1.11**. The bias adjustment factor applied to the raw annual means of the diffusion tubes was therefore **1.11** for 2021 data. Precision and Bias Adjustment Data (Reference 20) are shown in Appendix C. The Local Bias Adjustment Factor was calculated at **1.06** using the same procedures.

The decision to use the local bias adjustment factor has been taken for the following reasons:-

1. The East Ayrshire Council co-location site had “good” precision for the diffusion tubes and also had high quality chemiluminescence results, i.e. to national AURN standards.

2. 5 out of the 7 sites used for the national bias adjustment had “poor precision”.

3. Only two site used for the national bias adjustment factor were located in Scotland, unlike previous years.

St. Marnock St., Kilmanock

Kilmarnock, St. Marnock St. Monitoring Station - Carpark Looking South

Site	North	East	South	West
				

John Finnie St., Kilmarnock – Typical NO_2 Diffusion Tube on Street Locations

Diffusion Tube Annualisation

One diffusion tube monitoring location at The Cross, Mauchline (DT57) (short survey) within East Ayrshire Council recorded annual data capture < 75% therefore it is required to annualise diffusion tube data from this site.

Diffusion Tube Bias Adjustment Factors

East Ayrshire Council have applied a local bias adjustment factor of 1.06 to the 2021 monitoring data. A summary of bias adjustment factors used by East Ayrshire Council over the past five years is presented in Table C.1.

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	Local	-	1.06
2020	National	03/21	0.96
2019	National	03/20	0.86
2018	National	03/19	0.86
2017	National	03/18	0.91
2016	National	06/17	0.97

NO_2 Fall-off with Distance from the Road (NO_2 Diffusion Tube)

As per guidance, no NO_2 diffusion tube monitoring locations within the East Ayrshire Council area required distance correction during 2021, since all diffusion tube recorded levels were 24.8 µg/m^3. Due to the sensitive nature of the location near a nursery school, Tube 57, located at The Cross, Mauchline was distance corrected to give an estimate of NO_2 at the nursey façade.

QA/QC of Automatic Monitoring

The maintenance of the monitoring site at Kilmarnock is carried out by Acoem UK. This involves routine servicing and provision for emergency callouts as required. Manual calibration, zero and span checks are carried out monthly by Acoem. The manual span check consists of a gas of known concentration being passed through the NOx analyser and the measured concentration being recorded for rescaling. Servicing is carried out at six monthly intervals by Acoem. The Kilmarnock site is part of the Scottish Air Quality Network and is audited twice yearly by Ricardo on behalf of the Scottish Government. Ricardo also undertake the data management for the site. Since the installation of web loggers, the data is checked daily by East Ayrshire Council Environmental Health staff to ensure there are no faults showing with any of the analysers and the data looks credible. Ricardo and Acoem

also check the data at regular intervals and e-mail or telephone Environmental Health if any problems occur. An officer from Environmental Health will attend the site to rectify any problems found, often in consultation with an engineer from Acoem. If the problem cannot be rectified by Environmental Health staff, Acoem attend the site and rectify the faults found. Air Monitors, or an officer from Environmental Health, carry out any routine filter changes, inlet cleaning etc. as recommended in the equipment instruction manual. At the request of Ricardo manual calibration checks are now carried out in preference to automatic calibrations due to some technical issues with the latter method. Regular visits to the monitoring sites are also good practice as any other faults, which may arise from time to time, can be picked up and quickly rectified.

Ricardo undertakes quality control of the automatic data for the Kilmarnock site. The QA/QC procedures follow the requirements of the Local Air Quality Management Technical Guidance LAQM.TG(16) (Reference 1) and are equivalent to those used at UK National Network monitoring sites (Automatic Urban and Rural Network (AURN)). This gives a high degree of confidence in the data obtained for reliable concentrations at the automatic sites. Once the calibration factors have been applied Ricardo carry out monthly Data Validation. In essence, the data is screened by visual examination to determine if it contains spurious and/or unusual measurements. Any suspicious data, such as large spikes or high concentrations are “flagged” or marked to be investigated more fully. At three monthly intervals Ricardo carry out Data Ratification. This involves thorough checking of the data to ensure it is reliable and consistent. Essentially the data ratification procedure involves a critical review of all information relating to a particular data set in order to verify, amend or reject the data. When the data has been ratified, Ricardo present the final data set to be used in Review and Assessment Process. BAM PM_{10} data was corrected for slope using a factor of 0.83333 to give an Indicative Gravimetric Equivalent (Reference 8). The Air Pollution Reports produced by Ricardo on behalf of the Scottish Government can be found in Appendix C. Live Data is available via the Scottish Air Quality Website (Reference 10).

NO_2 Fall-off with Distance from the Road

No automatic NO_2 monitoring locations within the East Ayrshire Council area required distance correction during 2021, since all site were under 51% of the Annual Mean Objective.

PM_{10} and $PM_{2.5}$ Monitoring Adjustment

All historic BAM PM_{10} data was corrected for slope using a factor of 0.83333 to give an Indicative Gravimetric Equivalent (Reference 8). A BAM1020 was last used in 2016.

The type of PM_{10}/$PM_{2.5}$ monitor (Fidas) utilised within East Ayrshire Council since August 2016 does not require the application of a correction factor. This may change in the future as Ricardo are running trials collocating a Fidas Monitor with a Reference Monitor. Early data suggests the Fidas maybe under reading, particularly at roadside and more so at kerbside locations. East Ayrshire Council levels of PM_{10} and $PM_{2.5}$ are substantially below the Scottish Air Quality Objects and the suggested correction should have no significant effect on the conclusions.

Short-term to Long-term Data adjustment

Where only short-term periods of monitoring data are available, the results may be adjusted to estimate an annual mean concentration using the approach set out in Technical Guidance LAQM Technical Guidance (TG16; Box 7.9)((Reference 1).

Adjustment to estimate annual mean

The adjustment is based on the fact that patterns in pollutant concentrations usually affect a wide region. Thus if a six month average is above average at one place it will almost certainly be above average at other locations in the region. The adjustment procedure is as follows:-

1. Three long term, continuous monitoring sites, from the Scottish Automatic Urban and Rural Network, with high Data Capture (DC), within 50 miles were identified: Coatbridge Whifflet (DC 97%), Glasgow Townhead (DC 99%) and Falkirk Grangemouth (DC 98%), all Urban Background Sites.
2. The results of the annual mean, **Am,** for these sites in 2021 were obtained from The Scottish Air Quality Website (Reference 10).
3. The period means, **Pm,** for 2021 were obtained for the months of the short term monitoring in East Ayrshire and the Aurn sites.
4. The Ratio, **R,** of the annual mean/period mean (**Am/Pm)** for each of the sites was then calculated.
5. The average of these ratios, $\mathbf{R_a}$**,** was then calculated to give an adjustment factor.
6. The measured period mean **M** was multiplied by the adjustment factor $\mathbf{R_a}$ to give the estimate of the annual mean for 2021 (Table C.2).

If no background sites are available, and the site to be annualised is itself an Urban Centre, Roadside or Kerbside site, then it is permissible to annualise using roadside or kerbside sites rather than background sites, though this should be clearly stated in the annual report.

Table C.2 – Annualisation NO_2 Summary (concentrations presented in µg/m^3)

	NO_2 Annual Mean (Am)	**NO_2 Period Mean 03/09/2021-11/01/2022**	**Ratio (R) = Am/Pm**
Coatbridge Whifflet	11.68	14.35	0.814
Glasgow Townhead	18.53	20.67	0.896
Falkirk Grangemouth	14.02	15.22	0.921
		Average (Ra)	0.877

	NO_2 Period Mean (Pm) 03/09/2021-11/01/2022	**Average (Ra)**	**NO_2 Annual Mean (Am)**
The Cross, Mauchline	22.58	0.877	19.80

Table C.3 – National Bias Adjustment Calculations

QA/QC Data: Defra and The Devolved Administrations, Spreadsheet of Bias Adjustment Factors, Version Number 06/22

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 06/22

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 September 2022

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 [2] data

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@bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To update your selection, choose (All) from the pop-up list)	Year[5] (To update 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)
Glasgow Scientific Services	20% TEA in water	2021	R	Glasgow City Council	12	26	25	4.1%	P	**0.96**
Glasgow Scientific Services	20% TEA in water	2021	R	Glasgow City Council	11	16	21	-22.1%	P	**1.28**
Glasgow Scientific Services	20% TEA in water	2021	R	Glasgow City Council	12	18	22	-19.8%	P	**1.25**
Glasgow Scientific Services	20% TEA in water	2021	KS	Glasgow City Council	12	37	44	-15.3%	P	**1.18**
Glasgow Scientific Services	20% TEA in water	2021	UB	Glasgow City Council	12	14	17	-19.3%	P	**1.24**
Glasgow Scientific Services	20% TEA in water	2021	KS	Marylebone Road Intercomparison	10	46	41	11.9%	G	**0.89**
Glasgow Scientific Services	20% TEA in water	2021	R	East Ayrshire Council	10	18	19	-5.9%	G	**1.06**
Glasgow Scientific Services	20% TEA in water	2021		**Overall Factor[3] (7 studies)**				**Use**		**1.11**

[1] For Casella Stanger/Bureau Veritas (NOT Bureau Veritas Labs) use Gradko 50% TEA in Acetone.
For Casella Seal/GMSS/Casella CRE/Bureau Veritas Labs/Eurofins/ use Environmental Scientific Groups.
From 2011 for Environmental Scientific Groups use ESG Glasgow.
From 2011 for Harwell Scientific Services use ESG Didcot.
For 2017 for SOCOTEC use ESG Didcot, as name changed mid year.
For 2018 SOCOTEC entered as Didcot and Glasgow. Glasgow analysis lab moved to Didcot mid 2018.
For Staffordshire CC SS/Staffordshire County Analyst use Staffordshire Scientific Services.
For Bodycote Health Sciences and Clyde Analytical Laboratories use Exova.
For Rotherham MBC use South Yorkshire Labs.
For Dundee CC use Tayside SS.
For Leicester Scientific Services use Staffordshire Scientific Services.
For South Yorkshire Air Quality Samplers use South Yorkshire Labs. As of January 2010 sampler body changed. As of April 2010 sampler cap changed.
Lancashire County Analysts withdrew from the Field intercomparison at the end of 2010. No submissions were supplied in 2011.
Walsall MBC closed in March 2011.
Bristol Scientific Services closed at the end of 2011.
Somerset County Council did not start the Marylebone road intercomparison until June 2012.
Exova stopped providing diffusion tubes at the end of 2013.
Kent Scientific Services stopped providing diffusion tubes at the end of 2013.

