2015 Updating and Screening Assessment for EAST AYRSHIRE COUNCIL

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

December 2015

East Ayrshire COUNCIL

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Executive Summary

East Ayrshire Council has carried out a review of air quality within East Ayrshire, which fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995) and the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007. The Report follows Technical Guidance LAQM.TG(09) (Reference 1), issued by the Scottish Government to assist local authorities in their Review and Assessment of air quality.

The report forms the 2015 Updating and Screening Assessment (USA) of the sixth round of the Review and Assessment process and includes the latest available data up to the end of 2014. It also considers the conclusions of the previous rounds of Review and Assessment and any changes that have occurred since then which would have an effect on local air quality.

The report sets out the results of air quality monitoring carried out by East Ayrshire Council and considers the potential impacts from a range of sources such as road traffic and other transport emissions, industrial processes, commercial and domestic fuel use and fugitive emission sources which may have changed since the 2012 Updating and Screening Assessment and the 2013 and 2014 Progress Report.

The USA concluded that concentrations of the Air Quality Objectives outlined in Table 1.1 are unlikely to be exceeded for the following pollutants. On the basis of this assessment, no further action is required in respect of the pollutants:

Carbon Monoxide
Benzene
1,3-Butadiene
Lead
Sulphur Dioxide

Nitrogen Dioxide and PM_{10}

All monitoring locations where both automatic and passive monitoring was carried out for NO_2 resulted in measured concentration below the Annual Mean Air Quality Objective (40µg/m^3) (Table2.3 and 2.5). No exceedences of the 1-hour mean (Table 2.4) were recorded at John Finne Street with one exceedence of the 1- hour mean recorded at St. Marnock Street (99.8th percentile of hourly means at 118µg/m^3).

Automatic annualised monitoring results of PM_{10} recorded at the John Finnie St. monitoring location, Kilmarnock (Table 2.7) during 2014 indicated that PM_{10} levels, at 15 µg/m^3, were below the Annual Mean Air Quality Objective (18 µg/m^3). We can conclude that measured levels of PM_{10} in John Finnie St. have dropped considerably since 2010 and 2011 (Table 2.6), although further monitoring is necessary to ascertain whether this drop is a short term or a long term trend. The recorded results at the St. Marnock St. site, at 20 µg/m^3, would infer exceedence. A difference of 5 µg/m^3 between both monitoring locations does seem particularly high as both

monitors are located within the town centre one way system. The major part of the difference is due to the technology used in the monitors. BAM 1020 monitors use a correction factor to obtain the final result. Since BAM 1020's are known to absorb moisture onto the filter paper and also the particles themselves absorb moisture they tend to over read since the beta radiation is absorbed by this moisture and read as particulates. With funding from the Scottish Government East Ayrshire Council, in conjunction with Ricardo AEA, have set up a collocation study comprising of two adjacent monitors, a BAM 1020 and a TEOM FDMS. Initial results for the first years data (2014) suggest the BAM 1020, at 20 µg/m^3, is indicating exceedence, and the TEOM FDMS, at 11µg/m^3 is indicating compliance. Environmental Health are inclined to use the results from the TEOM FDMS monitors due to the characteristic of the BAM 1020 to read moisture as particulates and also the fact the FDMS is the monitor of choice on the National Network (further explanation in Section 2). We can therefore conclude that the levels of PM_{10} within Kilmarnock Town Centre are in compliance with the annual mean Scottish Air Quality Objective.

No exceedences of the PM_{10} 24-hour objective occurred at the John Finnie St. monitoring site (98.08th percentile of 32µg/m^3). Two exceedences of the 24-hour mean occurred at the St. Marnock St. monitoring site.

Since the BAM 1020 is indicating exceedence of the annual mean PM_{10} Objective East Ayrshire Council will proceed to an update of the 2013 Kilmarnock Town Centre Detailed Assessment (Reference 26). Results from the updated collocation study will also be discussed within the document. This should be completed in early 2016.

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1 Introduction

1.1 Description of Local Authority Area

East Ayrshire is one of 32 unitary authority council areas in Scotland. It borders onto North Ayrshire, East Renfrewshire, South Lanarkshire, South Ayrshire and Dumfries and Galloway. With South Ayrshire and the mainland areas of North Ayrshire, it formed the former county of Ayrshire. The area was formed in 1996, from the former Kilmarnock and Loudoun and Cumnock and Doon Valley Districts.

East Ayrshire has an area of 1,262 Km^2 (97% rural) and a population of 124,700 (Scotland's Census 2011), giving a population density of 99/Km^2. East Ayrshire has 22 localities with populations over 500. Kilmarnock is the largest town with a population of around 43,000. There are three other towns with populations over 5,000, namely Cumnock (9,400), Stewarton (6,600) and Galston (5,000).

Agriculture is the dominant land use, with pastoral farming the main type, along with small areas of arable crops grown mainly for animal feed. 22% of the land area is covered in woodland. Significant areas of land are used for open cast coal mining, stretching north and east from Dalmellington in the south west of the district, through Cumnock and New Cumnock to Muirkirk and into South Lanarkshire. In 2013 two large operators, Scottish Coal and ATH Resources, went into liquidation cutting operational mines by over fifty percent at the time with only three operational at present.

East Ayrshire, in common with the rest of Scotland, has seen the decline of traditional heavy industry and manufacturing along with the closure of deep-mine collieries. Employment is now provided by service industries, light industry, smaller-scale manufacturing, retail and the public sector, with deep mining being replaced by open-cast mining. The Diageo Johnnie Walker whisky bottling plant, Kilmarnock's largest private employer, closed in March 2012 with the loss of over 700 jobs. A significant proportion of the population now work outside the district, with significant areas of new housing developments reflecting this. New housing on the north side of Kilmarnock is one example of this, with many of the new residents heading north towards Glasgow and beyond on the M77.

The main transportation route within East Ayrshire is the A77/M77, which runs from the port of Stranraer in Dumfries and Galloway, passing through South Ayrshire and East Ayrshire, before heading north to Glasgow. Although the most heavily trafficked route by far within East Ayrshire, with daily traffic flows in excess of 40,000 vehicles (Source: Transport Scotland), the road bypasses all centres of populations and built-up areas.

East Ayrshire is also served by six railway stations, with Kilmarnock being the largest, with an annual passenger usage of 421,000.

Previous monitoring and modelling has indicated that road traffic is the major localised source of PM_{10} and NO_2 within East Ayrshire. Where traffic levels are high, combined with congestion (due to traffic lights, frequent junctions etc.) and relatively

narrow streets with tall buildings on either side of the road, has resulted in annual mean PM_{10} exceedences (2010, 2011, 2013 and 2014, Table 2.7 (BAM technology)) and annual mean NO_2 exceedences (2010, Table 2.3 (automatic monitoring)) in Kilmarnock Town Centre. Similar combinations in Newmilns and Mauchline have led to NO_2 being close to the annual mean (diffusion tube monitoring, Table 2.6).

Kilmarnock Town Centre
John Finnie Street is part of the one way system in the centre of Kilmarnock and has three lanes of traffic with parking bays on either side of the street. Most of the street has tall buildings on both sides of the road close to the kerb. Annual average daily traffic flows, although in excess of 17,000 vehicles per day during 2006 have dropped to just below 14,000 during 2013 (source, Traffic Section, East Ayrshire Council); there are several feeder roads and several sets of traffic lights along the street, with the resultant stationary traffic. All these factors combine to give raised levels of nitrogen dioxide and PM_{10}.

Newmilns
Daily traffic flows through Newmilns (A71) are in the region of 10-11,000 vehicles (source, Traffic Section, East Ayrshire Council), and that combined with the relatively narrow streets and high buildings on either side of the street (canyon effect), combined with pedestrian lights has resulted in levels of nitrogen dioxide around the annual mean Air Quality Objective of 40 $\mu g/m^3$ (Table 2.6) in previous years along the A71.

Mauchline
The A76 Kilmarnock to Dumfries Trunk Road runs through Mauchline and daily traffic flows are in the region of 12-13,000 vehicles (source, Transport Scotland). This combined with relatively narrow streets and high buildings (canyon effect) with traffic lights both at the intersection of the A76 and the B743 (Mauchline/Ayr Road) in conjunction with pedestrian lights, has resulted in levels of nitrogen dioxide around the annual mean Air Quality Objective (diffusion tube monitoring, Table 2.6) in recent years along the A76.

New Cumnock
New Cumnock was chosen as an automatic monitoring site in previous years as it lies in an area of extensive open cast coal mining. Concern had been raised about the level of PM_{10} emanating from coal extraction. Castle was chosen as an area which was representative of a typical residential area within the town. Monitoring was discontinued in New Cumnock at the end of 2011 due to levels of NO_2 and PM_{10} being well below the Scottish Air Quality Objectives (Table 2.3, 2, 4, 2.7 and 2.8).

A map of the area is included in Figure 1.

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical

Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

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

The Updating and Screening Assessment presented in this document was carried out in accordance with the most recent technical guidance document, Local Air Quality Management Technical Guidance LAQM.TG(09) (Reference 1).

1.3 Air Quality Objectives

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

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

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

1.4 Summary of Previous Review and Assessments

LQMA Activity	Date	Outcome
First Round of Review and Assessment	1998-2001	No exceedences of Air Quality Objectives were found or predicted.
Updating and Screening Assessment	2003	No exceedences of Air Quality Objectives were found or predicted.
Progress Report	2004	Although some exceedences of the Air Quality Objective for benzene were predicted for 2010 levels, this was as a result of problems associated with the analytical laboratory. No other exceedences were found or predicted.
Progress Report	2005	No exceedences of the Air Quality Objectives were found or predicted.
Updating and Screening Assessment	2006	No exceedences of the Air Quality Objectives were found or predicted. Although future levels of nitrogen dioxide and PM_{10} were predicted to be within future Air Quality Objective limits, the levels found suggested more detailed monitoring was required.
Progress Report	2007	No exceedences of Air Quality Objectives were found or predicted.
Progress Report	2008	No exceedences of Air Quality Objectives were found or predicted for all pollutants. However, due to nitrogen dioxide levels being close to the annual mean objective within John Finnie Street, Kilmarnock, it was decided to commission a Detailed Assessment.
Detailed Assessment	2008	An atmospheric dispersion modelling of road traffic emissions was undertaken to determine nitrogen dioxide pollutant concentrations at locations of relevant public exposure, within John Finnie Street, Kilmarnock. No exceedences of both the annual mean and the 1-hour objective for nitrogen dioxide were predicted at areas of relevant public exposure. It was therefore not necessary to declare an Air Quality Management area at this time. Extra monitoring was recommended using both diffusion tubes (underway August 2009) and automatic monitoring (nearing installation).
Updating and Screening Assessment	2009	No exceedences of Air Quality Objectives were found or predicted for all pollutants at locations of relevant public exposure. Further monitoring was deemed necessary particularly in Kilmarnock, Newmilns and Mauchline as levels of NO_2 were just below the Air Quality Objectives.
Progress Report	2010	No exceedences of Air Quality Objectives were found

		or predicted for all pollutants at locations of relevant public exposure. Further monitoring was deemed necessary particularly in Kilmarnock, Newmilns and Mauchline as levels of NO_2 were just below the Air Quality Objectives.
Progress Report	2011	Exceedences of Air Quality Objectives were found for both annual mean PM_{10} and annual mean NO_2 within Kilmarnock. Due to the exceptional weather conditions associated with 2010 further monitoring was deemed necessary and if either PM_{10} or NO_2 levels exceeded the Air Quality Objectives for a second year East Ayrshire Council would proceed to a Detailed Assessment.
Updating and Screening Assessment	2012	In 2011 exceedence of the annual mean Air Quality Objective was found for PM_{10} within John Finnie Street, Kilmarnock with no exceedence of the 24-hour mean PM_{10} Objective. No exceedences were found for NO_2 Air Quality Objectives within East Ayrshire in 2011. Due to two consecutive years with PM_{10} annual mean exceedence (Table 2.7), East Ayrshire Council has proceeded to a Detailed Assessment centred around John Finnie Street. NO_2 has also been included in the Detailed Assessment due to past exceedences (Table 2.6).
Detailed Assessment	2013	Source apportionment analysis indicates that road traffic emissions appear to be the main contributor to NO_x concentrations at all specified receptors whereas for PM_{10} the main contributor is from background sources with road traffic emissions being responsible fort he next highest contribution. Detailed atmospheric dispersion modelling of pollutant emissions, PM_{10} and NO_x, from road traffic was conducted around Kilmarnock Town Centre focused on John Finnie Street to investigate the potential for exceeding the NO_2 and PM_{10} annual mean Objectives at relevant receptor locations. Predicted NO_2 concentrations were compared against the 2011 measured concentrations from the Council's passive and automatic monitoring network. The modelling predictions were shown to significantly over predict and following the guidance provided in Technical Guidance TG (09) an appropriate adjustment factor was calculated and applied. Following adjustment the modelling predictions indicated that the NO_2 annual mean objective was being met at all specified receptors in 2011 and therefore no requirement for an AQMA. Predicted PM_{10} concentrations were also compared against the 2011 measured concentrations from the Council's monitoring site. The modelling predictions were shown to significantly under predict and following the guidance provided in TG (09) an

		appropriate adjustment factor was calculated and applied. After adjustment the modelling predictions indicated that the PM_{10} annual mean objective was being exceeded at all locations adjacent to all modelled roads in 2011. However, the 2012 PM_{10} monitoring undertaken by the Council indicates that there has been a substantial reduction in PM_{10} in John Finnie Street. Measured PM_{10} concentrations reduced by 8 $\mu g/m^3$ between 2011 and 2012. The monitoring results also indicate 5 $\mu g/m^3$ difference in measured concentrations at John Finnie Street and St. Marnock Street, which seems to be an unusually high difference given the proximity of these two sites. The modelling predictions based on current traffic flows would indicate a difference of approximately 0.3 $\mu g/m^3$ between the two monitoring sites where unadjusted concentrations are considered. If the modelling predictions for 2011 are verified against 2012 monitoring data the results indicate that in 2012 the PM_{10} annual mean is currently being met at all specified receptors. On the basis of both the results of the modelling study and the 2012 measured annual mean concentrations of PM_{10} the Council has delayed consideration of the declaration of an AQMA in respect of PM_{10} annual mean until 12 months of ratified data with the recommended >90% data capture is obtained. If a successful funding bid is obtained from the Scottish Government and following completion of a full twelve months of representative monitoring data, an Addendum to this report will be undertaken which will update the modelling study with additional monitoring data and, if required, population exposure calculations will also be undertaken at that time.
Progress Report	2013	No exceedences of Air Quality Objectives were found or predicted for all pollutants at locations of relevant public exposure during 2012. Further monitoring was deemed necessary, particularly in Kilmarnock, Newmilns and Mauchline, as levels of NO_2 were just below the Air Quality Objectives during 2012 at certain locations in all three towns and PM_{10} levels were just below the Air Quality Objectives during 2012 in Kilmarnock Town Centre, in addition to exceedences of both NO_2 and PM_{10} which had previously occurred.
Progress Report	2014	No exceedences of Air Quality Objectives were found or predicted for all pollutants at locations of relevant public exposure during 2013 (TEOM FDMS technology). Further monitoring was deemed necessary, particularly in Kilmarnock, Newmilns and Mauchline, as levels of NO_2 were just below the Air

		Quality Objectives during 2013 at certain locations in all three towns and PM_{10} levels were just below the Air Quality Objectives during 2012 in Kilmarnock Town Centre, in addition to exceedences of both NO_2 and PM_{10} which had occurred in previous years.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

East Ayrshire Council carried out automatic monitoring for NO_2 and PM_{10} and non-automatic monitoring for NO_2 during 2014.

Automatic Monitoring for NO_2 and PM_{10} was carried out at two locations within East Ayrshire during 2014, using two API Chemiluminescent $NO/NO_2/NO_x$ Analysers and one Met One Instruments BETA Attenuation Mass Monitor (BAM 1020) and two TEOM FDMS Monitors. The St. Marnock St. site included a Scottish Government funded co-location study with a BAM 1020 particulate monitor co-located with a TEOM FDMS particulate monitor. All monitors are fitted with web logger functionality.

Automatic monitoring commenced for NO_2 and PM_{10} in John Finnie Street, Kilmarnock (Figure 4) in February 2010 and continued during 2011, 2012, 2013 and 2014. John Finnie Street was chosen for NO_2 monitoring since previous monitoring using diffusion tubes has indicated that NO_2 levels are just below the National Air Quality Objective (Table 2.3 and 2.6) and it is a heavily trafficked town centre road, with several feeder roads, several sets of traffic lights and tall buildings on either side of the road. Although earlier modelling suggested 2010 PM_{10} levels would be under 18 $\mu g/m^3$, the fact that levels of NO_2 were close to the Air Quality Objective due to high levels of road traffic (and experience suggests PM_{10} levels would also be close to the Air Quality Objective in these circumstances), monitoring to check actual PM_{10} levels was sensible. In fact monitoring during 2010 and 2011 indicated that PM_{10} levels, at 21 and 20 $\mu g/m^3$ respectively, were in fact above the annual mean Air Quality Objective (Table 1.1 and Table 2.7). Further monitoring was therefore deemed necessary and the BAM1020 in John Finnie Street was replaced by a TEOM FDMS PM_{10} monitor in the early part of 2012 and the BAM1020 and API Chemiluminescent analyser moved from New Cumnock to St. Marnock Street, Kilmarnock (Figure 4), part of the one-way system. This was deemed sensible for two reasons, firstly, two years monitoring at New Cumnock confirmed that both NO_2 and PM_{10} are consistently well below Air Quality Objectives (Table 2.3, 2.4, 2.7 and 2.8, East Ayrshire Council 2012 USA Ref. 22) and as no major change was predicted the analysers were moved to St. Marnock Street, Kilmarnock. This second site within the heavily trafficked Kilmarnock one way system will give us additional robust monitoring data which will allow more accurate modelling if any detailed or further assessments are required in the future.

Further details of all two monitoring stations are provided in Table 2.1. The locations of both Kilmarnock sites are shown in Figure 4.

Table 2.1 Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
A2	Kilmarnock, John Finnie Street	Roadside	242691	638095	1.77	NO_2	N	Chemiluminescent	Y (<1m)	2.79	Y
					2.11	PM_{10}	N	TEOM-FDMS	Y (<1m)	2.73	Y
A3	Kilmarnock, St. Marnock Street	Roadside	242742	637705	2.13	NO_2	N	Chemiluminescent	Y (<1m)	3.18	Y
					1.95	PM_{10}	N	BAM 1020	Y (<1m)	3.54	Y
					2.35	PM_{10}	N	TEOM-FDMS	Y (<1m)	3.50	Y

QA/QC of the Automatic Monitoring

The maintenance of the two monitoring sites at Kilmarnock is carried out by Air Monitors. This involves routine servicing and provision for emergency callouts as required. Manual calibration, zero and span checks are carried out monthly by Air Monitors. 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. Both Kilmarnock sites are part of the Scottish Air Quality Network and are audited twice yearly by Ricardo AEA on behalf of the Scottish Government. AEA also carry out the data management for these two sites. 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. AEA and Air Monitors 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 Air Monitors. If the problem cannot be rectified by Environmental Health staff, Air Monitors attend the site and rectify the faults found. Air Monitors or an officer from Environmental Health carries out any routine filter changes, inlet cleaning etc. as recommended in the equipment instruction manual. At the request of AEA Technology 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.

AEA undertake quality control of the automatic data for both the Kilmarnock sites. The QA/QC procedures follow the requirements of the Local Air Quality Management Technical Guidance LAQM.TG(09) (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 AEA 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 AEA 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, AEA 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 9). The Air Pollution Reports produced by AEA on behalf of the Scottish Government can be found in Appendix C.

2.1.2 Non-Automatic Monitoring Sites

Non-automatic monitoring of nitrogen dioxide using passive diffusion tubes was undertaken at 22 separate locations in East Ayrshire during 2014 (Figures 5a-5n Reference 22, Air Quality Reports, East Ayrshire Council and Table 2.2, 2.5 and 2.6). Monitoring commenced at six new sites in 2014 including five new sites in Kilmarnock towards the end of 2014 due to concerns at the location of an industrial wood pellet biomass fuelled drying plant (Campbell Fuels) and also one new site in Mauchline. (Table 2.2 and Figures 5a – 5n). Since monitoring commenced late in 2014 around Campbell Fuels in Kilmarnock, and monitoring will continue until the end of 2016 to give a full year of results, the locations and results will be discussed in the 2016 Progress Report.

Diffusion tube monitoring was discontinued at ten sites at the beginning of 2014 due to levels of NO_2 being well below the annual mean Air Quality Objective at these locations (Table 2.6). Of the ten sites six were in Kilmarnock, one in Newmilns, one in Mauchline, one in Ochiltree and one in Cumnock.

The diffusion tube locations are described in Table 2.2. All diffusion tubes are located at a height of 2.95m. A lower height would be preferred but a compromise of 2.95m was necessary to minimise vandalism but still be representative of the air people breathe at street level.

