Annual Progress Report (APR)

2022 Air Quality Annual Progress Report (APR) for West Lothian Council

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

June 2022

Information	West Lothian Council
Local Authority Officer	Lynn Parsler/Sarah Gillespie
Department	Environmental Health
Address	West Lothian Civic Centre, Howden South Road, Livingston, West Lothian, EH54 6FF
Telephone	01506 280000
E-mail	environmentalhealth@westlothian.gov.uk
Report Reference Number	M057453
Date	June 2022

Executive Summary: Air Quality in Our Area

Air Quality in West Lothian Council

West Lothian Council has continued to review and assess air quality throughout the district in 2021 to determine whether or not air quality objectives are likely to be achieved. Air pollutants Nitrogen Dioxide (NO_2) and fine particles (PM_{10} & $PM_{2.5}$), which are mainly associated with vehicle emissions and domestic fuel burning, are measured using a network of three continuous air quality monitoring stations located in Linlithgow, Broxburn and Newton.

There are also 48 NO_x passive diffusion tubes located throughout West Lothian at 23 sites in total. There are two tubes co-located at 21 sites and three tubes co-located with the air quality monitoring stations at Broxburn and Linlithgow (Sites DT 4 and DT14) – we also employ 1 travel tube. Three new NO_x tube sites were added in April 2019. These were added in Winchburgh and East Calder due to new housing developments in these areas. All diffusion tube locations can be found on the Air Quality in Scotland website: http://www.scottishairquality.scot/latest/diffusion-sites.

A diffusion tube location map is provided at the end of this report in Appendix C. At the end of 2021, a review of the diffusion tube locations took place. The new diffusion tube locations will be in place for the start of 2022.

During 2021, there were a number of ongoing issues with regard to the equipment at all of our automatic monitoring stations. In particular, the equipment at Linlithgow and Newton encountered several problems during 2021 – this affected both the NOx and particulate matter analysers at both sites and severely reduced our data capture rates.

The 2021 monitoring data at all three continuous air quality monitoring stations has shown that the NO_2, PM_{10} and $PM_{2.5}$ long term average air quality objectives have been met. NO_2 levels increased at all three continuous monitoring sites from the levels found in 2020. However, as the country emerged from the Coronavirus lockdowns of 2020, traffic steadily increased and it is likely that this is the reason that levels have increased to be more in line with pre-pandemic levels. PM_{10} levels also slightly increased at Linlithgow and Broxburn – Newton had the same long-term average as the previous year. $PM_{2.5}$ levels remained fairly stable at all 3 sites and were very similar to the levels measured the previous year. There

were no exceedances of the short term NO_2 and PM_{10} air quality objectives at any of the three sites.

NOx passive diffusion tubes located throughout West Lothian have not shown any exceedances during 2021.

Further information on the location of the AQMA's can be found at https://www.westlothian.gov.uk/article/34729/Air-Pollution

Actions to Improve Air Quality

The actions taken to improve air quality within West Lothian during 2021 include;

- The Eco Stars fleet recognition scheme membership within West Lothian continued to increase during 2021. As of December 2021, 138 members (4047 vehicles) are now part of the scheme within the West Lothian Council area. West Lothian Councils own fleet of vehicles are also members of this Eco stars scheme;
- West Lothian Council added a further 20 electric pool vehicles to its fleet during 2021. By December 2021, there were 51 electric vehicles in the Council fleet in total;
- During 2021, a cross-service working group was set up. This group will look at how the Council decarbonises its fleet in line with Scottish Government targets. A report has been submitted to the Executive Management Team with the first major milestone for decarbonising part of the fleet (cars) being introduced from 2025 onwards. The group will look to put together a 'Decarbonising the Councils Fleet' Strategy;
- Coronavirus pandemic active travel measures remained in place during 2021, to make it safer for people who choose to walk, cycle or wheel for essential trips and exercise during Covid19. Nine packages of work were introduced, one of which was the introduction of localised footway widening at known narrow public footways. These footway widenings were installed at High Street in Linlithgow, Main Street in East Calder, Main Street in Mid Calder, Main Street in West Calder and Station Road in Kirknewton. These measures are constructed with temporary footway surfacing, temporary kerbing and removable reflective bollards.
- Continued use of electric vehicles within Environmental Health and Trading Standards along with greater use within the Council as a whole;
- Bikeability activities continued to return to normal during 2021. There was a greater level of activity possible once again from April to June 2021. Level 1 Bikeability was

delivered to 462 pupils across 14 schools and Level 2 (on road) delivered to 183 pupils across 7 schools. After the summer break in 2021, 3 Bikeability Scotland training courses were organised for West Lothian school staff to allow for further Bikeability sessions to take place across West Lothian. This has resulted in the training of 16 new Bikeability Scotland instructors from several different primary schools across the area. By the end of the academic year, a further 210 pupils across 10 schools had also completed their Level 1 Bikeability and 49 pupils from 4 schools had completed the Level 2 course. It is hoped that this training continues to promote cycling as a safe method of active travel to schools and beyond for West Lothians children.