[2] In this situation it would be reasonable to use data from the nearest year.

[3] Overall factors have been calculated using orthogonal regression to allow for uncertainty in both the automatic monitor and diffusion tube. The uncertainty of the diffusion tube has been assumed to be double that of the automatic monitor.

[4] If you have your own co-location study, please send your data to us, so that it can be included here. If this is not possible, but you wish to combine these factors with your own, select and copy the relevant data from this spreadsheet and paste them into a new one (otherwise your calculations will include hidden data). Then add your own data and calculate the bias. To obtain a new correction factor that includes your data, average the bias (B) values, expressed as a factor, i.e. -16% is -0.16. Next add 1 to this value, e.g. -0.16 + 1.00 = 0.84 in this example, then take the inverse to give the bias adjustment factor 1/0.84 = 1.19. (This will not be exactly the same as the correction factor calculated using orthogonal regression as used in this spreadsheet, but will be reasonably close).

To add data download a questionnaire

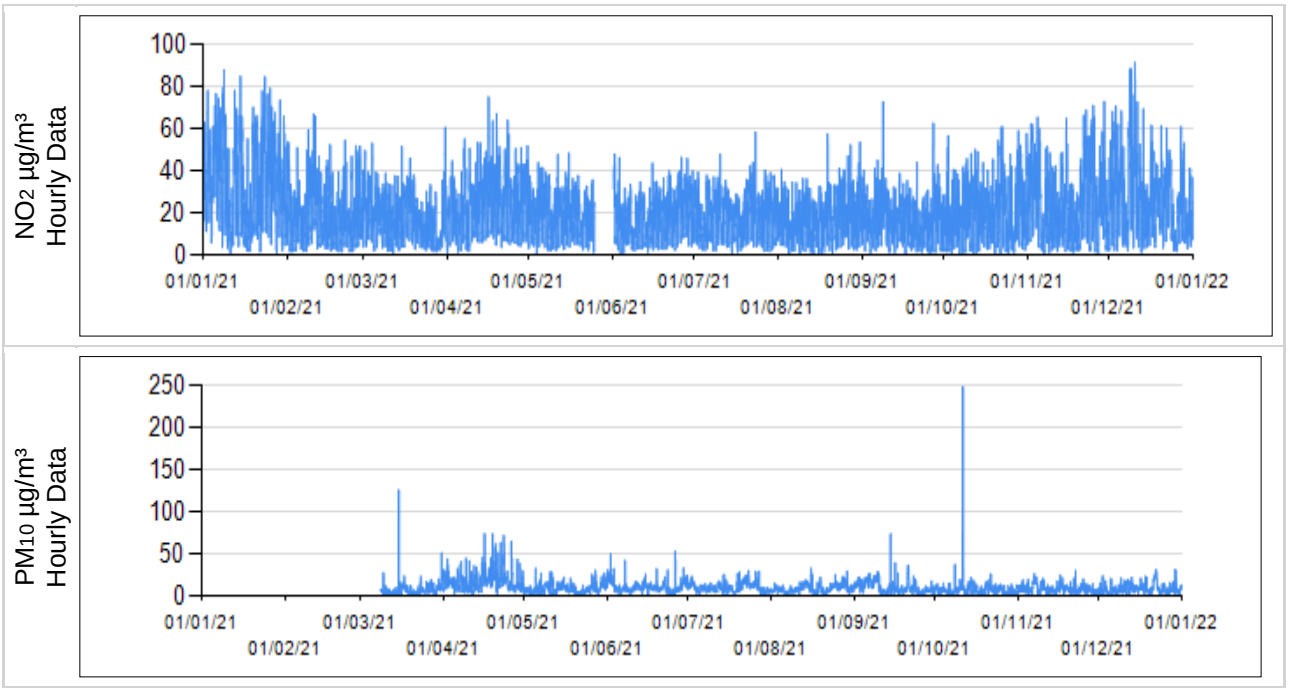
[5] Where an annual data set falls into two years it has been ascribed to the year in which most of the data has fallen.

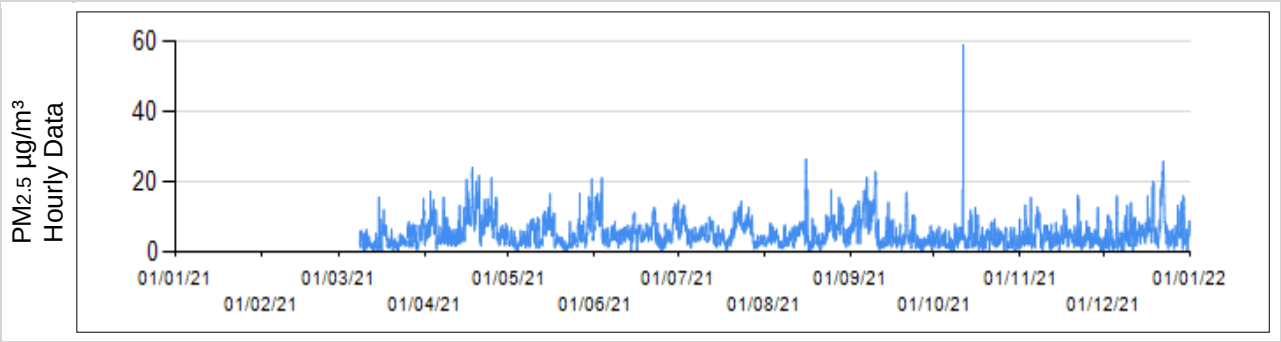
[6] Tube precision is determined as follows: G = Good precision - coefficient of variation (CV) of diffusion tube replicates is considered G when the CV of eight or more periods is less than 20%, and the average CV of all monitoring periods is less than 10%; P = Poor precision - CV of four or more periods >20% and/or average CV >10%; S = Single tube, therefore not applicable; na = not available.

Table C.4 – Ratified Results of Automatic Monitoring for NO_2, PM_{10} and $PM_{2.5}$ – Kilmarnock, St. Marnock Street 2021

	V High (No. of Days)	High (No. of Days)	Mod (No. of Days)	Low (No. of Days)	Max. Hourly Conc.	Max. Daily Conc.	Max. Running 8 Hour Mean	Max. Running 24 Hour Mean	Period Mean Conc.	Period Data Capture (%)
NO_2 (µg/m³)	0	0	0	359	91	50	72	53	20.3	97.8
PM_{10} (µg/m³)	0	0	0	298	248	28	54	29	9.9	81.6
$PM_{2.5}$ (µg/m³)	0	0	0	298	59	20	24	21	5.2	81.6

	Air Quality Objective	Exceedances	Days
NO_2	Hourly mean > 200 µg/m³	None	0
NO_2	Period mean > annual mean obj 40 µg/m³	No	
PM_{10}	Daily mean > 50 µg/m³	None	0
PM_{10}	Period mean > annual mean obj 18 µg/m³	No	
$PM_{2.5}$	Period mean > annual mean obj 10 µg/m³ (Scotland)	No	
Note: When comparing site measurements against the air quality objectives data capture should meet or exceed 90% across a calendar year.			