Table 2.2 Details of Non-Automatic Monitoring Sites

Site ID / Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to annual mean relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
1. Fowlds Street/King Street Junction, Kilmarnock	Kerbside	242805	637620	2.95	NO_2	N	N	Y(35m)*	< 1m	Y
2. 28 John Finnie Street, Kilmarnock	Roadside	242701	638083	2.95	NO_2	N	N	Y(3 – 4m)	2-3m	Y
3. 19 Lainshaw Street, Stewarton	Kerbside	241907	645820	2.95	NO_2	N	N	Y(2 – 3m)	< 1m	Y
4. 40 Main Street, Newmilns	Roadside	253601	637310	2.95	NO_2	N	N	Y(< 1m)	2-3m	Y
6. 8A Kilmarnock Road, Mauchline	Roadside	249826	627335	2.95	NO_2	N	N	Y(2 – 3m)	2-3m	Y
11. 96 John Finnie Street, Kilmarnock	Roadside	242657	637883	2.95	NO_2	N	N	Y(3-4m)	2-3m	Y
12. 62 John Finnie Street, Kilmarnock	Roadside	242673	637955	2.95	NO_2	N	N	Y(3 – 4m)	2-3m	Y
14. 95/97 John Finnie Street, Kilmarnock	Roadside	242619	637773	2.95	NO_2	N	N	Y(100m)*	3m	Y
15. 16 West George Street, Kilmarnock	Roadside	242766	638160	2.95	NO_2	N	N	Y(35m)*	1-2m	Y

Site ID / Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to annual mean relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
17. 23/25 Loudoun Road, Newmilns	Roadside	253204	637237	2.95	NO_2	N	N	Y(<1m)	2-3m	Y
23. 3/5 Loudoun Street, Mauchline	Roadside	249867	627232	2.95	NO_2	N	N	Y(<1m)	3-4m	Y
24. 5/7 Earl Grey Street, Mauchline	Roadside	249894	627233	2.95	NO_2	N	N	Y(<1m)	2m	Y
25. John Finnie Street Monitor, Kilmarnock	Roadside	242691	638095	2.95	NO_2	N	Y	Y(17m)*	2-3m	Y
27. Junction King Street/St. Marnock Street, Kilmarnock	Kerbside	242771	637714	2.95	NO_2	N	N	Y(44m)*	<1m	Y
32. Kay Park, Kilmarnock	Urban Background	243302	638259	2.95	NO_2	N	N	Y(>50m)	N/A	N
33. Howard Park, Kilmarnock	Urban Background	242581	637409	2.95	NO_2	N	N	Y(>50m)	N/A	N
38. 16/18 Earl Grey Street, Mauchline	Roadside	249897	627184	2.95	NO_2	N	N	Y(1-2m)	<1m	Y

*Although these sites are greater than 5m from relevant exposure (annual mean), they are representative of such exposure. These locations were chosen because of the suitability of mounting the NO_2 diffusion tubes at equivalent representative points to annual mean relevant exposure. Although diffusion tubes can only be used to measure annual mean levels of NO_2 they do give an indication of whether the hourly mean objective is likely to be breached (Reference 6). It is therefore reasonable to conclude that all of the above sites have relevant exposure as members of the public might reasonably be expected to spend one hour or longer at these locations. Details of previous sites can be obtained from previous East Ayrshire Council Air Quality Reports, Ref

Nitrogen Dioxide Diffusion Tube Monitoring Procedure

The nitrogen dioxide diffusion tubes are placed at each location by East Ayrshire Council to give 12 periods within the calendar year. After either a four or 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 from January 2014 to February 2015 GSS obtained 5 rounds at 100%, giving a combined score of 100% 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.

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. 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 2 sites, including the Marylebone Road site in London were present on the spreadsheet. A resultant bias adjustment is then computed for each site. A combined bias adjustment is then calculated from these 2 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 2014 the overall bias adjustment factor was computed at **0.83**. The bias adjustment factor applied to the raw annual means of the diffusion tubes was therefore **0.83** for 2014 data. Precision and Bias Adjustment Data (Reference 20) are shown in Appendix A.

2.2 Comparison of Monitoring Results with Air Quality Objectives

This section sets out the results of all monitoring carried out by East Ayrshire Council in 2014 and where relevant, provides results from previous years to identify any trends.

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

The results of automatic monitoring for nitrogen dioxide carried out in 2014 at St. Marnock Street and John Finnie Street, Kilmarnock are displayed in Table 2.3 and 2.4 and the full report produced by Ricardo-AEA on behalf of the Scottish Government in Appendix C.

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

Site ID/Location	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2014 % [b]	Annual Mean Concentration (µg/m^3)				
					2010	2011	2012	2013	2014
A2/John Finnie Street, Kilmarnock	Roadside	N		69.2	**43**	**35**	30	39	32
A3/St. Marnock Street, Kilmarnock	Roadside	N		83.3			29 (36 annualised)	32 (30 annualised)	30

Annual Mean Air Quality Objective (included in Regulations for the purpose of LAQM in Scotland) for Nitrogen Dioxide - 40 µg/m^3.

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

NO_x monitoring in Kilmarnock was carried out from 1st January until 31st December 2014 but due to technical and servicing problems with the NO_x monitor valid data was reduced to 69.2% at the John Finnie St. site. It was not possible to annualise the NO_2 data due to the intermittent spread of the data.

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.TG(09) Box 3.2 (Reference 1).

Adjustment to estimate annual mean (Appendix D)

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 with good data capture, from the Scottish Automatic Urban and Rural Network, within 50 miles were identified: Edinburgh Currie, Glasgow Townhead and North Lanarkshire Whifflet.
2. The results of the annual mean, **Am,** for these sites in 2014 were obtained.
3. The period means, **Pm,** for 2014 were obtained for the months of the short term monitoring in East Ayrshire.
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 2013 (Table 2.3 and 2.7).

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

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2013 %	Number of Hourly Means > 200µg/m^3				
					2010	2011	2012	2013	2014
A2/John Finnie Street, Kilmarnock	Roadside	N		69.4	16(197 µg/m^3)	1(159 µg/m$^{3)}$	0(109µg/m$^{3)}$	0	0(134 µg/m^3)
A3/St. Marnock Street, Kilmarnock	Roadside	N		83.3			0(122 µg/m^3)	1(124 µg/m^3)	1(118 µg/m^3)

Annual 1-hour mean Air Quality Objective (included in Regulations for the purpose of LAQM in Scotland) for Nitrogen Dioxide - 200 µg/m^3, not to be exceeded more than 18 times a year.

In bold, exceedence of the NO_2 hourly mean AQS objective (200µg/m^3-not to be exceeded more than 18 times per year).Where the period of valid data was less than 90% of the full year, the 99.8th percentile of hourly means are included in brackets.

Kilmarnock

As a result of high levels of nitrogen dioxide found in John Finnie Street from long term monitoring a Detailed Assessment was carried out by BMT Cordah in 2008 (Reference 5) and by Golder Associates in 2013 (Reference 26). The modelling studies concluded that although the annual mean NO_2 objective would be exceeded along the centre of the road, no exceedences of the annual mean were predicted at locations of relevant public exposure. Furthermore, no exceedences of the 1-hour mean objective were predicted at areas of relevant public exposure. It was therefore not considered necessary to declare an Air Quality Management Area for NO_2 at this time. The 2007 report also recommended that the location of the diffusion tube monitoring sites be reviewed and an additional location on the south west of John Finnie Street be considered. This has been carried out (Figure 5c), along with one tube sited on West George Street (Figure 5c). The 2008 report also recommended that an automatic monitoring unit be installed on John Finnie Street. This commenced in John Finnie Street in February 2010 (Figure 4).

Annual mean levels of NO_2 in John Finnie Street and St. Marnock Street Kilmarnock during 2014 were at 32 µg/m^3 and 30 µg/m^3 respectively (Table 2.3, automatic monitoring sites) under the annual mean Air Quality Objective. 2010 levels at John Finnie Street, at 43 µg/m^3, were raised due to long periods of cold still weather and were higher than any year since monitoring started. 2011 levels, at 35 µg/m^3 and 2012 levels monitored levels at 30 µg/m^3 recorded a substantial drop from 2010. 2013 levels at 39 µg/m^3 indicated a substantial rise. St. Marnock Street station recorded a drop from 36 µg/m^3 to 30 µg/m^3 between 2012 and 2013, although these were annualised figures, with the recorded part year data indicating a 3 µg/m^3 rise, indicating that the difference may have been partly due to the uncertainty of measurement with the analysers and the use of annualisation at one site. The rise was certainly in line with diffusion tube data (Table 2.6). Levels at locations where members of the public might be regularly exposed such as building facades of residential property, schools, hospitals, care homes etc. would be less than the levels found at the roadside as NO_2 levels drop off with distance from the roadside. Although the actual site of the automatic monitoring stations have no actual relevant exposure as regards the annual mean they can be regarded as representative of an area of relevant exposure as they are located at a similar distances from the road as other properties along the length of the road. As they are located near a busy shopping area relevant exposure is applicable to the 1-hour mean. 1-hour mean levels apply to all locations where the annual mean applies, as well as gardens of residential properties, kerbside sites (for example, pavements of busy shopping streets), hotels etc., in essence all locations where members of the public might reasonably be expected to spend one hour or more. There were no exceedences of the 1-hour mean (200 µg/m^3) recorded in John Finnie St. with one exceedence recorded in St. Marnock St. during 2014. The Air Quality Regulations state that 1-hour mean of 200 µg/m^3 NO_2 levels should not be exceeded more than 18 times per year and therefore both locations are in compliance with the 1-hour mean Objective. Since data capture at both John Finnie Street and St Marnock St. was below 90% the 99.8th percentile of hourly means was included and at 134 µg/m^3 at John Finnie Street and 118 µg/m^3 (Table 2.4) was significantly below the objective 200 µg/m^3 limit (Table 1.1)

Nitrogen dioxide levels were predicted to fall steadily within Kilmarnock from 2008 (Detailed Report, Reference 5) to follow predicted national trends. Although the sharp rise in 2010 may be due to the exceptionally long cold weather in that year, the accepted evidence of a levelling-off in the reduction in concentrations in recent years (AQEG 2007, Reference 21) may be due to:

1/ An increase in the proportion of the total NO_x emitted directly to the atmosphere as NO_2 . This in turn is due to the increased penetration of diesel cars and the retrofitting of pollution control devices, such as catalytically regenerative traps to buses.

2/ Increasing background concentrations of O_3, which promotes the oxidation of emitted NO to NO_2.

3/ Recent research has also indicated that actual emissions from vehicles are higher in real driving conditions than when the vehicles were tested under European Emissions Standards using a test completed under a standardised test cycle. The expected reductions in emissions from more modern vehicles have been much more limited than predicted.

The actual trend is more likely to, at best, allow levels of nitrogen dioxide from road transport to remain static until increasing numbers of Euro 6/VI diesels are present on our roads, although initial research suggests patchy results when vehicles were tested under real world driving conditions.

The International Council on Clean Transportation (ICCT) - real world emissions study- diesel cars

• The average on-road emissions levels of NOx were estimated at **7 times** the certified emission limit for Euro 6 vehicles. The best performing vehicle complied (just) with the limits, the worst performing exceeded limits by 25 times.
• Most of the cars tested also exceeded the Euro 5 limits
• This supports the idea that the technology exists to comply with Euro 6 under real world conditions and manufacturers should focus on those technologies

http://www.theicct.org/sites/default/files/publications/ICCT_PEMS-study_diesel-cars_20141010.pdf (Reference 24)

In summary

• The Scottish fleet in 2014 is still quite mixed (Euro3, 4 & 5 mainly)
• A steady increase in Euro VI and Euro 6 vehicles in the next 10 years is forecast
• Euro VI/6 should be dominant by 2020 and almost all vehicles will be of this standard by 2025
• The new Euro standards bring with them important changes to type testing regimes, but at the moment the testing requirements for light and heavy vehicles are not consistent
• Most problems (in terms of exceeding limits) are with NOx
• Real world driving emissions of NOx and PM10 from early studies suggest Euro VI heavy vehicles are meeting the standards, though NOx is still quite high in extreme urban conditions. Euro V heavies are still problematic

• Real world driving emissions from Euro 6 light vehicles are still exceeding the NOx limit, by some margin in some cases. Euro 5 vehicles similar
• The testing regime for heavy vehicles, as it stands, is more rigorous for heavy vehicles - though changes are expected at the European level in 2017/18 to bring light vehicles into line

Further automatic monitoring in Kilmarnock is therefore essential to verify actual levels of nitrogen dioxide and likely future trends.

Diffusion Tube Monitoring Data

The diffusion tube method is open to a degree of uncertainty inherent in the method and as such the results of the survey should be treated with caution and used as indicators of nitrogen dioxide levels only. That said it is a useful screening method which can be used to cover multiple sites at low cost. They are also easily located, where it may not be practical to site bulky automatic monitoring equipment and this ensures good coverage of an area and therefore 'hotspots' are more likely to be picked up.

The diffusion tube monitoring data for nitrogen dioxide is presented below in Tables 2.5 and 2.6 with the full monthly dataset displayed in Appendix B. Diffusion tube locations are shown in Figure. 5a-5n.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2014

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.83) 2014 (μg/m^3)
1	Fowlds Street/King Street Junction, Kilmarnock	Kerbside	N	N	11		N	24.2
2	28 John Finnie Street, Kilmarnock	Roadside	N	N	12		N	26.2
3	19 Lainshaw Street, Stewarton	Kerbside	N	N	12		N	23.2
4	40 Main Street, Newmilns	Roadside	N	N	11		N	24.2
6	8A Kilmarnock Road, Mauchline	Roadside	N	N	11		N	23.4
11	96 John Finnie Street, Kilmarnock	Roadside	N	N	12		N	24.9
12	62 John Finnie Street, Kilmarnock	Roadside	N	N	12		N	26.8
14	95/97 John Finnie Street, Kilmarnock	Roadside	N	N	12		N	30.0

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2014 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.83) 2014 (μg/m^3)
15	16 West George Street, Kilmarnock	Roadside	N	N	12		N	29.1
17	23/25 Loudoun Road, Newmilns	Roadside	N	N	11		N	26.0
23	3/5 Loudoun Street, Mauchline	Roadside	N	N	12		N	21.5
24	5/7 Earl Grey Street, Mauchline	Roadside	N	N	11		N	30.5
25	John Finnie Street, Kilmarnock	Roadside	N	Collocated	12		N	24.4
27	Junction King Street/St. Marnock Street, Kilmarnock	Kerbside	N	N	12		N	28.1
32	Kay Park, Kilmarnock	Urban Background	N	N	12		N	10.2
33	Howard Park, Kilmarnock	Urban Background	N	N	12		N	10.5
38	16/18 Earl Grey Street, Mauchline	Roadside	N	N	10		N	29.8

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

Site ID	Location	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) μg/m³					
				2009 (Bias Adjustment Factor = 1.23	**2010 (Bias Adjustment Factor = 1.12)**	**2011 (Bias Adjustment Factor = 0.94)**	**2012 (Bias Adjustment Factor = 0.96)**	**2013 (Bias Adjustment Factor = 0.99)**	**2014 (Bias Adjustment Factor = 0.83)**
1.	Fowlds Street/King Street Junction, Kilmarnock	Kerbside	N	32.3	39.1	25.0	27.4	32.4	24.2
2.	28 John Finnie Street, Kilmarnock	Roadside	N	32.8	**40.2**	32.1	26.4	34.0	26.2
3.	19 Lainshaw Street, Stewarton	Kerbside	N	31.2	35.8	27.0	28.7	31.7	23.2
4.	40 Main Street, Newmilns	Roadside	N	29.9	33.0	25.9	26.5	30.8	24.2
6.	8A Kilmarnock Road, Mauchline	Roadside	N	30.7	31.6	27.9	23.5	29.7	23.4
7.	Junction at Main Street & A70 Ochiltree	Roadside	N	23.2	26.2	19.9	20.3	20.9	
9.	Townhead/Glaisnock Street Junction, Cumnock	Roadside	N	18.5	17.4	15.6	13.8	15.4	
11.	96 John Finnie Street, Kilmarnock	Roadside	N	33.3	34.8	27.9	28.4	32.1	24.9
12.	62 John Finnie Street, Kilmarnock	Roadside	N	38.3	**40.0**	33.3	31.1	33.1	26.8
14.	95/97 John Finnie Street, Kilmarnock	Roadside	N	**43.7***	**43.8**	34.2	33.7	35.4	30.0
15.	16 West George Street, Kilmarnock	Roadside	N	39.9*	**43.2**	35.8	34.8	36.9	29.1
17.	23/25 Loudoun Road, Newmilns	Roadside	N	39.8*	**40.6**	30.4	31.8	34.7	26.0

18.	100 Main Street, Newmilns	Roadside	N	24.4*	26.4	22.1	19.9		
19.	57/59 Townhead Street, Cumnock	Roadside	N	19.6*	22.6	19.0	17.5		
20.	66 Main Street, Muirkirk	Roadside	N	15.1*	17.8	14.2	12.9		
22.	The Cross, Mauchline	Roadside	N	28.7*	29.5	29.6	24.7	29.6	
23.	3/5 Loudoun Street, Mauchline	Roadside	N	31.2*	31.4	28.4	26.0	27.3	21.5
24.	5/7 Earl Grey Street, Mauchline	Roadside	N	**41.3***	39.5	34.2	33.5	39.5	30.5
25A.	John Finnie Street, Kilmarnock	Roadside***	N		35.2	28.2	28.9		
25B.	John Finnie Street, Kilmarnock	Roadside***	N		39.8	28.0	29.5		
25C	John Finnie Street, Kilmarnock	Roadside***	N		37.8	30.6	28.9		
Mean 25A-25C	John Finnie Street, Kilmarnock	Roadside***	N		37.7	29.0	29.1		
25	John Finnie Street Monitor, Kilmarnock	Roadside	N					32.5	24.4
26	76 Loudoun Road, Newmilns	Roadside	N			21.4	18.8		
27	Junction King Street/St. Marnock Street, Kilmarnock	Kerbside	N			30.8	29.9	30.8	28.1
28	2A Welbeck Street, Kilmarnock	Roadside	N			25.6	24.9	25.0	
29	Junction McLelland Drive/Dundonald Road, Kilmarnock	Roadside	N			25.2	25.2	26.4	

30	16 Cumnock Road, Mauchline.	Roadside	N			19.1	20.0		
31	Wellington Street, Kilmarnock	Kerbside	N			21.8	26.2	26.7	
32	Kay Park, Kilmarnock	Urban Background	N					12.1	10.2
33	Howard Park, Kilmarnock	Urban Background	N					12.6	10.5
34	39 Loudoun Road, Newmilns	Roadside	N					28.9	
35	Nelson Street, Kilmarnock	Roadside	N					19.6	
36	17 Portland Road, Kilmarnock	Roadside	N					19.6	
37	Sturrock Street, Kilmarnock	Roadside	N					21.9	
38	16/18 Earl Grey Street, Mauchline	Roadside	N						29.8

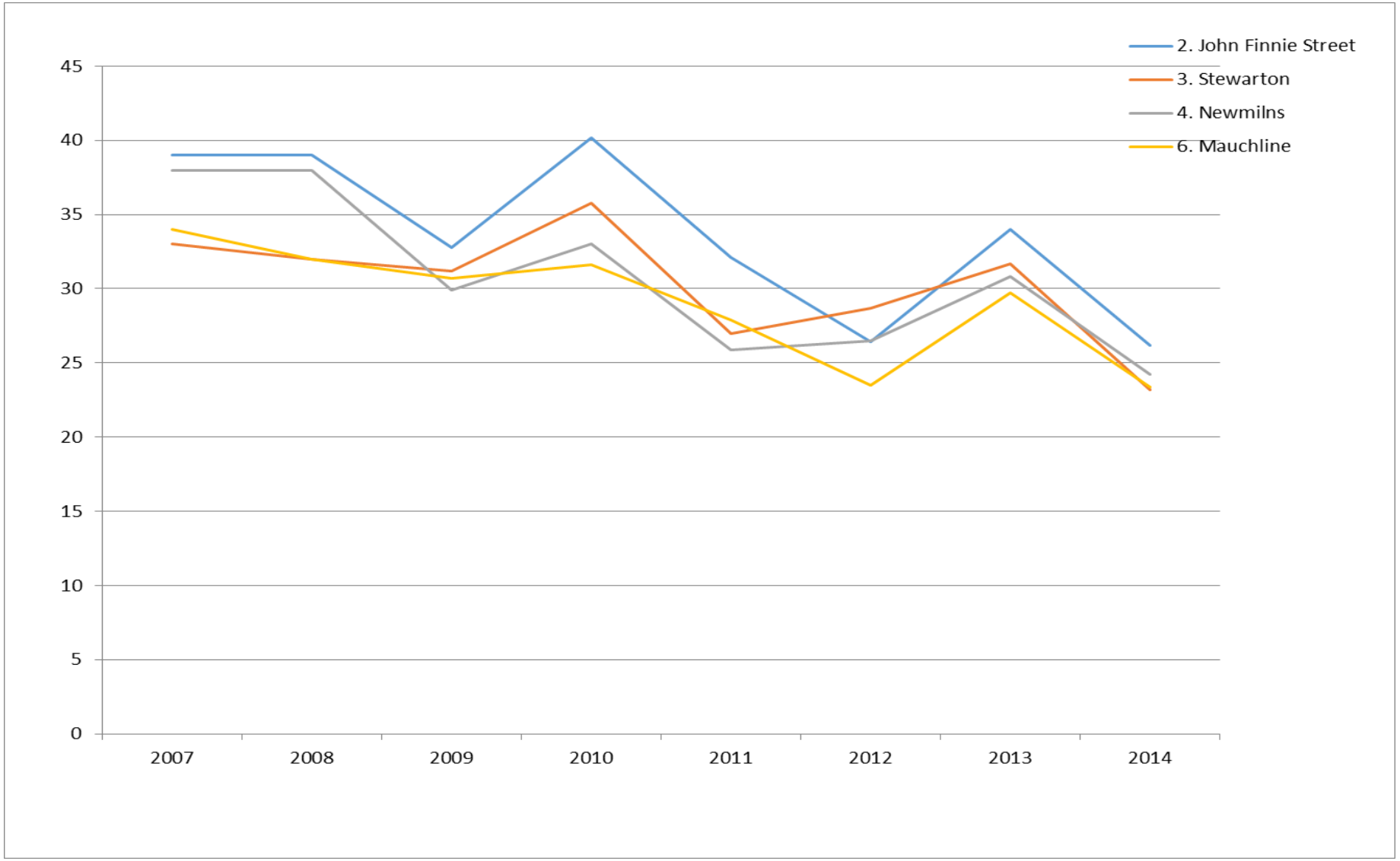
Annual mean Air Quality Objective (included in Regulations for the purpose of LAQM in Scotland) for Nitrogen Dioxide - 40 µg/m^3.