- During 2021, there was further expansion of the publicly available EV charging points installed by West Lothian Council. There are now 14 dual outlet fast chargers, 9 50kW rapid chargers and 1 7kW dual outlet chargers installed throughout different public spaces within West Lothian;
- West Lothian Council also continues to provide the management and administration support for the East Central Scotland Vehicle Emissions Partnership (VEP), which is in collaboration with several other local authorities. The remit of the VEP is to help reduce vehicle emissions by encouraging drivers to switch off their engine whenever possible, encourage good travel modes and vehicle choices and handling idling and emissions complaints. In addition, the VEP uses a broad variety of advertising media to encourage change in driving habits across the councils' areas. Media used includes local TV, radio, public transport networks such as buses and social media.

Local Priorities and Challenges

In West Lothian, as explained in last year's report, the main priority is to complete the detailed assessments so as to determine whether the three Air Quality Management Areas (AQMAs) need to be revoked due to air pollution levels meeting the target air quality objectives for the previous three years. The detailed assessments will include land allocated for development and will detail whether there will be any potential future exceedances of pollutants at relevant receptors. Detailed traffic scenario modelling is still being carried out and there have been some delays internally within the Council in obtaining the correct data, to inform the detailed assessments. Once this is complete the detailed assessments can then be finalised and a decision can be made on the future of

the existing AQMAs. Unfortunately, this work was not progressed during 2021, due to delays in obtaining the data within the Council and other work priorities as a result of the Coronavirus pandemic. Resources were also taken up dealing with the various issues that arose with the continuous monitoring equipment.

Funding applications will continue to be made to the Scottish Government for monitoring equipment and action plan measures.

During 2022 we will be implementing our new diffusion tube locations and will also look to upgrade some of our continuous monitoring equipment, with a view to attaining a better data capture rate. We will also look to refresh our Local Site Operator training and ensure that relevant staff are well trained with regards to air quality work.

How to Get Involved

If you would like to find out more about air quality within West Lothian, please visit the Air Pollution pages of our website at https://www.westlothian.gov.uk/article/34729/Air-Pollution.

Linlithgow Continuous Monitor with ‘Switch off and breathe’ initiative signage installed adjacent to it

Linlithgow Partnership Centre – fleet of electric pool cars on charge

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

This report provides an overview of air quality in West Lothian Council during 2021. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Progress Report (APR) is summarises the work being undertaken by West Lothian Council to improve air quality and any progress that has been made.

Table 1.1 – Summary of Air Quality Objectives in Scotland

Pollutant	Air Quality Objective Concentration	Air Quality Objective Measured as	Date to be Achieved by
Nitrogen dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
Nitrogen dioxide (NO_2)	40 µg/m^3	Annual mean	31.12.2005
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
Particulate Matter (PM_{10})	18 µg/m^3	Annual mean	31.12.2010
Particulate Matter ($PM_{2.5}$)	10 µg/m^3	Annual mean	31.12.2021
Sulphur dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
Sulphur dioxide (SO_2)	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
Sulphur dioxide (SO_2)	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005
Benzene	3.25 µg/m^3	Running annual mean	31.12.2010
1,3 Butadiene	2.25 µg/m^3	Running annual mean	31.12.2003
Carbon Monoxide	10.0 mg/m^3	Running 8-Hour mean	31.12.2003

2 Actions to Improve Air Quality

Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12 months, setting out measures it intends to put in place in pursuit of the objectives. Whilst West Lothian Council has three declared AQMA's, only one has an agreed action plan. The other two have draft action plans. As detailed later in this report, successive years of monitoring data within the AQMA's has shown that air pollution objective limits are being met comfortably. The Councils focus has therefore turned to the revocation of these AQMA's, although progress has so far been slow in actioning this, for various reasons. It was hoped that work could progress on the revocations during 2021, however, there have been problems in obtaining data from other Council departments to inform the detailed assessments and due to a poor data capture rate during 2021, the planned work may be further delayed.