Note: Full data and analysis available from the Scottish Air Quality Database, link below.

https://www.scottishairquality.scot/assets/reports/366/East_Ayrshire_annual_2021.html

Table C.5A – Calibration Certificates 2021 – Kilmarnock, St. Marnock Street

CERTIFICATE OF CALIBRATION

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

Telephone 01235 753434

0401

Approved Signatories:

☐	S. Eaton	☐	B Stacey
☐	D Hector	☐	S Stratton
☐	N Rand	☑	S Telfer
☐	B Davies	☐	S Gray

Signed: STelfer

Date of issue: 29 July 2021

Certificate Number: 5497

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 the air monitoring station(s) at East Ayrshire Council

Ricardo Energy & Environment ID: ED11194/5497

The reported expanded uncertainties are 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.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory

Ricardo Energy & Environment

18 Blythswood Square (2nd Floor),
Glasgow,
G2 4BG

Tel: 01235 753265

Registered office
Shoreham Technical Centre
Shoreham-by-Sea
West Sussex
BN43 5FG

Registered in England No.
08229264

VAT Registration No.
GB 212 8365 24

ee.ricardo.com

CERTIFICATE OF CALIBRATION

Date of issue: 29 July 2021

Certificate Number: 5497

Ricardo Energy & Environment ID: ED11194/5497

East Ayrshire Council
NOx analysers

Station	Date of Audit	Species	Analyser Serial no	Zero Response[1]	Zero uncertainty ppb	Calibration Factor[2]	Factor uncertainty %	Converter eff. (%)[3]
East Ayrshire Kilmarnock St Marnock Street	24 June 2021	NOx	2361	20.6	2.6	0.9600	3.50	96.5
		NO		16.6	2.5	0.9931	3.50	

Fidas analysers

Station	Date of audit	Analyser Serial no	Calculated ko[5]	Uncertainty %	Total flow[4]	Uncertainty %	Main flow	Uncertainty %
East Ayrshire Kilmarnock St Marnock Street	24 June 2021	7476			4.93	2.2		2.2

CERTIFICATE OF CALIBRATION

Date of issue:	29 July 2021
Certificate Number:	5497
Ricardo Energy & Environment ID:	ED11194/5497

The gaseous ambient analysers listed above have been tested for zero response, calibration factor, linearity and converter efficiency (NOx analysers) 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.

[1] The 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.

[2] The 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, SO_2, O_3 and ppm for CO. Where 1ppm = 1000ppb). 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

[3] Converter eff. is the measured efficiency of the NO_2 to NO converter within the oxides of nitrogen analyser under test.

[4] The measured main flow rate (where this is applicable) is the flow rate through the sensor unit 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 $l.min^{-1}$, reported at prevailing ambient conditions unless otherwise specified. 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.

[5] The calculated k0 value (specifically for TEOM analysers) 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 value of k0.

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.

Table C.5B – Calibration Certificates 2022 – Kilmarnock, St. Marnock Street

CERTIFICATE OF CALIBRATION

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

Telephone 01235 753434

0401

Page 1 of 3

Approved Signatories:

☐	S. Eaton	☐	B Stacey
☐	D Hector	☐	S Stratton
☐	N Rand	☑	S Telfer
☐	B Davies	☐	S Gray

Signed: STelfer

Date of issue: 25 February 2022

Certificate Number: 5740

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 the air monitoring station(s) at East Ayrshire Council

Ricardo Energy & Environment ID: ED11194/5740

The reported expanded uncertainties are 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.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory

Ricardo Energy & Environment

18 Blythswood Square (2nd Floor),
Glasgow,
G2 4BG

Tel: 01235 753205

Registered office
Shoreham Technical Centre
Shoreham-by-Sea
West Sussex
BN43 5FG

Registered in England No.
08229264

VAT Registration No.
GB 212 8365 24

ee.ricardo.com

CERTIFICATE OF CALIBRATION

Date of issue: 25 February 2022

Certificate Number: 5740

Ricardo Energy & Environment ID: ED11194/5740

East Ayrshire Council
NOx analysers

Station	Date of Audit	Species	Analyser Serial no	Zero Response[1]	Zero uncertainty nmol/mol	Calibration Factor[2]	Factor uncertainty %	Converter eff. (%)[3]
East Ayrshire Kilmarnock St Marnock Street	24 December 2021	NOx	2361	3.4	2.5	1.0062	3.50	96.7
		NO		0.1	2.5	1.0077	3.50	

PM10 analysers

Station	Date of audit	Analyser Serial no	Calculated ko*	Uncertainty %	Total flow*	Uncertainty %	Main flow	Uncertainty %
East Ayrshire Kilmarnock St Marnock Street	24 December 2021	7476			4.82	2.2		2.2

CERTIFICATE OF CALIBRATION

Date of issue:	25 February 2022
Certificate Number:	5740
Ricardo Energy & Environment ID:	ED11194/5740

The gaseous ambient analysers listed above have been tested for zero response, calibration factor, linearity and converter efficiency (NO_x analysers) 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 k_0 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 reported in concentration units of nmol/mol or µmol/mol.

[1] The 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.

[2] The calibration factor is the multiplying factor required to scale the reading on the data logging system of the analyser into reported concentration units (nmol/mol for NO, NO_x, SO_2, O_3 and µmol/mol for CO). 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

[3] Converter eff. is the measured efficiency of the NO_2 to NO converter within the oxides of nitrogen analyser under test.

[4] The measured main flow rate (where this is applicable) is the flow rate through the sensor unit 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 $l.min^{-1}$, reported at prevailing ambient conditions unless otherwise specified. 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.

[5] The calculated k_0 value (specifically for TEOM analysers) is the calculated k_0 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 value of k_0.

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.

Table C.6 – Ratified Results of Automatic Monitoring for NO_2, PM_{10} and $PM_{2.5}$ – Cumnock, Holmhead Road

East Ayrshire Cumnock

01/01/2021 to 31/03/2021

East Ayrshire Council AQMesh site.

These data have been fully ratified

	V High (No. of Days)	High (No. of Days)	Mod (No. of Days)	Low (No. of Days)	Max. Hourly Conc.	Max. Daily Conc.	Max. Running 8 Hour Mean	Max. Running 24 Hour Mean	Period Mean Conc.	Period Data Capture (%)
NO2 (µg/m³)	0	0	0	1473	63	-	12	10	19.0	68

	Air Quality Objective	Exceedances	Days
NO_2	Hourly mean > 200 µg/m³	None	0
NO_2	Period mean > annual mean objective 40 µg/m³	No	
Note: When comparing site measurements against the air quality objectives data capture should meet or exceed 90% across a calendar year.			

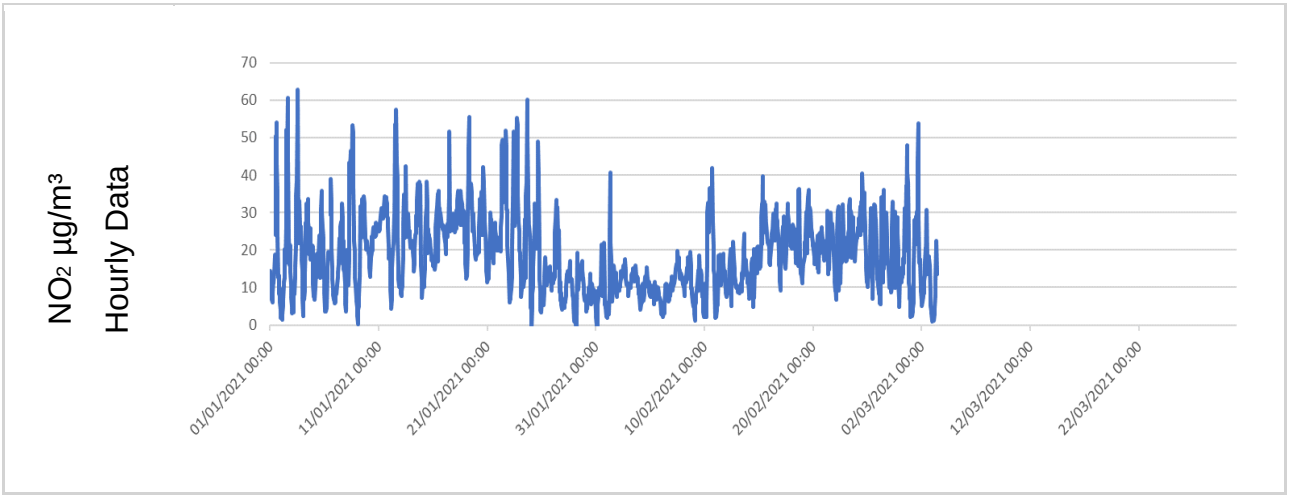


Table C.7 – Ratified Results of Automatic Monitoring for NO_2, PM_{10} and $PM_{2.5}$ – Cumnock, Barony Campus