*2009 Short term data annualised (2010 Air Quality Progress Report East Ayrshire Council, Reference 22).

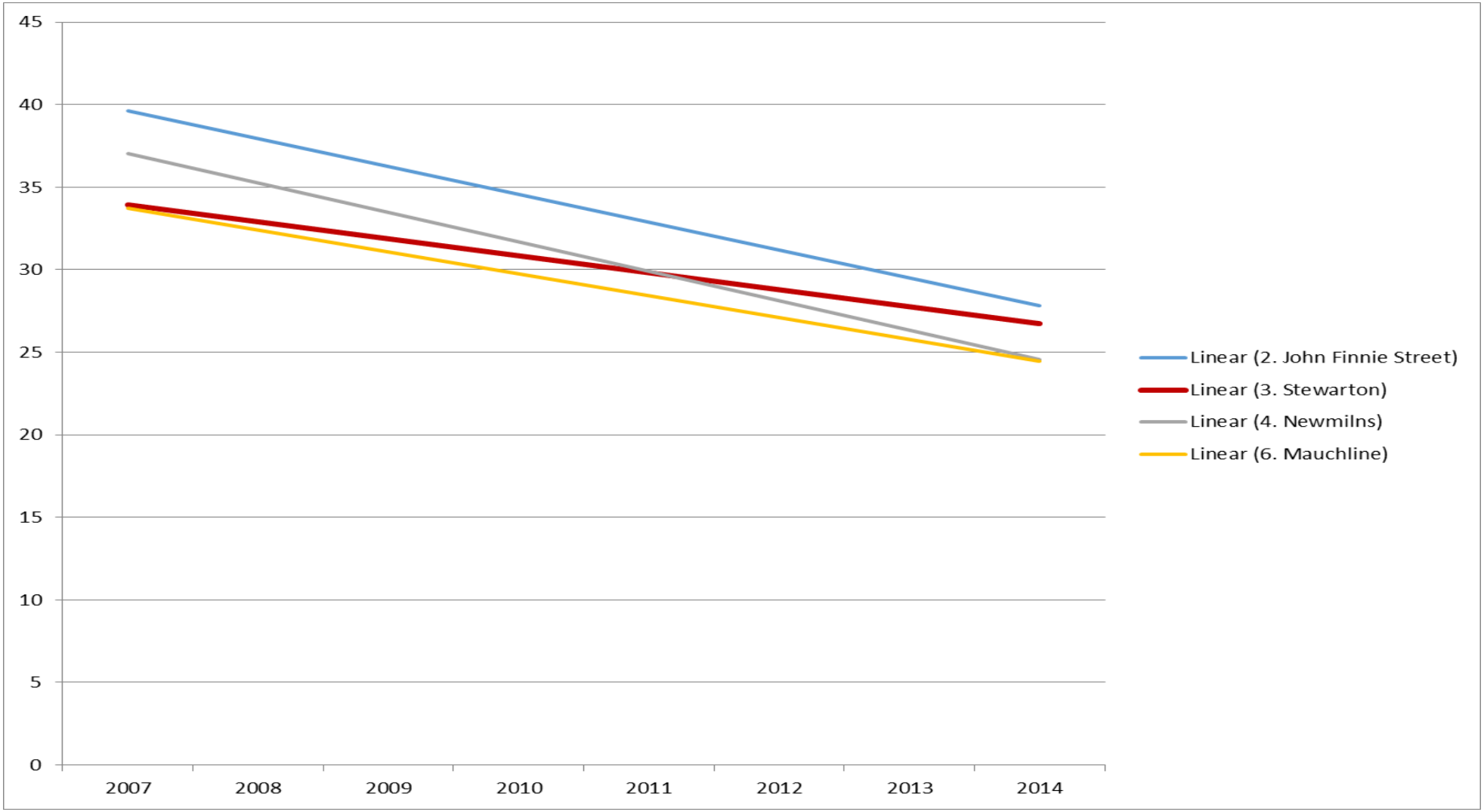
In bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3

*** Triplicate and co-located tubes

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



Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites - Linear



Annual mean nitrogen dioxide levels in µg/m^3 (y-axis) were plotted against the year of measurement 2006-20013 (x-axis) for the long term diffusion tube monitoring sites. From the data available the overall trend from seven long term monitoring sites within East Ayrshire over the last eight years would appear to be marginally downwards from years 2006 -2009 with a sharp rise in 2010, with a significant fall in 2011 and a levelling off in 2012 and again a noticeable rise in 2013. The sharp rise in 2010 was almost certainly due to the prevailing period of very cold weather experienced during that year. The overall trend would appear to be generally downwards.

2014

All locations where nitrogen dioxide tubes were located within East Ayrshire displayed levels of nitrogen dioxide below the 40 µg/m^3 annual mean Air Quality Objective (Table 2.5 and 2.6).

Kilmarnock

Diffusion tube monitoring was discontinued at six locations in Kilmarnock in January 2014 due to levels of nitrogen dioxide being well under the annual Air Quality Objective. The six locations were Wellbeck Street, Junction McLelland Drive/Dundonald Road, Wellington Street, Nelson Street, Portland Road and Sturrock Street (Table 2.6). Five new locations were added in Kilmarnock (Table 2.2) in October 2014 to ascertain the impact of 5 new biomass boilers installed at Campbell Fuels. This monitoring has been continued into 2015 to provide full years data. The locations and results will be discussed in the 2016 Progress Report.

It should be noted that Kilmarnock Town Centre Regeneration works are ongoing and are expected to continue for a considerable period of time. The works are producing particulates from building and ground works as well as the use of generators and traffic disruption which are producing increased NO_x emissions. The main detrimental effect on air quality from the town centre works is likely to result from disruption to traffic flow. This was evidenced from October through to December 2010 and during periods in 2011 where one lane was closed off at the northern end of John Finnie Street and West George Street resulting in a build up of slow-moving traffic and the associated increase of accelerations, decelerations and braking. Major sewer replacement works were also being carried out during 2012 and 2013 in the centre of Kilmarnock resulting in, as previously mentioned, disruption to monitoring at St. Marnock Street. Similar to the regeneration works being carried out the replacement sewer works were increasing the pollutant levels within the town centre, particularly PM_{10} levels as the temporary material handling yard lies in the vicinity of the St. Marnock St. automatic monitor.

In summary the diffusion tube results for the one way system in Kilmarnock were all at 30 µg/m^3 or less, well within 40 µg/m^3 annual mean Air Quality Objective (Table 2.5 and 2.6) Further monitoring will be carried out to establish whether levels of NO_2 will remain consistently below the annual mean Air Quality Objective (Table 2.6).

Newmilns
Both sites were below the annual mean Air Quality Objective (both under 30 µg/m^3) during 2014 (Table 2.5). This showed a substantial fall on 2010 where prolonged very cold weather patterns were experienced which led to raised levels of NO_2 (Table 2.4). One location, 39 Loudoun Road, was discontinued in January 2014 as the short (one year) survey indicated levels were under 30 µg/m^3 during 2013 and the nearby site at 23/25 Loudoun Road was considerably higher at 34.7 µg/m^3 and therefore this site will continue for the foreseeable future to monitor the levels in Loudoun Road (Table 2.6). Since levels in previous years have been around the 40 µg/m^3 annual mean objective at 23/25 Loudoun Road (Table 2.6) further monitoring is necessary to establish if levels will remain consistently below the annual mean Air Quality Objective.

Mauchline
All sites were below the annual mean Air Quality Objective during 2014 (Table 2.5). One diffusion tube was moved from The Cross where levels have been consistently below 30 µg/m^3 (Table 2.6) to 16/18 Earl Grey Street, Mauchline in January 2014, for a 12 month survey since levels in previous years have been around the of 40 µg/m^3 annual mean objective in this street in previous years (Table 2.6). Due to the previous raised levels further monitoring is necessary in Mauchline to establish if levels will remain consistently below the annual mean Air Quality Objective.

Stewarton
Annual mean levels of NO_2 were, at 23.2 µg/m^3, well below the annul mean Air Quality Objective (Table 2.5). Previous levels (Table 2.6) have indicated levels in the mid 30's µg/m^3 and therefore monitoring will be continued for the foreseeable future in Stewarton.

Cumnock
The final NO_2 diffusion tube monitoring site at Townhead/Glaisnock Street Junction was discontinued in January 2014 since measured levels of NO_2 have been below 20 µg/m^3 since 2009 (Table 2.6). No NO_2 monitoring will be carried out in Cumnock unless there is substantial development taking place which would have a large detrimental effect on air quality.

Muirkirk
No NO_2 monitoring will be carried out in Muirkirk unless there is substantial development taking place which would have a large detrimental effect on air quality.

Ochiltree
The final NO_2 diffusion tube monitoring site in Ochiltree was discontinued in January 2014 since measured levels of NO_2 have been below 20 µg/m^3 since 2009 (Table 2.6). No NO_2 monitoring will be carried out in Ochiltree unless there is substantial development taking place which would have a large detrimental effect on air quality.

Summary
In summary diffusion tube monitoring is open to a degree of uncertainty and although levels of nitrogen dioxide in Kilmarnock, Newmilns, Stewarton and Mauchline are below the annual mean Air Quality Objective, the raised levels indicate the need to carry out further monitoring.

Relevant Exposure
Diffusion tube monitoring can only give an 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. In the past where levels have exceeded the annual Air Quality Objectives the extrapolated NO_2 levels from the kerbside and roadside data were computed using The NO_2 With Distance From Roads Calculator (Reference 8):-

Cz = ((Cy - Cb) / (-0.5476 x Ln(Dy) + 2.7171)) x (-0.5476*Ln(Dz) + 2.7171) + Cb

Where:

Cz is the total predicted concentration (µg/m^3)at distance Dz;
Cy is the total measured concentration (µg/m^3) at distance Dy;
Cb is the background concentration (µg/m^3);
Dy is the distance from the kerb at which concentrations were measured; and
Dz is the distance from the kerb at which concentrations are to be predicted.
Ln(D) is the natural log of the number D.

Since all monitoring locations during 2014 recorded levels below the annual mean objective this calculation has not been necessary for this report.

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 6, Laxen D and Marener B (2003)) identified a relationship between the annual mean and the 1-hour objective, such that exceedences of the latter were considered unlikely where the annual mean was below 60 µg/m^3. An updated analysis (Reference 7, 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 exceedences of the 1-hour mean objective where annual mean levels 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 exceedences were associated with a regional pollution event that occurred over several days in December 2007. If these latter exceedences are excluded the number of exceedences of the 1-hour mean where annual mean are below 60 µg/m^3, is extremely limited. On the basis of this new evidence, the guidance remains unchanged and authorities may assume that exceedences 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 historically well below 60 µg/m^3 throughout all monitoring sites within East Ayrshire (Table 2.5 and 2.6) and we can therefore conclude no exceedences 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).

2.2.2 PM_{10}

The results of the automatic monitoring carried out at both Kilmarnock sites are set out in Table 2.7 and Table 2.8 and the full monthly dataset in Appendix C. The BAM 1020 data was corrected using a gravimetric factor of 0.83333 for Indicative Gravimetric Equivalent (Appendix C) (Reference 9).

PM Monitoring Adjustment

The UK objectives for particulate matter (and the EU limit values) are based upon measurement carried out using the European reference sampler; this is a gravimetric device, where the particle mass is collected onto a filter and subsequently weighed. This type of sampler has significant disadvantages, in that only 24-hour mean concentrations are recorded, the data cannot be disseminated to the public in real time, and the operation is labour intensive. East Ayrshire Council therefore used two Beta Attenuation Monitor (with unheated inlets) (BAM 1020) continuous analysers during 2009 – 2011 and one BAM 1020 and one TEOM FDMS 1405 during 2012 and 2013 and in 2014 one BAM 1020 collocated with a TEOM FDMS in St. Marnock St., as part of a survey funded by the Scottish Government, and one TEOM FDMS 1405 located in John Finnie Street..

Unheated BAMs have a tendency to over-read PM_{10} with respect to the gravimetric method since they can also read absorbed moisture as particulate matter. In 2006, the UK Government and the Devolved Administrations published a report on the outcome of detailed equivalence tests for various PM_{10} samplers when compared with the European reference sampler. The tests carried out were based on the Guidance for the Demonstration of Equivalence of Ambient Air Monitoring Methods issued by an EC Working Group. In simple terms, the guidance sets out an approach whereby it is possible to test whether an instrument is able to comply with the Data Quality Objective for overall uncertainty as defined within the relevant Air Quality Directive – in the case of PM_{10} this is 25%. The tests were conducted at four sites within the UK, over both summer and winter seasons. The full report can be downloaded from the web (Harrison D (2006) Reference 9).

The Met-One BAM (with unheated inlet) meets the equivalence criteria for PM_{10} monitoring provided the results are corrected for slope. A correction for slope of 0.83333 was therefore used (Appendix C) (Reference 9).

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

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %[a]	Valid Data Capture 2014 %[b]	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration μg/m³				
						2010*[c]	2011*[c]	2012*[c]	2013*[c]	2014[c]
A1	Roadside	Y	95		Y	25.1	26.2	28.7	26.3	27.0
A2 (FDMS 1405) Kilmarnock, John Finnie Street	Roadside	N		67.3	Y	**21**	**20**	13(12 annualised)	16(15 annualised)	15(15 annualised)
A3 (BAM) Kilmarnock, Saint Marnock Street	Roadside	N		94.1	Y			**19**(17 annualised)	**19**	**20**
A3 (FDMS 1405) Kilmarnock, Saint Marnock Street	Roadside	N		64.5	Y					11(10 annualised)

Annual mean Air Quality Objective (included in Regulations for the purpose of LAQM in Scotland) for PM_{10} - 18 μg/m³.

In bold, exceedence of the PM_{10} annual mean AQS objective of 18μg/m³

Means were "annualised" as in Box 3.2 of TG(09) (http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38) (Appendix E).

PM_{10} monitoring in Kilmarnock was carried out from 1st January until 31st December 2014 but due to technical and servicing problems data capture was below 90% for both TEOM FDMS units.

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

Site ID	Site Type	Within AQMA ?	Valid Data Capture for monitoring Period %[a]	Valid Data Capture 2014 %[b]	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 µg/m³)				
						2010*[c]	2011*[c]	2012*[c]	2013*[c]	2014[c]
A1	Roadside	Y	95	92	Y	3	4	8	6	1
A2 (FDMS 1405) Kilmarnock, John Finnie Street	Roadside	N		67.3	Y	0(40µg/m³)	1(38µg/m³	0(21µg/m³)	0(35µg/m³)	0(27µg/m³)
A3 (BAM) Kilmarnock, Saint Marnock Street	Roadside	N		94.1	Y			3(44µg/m³)	2(46µg/m³)	2
A3 (FDMS 1405) Kilmarnock, Saint Marnock Street	Roadside	N		64.5	Y					0(32µg/m³)

24- hour mean Air Quality Objective (included in Regulations for the purpose of LAQM in Scotland) for PM_{10} - 50 µg/m³, not to be exceeded more than 7 times a year.

In bold, exceedence of the PM_{10} daily mean AQS objective (50µg/m³ – not to be exceeded more than 7 times per year).

Where the period of valid data was less than 90% of the full year, the 98.08th percentile of hourly means are included in brackets.

Kilmarnock John Finnie Street and St. Marnock Street (Table 2.7 and 2.8)

An estimated annualised PM_{10} annual mean for 2014 of 15 µg/m^3 (Table 2.7 and Appendix E) was computed for John Finnie Street (Appendix C), lower than the annual mean objective of 18 µg/m^3. No exceedences of the 24-hour objective occurred during 2014 within John Finnie Street. The 98.08th percentile of daily means was 27 µg/m^3 (included since data capture was below 90%)(Table 2.8).

An annual mean of **20** µg/m^3 was measured for St. Marnock Street (Table 2.7) during 2014 using BAM technology. This is higher than the annual mean objective of 18 µg/m^3. With funding from the Scottish Government East Ayrshire Council commissioned a collocation study in conjunction with Ricardo AEA to compare the BAM 1020 and TEOM FDMS particulate monitors over two years starting from January 2014. With the first 12 months of the trial completed (December 2014) the BAM 1020 recorded **20** µg/m^3 and the collocated TEOM FDMS recorded 11µg/m^3 (annualised at 10µg/m^3). It is suggested the BAM 1020 is over estimating PM_{10} by some margin in higher rainfall/humidity areas particularly when PM levels are raised. This is backed up by East Ayrshire Council's collocation study which suggests that when PM_{10} is higher the margin between the two instruments is also greater suggesting absorbed moisture by the tape and the particulates is the likely cause (Further discussion will take place during the 2016 Progress Report once the trial is complete). Since the TEOM FDMS is the particulate monitor of choice on the national network and evidence from trial work (reinforced by the 2014 readings from the TEOM FDMS monitor at John Finnie St. reading 15 µg/m^3). East Ayrshire Council Environmental Health is satisfied that East Ayrshire PM_{10} levels are in compliance with annual LAQM Air Quality Objectives. 2 exceedences (BAM 1020) of the 24-hour mean occurred during 2014 within St. Marnock Street using BAM technology. No exceedences of the daily mean occurred from measured collocated TEOM FDMS data, suggesting moisture is the most likely cause for the BAM measured data indicating exceedences. The 98.08th percentile of daily means was 32 µg/m^3 (included since data capture was below 90%).

As in the previous discussion regarding NO_2 the main source of localised PM_{10} in John Finnie Street is due to road traffic. As previously discussed Town Centre Regeneration construction works are directly increasing PM_{10} levels, and indirectly through associated traffic flow changes.

PM_{10} Summary

Annual mean PM_{10} levels recorded at both town centre locations varied by 5 µg/m^3, between the BAM 1020 located at St. Marnock St. and the FDMS 1405 located at John Finnie St. This is unusually high as both monitors are located within the one way system and traffic levels are similar, and indeed higher at St. Marnock St. (2013 Detailed Assessment Ref. 26). Data capture was below 90% for both TEOM FDMS monitors due to technical and servicing issues, therefore caution should be used when interpreting the results. The conclusion that can be drawn from this difference is that it is in the main due to the difference in measurement method between the BAM 1020 and the TEOM FDMS. As mentioned earlier the BAM 1020 requires correction since the BAM measures particulate mass indirectly and has a propensity to read particle bound water and filter absorbed water as particulate mass. We are therefore inclined towards using the data from the FDMS monitor (instrument of choice on the national network) as being nearer the true particulate mass reading. Therefore we can conclude that PM_{10} levels in Kilmarnock Town Centre are in compliance with the annual mean and hourly LAQM Scottish Objectives.

2.2.3 Sulphur Dioxide

No Sulphur Dioxide monitoring was carried out in East Ayrshire in 2014. Monitoring was discontinued in 2005 due to the very low levels recorded.

Previous monitoring of sulphur dioxide showed no exceedences of Air Quality Objectives were found or predicted.

Previous assessment of sources of sulphur dioxide concluded that no exceedences of Air Quality Objectives were likely due to the reduction in domestic coal usage and industrial sources.

2.2.4 Benzene

No benzene monitoring was carried out in East Ayrshire in 2014. Monitoring of Benzene was discontinued in January 2008 due to the very low levels of benzene recorded.

Previous monitoring of benzene showed no exceedences of Air Quality Objectives were found or predicted.

Previous assessment of sources of Benzene concluded that no exceedences of Air Quality Objectives were predicted.

2.2.5 Other pollutants monitored

No other pollutants, included in the Regulations for the purpose of Local Air Quality Management in Scotland, were monitored by East Ayrshire Council in 2014.

2.2.6 Summary of Compliance with AQS Objectives

East Ayrshire Council has examined the results from the 2014 monitoring stations within East Ayrshire. Concentrations are all below the objectives with the proviso that the BAM 1020 technology is indicating PM_{10} exceedence. With the updated data for 2014 comparative trial East Ayrshire Council will submit an update to the 2013 Detailed Assessment.

3 Road Traffic Sources

In order to provide an assessment of road traffic sources for this report, the most up to date information on traffic flows on several roads within East Ayrshire was obtained from the Traffic Section, East Ayrshire Council and Transport Scotland.

The following sources were considered:-

- Narrow congested streets with residential properties close to the kerb.
- Busy streets where people may spend one hour or more close to traffic.
- Roads with a high flow of buses and/or HGVs.
- Junctions.
- New roads constructed or proposed since the last Round of Review and Assessment.
- Roads with significantly changed traffic flows.
- Bus or coach stations.

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Narrow congested streets were identified in previous rounds of Review and Assessment, including streets within Kilmarnock, Cumnock, Stewarton, the A71 which runs through Newmilns and the A76 which runs through Mauchline. These are at present subject to nitrogen dioxide monitoring with the exception of Cumnock where monitoring has now ceased due to the low measured values (Table 2.6). Exceedences of the Air Quality Objectives have been found for both NO_2 and for PM_{10} within Kilmarnock Town Centre in 2010 and PM_{10} only during 2011, 2013 and 2014 using BAM technology. (Refer to Section 2). Automatic monitoring for both NO_2 and PM_{10} and diffusion tube monitoring for NO_2 is continuing within Kilmarnock Town Centre (Table 2.3, Table 2.4, 2.5, 2.6, 2.7 and 2.8).