A summary of AQMAs declared by West Lothian Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=390 see the full list of Air Quality Management areas at https://uk-air.defra.gov.uk/aqma/list

We hope to revoke all of our AQMA's over the next few years, as pollutant levels have remained well below objectives in recent years. However, due to problems with data capture during 2021, we wish to focus on obtaining quality data before pursuing this further with any of the sites.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	Description	Action Plan
AQMA Linlithgow	• NO_2 annual mean • PM_{10} annual mean	Linlithgow	Includes Linlithgow, Linlithgow Bridge & land allocated for development	Draft Action Plan
AQMA Broxburn	• NO_2 annual mean • PM_{10} annual mean	Broxburn	West Main Street eastwards to western boundary of service station, Broxburn	Action Plan
AQMA Newton	• PM_{10} annual mean	Newton	The whole of Newton village	Draft Action Plan

Cleaner Air for Scotland 2

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

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

2.1.1 Placemaking – Plans and Policies

Local authorities with support from the Scottish Government will assess how effectively air quality is embedded in plans, policies, City Deals and other initiatives, and more generally in cross departmental working, identifying and addressing evidence, skills, awareness and operational gaps.

The council's current Active Travel Plan (ATP) for West Lothian, 2016-21 "Making Active Connections" is a plan to link people to places by active travel. It is not just about physical connections however - it is also a framework for mainstreaming active travel in West Lothian, and creating a culture where active travel becomes the norm for suitable everyday trips. To achieve this, it is crucial that West Lothian Council works successfully with external partners, schools and local communities, and "joins up" policies and projects delivered by different Services and teams across the Council. Embedding positive behaviours at an early age is essential, and schools throughout West Lothian encourage pupils to use active travel methods, emphasising the health, wellbeing and environmental benefits.

West Lothian Council also has a 'decarbonising the fleet' working group that is actively developing a strategy to reduce the impact of vehicle emissions from the Council fleet of vehicles.

There is a climate change group which also meets regularly to discuss and consolidate issues around the climate change emergency which includes matters linked to air quality.

There are further initiatives focussing on the Councils more remote housing stock (Westfield/Wilkieston), to replace oil fired and coal fired heating systems with more modern solutions such as heat pumps. This will help to improve the local air quality in these areas.

Other relevant policies and plans which also contain initiatives that affect air quality include;

- West Lothian Local Outcomes Improvement Plan 2013-2023
- Regional Transport Strategy, Local Transport Strategy, Green Transport Strategy 2008-2023, West Lothian Local Plan
- Supplementary Planning Guidance, including the one on Air Quality 2018
- West Lothian Climate Change Strategy 2021-2028

- Space Strategy, Active Travel Plan 2016-2021
- West Lothian Local Development Plan 2018

2.1.2 Transport – Low emission Zones

Local authorities working with Transport Scotland and SEPA will look at opportunities to promote zero-carbon city centres within the existing LEZs structure.

Low Emission Zones have not yet been considered appropriate for implementation within West Lothian Council.

Progress and Impacts of Measures to address Air Quality in West Lothian Council

West Lothian Council has taken forward a number of measures during the current reporting year of 2021 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. More detail on these measures can be found in the air quality Action Plan relating to each AQMA and also the various plans and strategies noted in Section 2.1.1 of this report. Key completed measures are:

- Continued progress with the EcoStars fleet management scheme within West Lothian;
- Further update and use of electric vehicles within the Council's fleet management scheme;
- Further progress in the installation of electric vehicle charging points

Progress on the following measures has been slower than expected due to:

- Progress with the detailed assessments to work towards revocation of our Air Quality Management Areas. There has been a continued delay in obtaining traffic data in the correct format, to allow us to progress with the detailed assessments. This is due to work pressures within other departments of the Council. In addition, a lot of resources were employed within Environmental Health during 2021, to deal with several problems with our continuous monitoring equipment

West Lothian Council expects the following measures to be completed over the course of the next reporting year:

- Ensuring that our continuous monitoring equipment is fit for purpose and is repaired/replaced as required to allow for good data capture rates and allow quality data to be obtained. Once this is complete, the focus can move to the detailed assessments and revocation of the Air Quality Management Areas;
- Ensuring that sufficient staff have obtained Local Site Operator training;
- Establishing new diffusion tube monitoring sites using traffic data, local knowledge and any information from planning applications that is relevant.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	Electric Vehicle Charging Point Installation	Promoting low emission transport	Building a network for low emission vehicles	Env. Health	June 2016 onwards	Ongoing	Installation of EV charging points	Reduction in air pollution through encouraging the use of EV's	Ongoing program of installing chargers on Council land	Ongoing	Fulfils action plan measure 15 of Broxburn AQAP
2	Improving links with local planning & development framework	Policy guidance and development control	Air Quality Planning Guidance	Env. Health	November 2016 onwards	2019	Air Quality Planning Guidance approved by council executive	Reduction in Air Pollution	Air Quality Planning guidance approved but non-statutory	Completed in 2019	Fulfils action plan measure 2 of Broxburn AQAP
3	Active Travel and Cycling Infrastructure	Promoting Travel Alternatives	Bikeability Officer in post	West Lothian Leisure/ West Lothian Council	2017/2018 onwards	From 2019 onwards	Post filled and training delivered to schools	Encouraging a reduction in car journeys	Training was increased again during 2021, after reduced activities due to the Coronavirus pandemic	Ongoing	Fulfils action plan measure 20 of draft Linlithgow AQAP

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
4	Ecostars fleet recognition scheme	Promoting low emission transport	Taken forward by vehicle emissions partnership	Vehicle emissions partnership	2018/ 2019	Ongoing	Businesses being visited by the scheme	Reduction in high emission journeys and vehicle	As of January 2022, West Lothian has 138 members with 4047 vehicles in scheme	Ongoing initiative	Fulfils action plan measure 8 of draft Newton AQAP
5	Electric Pool Cars for council staff in an AQMA	Promoting low emission transport	Replacing petrol and diesel pool cars with electric pool cars	Fleet and Transportation	2019/ 2020	2020/ 2021	Pool cars available for use in Linlithgow	Reduction in high emission journeys and air pollution	Four electric pool cars in use. Removal of petrol and diesel vehicles	Ongoing	Fulfils action plan measure 20 of Linlithgow AQAP
6	Adoption of Residential Development Guide – Supplementary Guidance	Policy guidance and development control	Planning Guidance affecting air quality	Development Planning/ Env. Health	2019	2019	Supplementary Planning Guidance approved by council executive	Guidance on EV installation, air quality and other areas linked to improving Air Quality within AQMA and the wider area	Guidance is in place and all new residential applications for development are required to meet these standards	Ongoing	Fulfils action plan measure 2 of Broxburn AQAP

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
7	Removal of solid fuel fires in Council housing in Newton	Promoting low emission plants	Initiative to replace polluting solid fuel fires within Council housing stock with Air Source Heat Pumps	Housing, Customer & Building Services	2008	Ongoing	Installation of Air Source heat Pumps in all 12 Council properties in Newton. 7 homes have been completed, 5 still to go	Reduction in particulate emitted as a result of solid fuel burning	The Council owns 12 homes in Newton, so far 7 have had air source heat pumps installed, with 5 still to be done	This is ongoing, some residents have refused the Air source heat pumps so they will not be installed until the tenant moves out. Other more rural housing areas within the Council are also being targeted with this initiative.	Draft Air Quality Action Plan Measure 5 – Reduce Emissions from non-transport sources

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives

Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

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

West Lothian Council undertook automatic (continuous) monitoring at 3 sites during 2021. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at http://www.scottishairquality.scot

Maps showing the location of the monitoring sites are provided in Appendix C. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

West Lothian Council undertook non- automatic (passive) monitoring of NO_2 at 23 sites during 2021. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix C. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are also included in Appendix C.

3.1.3 Other Monitoring Activities

There were no other monitoring activities during 2021.

Individual Pollutants

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

3.1.4 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40 µg/m^3. The table shows that the annual mean objective was met at all three continuous monitoring sites, along with all of the diffusion tube locations. It is noted that data capture at the Linlithgow and Newton continuous monitoring sites was poor during 2021, so the levels found have been annualised. At all continuous monitoring sites, the level was up compared to 2020, but was still well within the objective level. It is likely that these levels rose as traffic increased with the easing of pandemic restrictions.

For diffusion tubes, the full 2021 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past five years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year. There were no exceedences of this measure during 2021, althought the poor data capture at the Linlithgow and Newton sites is again noted. West Lothian has consistently met this objective at the 3 continuous monitoring stations, with only one exceedence at Linlithgow in 2019.

3.1.5 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past five years with the air quality objective of 18µg/m^3. All three continuous monitoring sites have remained within the objective limit. It is acknowledged that there was poor data capture at Linlithgow and Newton continuous monitoring sites and that the data was therefore annualised. All levels increased from last year, but they did not get as high as the levels prior to the start of the pandemic.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past five years with the air quality objective of 50µg/m^3, not to be

exceeded more than seven times per year. There were no exceedances of this limit during 2021.