East Ayrshire Cumnock Barony Campus

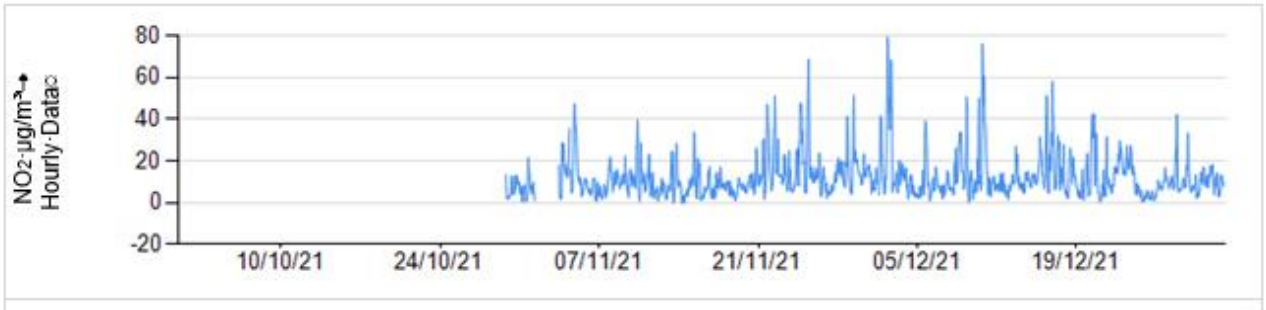
29/10/2021 to 31/12/2021

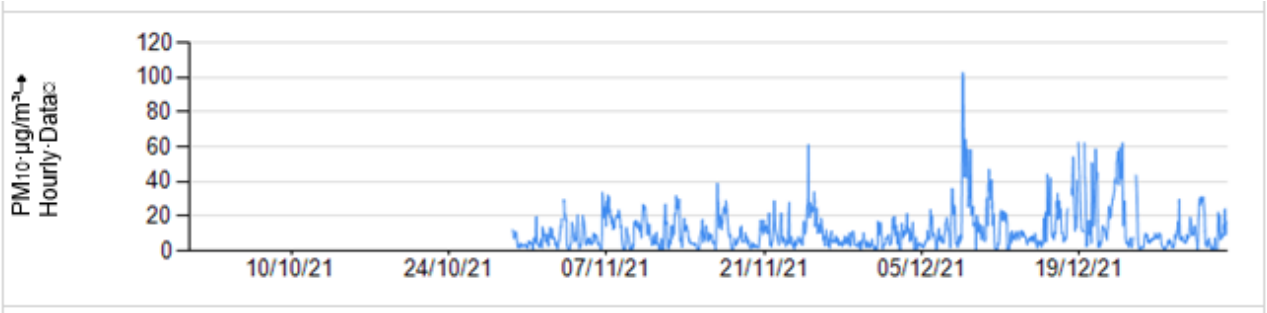
East Ayrshire Council AQMesh site.

Note: These data are fully ratified

	V High (No. of Days)	High (No. of Days)	Mod (No. of Days)	Low (No. of Days)	Max. Hourly Conc.	Max. Daily Conc.	Max. Running 8 Hour Mean	Max. Running 24 Hour Mean	Period Mean Conc.	Period Data Capture (%)
NO_2 (µg/m³)	0	0	0	63	79	31	55	35	12.0	96.8
PM_{10} (µg/m³)	0	0	0	63	103	42	73	50	12.0	99.4
$PM_{2.5}$ (µg/m³)	0	0	0	63	50	26	36	27	5.0	99.8

	Air Quality Objective	Exceedances	Days
NO_2	Hourly mean > 200 µg/m³	None	0
NO_2	Period mean > annual mean obj 40 µg/m³	No	
PM_{10}	Daily mean > 50 µg/m³	None	0
PM_{10}	Period mean > annual mean obj 18 µg/m³	No	
$PM_{2.5}$	Period mean > annual mean obj 10 µg/m³ (Scotland)	No	
Note: When comparing site measurements against the air quality objectives data capture should meet or exceed 90% across a calendar year.			





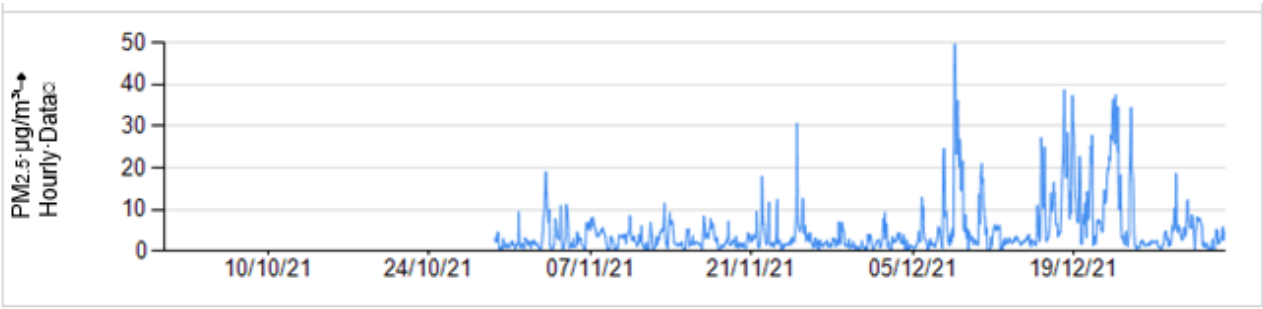

PM2.5 µg/m³ Hourly Data
50
40
30
20
10
0
10/10/21
24/10/21
07/11/21
21/11/21
05/12/21
19/12/21

Table C.8 – Industrial Premises Regulated by SEPA under the Pollution Prevention and Control (Scotland) Regulations 2012

Authorisation Number	Regulatory Regime	Authorisation Level	Site Name	Grid Ref	Catchment	Team
PPC/W/0020019	PPC	Part A	Barr Environ, Garlaff L/F, Skares Rd, Cumnock	NS 54105 17620	River Ayr	Southwest Scotland
PPC/A/1017028	PPC	Part A	Enva Ltd, Dunniflats Depot, Lugton	NS 41867 53138	River Garnock	Southwest Scotland
PPC/W/0020040	PPC	Part A	Egger (UK) Ltd, Barony Rd, Ayr	NS 52916 22070	River Ayr	Southwest Scotland
PPC/W/0020017	PPC	Part A	MAHLE Engine Systems Ltd	NS 42966 36390	River Irvine	Southwest Scotland
PPC/A/1138296	PPC	Part A	Chalmerston Farm Eggs, Mauchline	NS 45960 23120	River Ayr	Southwest Scotland
PPC/A/1142722	PPC	Part A	Commondyke Farm Poultry Unit, Auchinleck	NS 57700 22300	River Ayr	Southwest Scotland
PPC/A/1082048	PPC	Part A	Thomarston Poultry Farm Loganhill Rd Cumnock	NS 58949 20049	River Ayr	Southwest Scotland
PPC/A/1079002	PPC	Part A	Auldhouseburn Farm, Muirkirk	NS 70717 26945	River Ayr	Southwest Scotland
PPC/W/0020019	PPC	Part A	Barr Environ, Garlaff L/F, Skares Rd, Cumnock	NS 54105 17620	River Ayr	Southwest Scotland
PPC/A/1017028	PPC	Part A	Enva Ltd, Dunniflats Depot, Lugton	NS 41867 53138	River Garnock	Southwest Scotland
PPC/B/1031777	PPC	Part B	Tesco FS Glen Cairn Retail Pk Kilmarnock	NS 42740 36700	River Irvine	Southwest Scotland
PPC/W/0030114	PPC	Part B	Glencairn Service Station, Kilmarnock	NS 42801 36823	River Irvine	Southwest Scotland
PPC/B/1004559	PPC	Part B	Campbell Fuel Oils, Hurlford Road, Kilmarnock	NS 43230 36377	River Irvine	Southwest Scotland
PPC/B/1004563	PPC	Part B	Asda Petrol Filling Station, Kilmarnock	NS 43349 36873	River Irvine	Southwest Scotland
PPC/B/1004562	PPC	Part B	BP Filling Stn, Western Road, Kilmarnock	NS 43758 40205	River Irvine	Southwest Scotland
PPC/B/1000088	PPC	Part B	Kilmarnock Service Station	NS 44175 36502	River Irvine	Southwest Scotland
PPC/W/0030111	PPC	Part B	Central Garage, 85/89 Glaisnock St, Cumnock	NS 56971 19973	River Ayr	Southwest Scotland
PPC/B/1004450	PPC	Part B	Burnside Filling Station,Glasgow Rd, Sanquhar	NS 77816 10125	River Nith	Southwest Scotland
PPC/W/0030071	PPC	Part B	Braehead Metals Limited	NS 40804 38130	River Irvine	Southwest Scotland
PPC/B/1120396	PPC	Part B	Mobile Plant - Dundonald WRC	NS 47200 36060	River Irvine	Southwest Scotland
PPC/B/1149071	PPC	Part B	Mobile Plant - 142 Main Street, Newmilns	NS 53924 37346	River Irvine	Southwest Scotland
PPC/B/1024880	PPC	Part B	Moorfield Concrete Plant, Kilmarnock	NS 40160 37110	River Irvine	Southwest Scotland
PPC/B/1017559	PPC	Part B	Crosshouse Laundry, Ayrshire	NS 39270 38360	River Irvine	Southwest Scotland
PPC/B/1025233	PPC	Part B	Beez Neez 9-11 Brown Street Stewarton KA3 5AW	NS 41940 45985	River Irvine	Southwest Scotland
PPC/B/1015138	PPC	Part B	Eazyclean Kilmarnock	NS 42890 36840	River Irvine	Southwest Scotland
PPC/W/0030146	PPC	Part B	Scottish Coal, Killoch	NS 48045 20402	River Ayr	Southwest Scotland
PPC/B/1030092	PPC	Part B	Killoch Depot, Ochiltree	NS 48045 20402	River Ayr	Southwest Scotland
PPC/B/1119548	PPC	Part B	Killoch, Ochiltree, Cumnock	NS 48052 20432	River Ayr	Southwest Scotland
PPC/B/1081430	PPC	Part B	Strandhead Farn, Tarbolton, Mauchline	NS 43360 26164	River Ayr	Southwest Scotland
PPC/B/1183585	PPC	Part B	Barony Campus, Auchinleck Rd, Cumnock	NS 55930 20490	River Ayr	Southwest Scotland

Note: The above table may not be complete due to cyber-attack on SEPA data.