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

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

Busy streets within East Ayrshire with significant numbers of shops were previously assessed in previous rounds of Review and Assessment.

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

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

Roads with potentially a high flow of buses and/or HGVs were assessed in previous rounds of Review and Assessment.

East Ayrshire Council confirms that there are no new/newly identified roads with high flows of buses/HGVs.

3.4 Junctions

Busy roads and junctions (greater than 10,000 vehicles per day), with relevant exposure, were assessed in previous round of Review and Assessment. Where necessary, these junctions and busy roads are subject to further air quality monitoring (Table 2.3, Table 2.4, 2.5, 2.6, 2.7 and 2.8).

East Ayrshire Council confirms that there are no new/newly identified busy junctions/busy roads.

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

No new roads have been built within East Ayrshire since the last round of Review and Assessment, with either, traffic flow of greater than 10,000 vehicles a day, or, which have increased traffic flow significantly on existing roads having a NO_2 annual mean greater than 36µg/m^3.

East Ayrshire Council confirms that there are no new/proposed roads.

3.6 Roads with Significantly Changed Traffic Flows

There are no roads within East Ayrshire, with traffic flows of greater than 10,000 which have experienced “large” increases (>25%) in traffic.

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

3.7 Bus and Coach Stations

East Ayrshire Council has two bus stations, one in Kilmarnock and one in Cumnock. Kilmarnock Bus Station has 850 bus movements per day and Cumnock has 420 bus movements per day. These numbers of movements are well below the criteria, of 2500 movements per day, required for an assessment of NO_2 and PM_{10} to be carried out.

East Ayrshire Council confirms that there are no relevant bus stations in the Local Authority area.

New developments which may have an impact on road traffic emissions

Two developments which have the potential to have a peak period, localised increase in road traffic are the new **Kilmarnock College Campus** under construction on the old Diageo Johnnie Walker whisky bottling plant and the new **Kilmarnock Learning Campus** which will replace two secondary schools, two primary schools and incorporate a new early learning centre and new grass and synthetic pitches for school and community use.

The new **Kilmarnock College Campus** is a replacement for the old Kilmarnock College located on Holehouse Road and is therefore unlikely to generate more traffic than the previous college but will obviously have different impacts on different roads. The new college is located on the edge of the town centre within close proximity to the rail and bus stations which should encourage use of public transport. It is also close to cycling routes and within walking distance for many students. A travel co-ordinator will be responsible for promoting and developing the college travel plan to encourage non car based transport and in particular walking and cycling to promote

health and fitness. The original travel assessment, submitted as part of the planning application, outlined the increase in traffic on routes likely to be used by students and staff and concluded that there would be an increase in traffic on the one way system at peak morning and afternoon periods but junctions affected would still continue to operate satisfactorily. The transport assessment can be accessed on East Ayrshire Council's Planning Website. (Planning Application No. 12/0883/PPP). The increase in traffic from the new college and its impact on air quality will be considered in more detail in the updated Detailed Assessment.

A recent update to the college planning application is for the creation of a new access road directly off the Western Road in Kilmarnock to the new college campus, which will lessen the impact of college traffic in the town centre.

The new **Kilmarnock Learning Centre** is a replacement for existing premises and therefore pupil numbers are unaffected. Trips to and from the school will be on average longer, leading to an increase in car journey numbers and length, with more pupils also travelling by bus. Again an active travel plan will help encourage walking and cycling. The travel assessment indicated that the impact on junctions would not be substantial, particularly as the new school will be located on the site of the existing James Hamilton Academy and New Farm Loch Primary School, two of the schools being replaced, and the site is in a location where road traffic is generally light. The use of community pitches will result in a small increase in vehicular traffic but this will tend to be in the evening, weekends and holiday periods when traffic numbers are generally light. The original proposal incorporated a biomass boiler for heating and hot water but will now be provided by modern efficient clean burning gas boilers. The impact of traffic on air quality will be assessed as part of the updated Detailed Assessment. The transport assessment can be accessed on East Ayrshire Council's Planning Website. (Planning Application No. 15/0375/PP).

4 Other Transport Sources

4.1 Airports

East Ayrshire Council confirms that there are no airports in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

Information on rail transport was obtained from ScotRail and Network Rail

4.2.1 Stationary Trains

East Ayrshire has 6 railway stations in the towns of Kilmarnock, Kilmaurs, Stewarton, Dunlop, New Cumnock and Auchinleck, with Kilmarnock being the largest with a weekday hourly service to Glasgow (half hourly during the day), nine daily services to Dumfries and Carlisle with three through to Newcastle, seven trains to Ayr with four through to Stranraer. Kilmarnock station has an annual passenger usage of 421,000 (2009/2010). Kilmarnock is the only station with the potential for trains to be stationary for over the 15 minute criteria for further assessment. Information from ScotRail indicates that diesel locomotives have their engines shut off before being stationary for 15 minutes, and in any case, have an automatic cut-off fitted to the engine which activates on a timer after the engine is stationary for 15 minutes. There are also no more than two trains in the station at any one time. There is also no residential housing or shops within 15 m of the station. It is therefore unlikely that members of the public will be exposed to 15 minute levels of SO_2 above 266 µg/m^3.

East Ayrshire has two operational rail sidings for loading and movement of coal, Killoch, Ochiltree and one at New Cumnock. There is also a railway carriage refurbishment works, Brush Barclay, located at the Caledonia Works, Kilmarnock. These utilise diesel shunters, which although may be stationary for more than 15 minutes, are located more than 15m from people with relevant exposure.

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

4.2.2 Moving Trains

East Ayrshire has no railway lines with a high usage of diesel locomotives. No further assessment for NO_2 levels is therefore required.

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

4.3 Ports (Shipping)

East Ayrshire Council confirms that there are no ports or shipping within the Local Authority area.

East Ayrshire Council confirms that there are no ports or shipping within the Local Authority area.

5 Industrial Sources

Information on installations regulated under the Pollution Prevention and Control (Scotland) Regulations 2000 as either Part A or Part B processes was obtained from SEPA. The list of authorised processes is set out in Appendix D.

The local plan currently in force within the East Ayrshire unitary authority is the **East Ayrshire Council local Plan (2010)** (Reference 14). It contains the following policy which is used to assess planning applications:-

Policy ENV25

The Council will require all developers to ensure that their proposals have minimal adverse impact on air quality and will require air quality assessments to be undertaken in respect of any proposed developments which it considers may significantly impact on air quality. The Council will also ensure that any new development will have minimum adverse effects on the physical environment and the amenity of an area as a result of light and noise pollution. Appropriate conditions and Section 75 Agreements will be attached to individual planning consents to ensure that environmental impacts caused by air, light and noise pollution are minimised wherever possible.

East Ayrshire Council Environmental Health assess each planning application for the air quality impact using LAQM.TG(09) and Environmental Protection UK (EPUK) Biomass Guidance for Scottish Local Authorities (Ref. 27).

5.1 Industrial Installations

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

Information on any new or proposed installations for which an air quality assessment has been carried out was obtained from SEPA and East Ayrshire Council Planning Department. It was concluded that all new or proposed installations have been assessed in previous reports.

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

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

Information obtained from SEPA and East Ayrshire Council Planning Department indicates that there is one existing installation where emissions have substantially increased and for which planning approval has been granted since the last Updating and Screening Assessment, namely **Shield Mains Animal Feed Production Facility** at Coylton. A PM_{10} based air quality assessment, using ADMS-5 and 5 years of meteorological data (Prestwick), was submitted as part of the planning process and can be accessed on the East Ayrshire Council planning website (Planning Reference No. 15/0235/PP). The assessment concluded that no significant impact on local air quality would occur. Three sources of pollutant emission were identified at the proposed extension; two main process vents and a diesel fired boiler flue. Other potential sources of PM_{10} releases from the facility were judged to be limited to minor fugitive sources and were not included in the assessment.

The background concentration of PM_{10} (2014) was determined at 10.6$\mu g/m^3$ well below the objective of 18$\mu g/m^3$. The predicted annual mean and 98.08th Percentile of 24-Hour Mean at the onsite receptor, where concentrations were predicted to be highest, were 11.4$\mu g/m^3$ and 43.3$\mu g/m^3$ respectively. The PM_{10} impacts associated with the operation of the facility were thus judged to be insignificant particularly since assumptions were made that the process would operate 24 hours per day, 365 days per year which is not a likely scenario.

East Ayrshire Council has assessed industrial installations with <substantially increased emissions> <new relevant exposure in their vicinity>, and concluded that it will not be necessary to proceed to a Detailed Assessment since an Air Quality Assessment formed part of the planning application.

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

Information obtained from SEPA and East Ayrshire Council Planning Department indicates that there are no new or significantly changed installations where no previous air quality assessment was carried out.

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

5.2 Major Fuel (Petrol) Storage Depots

Information obtained by SEPA and from Appendix E of LAQM TG(09), confirms that there are no major fuel storage depots within East Ayrshire.

There are no major fuel (petrol) storage depots within the East Ayrshire Council area.

5.3 Petrol Stations

East Ayrshire Council has only one petrol station which has both an annual throughput of petrol greater than 2,000 m^3 and is situated adjacent to a busy road with more than 30,000 vehicles per day. Pace Petrol Station at the Bellfield Interchange, Kilmarnock sits adjacent to the intersection of the A77, A71, A76 and the A735. However, the nearest relevant exposure, a care home, is well in excess of 10m specified criteria, at 180m distant, and therefore, no detailed assessment for benzene is required.

East Ayrshire Council confirms that there are no petrol stations meeting the specified criteria**.**

5.4 Poultry Farms

East Ayrshire Council has seven poultry farms (Source; Scottish Government Rural Affairs Department) within its boundaries, two in the Mauchline area, three in the Stewarton area and two in the Muirkirk area. All seven have fewer than 40,000 birds, and therefore their numbers are well under the specified criteria for which a Detailed Assessment for PM_{10} would be required.

East Ayrshire Council confirms that there are no poultry farms meeting the specified criteria.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

Biomass boilers are assessed as part of the planning process using EPUK Biomass Guidance (Ref 27) and initial use of spreadsheet biomass nomograms or biomass screening tools.

The procedure set out in Section D.1a Chapter 5, TG(09) for biomass combustion was followed. Biomass boilers in the 50kW to 20 MW were identified and assessed using EPUK Guidance. Screening assessments are inherently conservative – they are worst case scenarios to ensure that worst cases (in terms of emissions and dispersion) are captured by the tool. If the screening tool predicts a significant impact on local air quality then more detailed assessment is required using a dispersion model that will model the emissions from the boiler to ascertain if they are significant.

If the screening assessment show an unacceptable impact on air quality the applicant is asked to commission a more detailed assessment using dispersion modelling. Dispersion modelling is also used to calculate the stack height necessary to ensure adequate dispersal of pollutants (however stack heights may be restricted by other considerations within the planning regime).

Several biomass combustion plants in the 50kW to 20MW range were identified since the last submitted report during the planning process as follows:-

1/ Torrance Lodge Nursing Home, Hurlford; installation of 4 number 300kw total capacity wood chip boilers. The screening tool was unable to be used in this case since the flu height was lower than the adjacent nursing home. Due to the nature of the business with 24 hour occupancy, ADMS dispersion modelling was carried out using 4 flue heights and 5 years meteorological data. A recommended flue height of 6.5m was specified to give acceptable maximum modelled PM_{10} annual mean of 14.4 $\mu g/m^3$ and modelled NO_2 annual mean of 26.5 $\mu g/m^3$ at any receptor. The full Air Quality Impact Assessment can be accessed on East Ayrshire Council Planning website (application number 14/0436/PP).

2/ Glennie House Nursing Home, Auchinleck; installation of 2 number, 180kw total capacity wood chip boilers. The screening tool was unable to be used in this case since the flu height was lower than the adjacent nursing home. Due to the nature of the business with 24 hour occupancy ADMS dispersion modelling was carried out using 3 flue heights and 5 years meteorological data. A recommended flue height of 6.3m was specified to give acceptable maximum modelled PM_{10} annual mean of 13.7 $\mu g/m^3$ and modelled NO_2 annual mean of 22.8 $\mu g/m^3$ at any receptor. The full Air Quality Impact Assessment can be accessed on East Ayrshire Council Planning website (application number 14/0426/PP).

3/ Campbell Fuels, Kilmarnock: installation of 5 biomass, 4 number 199kW wood chip boilers to dry wet woodchip for sale and to fuel the boilers plus 1 number 199kW woodchip boiler to provide onsite hot water. The screening tool was unable to be used in this case since the flu height was lower than the adjacent buildings. Due to

the fact the boilers are situated close to a primary school (Kirkstyle Primary School) and residential properties, ADMS-5 dispersion modelling was carried out, using an initial stack height of 6.5m (since this was already installed at the date of assessment), and using 3 years meteorological data.

The modelling concluded that for NO_2 there is sharp reduction in the maximum process contribution when increasing the stack height to between 7.5 m and 8.5 m, and then there is a noticeable reduction in benefit thereafter. Similarly for PM_{10}, it can be seen that there is sharp reduction in the maximum process contribution when increasing the stack height to between 7.5 and 8.5 m, and then there is a noticeable reduction in benefit thereafter. The maximum impact occurs within the industrial yard where the objectives do not apply (Table 5.5 and 5.6 below)

Table 5.5: Stack Height Sensitivity Analyses - Annual Mean NO_2 **Stack Height (m)**	**PC (µg/m3)**	**PEC (µg/m3)**	**Impact Magnitude**	**Absolute Concentration in Relation to Objective**	**Significance**
6.5	39.1	52.1	Large	Above	Substantial Adverse
7.5	20.7	33.7	Large	Below	Slight Adverse
8.5	7.7	20.7	Large	Well below	Slight Adverse
9.5	5.9	18.9	Large	Well below	Slight Adverse
10.5	4.2	17.2	Large	Well below	Slight Adverse

Table 5.6: Stack Height Sensitivity Analyses - Annual Mean PM_{10} **Stack Height (m)**	**PC (µg/m3)**	**PEC (µg/m3)**	**Impact Magnitude**	**Absolute Concentration in Relation to Objective**	**Significance**
6.5	15.3	27.7	Large	Above	Substantial Adverse
7.5	8.1	20.5	Large	Above	Substantial Adverse
8.5	3.1	15.5	Large	Below	Slight Adverse
9.5	2.3	14.7	Large	Below	Slight Adverse
10.5	1.7	14.1	Medium	Below	Slight Adverse

Please note the tables refer to the maximum pollutant levels (assuming the plant runs 24hrs a day 365 days a year) and are well within the boundary of the industrial yard where LAQM does not apply. PM_{10} and NO_2 drop off rapidly from the maximum levels within Campbell Fuels yard leading to maximum resulting increases of 0.9 µg/m^3 and 2.2 µg/m^3 respectively, at any relevant receptor with a 6.5m stack height (Table 4.4 – Table 4.10 Air Dispersion Modelling Report). Increasing the stack height to 7.5m reduces the process contribution of NO_2 and PM_{10} by nearly 50%. No exceedences of the NO_2 1-hour mean or the PM_{10} 24-hour mean were predicted. The existing stack heights of 6.5 m did not lead to any exceedences of air quality objectives in areas where they apply, and can therefore be considered acceptable. However, significant reductions in local process contributions can be achieved by increasing the stack heights to between 7.5 to 8.5 m, and this merited consideration. The site's impact upon the town centre, an area which could potentially be assigned an AQMA, was considered to be insignificant.

The statement below was submitted by Environmental Health in response to the planning consultation after completion by the applicant of air dispersion modelling.

Campbell Fuels Hurlford Planning Reference 14/0324/PP
Erection of a steel portal framed industrial shed to house 4 biomass boilers – Environmental Health Response to Planning

As requested by Environmental Health air dispersion modelling (documents attached) has now been carried out by Mabbet on behalf of Campbell Fuel Oils. The applicant was asked to assess the impact of the two major pollutants with regard to Local Air Quality Management (LAQM), namely nitrogen dioxide (NO_2) and particulates with a mean aerodynamic size of less than or equal to 10 microns (PM_{10}) on nearby receptors including Kirkstyle Primary School and residential housing, as well as town centre hotspots within or adjacent to Kilmarnock Town Centre.
To summarise, with the stack height of 6.5m as submitted by the applicant, modelled annual mean process contributions at most of the selected receptors are generally screened out as insignificant, including town centre receptors. There are five local residential and school receptors, including Kirkstyle Primary School, Annan Road, Carron Avenue and Hurlford Road where screening does not occur, however when background concentration are included for these receptors the calculated predicted environmental concentration values are comfortably below associated air quality objectives. The modelled short term ($NO_2$1-hour mean and PM_{10} 24-hour mean) process contributions at all selectors are screened out as insignificant.

The applicant was also asked to carry out a stack height sensitivity analysis. Increasing stack height reduces the concentration of pollutants at nearby receptors but will increase pollutant concentration at remote receptors, although in this case insignificant. To strike a balance to lower concentrations at the nearby primary school, nearby residential properties and within the works Environmental Health requested the applicant to raise the height of the flue. The applicant has agreed to raise the flue height from 6.5m to 7.5 m and this is deemed acceptable and therefore Environmental Health would wish to withdraw their objection with regards to Local Air Quality Management with the proviso that given the close proximity of the proposed development to a primary school, residential properties and other receptors it is suggested that odours from the combustion process may well give rise to complaints,

in which case this Service would be required to investigate under the Statutory Nuisance provisions of the Environmental Protection Act 1990, and to take action to secure abatement if necessary.

For extra reassurance Environmental Health has also located several nitrogen dioxide diffusion surrounding the plant to monitor NO_2 levels. NO_2 levels recorded to date are low and within levels normally found within residential areas in Kilmarnock.

The full Air Quality Impact Assessment can be accessed on East Ayrshire Council Planning website, application number **14/0324/PP.**

East Ayrshire Council has assessed biomass combustion plant, and concluded that **it has been necessary to proceed to a Detailed Assessment for NO_2 and PM_{10} for several planning applications and these are included above.**

6.2 Biomass Combustion – Combined Impacts

The procedure set out in Section D.1b of Chapter 5, TG(09) was followed.

An assessment of domestic solid fuel burning was carried out in previous LAQM assessments (see 6.3 below). The assessment indicated that due to the low density of domestic solid fuel burning no exceedences were likely. As there are only three known new biomass installations in East Ayrshire, since the last report, within the 50kW – 20MW range, and two of these are in semi rural areas, the combined impact is likely to be low at present, and therefore it is not necessary to carry out a Detailed Assessment of the combined impacts of biomass combustion on PM_{10} levels at this time.

It should be noted that East Ayrshire Council Environmental Health Service is having to deal with increasing numbers of complaints from wood burners (which by-pass the planning system) and the likely combined impact is most likely greater than the previous statement would suggest. Environmental Health tries to discourage biomass combustion where access to the gas grid is possible, and in any case, in urban areas due to the increasing number of nuisance calls. Automatic monitoring within Kilmarnock would suggest decreasing level of both NO_2 and PM_{10} indicating biomass combustion is not a significant problem as far as LAQM is concerned, but if any reversal in this trend occurs, combined impacts of biomass combustion would need to be re-visited.

East Ayrshire Council has assessed biomass combustion – combined impacts and concluded that it will not be necessary to proceed to a Detailed Assessment for PM_{10} at this time.

6.3 Domestic Solid-Fuel Burning

As previously mentioned an assessment of domestic solid fuel burning was carried out in previous LAQM assessments. Some physical checks were undertaken in some of the former traditional mining areas to check whether any significant coal burning was still taking place (using the checklist procedure contained in LAQM.TG(03). The results were much less than anticipated, and were substantially less than half of the suggested trigger of 100 houses per 500 by 500 metre grid squares burning solid fuel. Since this research was carried out, the number of houses burning coal has declined significantly, and therefore East Ayrshire Council confirms there are no issues with regards to sulphur dioxide due to domestic solid fuel burning. Past monitoring also confirms low levels of sulphur dioxide throughout the council area. Therefore, no Detailed Assessment for domestic properties burning solid fuel (SO_2 concentrations) is required at this time.

East Ayrshire Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

7 Fugitive or Uncontrolled Sources

Quarrying and mineral extraction sites
Landfill Sites
Coal and material stockyards, or materials handling
Major construction works
Unmade haulage roads on industrial sites
Waste transfer stations etc
Other potential sources of fugitive particulate emissions

The procedure set out in Box E of chapter 5, TG(09) was followed.

Opencast Coal Extraction

Open cast coal has reduced considerably since the last USA due to the collapse in 2013 of two large operators, Scottish Coal and ATH Resources, cutting operational mines by over fifty percent at the time (2013) to four operational mines. At the time of writing the report, only three mines are presently operational namely House of Water, New Cumnock, Greenburn, New Cumnock and Netherton, Cumnock with the latter coaling operations due to be completed in February 2016. It is unlikely this will change unless coal prices rise substantially.

All opencast operations/extensions have to produce an Environmental Statement as part of the planning application. An Environmental Statement (ES) is a detailed report which contains the findings of an assessment of the potential impacts of the proposed development upon the environment, referred to as an Environmental Impact Assessment (EIA). EIAs are undertaken in accordance with the Environmental Impact Assessment (Scotland) Regulations 1999. As part of the Environmental Statement an Environmental Impact Assessment is undertaken of all impacts that coal extraction will have on the environment. Part of the Environmental Assessment includes an Air Quality Assessment. They are all similar in nature and have been covered in previous reports. The potential rise in PM is assessed from coal extraction, handling and transport. Coal handling processes at the mines are subject to control under Section 3.4 Part B of Schedule 1 of the Pollution Prevention and Control (Scotland) Regulations 2000. Mine support area and coal handling operations are subject to “Part B” regulation by SEPA and authorisation is required to be varied when any of the extensions to currently operating surface mines are approved. All applications have submitted an Environmental Impact Assessment incorporating an Air Quality Assessment as part of the planning application. Proposed dust mitigation measures are also submitted as part of the application. With these mitigation measures in place, the majority of dust will be controlled at source. East Ayrshire Council have a transportation of coal by road protocol which addresses issues such as dust suppression measures in terms of the use of wheel and body washing, sweeping of public roads and the dampening of internal haul roads during dry and windy weather conditions.