3.1.6 Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A compares the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations since 2017, when West Lothian started monitoring $PM_{2.5}$ at two of our continuous monitoring sites. At Newton, $PM_{2.5}$ monitoring only started in 2019. The relevant air quality objective is 10µg/m^3. At Linlithgow during 2021, the level increased and at the other 2 sites, monitored levels remained the same as the previous year. It is likely that these levels increased as traffic movements also increased in line with pandemic restrictions easing. The data capture rates should also be noted for each site.

3.1.7 Sulphur Dioxide (SO_2)

During 2021, no monitoring of SO_2 was carried out within West Lothian.

3.1.8 Carbon Monoxide, Lead and 1,3-Butadiene

There was no monitoring of Carbon monoxide, Lead or 1,3-Butadiene during 2021 within West Lothian during 2021

4 New Local Developments

4.1 Road Traffic Sources

There were no new road traffic sources in 2021.

4.2 Other Transport Sources

There were no new other transport sources in 2021.

4.3 Industrial Sources

There were no new industrial sources during 2021.

4.4 Commercial and Domestic Sources

Installation of domestic wood burning stoves continues to grow within West Lothian. There have been several planning applications received within and out-with the AQMA's during 2021. These applications are generally given consent subject to flue height and applicants are given advice in line with DEFRA requirements for approved stoves and smokeless fuel etc. During 2021, the Environmental Health team started to keep a spreadsheet of wood burning stove applications. It is hoped that this will help to identify any potential hot spot areas, with larger numbers of stoves being installed. There were no applications for any larger scale commercial or domestic developments during 2021.

4.5 New Developments with Fugitive or Uncontrolled Sources

There were no new fugitive or uncontrolled sources during 2021.

5 Planning Applications

West Lothian Council has received the following applications in 2021 which might affect air quality;

- **0210/P/21 and 0206/P/21** - Drumshoreland Garden Community, Land North of Old Clapperton Hall, East Calder, West Lothian

  Planning permission in principle for a 58ha mixed use development including residential development (dwellings and flatted), local centre (including Class 1, Class 2 and Class 3 uses), community facilities, public open space, and associated works and infrastructure (EIA development)

  The air quality impact assessment for the smaller development can be found here - https://planning.westlothian.gov.uk/publicaccess/files/41620C7EEB0847B305A0ECF473EAF72A/pdf/0210_P_21-VOL_5_EIAR_APPENDIX_13_1_AIR_QUALITY_IMPACT_ASSESSMENT-3004398.pdf

  As part of the air quality impact assessment, detailed dispersion modelling using the ADMS-Roads modelling software was undertaken to predict the concentrations of NO2, PM10 and PM2.5 due to emissions from road traffic in conjunction with existing background concentrations, at existing sensitive human and ecological receptor locations within the study area.

  No exceedances of the AQSs for NO2, PM10 and PM2.5 (human receptors) are predicted at any of the sensitive receptors within the study area. The predicted change in NO2, PM10 and PM2.5 (human receptors) annual mean concentrations between the future without Proposed Development and future with Proposed Development scenarios shows that the Proposed Development is predicted to have a **Negligible impact** at all human receptors within the study area. The predicted short-term mean concentrations for NO2 and PM10 (human receptors) which are relevant for the short-term exposure of members of public, comply with the relevant AQSs for NO2 and PM10 at all human receptors.

In summary, the significance of effect associated with operational phase emissions upon local air quality of the Proposed Development is assessed as **not significant**.

An air quality impact assessment for the wider site was also carried out and it can be viewed here;

https://planning.westlothian.gov.uk/publicaccess/files/9D5C6DEFD2259B05563AD727BF7D128A/pdf/0206_P_21-VOL_5_EIAR_13_1_AIR_QUALITY_IMPACT_ASSESSMENT_WIDER_SITE_V1-3005136.pdf

As part of the air quality impact assessment, detailed dispersion modelling using the ADMS-Roads modelling software was undertaken to predict the concentrations of NO2, PM10 and PM2.5 due to emissions from road traffic in conjunction with existing background concentrations, at existing sensitive human and ecological receptor locations within the study area.

No exceedances of the AQSs for NO2, PM10 and PM2.5 (human receptors) are predicted at any of the sensitive receptors within the study area. The predicted change in NO2, PM10 and PM2.5 (human receptors) annual mean concentrations between the future without Proposed Development and future with Proposed Development scenarios shows that the Proposed Development is predicted to have a Negligible impact at most human receptors within the study area.

A **Slight Adverse impact** associated with the change in annual mean NO2 is predicted at receptor R28 (ground floor residential property on Drumshoreland Road).