Figure C.1: Map of Scottish Local Authorities

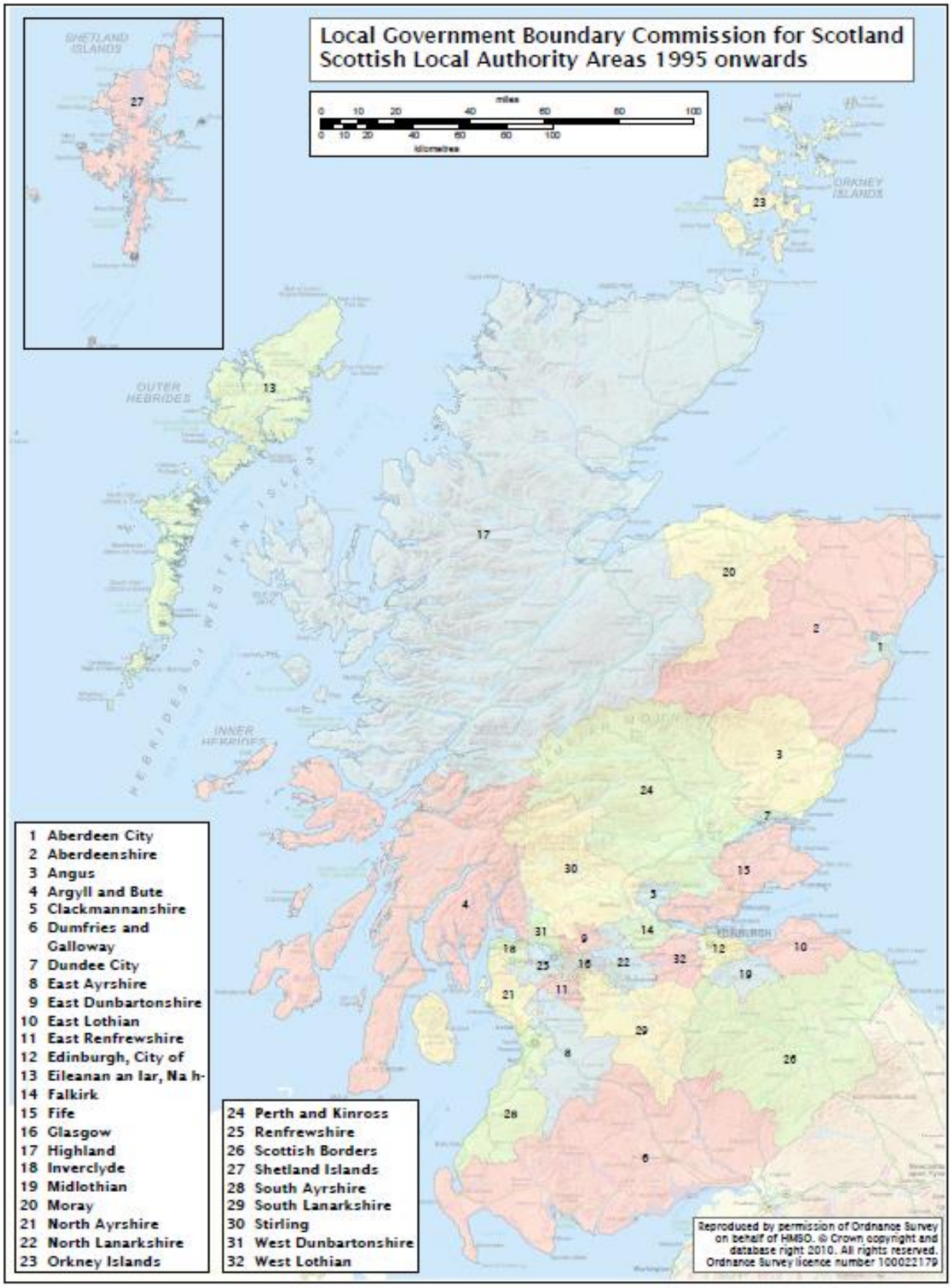


Figure C.2: Map of East Ayrshire

Note: No 1-13 are traffic count location points (Reference12, East Ayrshire Transport Strategy 2009 – 2014)