The revised technical guidance for local air quality management (LAQM.TG(09)) requires that detailed assessments should be conducted where there is any potential exposure within 200m of any source, irrespective of background. Detailed assessment of PM_{10} exposure for receptors more than 400m from mines and

quarries is unlikely to be required provided the annual mean background is <16 µg/m^3, implying that the contribution from fugitive dust operations is unlikely to exceed 2 µg/m^3 within 400m. The guidance also suggests that the level of complaints and dust at the site access to the public road should be taken into account. There have been no recorded complaints about dust from surface mines since the last Updating and Screening Assessment. Since the background PM_{10} is relatively low where open cast mining is taking place in East Ayrshire at less than 9 µg/m^3 (Scottish Background Maps Reference 12) (excluding industry contribution), a worst case scenario of a process contribution of 5 µg/m^3 close to the operational areas would still produce PM_{10} well below the 18 µg/m^3 annual Air Quality Objective. Actual monitoring at New Cumnock from 2009 to 2011 recorded actual annual mean levels within the town at between 9 and 12 µg/m^3,well below the annual Air Quality Objective. At these levels only one exceedence of the 24-hour mean of 50 µg/m^3 was predicted at any of the sites, well within the Air Quality Objective of a maximum of 7 exceedences per year. New Cumnock Air Quality Monitoring site experienced no exceedences of the 24-hour mean during 2009, 2010, or 2011. Similarly a worst case scenario for $PM_{2.5}$ of a process contribution of 2.5 µg/m^3 would produce $Pm_{2.5}$ levels well below the proposed $PM_{2.5}$ levels of 10 µg/m^3 since background levels (excluding industry contribution) in areas subject to open cast are at or below 6 µg/m^3. Actual levels at receptors are significantly lower than the worst case scenario, as PM levels drop off with distance from the working area, and are therefore likely to be well within the Air Quality Objectives.

Proposed mitigation for effective dust management requires integrated action on three aspects of control, design and engineering control, adequate process supervision and effective monitoring and review. The measures proposed are outlined in the Dust Management Plans submitted as part of the Environmental Statements.

To summarise, the impacts at receptors within the vicinity of coal extraction and preparation are likely to be of minor adverse significance, with proper mitigation as outlined in the Air Quality Assessments. Emissions from the coaling operations are very much reduced and no further assessment is needed at this time. The air quality impact from open cast restoration work will be discussed and assessed as part of the 2016 Progress Report.

Further information and viewing of relevant documents, including Environmental Statements, can be obtained from:-

East Ayrshire Council
Planning and Economic Development Services
Department of Neighbourhood Services
The Johnnie Walker Bond
15 Strand Street
Kilmarnock
KA1 1HU

Other Fugitive Sources

Quarries

The procedure set out in Box E of chapter 5, TG(09) was followed as previously outline for open cast mines.

One new quarry has received planning permission since the last Report, namely Townhead of Greenock Sand and Gravel Quarry, Muirkirk. The quarry comprises 40.56 Ha of principally semi improved agricultural land 4km to the west of Muirkirk and 10km north east of Cumnock and involves the phased removal of 200'000 to 3000,000 tonnes of sand and gravel annually over a period between 12.5 and 18.5 years, processed and transported by road mainly to Ayrshire based business activities. In addition a period of 9 months site restoration is anticipated.

An Air Quality Assessment was undertaken as part of the planning process to assess the impact on air quality. Both visible and smaller particles were included due to the activities associated with quarry including site preparation and restoration, haulage, excavation activities, storage and processing. Impacts from traffic emissions on local air quality were screened out of further assessment as traffic generated by the proposed development were below the relevant criteria.

A semi-quantitative assessment of deposited dust was undertaken; this identified the potential sources of dust onsite. Neighbouring receptors were ranked in terms of the risk of dust impact which is dependent on the distance from the site boundary, the frequency of wind direction and rainfall patterns. The majority of the receptors identified were considered to be at an insignificant risk of dust emissions. One receptor, Townhead of Greenock, was assessed as having an acceptable risk of impact. The property is the only receptor which is within 500m of the site boundary, being located 120 m to the south of the quarry operations. The 2013 PM_{10} concentration from background maps was 9.1 $\mu g/m^3$. Assuming a maximum process contribution of 5 $\mu g/m^3$ the PM_{10} maximum concentration for near receptors would be 14.1 $\mu g/m^3$ well below the 18 $\mu g/m^3$ Scottish annual mean Objective.

Mitigation measures were recommended and are in accordance with best practice measures. Regardless of the implementation of these recommended measures the report considered that the potential dust impacts at Townhead of Greenock would not be significant. All potential dust impacts from the proposed development are considered to be reversible i.e. the risk impact will cease on completion of the extraction and restoration activities at the site. The impacts from the proposed quarry are considered to be medium term with no significant impacts on local air quality resulting from the proposed development. Environmental Health confirms the submitted air quality assessment is sufficient for Review and Assessment purposes.

There has been only one potential dust complaint from open cast coal operations in recent years (covered previously in the 2012 USA). There have been no dust complaints from existing quarries or existing landfill sites (or other fugitive sources) since the 2012 USA.

There are no other new fugitive sources within East Ayrshire which are likely to have a detrimental impact on air quality. The full Air Quality Report can be accessed on the East Ayrshire Council Planning website (planning reference No. 12/0831/PP).

East Ayrshire Council confirms that there are a number of potential sources of fugitive particulate matter emissions in the Local Authority area. These have been assessed and no further action is required.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

Both automatic and passive monitoring for NO_2 carried out during 2014 resulted in no exceedences of the Annual Mean Air Quality Objective at all monitoring locations within East Ayrshire (Figures 2.3, 2.4, 2.5 and 2.6). One exceedence of the 1-hour mean occurred during 2014 at St. Marnock St., well below the 18 times a year Hourly Mean Air Quality Objective.

Automatic monitoring of PM_{10} at the John Finnie Street monitoring site indicated (part year measurements annualised at 15 µg/m^3) an annual mean level below the Air Quality Objective (18 µg/m^3) (Figures 2.7). An Annual Mean level of 20µg/m^3 was recorded at St. Marnock St. using the BAM 1020 and was therefore in exceedence of the Annual Mean Air Quality Objective. Referring to the earlier discussion preferred TEOM FDMS technology indicates compliance with the annual mean Air Quality Objective within the one way system in Kilmarnock and this has been confirmed by the 11 µg/m^3 (10 µg/m^3 annualised) recorded by the collocated TEOM FDMS monitor at St. Marnock St.. East Ayrshire Council are proceeding with an update to the 2013 Kilmarnock Town Centre Detailed Assessment bringing together recent monitoring data from both monitoring technologies. This should be completed early in 2016.

No exceedences of the PM_{10} 24-hour mean occurred at the John Finnie St. site during 2014 (98.08th percentile of 27 µg/m^3). 2 exceedences of the 24-hour Mean Objective occurred at St. Marnock St. during 2014 using BAM technology. TEOM FDMS technology recorded no exceedences of the 24 Hour Mean. As previously discussed the apparent divergence is likely due to the differences in technology.

There has been a slight downward trend in both diffusion tube measured NO_2 annual mean (Figure 2.4) since 2006 and a general downward trend in measured PM_{10} annual mean at the John Finnie St. monitoring site since 2010 (Table 2.7), although the latter is certainly partly due to the previously discussed differences in monitoring technology.

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.

8.2 Conclusions from Assessment of Sources

All the following have been considered:

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

Potential new sources are all screened at the planning application stage using appropriate guidance including TG (09) and EPUK Guidance and if this indicates significant potential air quality issues, the applicant will be asked to submit a detailed air quality assessment (if not already included in the application).

New Planning Applications

Of particular concern for local air quality within East Ayrshire is the rise in the number of biomass installations. The smaller log burners bypass the planning system and it is therefore difficult to ascertain the cumulative effect they will have on air quality. What we do know is that Environmental Health is now receiving more smoke related complaints from these log burners and they are often replacing cleaner burning gas fires. The larger installations are also of concern, particularly installations within Kilmarnock where levels of NO_2 and PM_{10} are already raised due mainly to vehicular traffic. Research recently published in the Scottish Farmer (Reference 25) is also suggesting that the efficiency levels quoted by manufacturers at over 90% are very optimistic and actual levels are nearer 55 – 75%.

All new local developments (or proposed developments) which may have a significant effect on air quality have been covered in Section 3 to 7. The developments which may have a significant impact on air quality have either submitted air quality assessments which have been considered acceptable to Environmental Health or in the case of applications for biomass boilers, where initial screening highlighted a problem, Environmental Health have requested dispersion modelling, which deemed the air quality impact to be acceptable (although often with the requirement for raised stack heights).

In conclusion, although all new sources would have a localised impact on air quality, all pollutants included in the Regulations for the purpose of Local Air Quality Management in Scotland would be well within the Air Quality Objectives in the areas affected by these.

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 Plan (2010)** (Reference 14). It contains the following policy which is used to assess planning applications:-

Policy ENV25

The Council will require all developers to ensure that their proposals have minimal adverse impact on air quality and will require air quality assessments to be undertaken in respect of any proposed developments which it considers may significantly impact on air quality. The Council will also ensure that any new development will have minimum adverse effects on the physical environment and the amenity of an area as a result of light and noise pollution. Appropriate conditions and Section 75 Agreements will be attached to individual planning consents to ensure that environmental impacts caused by air, light and noise pollution are minimised wherever possible.

In conclusion this updated policy 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.

8.3 Proposed Actions

Further automatic monitoring for both PM_{10} and NO_2 will be continued within Kilmarnock Town Centre to ascertain whether the downward trend in PM_{10} and NO_2 is for the long term and air quality objectives continue to be met. 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 2.5 and 2.6). 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 as several years monitoring has indicated levels of NO_2 are well below Air Quality Objectives. In the future if any location is subject to substantial change, e.g. substantial change in traffic flow, NO_2 diffusion tubes will be used as a screening tool in the first instance. As previously discussed a comparative trial is being carried out for 2 years with the co-location of a BAM1020 and a TEOM FDMS PM_{10} monitor with funding from the Scottish Government. Conclusions from this trial will be included in the 2016 Progress Report.

As PM_{10} levels exceeded the Annual Air Quality Objective using the BAM 1020 monitoring technology East Ayrshire Council is proceeding with an update of the 2013 Kilmarnock Town Centre Detailed Assessment in early 2016.

The next course of action for East Ayrshire Council will therefore be the submission of an updated Detailed Assessment for PM_{10} and NO_2 within Kilmarnock in early 2016 and submission of the 2016 Progress Report.

9 References

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Appendices

Appendix A:

QA/QC Data: Defra and The Devolved Administrations, Spreadsheet of Bias Adjustment Factors, Version Number 09/13. Accessed at www.uwe.ac.uk/agm/review/index.html

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 09/15

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 March 2016

LAQM Helpdesk Website

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

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

Step 1:	Step 2:	Step 3:	Step 4:								
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	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 a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no [2] data	If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953								
Analysed By[1]	Method	Year[5]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m^3)	Automatic Monitor Mean Conc. (Cm) (µg/m^3)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)	
Glasgow Scientific Services	20% TEA in water	2014	KS	Glasgow City Council	10	75	65	14.6%	P	0.87	
Glasgow Scientific Services	20% TEA in water	2014	KS	Marylebone Road Intercomparison	12	101	80	26.4%	G	0.79	
Glasgow Scientific Services	20% TEA in water	2014		Overall Factor[3] (2 studies)				Use		0.83	

Appendix B: Monthly NO_2 Diffusion Tube Data

East Ayrshire Monthly NO_2 Diffusion Tube Data 2014 ($\mu g/m^3$)

Bias Factor	0.83														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		Raw Mean	Corrected Mean (Bias Factor 0.83)
1. Fowlds Street/King Street Junction, Kilmarnock	37.8	27.7	30.9	35.2		12.6	27.6	23.6	37.1	33.5	21.9	33.4	11	29.21	24.24
2. 28 John Finnie Street, Kilmarnock	43.8	26.1	28.5	40.9	37.8	14.2	27.9	22	31.9	35.6	32.8	37.1	12	31.55	26.19
3. 19 Lainshaw Street, Stewarton	28.8	25.6	30.8	33.9	32.2	15	30.5	23.4	35.7	31.3	14.9	32.7	12	27.90	23.16
4. 40 Main Street, Newmilns	34.3	32.7	26.1	33.2	35.4	12.7	24.3	22.8	32.3	29	37.5		11	29.12	24.17
6. 8A Kilmarnock Road, Mauchline	35.6	22.6	28.5	34.6	37.8	12.1	27.4	22.3	31.2		29.8	28.2	11	28.19	23.40
11. 96 John Finnie Street, Kilmarnock	33.9	36	29.1	33.4	37.7	14.9	25.3	22.6	35.9	31.7	27.3	32.5	12	30.03	24.92
12. 62 John Finnie Street Kilmarnock	31.6	31.4	32.4	36.6	43.9	10.4	28.5	25.6	36.2	38.7	32.1	39.7	12	32.26	26.77
14. 95/97 John Finnie Street, Kilmarnock	42.4	40.1	34.3	41.5	37.9	13.8	30	38.7	41.6	36.8	29.5	47.4	12	36.17	30.02
15. 16 West George Street, Kilmarnock	37.5	32.6	36.2	39.6	42.2	16.4	34.6	34.2	34.6	37.5	31.2	43.8	12	35.03	29.08
17. 22/25 Loudoun Road, Newmilns	42.4	28.5	32.4	30.6	35	13	25.7		30.9	33.7	35.6	36.7	11	31.32	25.99
23. 3/5 Loudoun Street, Mauchline	35.4	31.2	24.9	32.6	32.3	10.7	25.5	22.4	30.9	10.5	23.5	30.8	12	25.89	21.49
24. 5/7 Earl Grey Street, Mauchline	31.5	34.7	36.7	43.2	44.5		34.7	24.2	42.4	36.6	31.8	44.2	11	36.77	30.52

25. John Finnie Street Monitor	31.7	32.40	27.77	33.87	35.60	12.20	28.93	26.70	33.07	28.97	22.27	38.67	12	29.35	24.36
27. Junction King St./St. Marnock St., Kilmarnock	39.6	34.6	29.8	37	40	15.6	30.3	28.9	37.3	36.8	34.6	41.3	12	33.82	28.07
32. Kay Park**,** Kilmarnock	18.7	13.6	12.9	13	9.6	4.1	8.4	8.3	12.8	12.7	17.8	15.3	12	12.27	10.18
33. Howard Park, Kilmarnock	15.8	14.2	12.5	14.4	12.2	4.9	8.6	7.6	13.6	13.8	21.3	13.3	12	12.68	10.53
38. 16/18 Earl Grey Street, Mauchline			39.6	42.4	45	15.1	40.6	42.6	36.6	24.7	23.3	48.5	10	35.84	29.75

Appendix C: Results of Automatic Monitoring for NO_2 and PM_{10}

Produced by Ricardo-AEA on behalf of Scottish Government

EAST AYRSHIRE KILMARNOCK JOHN FINNIE ST
1st January to 31st December 2014

These data have been fully ratified by Ricardo-AEA

POLLUTANT	NO_2	NO_X	PM_{10}*+
Maximum hourly mean	172 µg m^{-3}	533 µg m^{-3}	95 µg m^{-3}
Maximum daily mean	85 µg m^{-3}	196 µg m^{-3}	45 µg m^{-3}
99.8th percentile of hourly means	134 µg m^{-3}	-	-
98.08th percentile of daily means	-	-	27 µg m^{-3}
Average	32 µg m^{-3}	71 µg m^{-3}	15 µg m^{-3}
Data capture	69.4 %	69.4 %	67.3 %

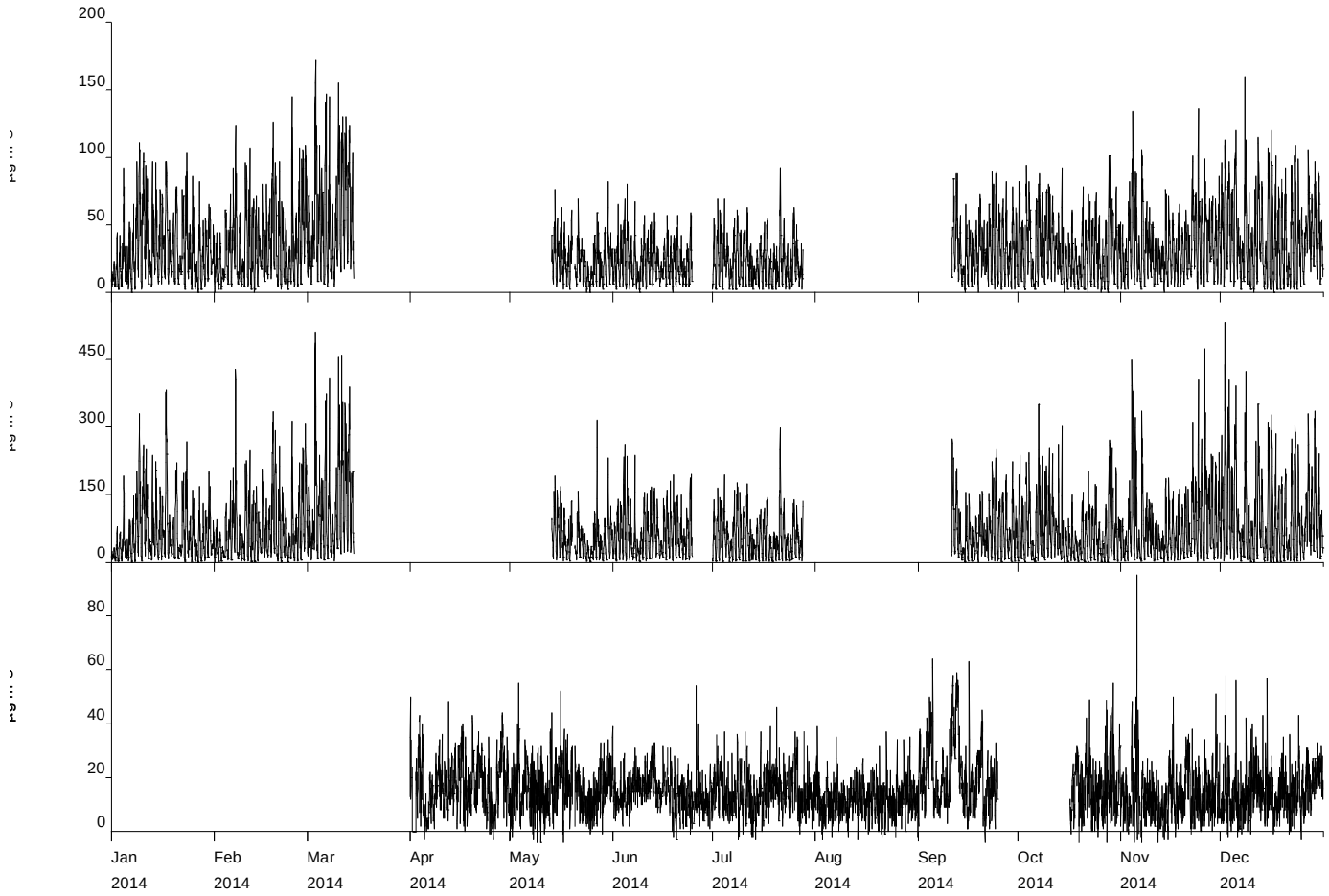
* PM_{10} as measured by a FDMS using a gravimetric factor of 1
All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.
NO_X mass units are NO_X as NO_2 µg m^{-3}

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

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

Produced by Ricardo-AEA on behalf of Scottish government

East Ayrshire Kilmarnock John Finnie St
Hourly Mean Data for 1st January to 31st December 2014



Date Created: 09/04/2015

Produced by Ricardo-AEA on behalf of the Scottish Government

EAST AYRSHIRE KILMARNOCK ST MARNOCK ST
1st January to 31st December 2014

These data have been fully ratified by Ricardo-AEA

POLLUTANT	NO_2	NO_X	PM_{10}*
Maximum hourly mean	233 µg m^{-3}	774 µg m^{-3}	142 µg m^{-3}
Maximum daily mean	65 µg m^{-3}	253 µg m^{-3}	62 µg m^{-3}
99.8th percentile of hourly means	118 µg m^{-3}	-	-
Average	30 µg m^{-3}	65 µg m^{-3}	20 µg m^{-3}
Data capture	83.3 %	83.3 %	94.1 %