A **Slight Adverse impact** associated with the change in annual mean PM10 is predicted at receptors R27 & R28 (ground floor residential properties on Drumshoreland Road).

The predicted short-term mean concentrations for NO2 and PM10 (human receptors) which are relevant for the short-term exposure of members of public, comply with the relevant AQSs for NO2 and PM10 at all human receptors.

In summary, the significance of effect associated with operational phase emissions upon local air quality of the Proposed Development is assessed as **not significant**.

- **0801/FUL/20** - Land South of Deanburn Road Linlithgow West Lothian

Erection of 60 houses with associated works, including access, landscaping and SUDS provision.
An air quality impact assessment was carried out as part of this application and it can be viewed here;
https://planning.westlothian.gov.uk/publicaccess/files/E3BFF064B5738BC4B0F136ED7E3AD1E6/pdf/0801_FUL_20-AIR_QUALITY_IMPACT_ASSESSMENT__5-3-21_-3031656.pdf

The air quality impact assessment found that the predicted change in NO2 as a consequence of the proposed development is of **negligible significance** at all sensitive receptors considered in the study area in terms of the IAQM/EPUK assessment framework. The predicted contribution from the proposed development to the annual mean PM10 is of **negligible significance** at all sensitive receptors considered within the study area in terms of the IAQM/EPUK assessment framework. The predicted contribution from the proposed development to the annual mean PM2.5 is of **negligible significance** at all sensitive receptors considered within the study area in terms of the IAQM/EPUK assessment framework.

Air quality is **predicted to comply** with the statutory Limit Value for NO2 and the Scottish Government's annual mean Objectives for particles at all sensitive receptors considered in the study area.

- **0328/P/21** - Clarendon Farm Manse Road Linlithgow West Lothian EH49 6QR

  Planning permission in principle for a 6.92ha residential development, including access roads, open space, landscaping and associated works

  An air quality impact assessment was carried out for this development. It can be found here;

  https://planning.westlothian.gov.uk/publicaccess/files/E5C1566D35DB3CF9D65FA73CAB31207C/pdf/0328_P_21-AIR_QUALITY-3101618.pdf

  The air quality impact assessment found that the model predicts **no significant change** in NO2, PM10 or PM2.5 concentrations at all Sensitive Receptors on comparison of the 'with' and 'without' development scenarios

- **0582/P/21** - Land South of B7066 And West of A706 Heartlands Whitburn West Lothian

  Planning permission in principle for a 78.4ha mixed-use development including residential, commercial land, community / education facilities, local services, open space, road infrastructure, engineering works and associated landscape proposals (EIA).

  The air quality impact assessment for the development can be found at the following link;

  https://planning.westlothian.gov.uk/publicaccess/files/DC221BB6319C6C0285A6428C320E56E9/pdf/0582_P_21-CH_10_-_AIR_QUALITY-3046571.pdf

  The assessment concluded that in relation to NO2 the impact of the proposed development is considered to be **Negligible** for all of the assessed sensitive receptors and therefore the resultant effects are **not significant**. The assessment concludes that in relation to PM10 the impact of the proposed development is considered to be **Negligible** for all of the assessed sensitive receptors and therefore the resultant effects are **not significant**. In relation to PM2.5 the impact of the proposed development is considered to be **Negligible** for all of the assessed sensitive receptors and therefore the resultant effects are considered to be **Not Significant**.

- **1036/P/21** - Land East of New Calder Mill Road Mid Calder West Lothian

  Planning permission in principle for a 6.91 Ha residential development with associated infrastructure, landscaping, open space and engineering work. **Planning permission was refused for this application, but it may come back in another year so worth noting**

6 Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

All long-term air quality objective levels were met in 2021 at all monitoring sites. There were also no short-term exceedances of any objective. It is noted that measured levels were higher than in 2020 and this is likely to be due to increased vehicle movements as the country moved out of the pandemic. There are now several years of data showing results below the air quality monitoring objectives. As in previous years, work had been planned to carry out detailed assessments to establish whether all three AQMA's could be revoked. It has been difficult to obtain the all of the required information from other departments to allow Environmental Health to progress with detailed assessments and resources were also taken up dealing with the numerous issues with our continuous monitoring equipment failures. A poor data capture rate in 2021 has meant that we are focussing our resources on ensuring that the monitoring equipment is repaired/replaced as required so that we have robust, reliable data going forward and then we can concentrate on the revocation of our Air Quality Management areas. Diffusion tube results again showed that all levels were below the objectives and this reinforced our decision to review the diffusion tube locations and plan some different monitoring locations for 2022.