Figure C.3a: Map of Coal Extraction Sites throughout East Ayrshire

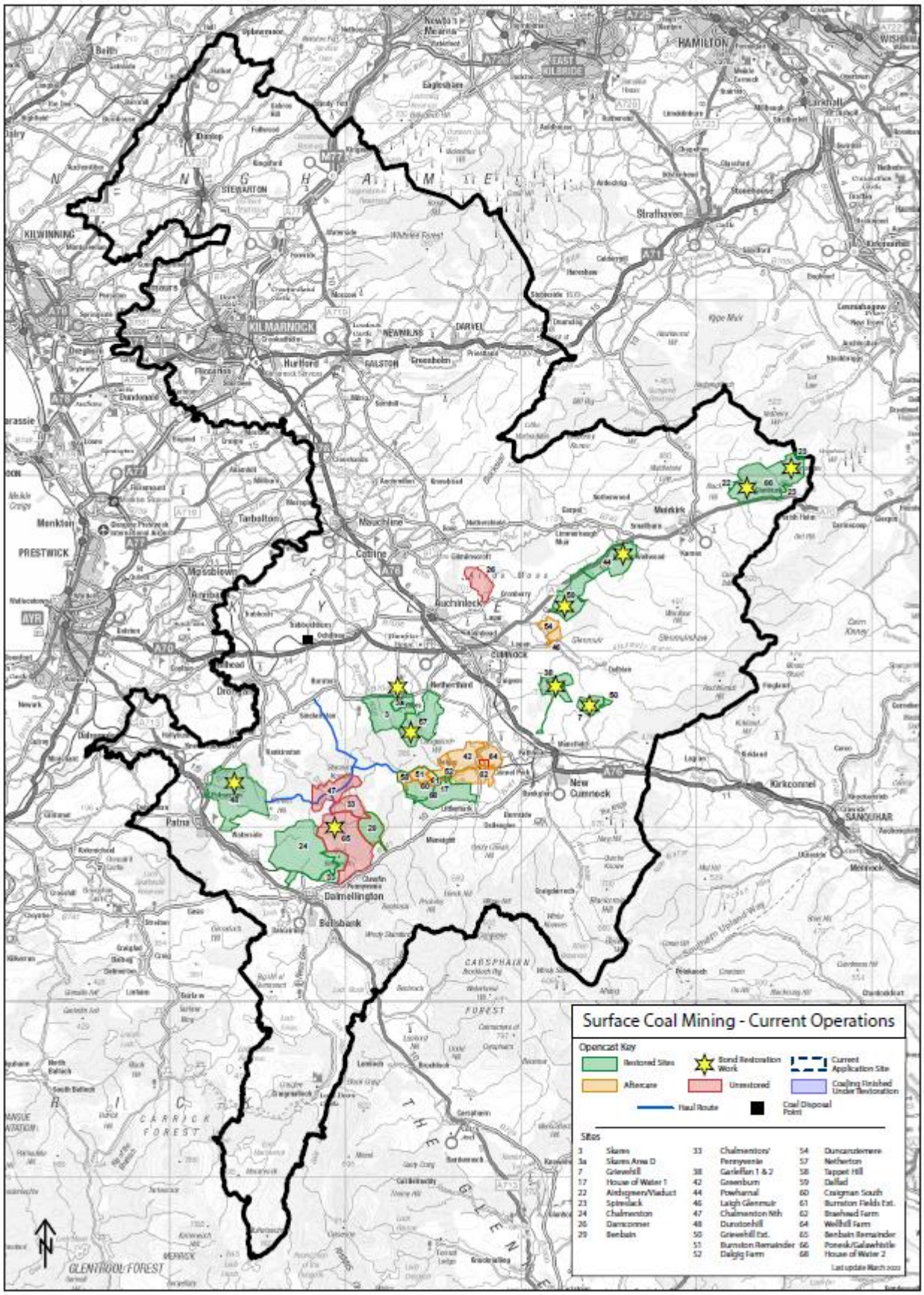


Figure C.3b: Map of Cumulative Land Use Sites throughout East Ayrshire

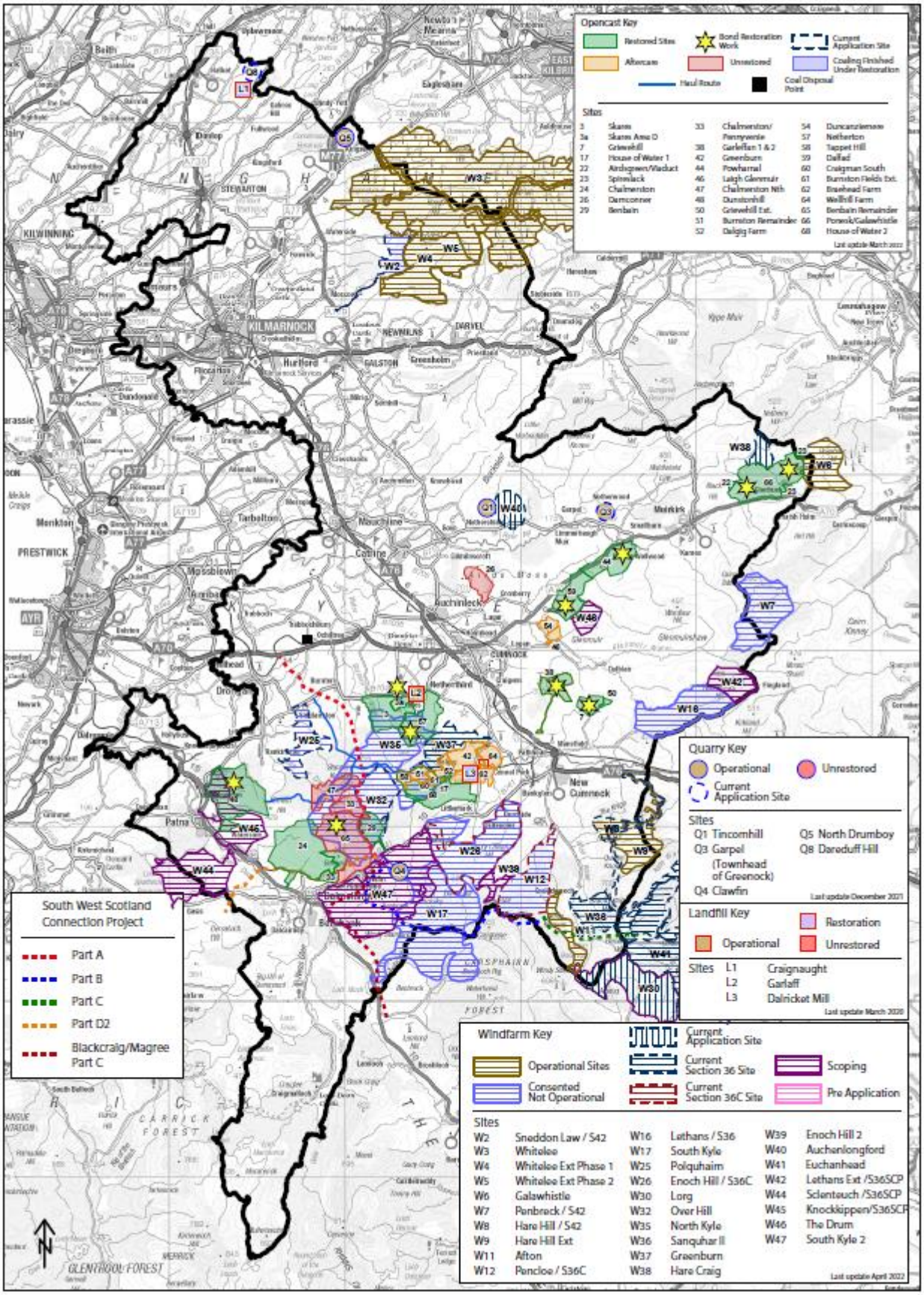


Figure C.4: Map of Kilmarnock Town Centre Automatic Monitoring Station and NO_2 Diffusion Tube Locations