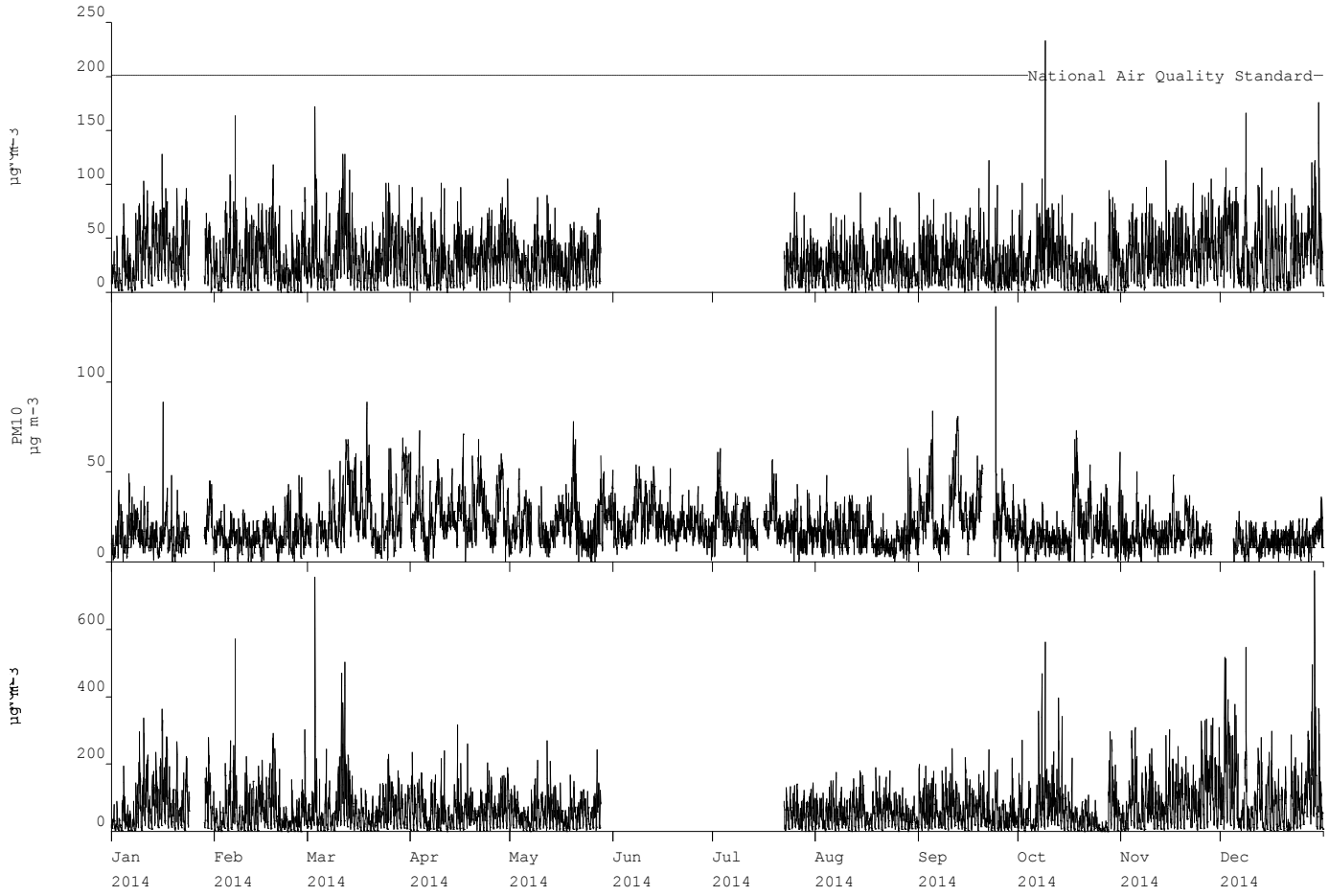
* PM_{10} instruments:
BAM using a gravimetric factor of 0.83333 for Indicative Gravimetric Equivalent from 1st January 2014
All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.
NO_X mass units are NO_X as NO_2 µg m^{-3}

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	1	1
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	2	2
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	1	-

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

Produced by Ricardo-AEA on behalf of the Scottish Government

East Ayrshire Kilmarnock St Marnock St
Hourly Mean Data for 1st January to 31st December 2014



Date Created: 09/04/2015

Produced by Ricardo-AEA on behalf of East Ayrshire Council

EAST AYRSHIRE ST MARNOCK ST FDMS
1st January to 31st December 2014

These data are fully ratified by Ricardo-AEA

POLLUTANT	PM_{10}+
Maximum daily mean	42 µg m^{-3}
90th percentile of daily means	18 µg m^{-3}
98.08th percentile of daily means	32 µg m^{-3}
Average	11 µg m^{-3}
Data capture	64.5 %

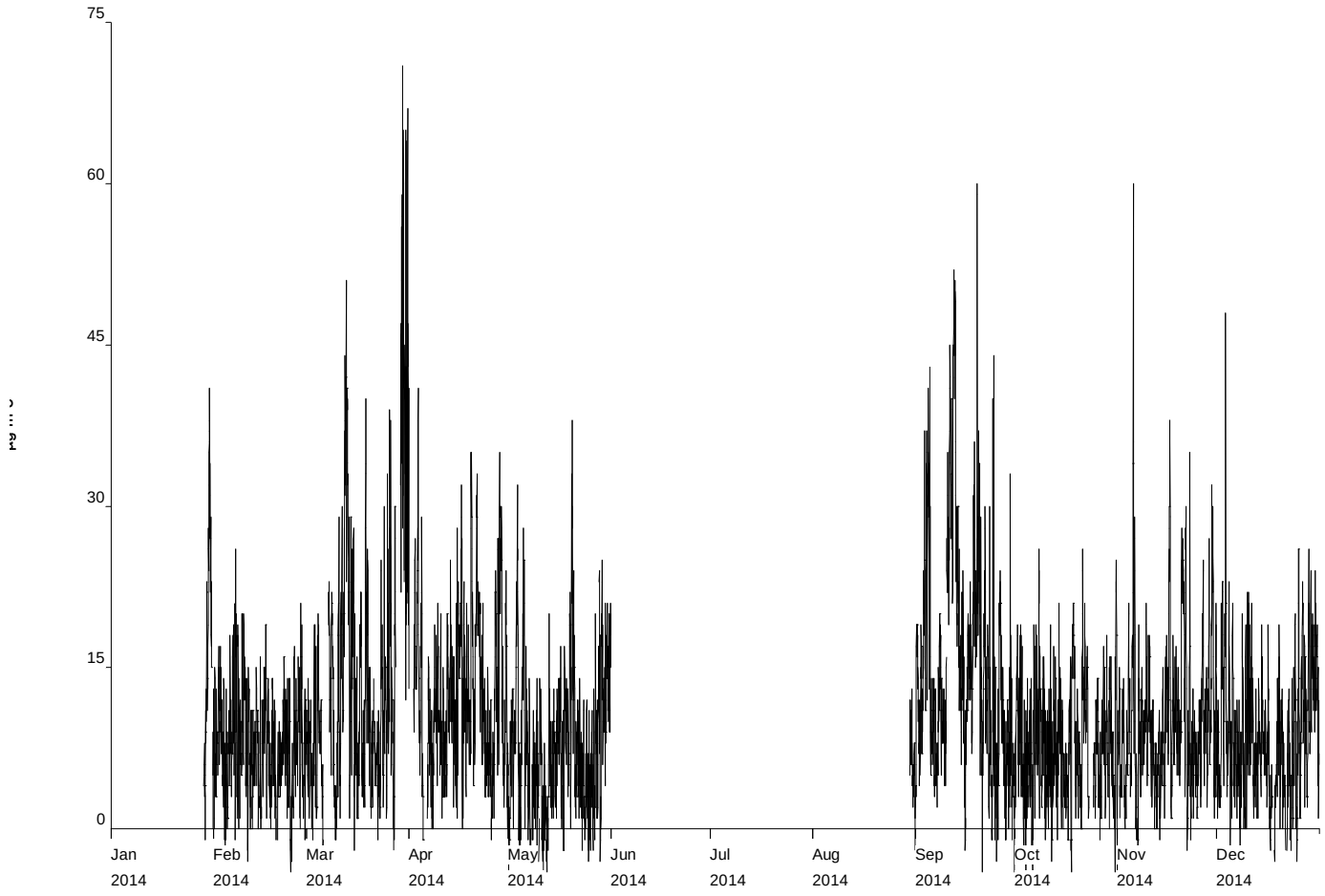
+ PM_{10} instruments:
Particulate matter concentrations are reported at ambient temperature and pressure.

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

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

Produced by Ricardo-AEA on behalf of East Ayrshire Council

East Ayrshire St Marnock St FDMS
Hourly Mean Data for 1st January to 31st December 2014



Date Created: 09/04/2015

Appendix D: Industrial Premises Regulated by SEPA under the Pollution Prevention and Control (Scotland) Regulations 2000

Part A

PPC/W/20040	Egger	East Ayrshire
PPC/A/1079002	Auldhouseburn Farm	East Ayrshire
PPC/A/1082048	Thomarston Poultry Farm	East Ayrshire
PPC/A/1088432	Hillhead Farm, Kilmaurs,	East Ayrshire
PPC/A/20019	Garlaff Landfill, Skares	East Ayrshire
PPC/A/1017028	Dunniflats Waste Site, Lugton	East Ayrshire
PPC/A/1038885	Billy Bowie Composting, Kilmarnock	East Ayrshire

Part B

PPC/W/30110	Ayr Road Garage, Dalmellington	East Ayrshire
PPC/W/30101	Bridgend Garage, Auchinleck	East Ayrshire
PPC/W/30111	Central Garage, Cummock	East Ayrshire
PPC/W/30112	JK Thomson, Cummock	East Ayrshire
PPC/B/1000090	AM Services, Mauchline	East Ayrshire
PPC/B/1004563	Asda Filling Station, Kilmarnock	East Ayrshire
PPC/W/30100	Blair Garage, Stewarton	East Ayrshire
PPC/W/30116	Bobbin Filling Station, Galston	East Ayrshire
PPC/B/1000092	Pace Petroleum, Galston	East Ayrshire
PPC/B/1000088	Pace Petroleum, Kilmarnock	East Ayrshire
PPC/W/30061	Morrisons, Kilmarnock	East Ayrshire
PPC/W/30114	Shell Glencairn, Kilmarnock	East Ayrshire
PPC/B/1033837	Burnpark FS, Kilmarnock	East Ayrshire
PPC/B/1004562	Western Filling Station, Kilmarnock	East Ayrshire
PPC/B/1004561	Malthurst, Kilmarnock	East Ayrshire
PPC/B/1004559	Campbell Fuel Oils, Kilmarnock	East Ayrshire
PPC/B/1000087	Grange Service Station, Kilmarnock	East Ayrshire
PPC/B/1031777	Tesco Petrol Filling Station, Kilmarnock	East Ayrshire
PPC/W/30071	Braehead Metals	East Ayrshire
PPC/W/30125	Barr Ltd (Mobile)	East Ayrshire

PPC/W/30126	BarrLtd (Mobile)	East Ayrshire
PPC/W/30141	BarrLtd (Mobile)	East Ayrshire
PPC/W/30142	Barr Ltd (Mobile) - Roadstone	East Ayrshire
PPC/W/30146	Killoch (SC) DP	East Ayrshire
PPC/W/30154	Skares OCCS	East Ayrshire
PPC/W/30158	Gasswater (SC)	East Ayrshire
PPC/B/1003136	BarrLtd (Mobile)	East Ayrshire
PPC/B/1003137	BarrLtd (Mobile)	East Ayrshire
PPC/B/1003138	BarrLtd (Mobile)	East Ayrshire
PPC/B/1003139	BarrLtd (Mobile)	East Ayrshire
PPC/B/1003189	BarrLtd (Mobile)	East Ayrshire
PPC/B/1004235	Airdsgreen (SC)	East Ayrshire
PPC/B/1004236	Chalmerston (SC)	East Ayrshire
PPC/B/1005102	BarrLtd (Mobile)	East Ayrshire
PPC/B/1009227	Lugton Limeworks, Lugton	East Ayrshire
PPC/B/1014191	Johnsons Cleaners UK Ltd	East Ayrshire
PPC/B/1015138	Eazyclean Ltd	East Ayrshire
PPC/B/1017559	Crosshouse Launderette	East Ayrshire
PPC/B/1019918	Barr Ltd (Mobile) RMC	East Ayrshire
PPC/B/1024480	Barr Limited, Moorfield Plant	East Ayrshire
PPC/B/1025233	Beez Neez, Stewarton	East Ayrshire
PPC/B/1030092	Barr Ltd (Killoch)	East Ayrshire
PPC/B/1081430	Ve-Tech, Stranhead Cement Batcher	East Ayrshire
PPC/B/1083652	ATH Resources, Netherton	East Ayrshire
PPC/B/1079817	Dunstonhill OCCS, Patna	East Ayrshire
PPC/B/1079266	Piperhill Coal Transfer, Sinclairston	East Ayrshire

Appendix E: Short-term to Long-term Data adjustment

All concentrations are reported as μg m^{-3}

	Period Mean	**Adj Annual Mean**				
John Finnie PM10	**15 (99%)**	**15**				
	Period Mean, Pm (01/04/2014 - 31/12/2014)	Annual Mean (Am)	Factor (F = Am/Pm	Pm DC (%)	Am DC (%)	J Finnie Pm (%)
Edinburgh Currie	11.16118887	10.91988657	0.98	96.3	96.6	
Glasgow Townhead	13.15424974	13.15512307	1.00	86.6	79.8	
N Lanarkshire Coatbridge Whifflet	13.18667604	13.13430525	1.00	86.2	88.5	
		Average F	0.99			

	Period Mean	**Adj Annual Mean**			
St Marnock FDMS PM10	**11 (65.8%)**	**10**			
	Period Mean, Pm (29/01/2014 - 31/05/2014)	Annual Mean (Am)	Factor (F = Am/Pm		
Edinburgh Currie	11.68480882	10.91988657	0.93	98.3	96.6
Glasgow Townhead	14.08453993	13.15512307	0.93	72.5	79.8
N Lanarkshire Coatbridge Whifflet	14.46156942	13.13430525	0.91	84.2	88.5
		Average F	0.93		

	Period Mean	**Adj Annual Mean**			
St Marnock FDMS PM10	**11 (97.3%)**	**10**			
	Period Mean, Pm (30/08/2014 - 31/12/2014)	Annual Mean (Am)	Factor (F = Am/Pm		
Edinburgh Currie	11.48777896	10.91988657	0.95	95.1	96.6
Glasgow Townhead	15.11007621	13.15512307	0.87	79.6	79.8
N Lanarkshire Coatbridge Whifflet	13.53536804	13.13430525	0.97	93.8	88.5
		Average F	0.93		