6.2 Conclusions relating to New Local Developments

There have been no new local developments that have the potential to introduce new exceedances of relevant air quality objectives in West Lothian. The Local Development Plan for West Lothian identifies various residential sites in and around the AQMAs. It's likely that these will introduce further traffic related emissions and may be subject to Air Quality Impact Assessments (AQIAs), as and when they arise. These will be considered in line with our adopted Air Quality Supplementary Planning Guidance.

6.3 Proposed Actions

Monitoring data for 2021 has not highlighted any need for additional monitoring to take place. There are no new exceedances of the objectives for any pollutant measured. Whilst measured levels increased during 2021, for reasons previously explained, it can be shown that levels of pollutants in West Lothian have continued to be comfortably below air quality objective limits for several years.

As per last year's report, the draft Linlithgow and Newton Air Quality Action Plans and the Broxburn Air Quality Action Plan may be superseded by Detailed Assessments. Any such assessments will consider land allocated for development in the local development plan and will set out whether any future exceedances of pollutants at relevant receptors are likely. West Lothian Council will aim to work towards assessing whether the current AQMA's should be revoked with the use of detailed assessments and further modelling as required. This work will proceed as soon as information is available and resources allow.

The main priorities for 2022 are;

- To establish new diffusion tube locations (potential hot spots), install the diffusion tubes and remove older tubes that have consistently shown readings below objective levels. Traffic data, local knowledge and information on new developments will be utilised to establish any new sites;
- Focus resources on ensuring the continuous monitoring equipment is repaired and/or replaced where necessary and work towards a good data capture rate, with reliable, quality data;
- Once we have reliable, quality data we can then progress towards the detailed assessments and revocation of the air quality management areas – subject to obtaining the necessary traffic data from within the Council;
- Ensure sufficient staff within Environmental Health are well trained and competent in local site operator duties;
- West Lothian Council will continue to apply to the Scottish Government for funding to assist with monitoring equipment and action plan measures;

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM1	Linlithgow High St	Roadside	300426	677172	NO_2; PM_{10}; $PM_{2.5}$,	Y Linlithgow	FIDAS; NO_X Analyser	4	1.36	2.32
CM2	Broxburn CNC	Roadside	308314	672231	NO_2; PM_{10}; $PM_{2.5}$	Y Broxburn	FIDAS; NO_X Analyser	3.5	2.20	2.36
CM3	Newton CNC	Roadside	309258	677728	NO_2; PM_{10}: $PM_{2.5}$	Y Newton	FDMS; NO_X Analyser	1.8	1.92	2.41

Notes:

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

(2) N/A if not applicable.

Table A.2 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT1	Newton	Roadside	309223	677711	NO_2	Y; Newton	3	1.6	N	2.4
DT2	Broxburn WMS	Roadside	308165	672222	NO_2	Y Broxburn	Façade	3.3	N	2.5
DT3	Broxburn EMS	Roadside	308426	672233	NO_2	Y Broxburn	Façade	4	N	1.8
DT4	Broxburn CNC	Roadside	308314	672231	NO_2	Y Broxburn	3.2	1.7	Y	2.5
DT5	Broxburn E Mains	Roadside	309368	672213	NO_2	Y Broxburn	5	1.5	N	2.7
DT6	Dedridge Cedric Rise	Urban Background	306403	666341	NO_2	N	2.5	1.6	N	2.4

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT7	West Calder	Roadside	301758	663158	NO_2	N	2	2	N	2.5
DT8	Whitburn	Roadside	294687	665030	NO_2	N	2	0.5	N	2.2
DT9	Armadale Cross	Roadside	293842	668588	NO_2	N	3	1.4	N	2.3
DT10	Bathgate, South Bridge Street	Roadside	297401	668772	NO_2	N	1	1.5	N	2.1
DT11	Bathgate Steelyard	Roadside	297467	668734	NO_2	N	Façade	2	N	2.5
DT12	Bathgate King St	Roadside	297570	668586	NO_2	N	5	4	N	2.5
DT13	Bathgate High St	Urban Background	297656	669298	NO_2	N	3	10	N	1.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT14	Linlithgow CNC	Roadside	300412	677124	NO_2	Y Linlithgow	4	1.36	Y	2.5
DT15	Linlithgow H ST NW	Roadside	299930	677070	NO_2	Y Linlithgow	2	1.4	N	2.4
DT16	Linlithgow H ST SW	Roadside	299911	677052	NO_2	Y Linlithgow	2	2.9	N	2.3
DT17	Linlithgow H ST NE	Roadside	300479	677148	NO_2	Y Linlithgow	3.4	2	N	1.5
DT18	Linlithgow H ST SE	Roadside	300485	677125	NO_2	Y Linlithgow	7.5	1.5	N	2.6
DT19	Linlithgow H ST N	Roadside	300398	677132	NO_2	Y Linlithgow	Façade	2.4	N	2.0
DT20	Linlithgow H ST S	Roadside	300405	677118	NO_2	Y Linlithgow	Façade	3	N	2.7