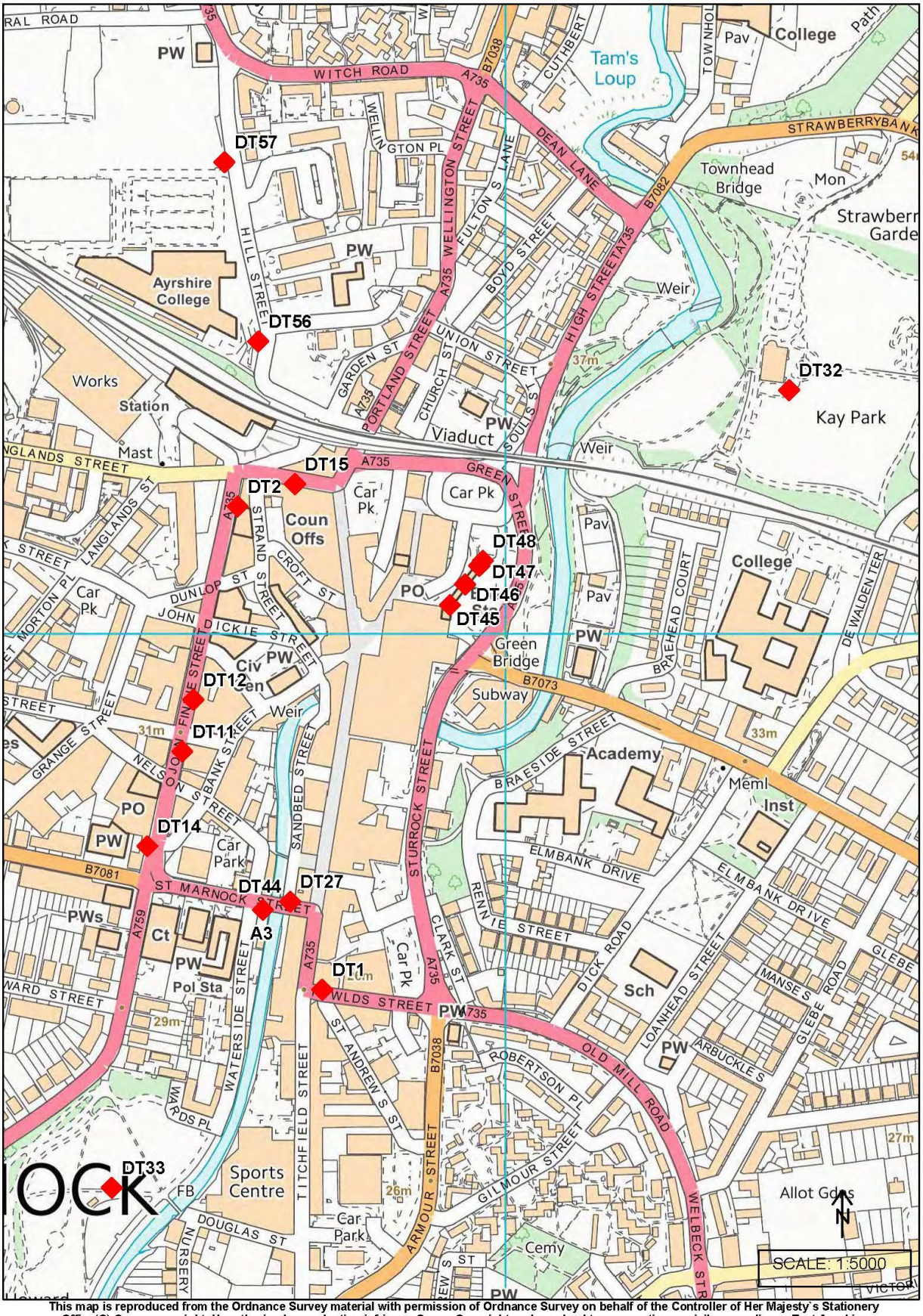


Figure C.5: Map of Stewarton NO_2 Diffusion Tube Location

Figure C.6: Map of Newmilns NO_2 Diffusion Tube Locations

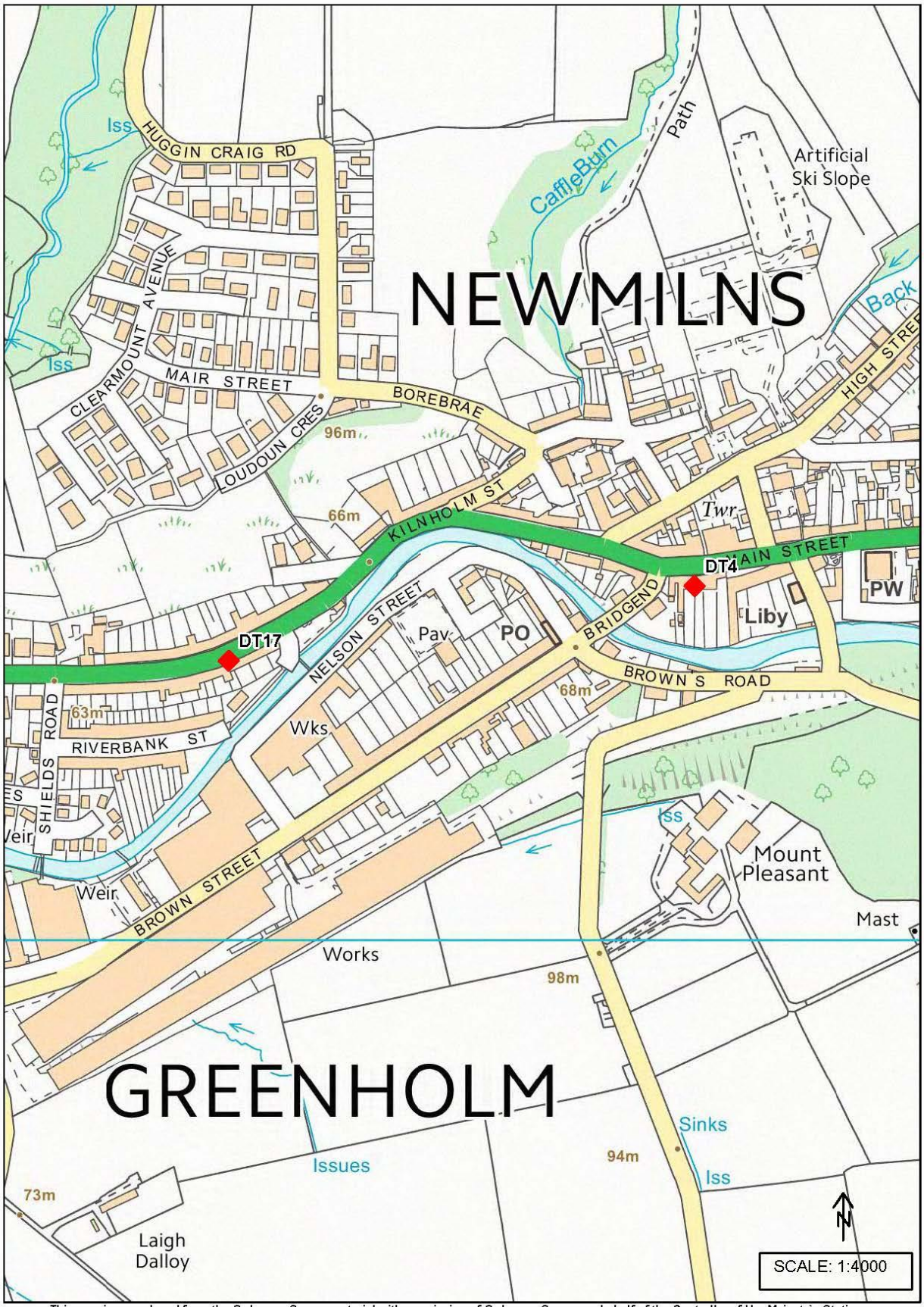


Figure C.7: Map of Mauchline NO_2 Diffusion Tube Locations

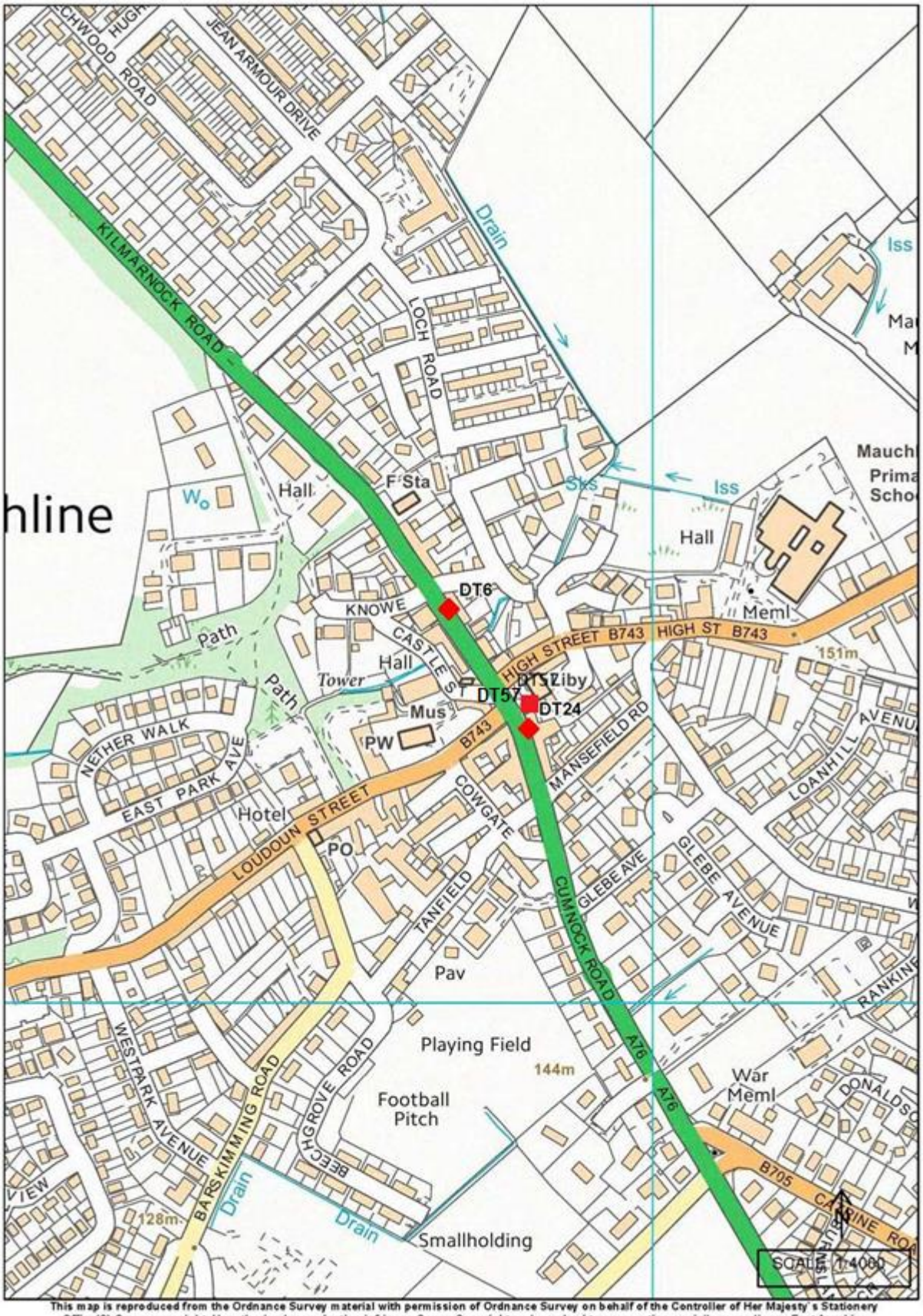


Figure C.8: Map of Cumnock NO_2 Diffusion Tube Locations

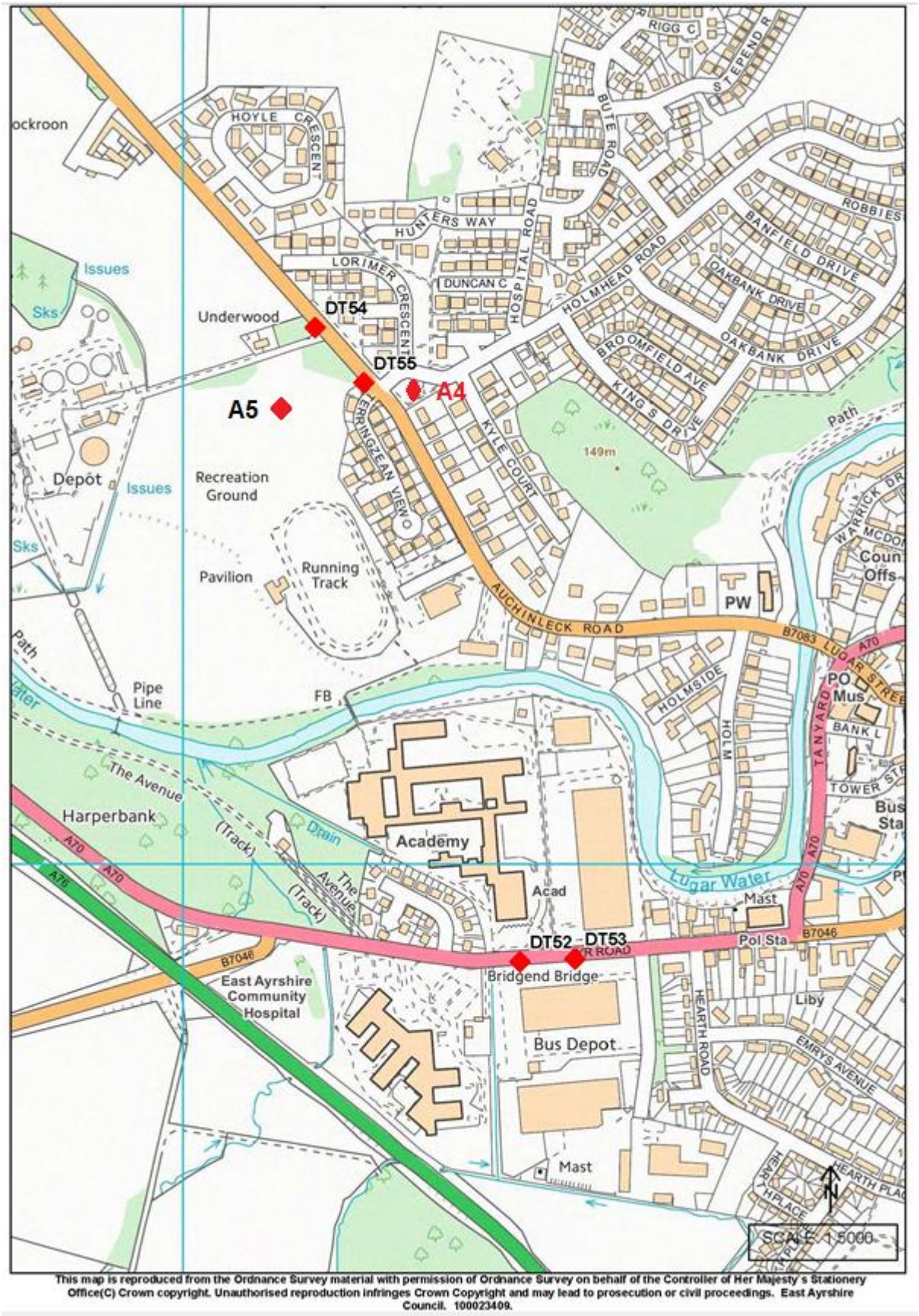
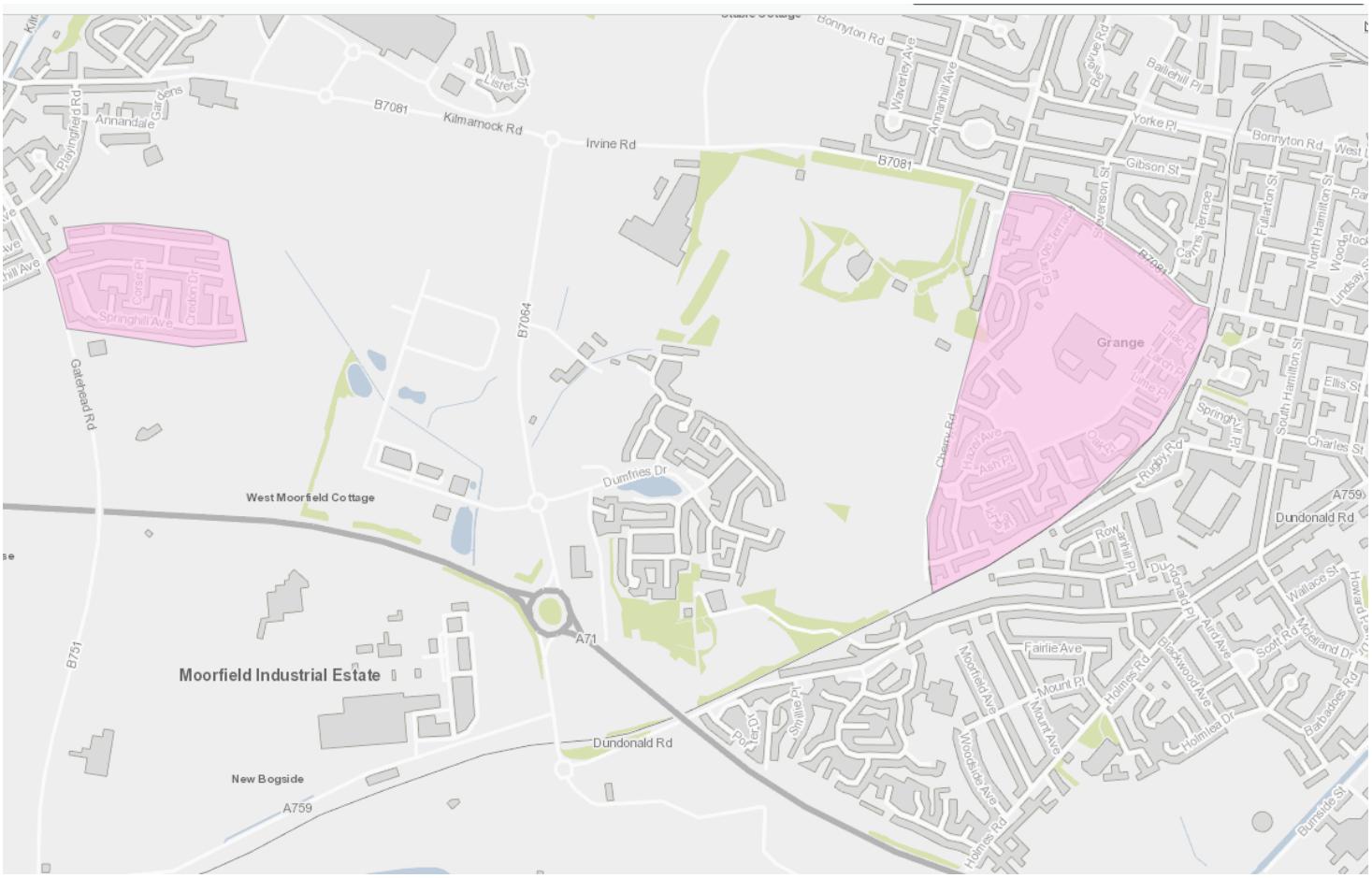