Figure 1a: Map of Scottish Local Authorities

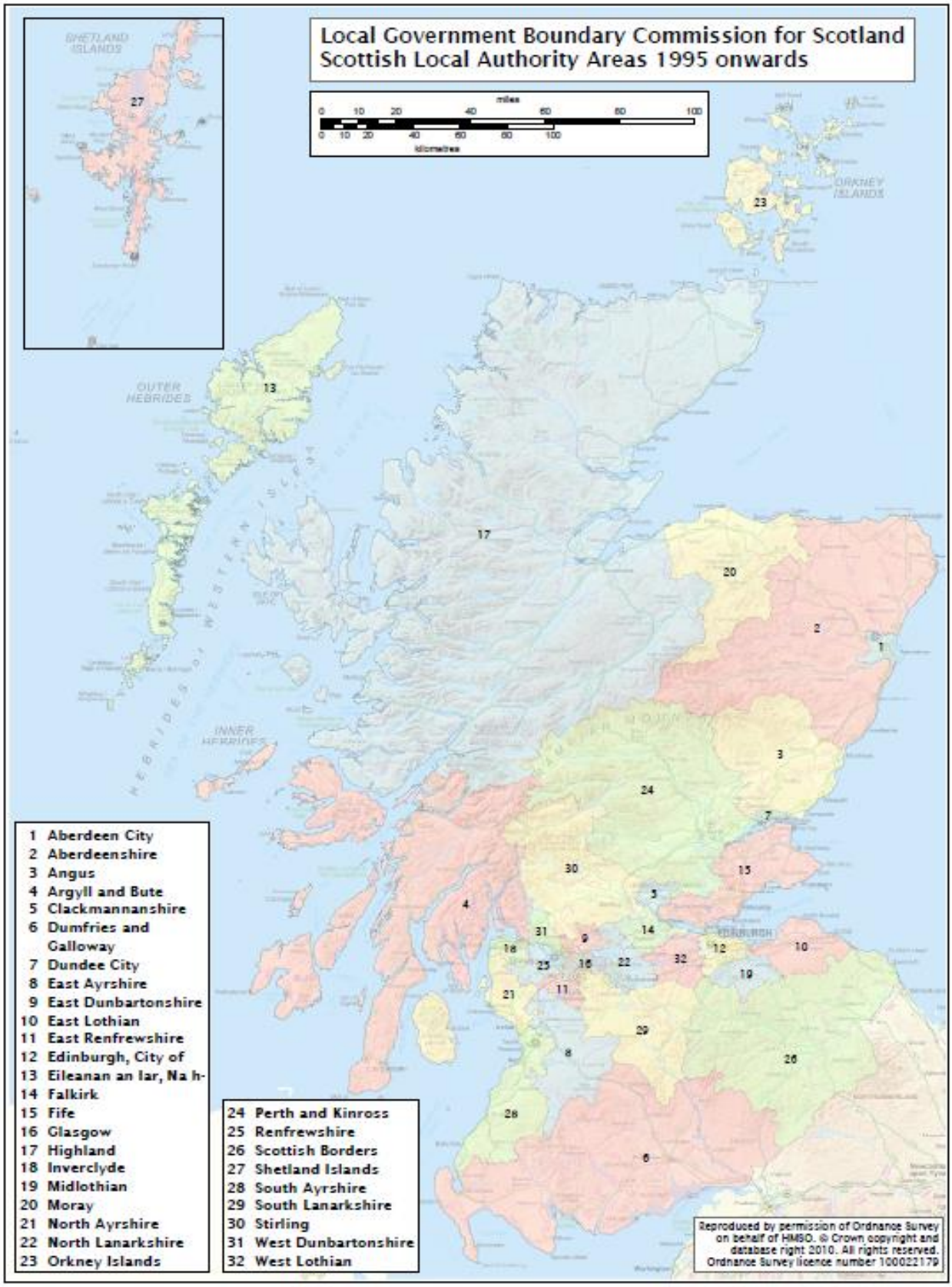


Figure 1b: Map of East Ayrshire

Figure 2: Map of Coal Extraction Sites around Cumnock and New Cumnock

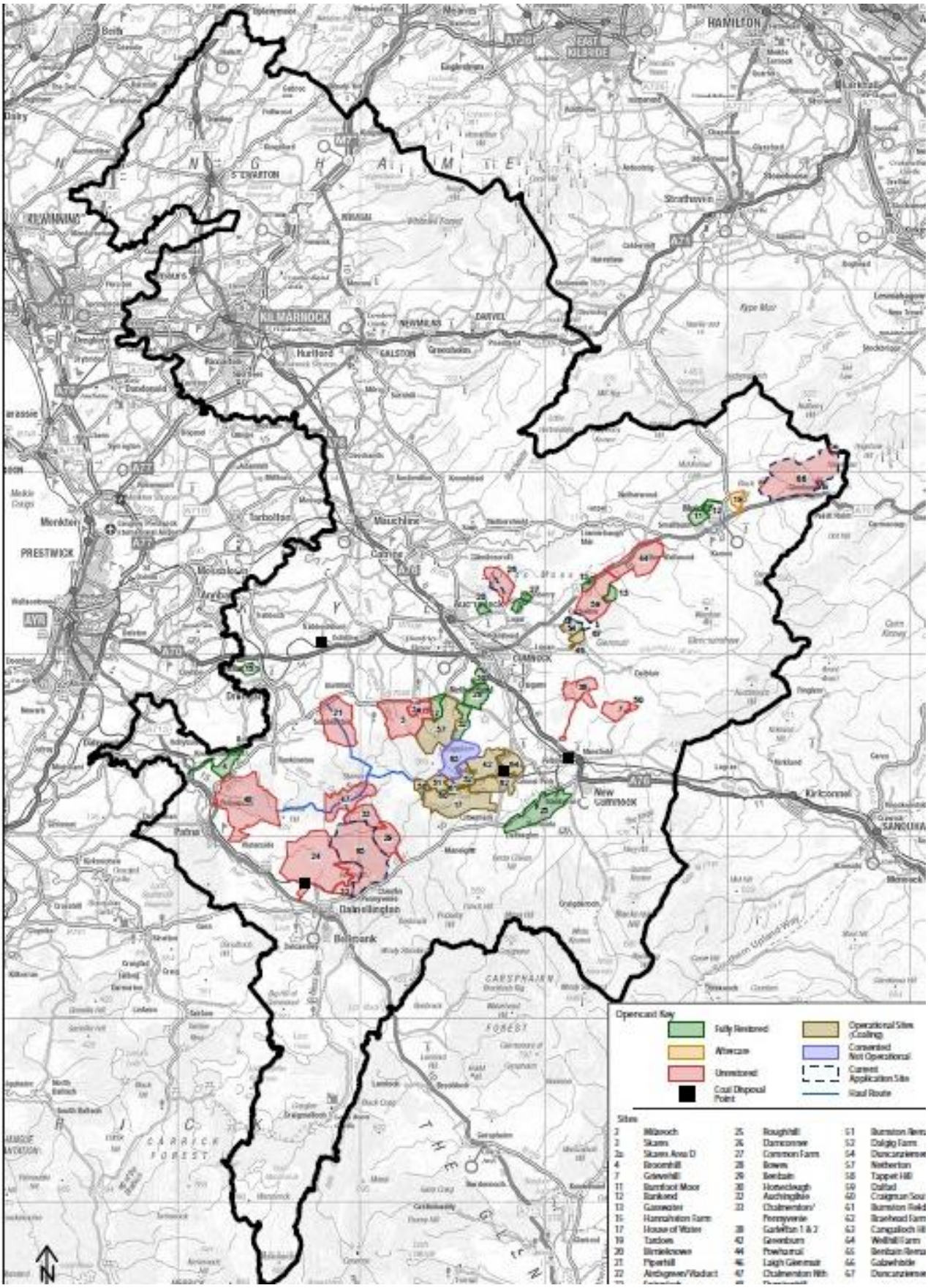


Figure 3: New Cumnock Automatic Monitoring Station

Figure 4: Kilmarnock Automatic Monitoring Stations

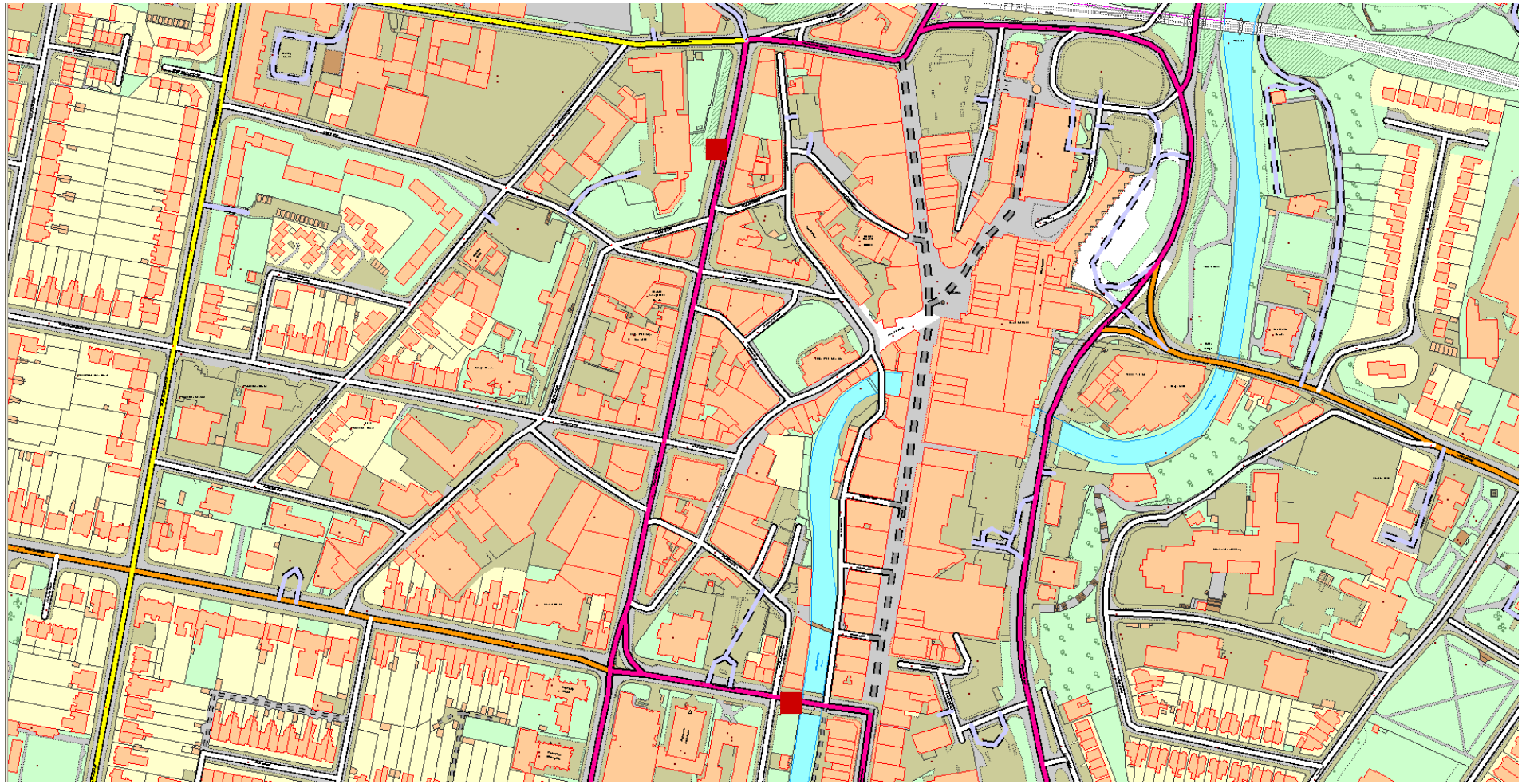


Figure 5a: Stewarton NO2 Diffusion Tube Location

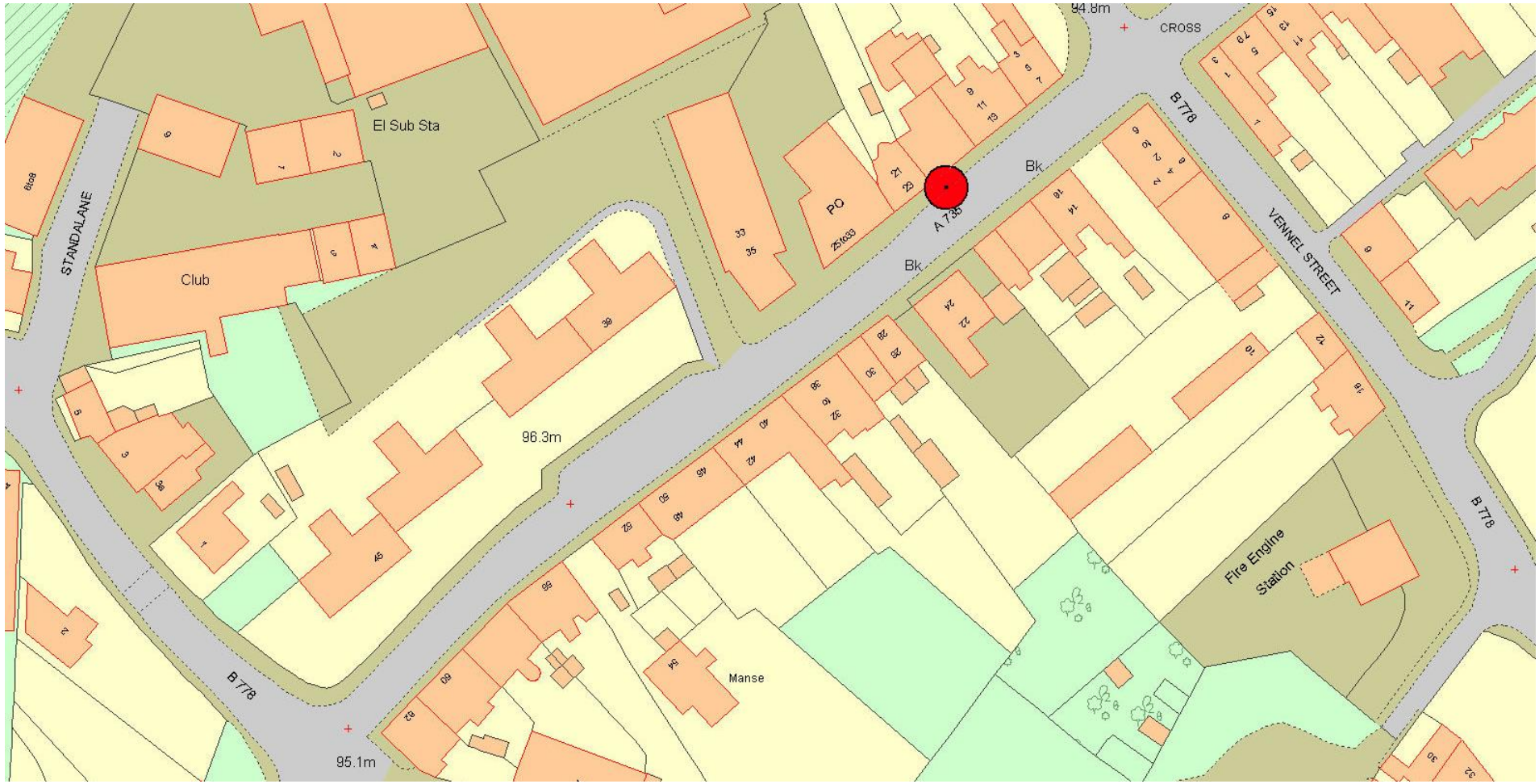


Figure 5b: Kilmarnock Town Centre Air Monitoring Locations

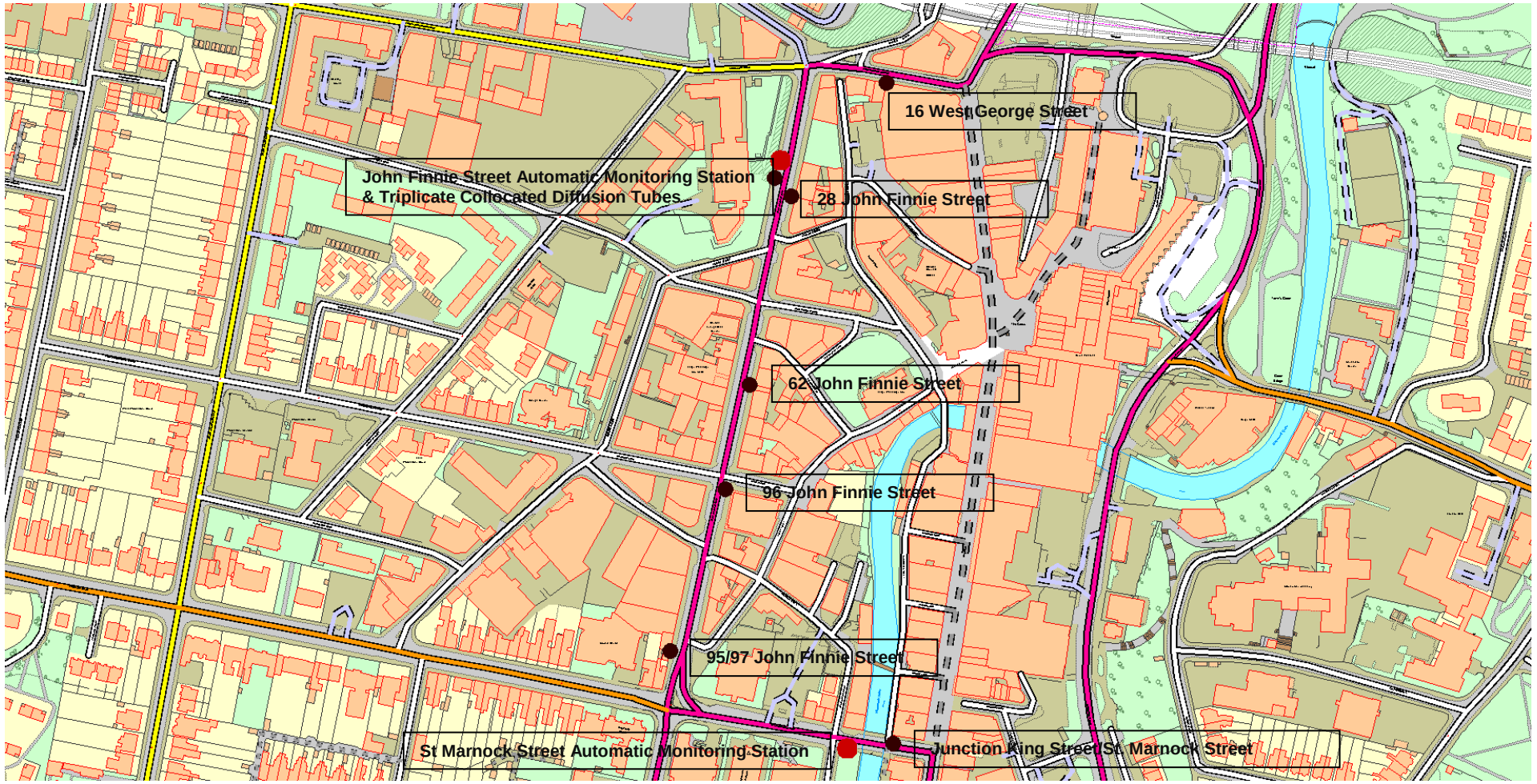


Figure 5c: Newmilns NO_2 Diffusion Tube Locations

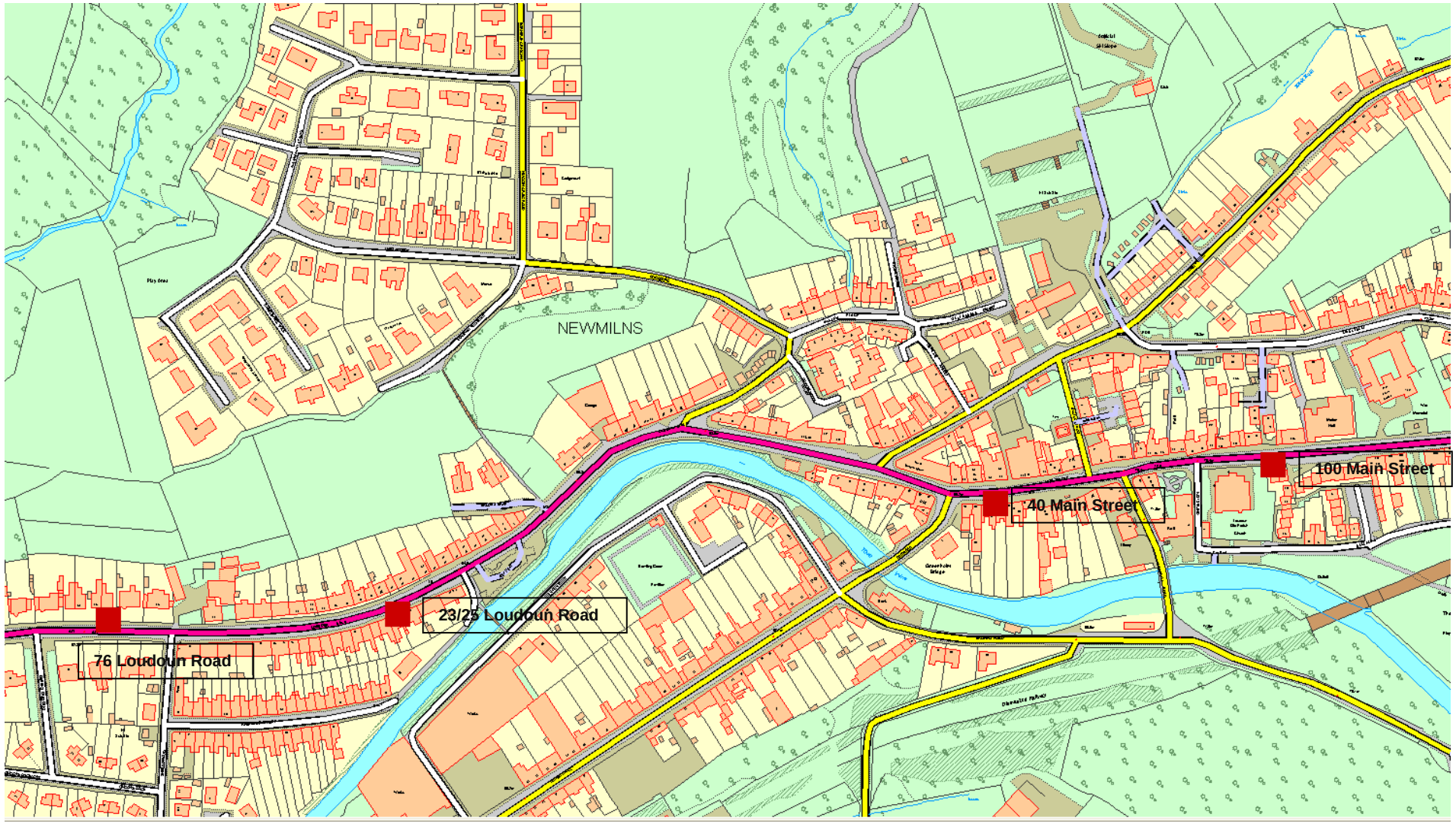


Figure 5d: Mauchline NO_2 Diffusion Tube Locations

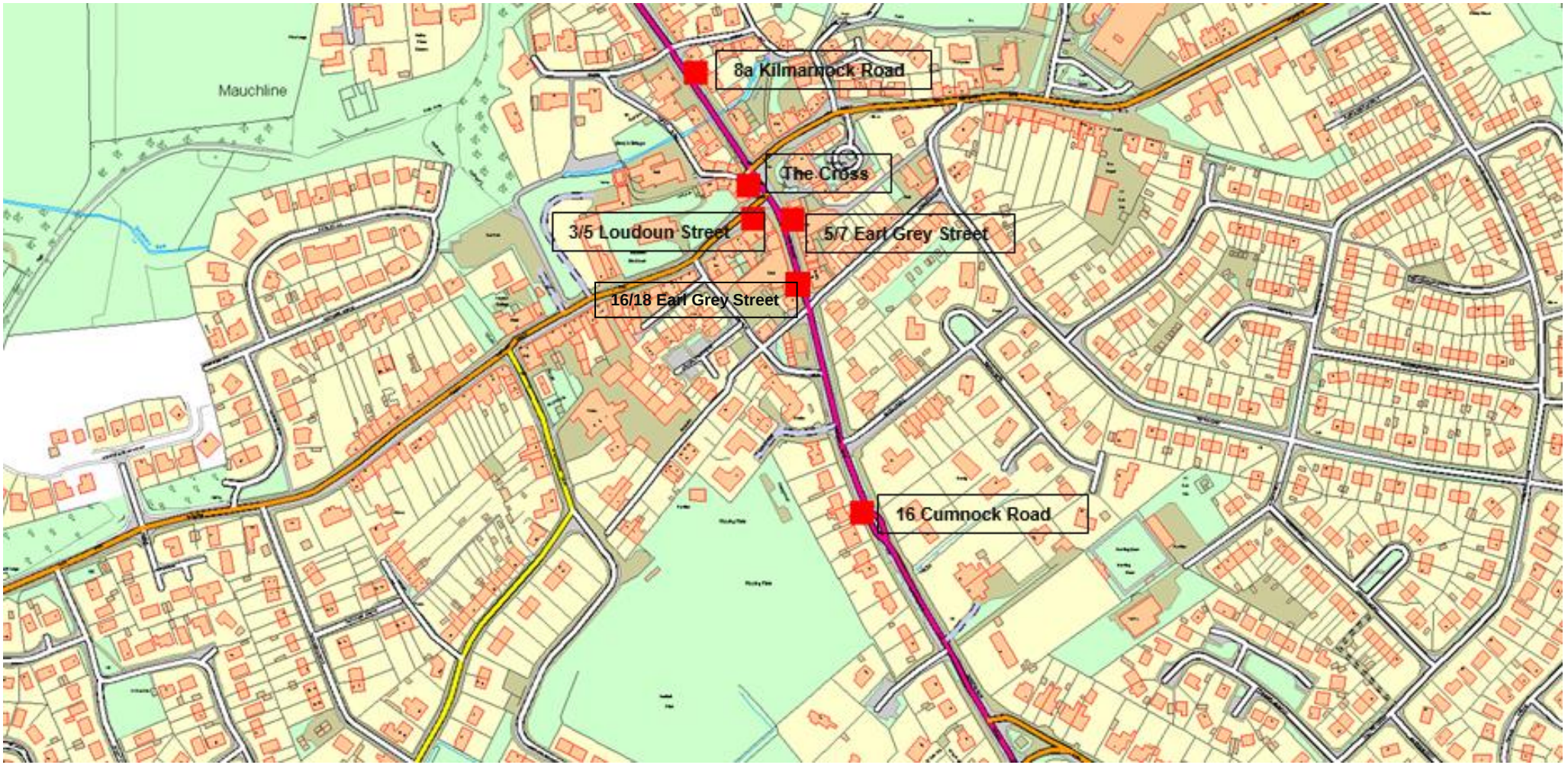


Figure 5e: Muirkirk NO_2 Diffusion Tube Location

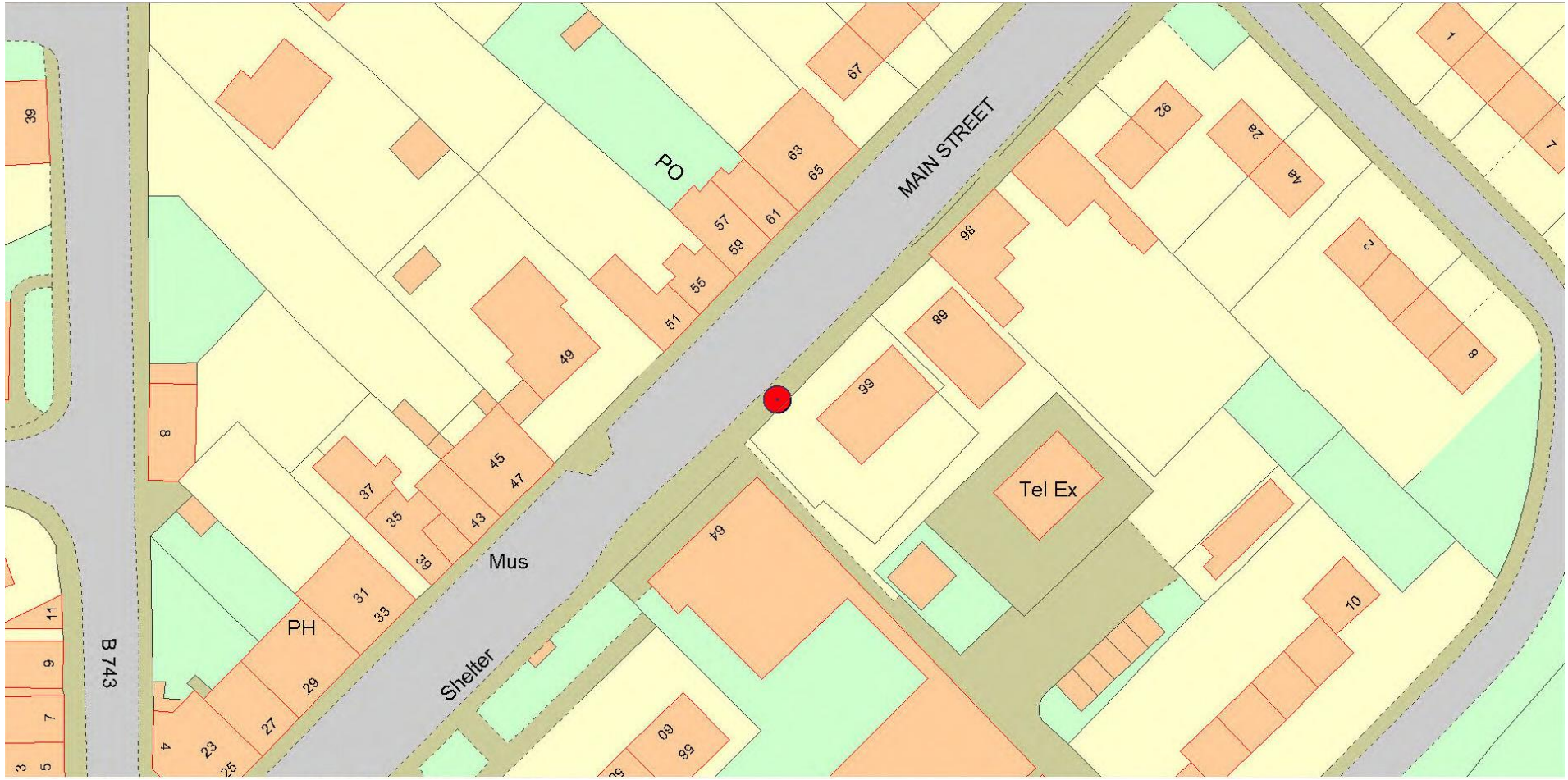


Figure 5f: Ochiltree NO_2 Diffusion Tube Location

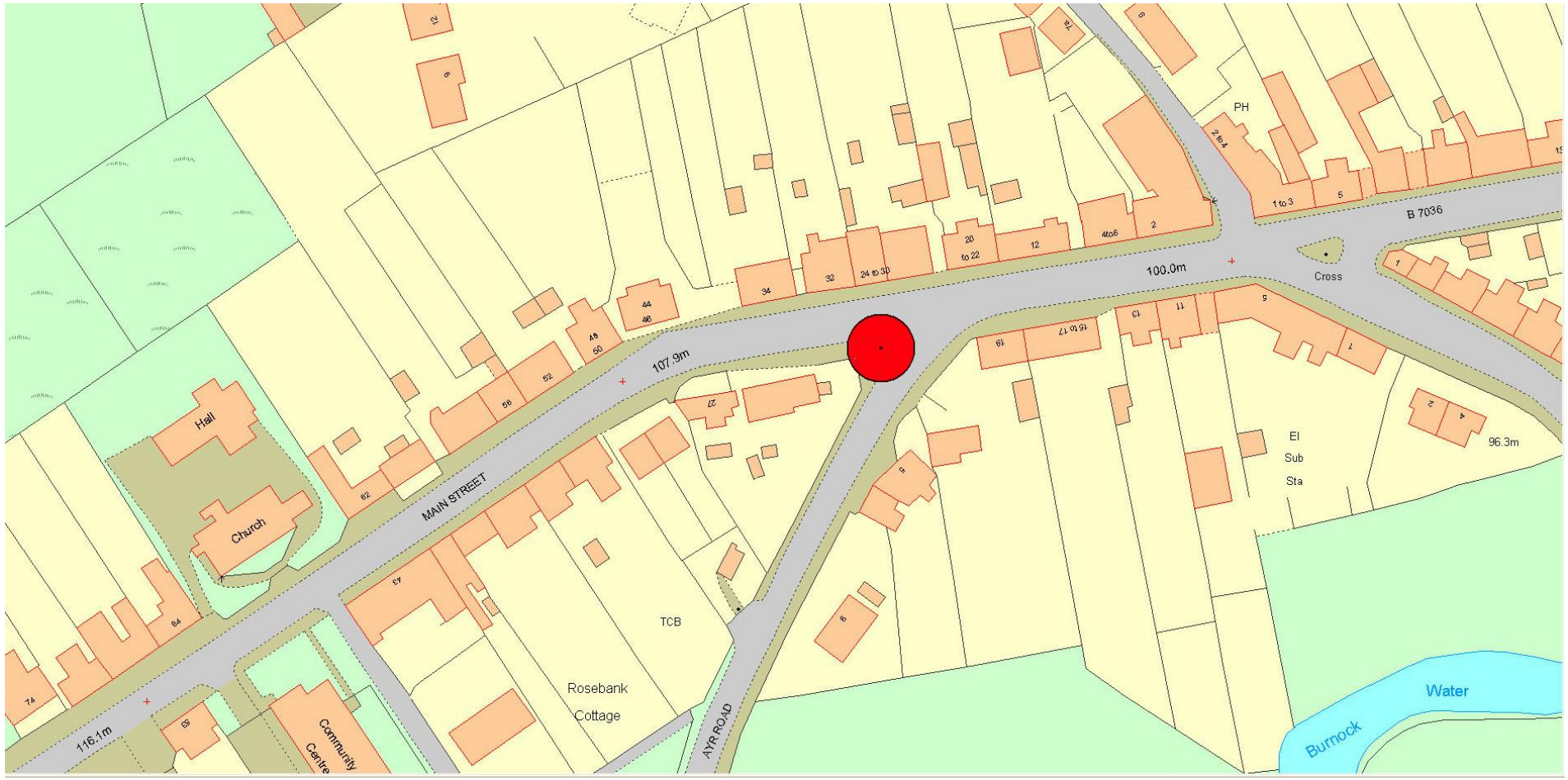


Figure 5g: Cumnock NO_2 Diffusion Tube Locations

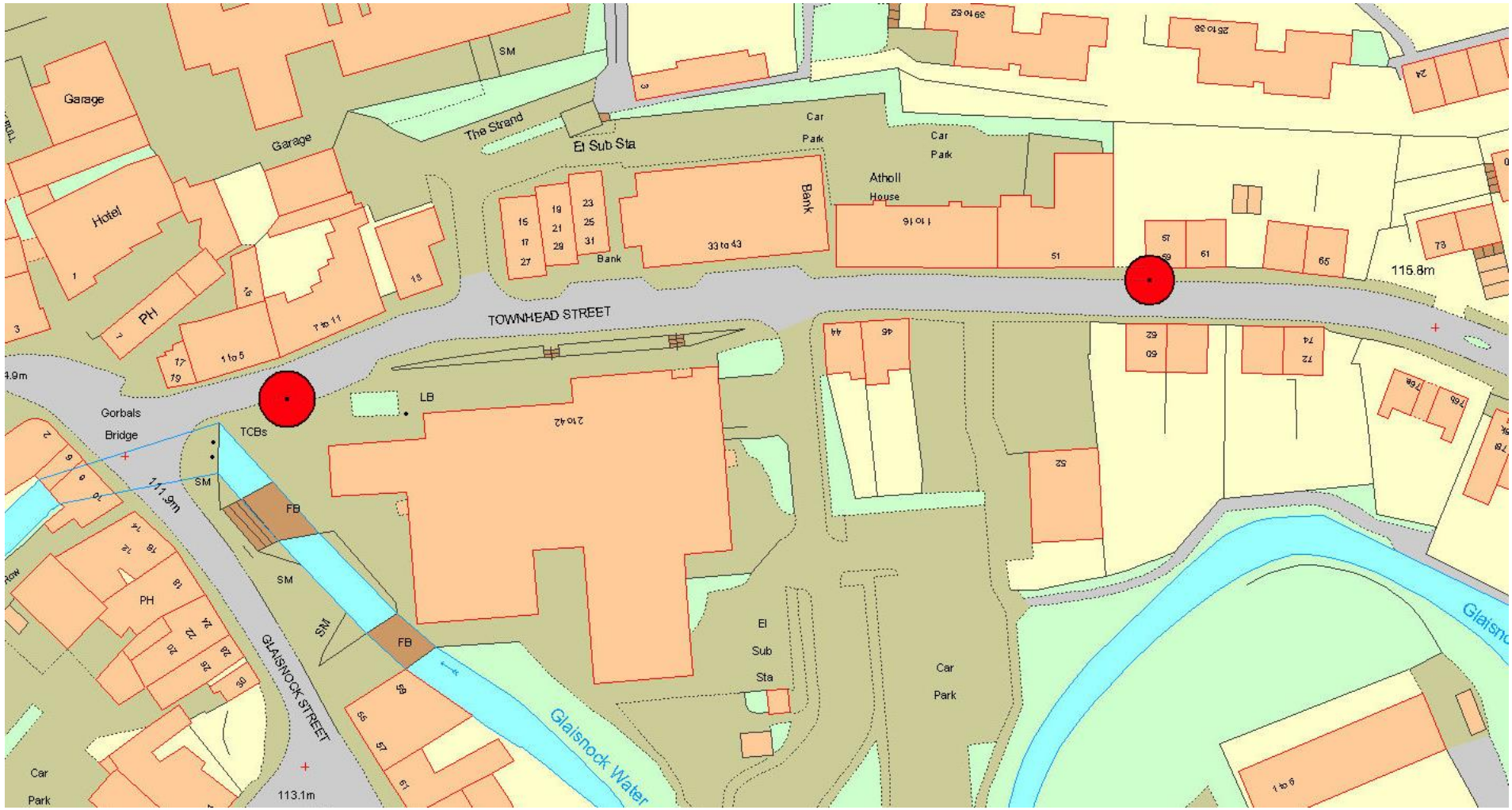


Figure 5h: Kilmarnock NO_2 Diffusion Tube Locations

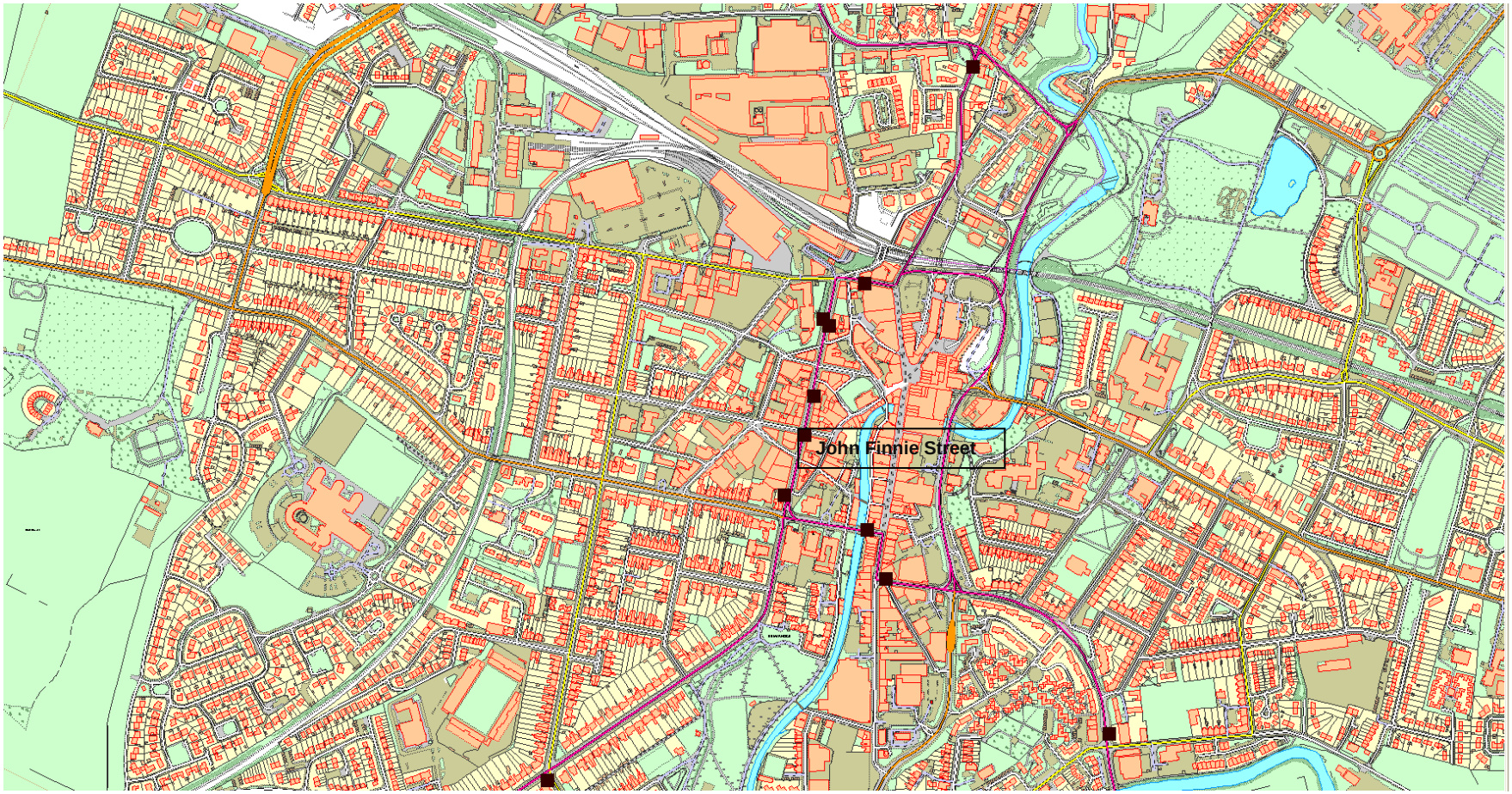


Figure 5i: Portland Road, Kilmarnock NO_2 Diffusion Tube Location

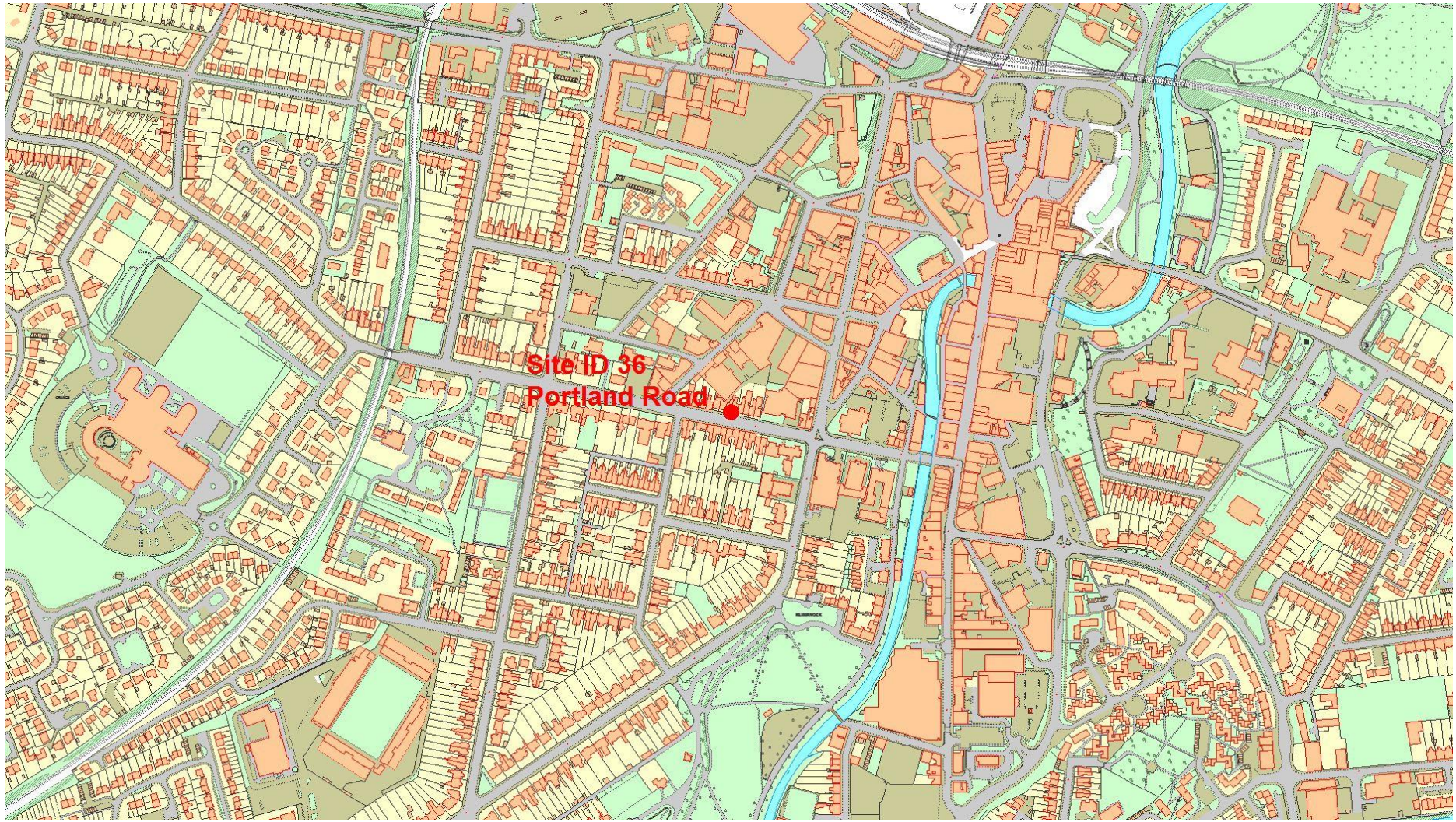


Figure 5j: Sturrock Street, Kilmarnock NO_2 Diffusion Tube Location

Figure 5k: Nelson Street, Kilmarnock NO_2 Diffusion Tube Location

Figure 5l: Kay Park, Kilmarnock NO_2 Diffusion Tube Location

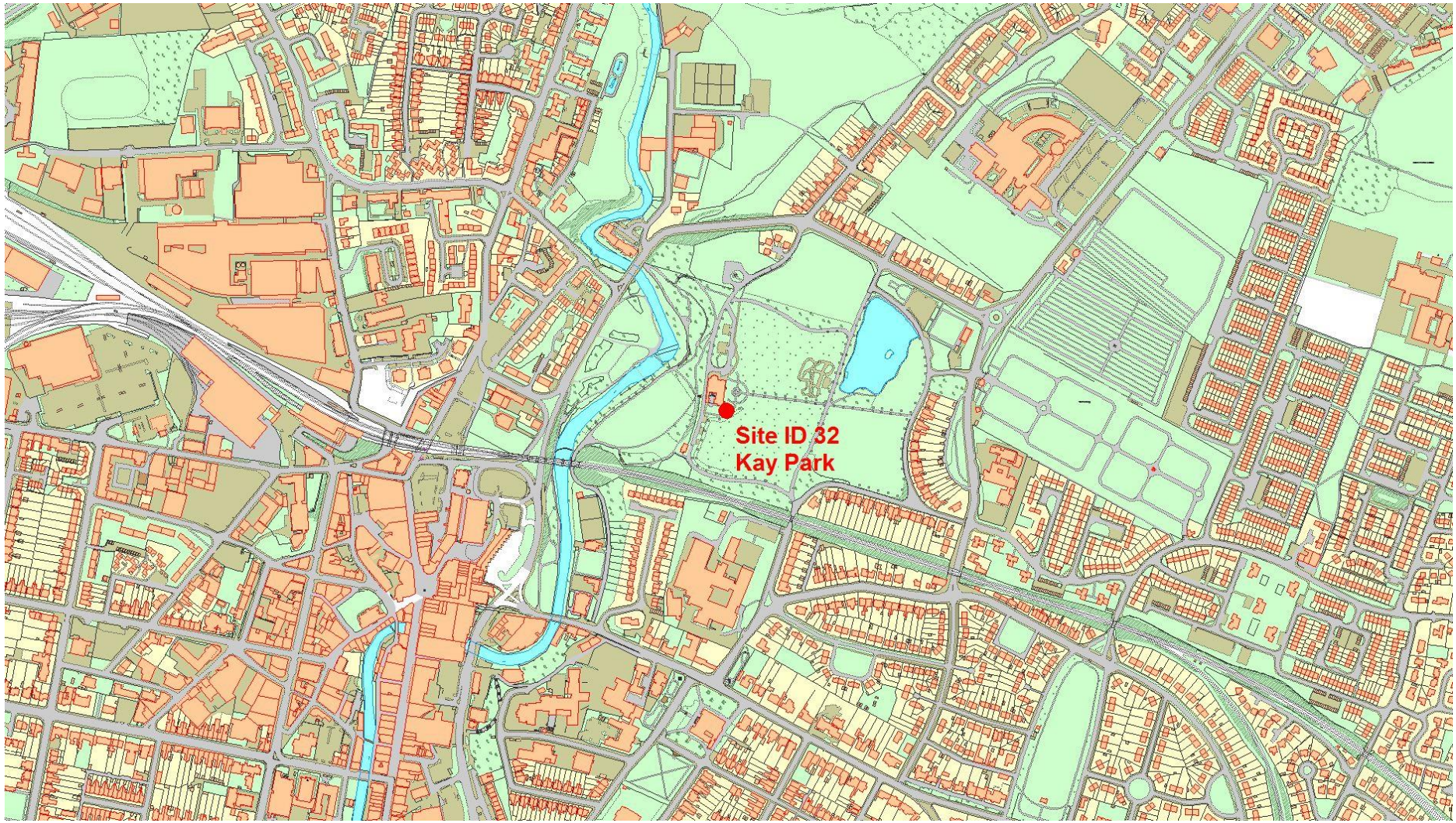


Figure 5m: Howard Park, Kilmarnock NO_2 Diffusion Tube Location

Figure 5n: Loudoun Road, Newmilns NO_2 Diffusion Tube Location