Figure C.9: Smoke Control Areas Kilmarnock and Crosshouse



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)
BAM	Beta Attenuation Mass Monitor
COMEAP	Committee on the Medical Effects of Air Pollutants
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
FIDAS	Fine Dust Analysis Systems
LAQM	Local Air Quality Management
LEZ	Low Emission Zone
NLEF	National Low Emission Framework
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
SCOOT	Split Cycle Offset Optimisation Technique
SO_2	Sulphur Dioxide
TEOM	Tapered Element Oscillating Microbalance

References

1. Defra and The Devolved Administrations, Local Air Quality Management, Technical Guidance LAQM.TG(16), 2016. Accessed at http://www.scottishairquality.co.uk/laqm/tools

2. Part IV of the Environment Act 1995 Local Air Quality Management Policy Guidance PG(S) (16) March 2016. Accessed at http://www.scottishairquality.co.uk/laqm/tools

3. Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users. Report to Defra and the Devolved Administrations. ED48673043 Issue 1a Feb2008. Authors Jaume Targa, Alison Lauder and the Defra Working Group on Harmonisation of Diffusion Tubes. Accessed at http://www.laqm.defra.gov.uk/

4. The Workplace Analysis Scheme for Proficiency (WASP) – summary of laboratory performance in rounds 103-107. Accessed at http://www.scottishairquality.co.uk/laqm/tools

5. Laxen D and Marner B (2003). Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites. Available at www.airquality.co.uk/archive/reports/list.php

6. Cook A (2008). Analysis of the relationship between annual mean nitrogen dioxide concentration and exceedences of the 1-hour mean AQS Objective. Available at www.airquality.co.uk/archive/reports/list.php

7. Fall-off in nitrogen dioxide concentrations at different distances from roads. The calculator can be accessed at www.airquality.co.uk/archive/laqm/tools.php

8. Harrison D (2006) UK Equivalence Programme for Monitoring of Particulate Matter. Available at www.airquality.co.uk/archive/reports/list.php

9. Background Pollutant Concentration Maps. Accessed at http://www.scottishairquality.co.uk/

10. Air Pollution in Scotland. Produced by AEA on behalf of the Scottish Government. Available at www.scottishairquality.co.uk

11. East Ayrshire Local Development Plan 2017. Accessed at http://www.east-ayrshire.gov.uk/

12. The East Ayrshire local Transport Strategy. Accessed at http://www.east-ayrshire.gov.uk/

13. East Ayrshire Council Carbon Management Programme Strategy and implementation Plan (SIP) October 2007. Accessed at http://www.east-ayrshire.gov.uk/

14. East Ayrshire Community Plan. Accessed at http://www.east-ayrshire.gov.uk/

15. East Ayrshire Council Sustainability Strategy. Accessed at http://www.east-ayrshire.gov.uk/

16. Carbon Trust Local Authority Carbon Management Programme. Accessed at: http://www.east-ayrshire.gov.uk/

17. Defra and The Devolved Administrations, Spreadsheet of Bias Adjustment factors. Accessed at www.scottishairquality.co.uk

18. Trends in Primary NO_2 in The UK

www.defra.gov.uk/environment/quality/air/airquality/publications/primaryno2-trends/index.htm (Accessed 25th February 2011)

19. East Ayrshire Council Air Quality Reports. Accessed at http://www.eastayrshire.gov.uk/PlanningAndTheEnvironment/Pollution/AirPollution/AirPollution.aspx

20. Bureau Veritas Marylebone laboratory inter-comparison study. Accessed at http://uk-air.defra.gov.uk/

21. ICCT – Real World Emissions Study – Diesel Cars. http://www.theicct.org/sites/default/files/publications/ICCT_PEMS-study_diesel-cars_20141010.pdf

22. Scottish Farmer Biomass Article Smiths Gore December 2014. http://www.thescottishfarmer.co.uk/

23. Detailed Assessment of John Finnie Street, Kilmarnock, Ayrshire. Compiled by Golder Associates on behalf of East Ayrshire Council; Report No: ED 59710 | Issue Number 3 | dated December 2016. Accessed at http://www.eastayrshire.gov.uk

24. Environmental Protection UK – Biomass and Air Quality Guidance for Scottish Local Authorities. Accessed at http://www.iaqm.co.uk/text/guidance/epuk/biomass_guidance_scotland.pdf

25. The Committee on the Medical Effects of Air Pollutants (COMEAP) https://www.gov.uk/government/collections/comeap-reports

26. Smoke Control Area Maps: https://smokecontrol.defra.gov.uk/index.php

27. Scottish Air Quality Website: http://www.scottishairquality.co.uk/

28. East Ayrshire Council Planning Website: https://www.eastayrshire.gov.uk/PlanningAndTheEnvironment/PlanningAndTheEnvironment.aspx

29. East Ayrshire Council State of the Environment Report: https://www.east-ayrshire.gov.uk/PlanningAndTheEnvironment/Development-plans/State-of-the-Environment-Report.aspx

30. Cleaner Air for Scotland – Road to a healthier Future http://www.scottishairquality.co.uk/news/index?id=513

    CAFS2: https://www.gov.scot/publications/cleaner-air-scotland-2-towards-better-place-everyone/

31. Breathe Scotland – the cleaner air initiative http://www.breathescotland.org.uk/

32. Dundee University Research Project https://www.dundee.ac.uk/news/2018/air-pollution-levels-linked-to-spikes-in-hospital-and-gp-visits.php

33. BMJ: https://doi.org/10.1136/bmj.l6609

34. Map of Car Charging PointS: https://www.chargeyourcar.org.uk/

35. DfT Traffic Counts, Kilmarnock

    https://roadtraffic.dft.gov.uk/manualcountpoints/1021