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
DT21	Main Street, East Calder	Roadside	308641	667912	NO_2	N	2.0	1.8	N	2.7
DT22	Butchers, Winchburgh	Roadside	308957	675025	NO_2	N	Façade	1.8	N	2.5
DT23	Main Street, Winchburgh	Roadside	309133	675028	NO_2	N	Façade	1.5	N	2.7

Notes:

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

(2) N/A if not applicable.

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2021 (%) [2]	2017	2018	2019	2020	2021
CM1	Roadside	Automatic		22	31	28	30	16.4	19.6
CM2	Roadside	Automatic		90	30	27	27	19	22
CM3	Roadside	Automatic		28	19	17	18	12.6[3]	15.7
DT1	Roadside	Diffusion Tube	-	100	23.3	21.1	20.7	8.7	14.9
DT2	Roadside	Diffusion Tube	-	83	26.2	26.5	23.2	12.3	19.2
DT3	Roadside	Diffusion Tube	-	100	25.5	22.2	22.2	11.6	19.9
DT4	Roadside	Diffusion Tube	-	100	28.4	28.0	27.2	15.5	25.6
DT5	Roadside	Diffusion Tube	-	100	26.7	22.5	22.6	13.5	21.8
DT6	Urban	Diffusion Tube	-	75	12.1	12.1	11.6	6.9	9.7
DT7	Roadside	Diffusion Tube	-	91	22.1	20.7	20.8	11.4	17.1
DT8	Roadside	Diffusion Tube	-	100	23.9	20.5	23.8	14.9	21.7
DT9	Roadside	Diffusion Tube	-	100	25.2	23.1	24.2	12.6	20.4
DT10	Roadside	Diffusion Tube	-	83	18.9	16.4	16.8	8.6	14.7

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2021 (%) [2]	2017	2018	2019	2020	2021
DT11	Roadside	Diffusion Tube	-	83	28.0	24.5	26.6	9.1	21.5
DT12	Roadside	Diffusion Tube	-	83	27.2	26.6	26.3	15.3	21.1
DT13	Urban	Diffusion Tube	-	100	10.7	9.9	9.5	6.1	8.2
DT14	Roadside	Diffusion Tube	-	100	31.6	26.9	25.3	13.9	19.3
DT15	Roadside	Diffusion Tube	-	100	28.1	24.7	24.6	11.8	18.4
DT16	Roadside	Diffusion Tube	-	100	33.9	29.2	29.4	13.8	21.3
DT17	Roadside	Diffusion Tube	-	100	25.7	21.8	26.7	9.9	14
DT18	Roadside	Diffusion Tube	-	100	30.6	25.4	22	11.5	16.7
DT19	Roadside	Diffusion Tube	-	100	26.5	22.7	22.4	8.9	16.5
DT20	Roadside	Diffusion Tube	-	83	30.8	26.6	25.1	13.9	17.9
DT21	Roadside	Diffusion Tube	-	91	N/A	N/A	12.9	6.3	11.9
DT22	Roadside	Diffusion Tube	-	91	N/A	N/A	16.2	9.0	13.8
DT23	Roadside	Diffusion Tube	-	91	N/A	N/A	13.0	7.7	13.5

Notes:

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

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

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

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

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

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM1	Roadside	Automatic	N/A	22%	0	0	**1**	0	0
CM2	Roadside	Automatic	N/A	90%	0	0	0	0	0
CM3	Roadside	Automatic	N/A	28%	0	0	0	0	0

Notes:

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM1	Roadside	N/A	42%	9	11	12	8(7.7)	8.5
CM2	Roadside	N/A	97%	14	13	14	11	12
CM3	Roadside	N/A	54%	15**(17)(3)**	14	14	11(11.3)	11.3

Notes:

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM1	Roadside	N/A	42%	0	0	**5**	0	0
CM2	Roadside	N/A	97%	0	0	**4**	0	0
CM3	Roadside	N/A	54%	0	**1**	**2**	0	0

Notes:

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM1	Roadside	N/A	42	5	6	7	5	5.4
CM2	Roadside	N/A	97	6	7	8	6	6
CM3	Roadside	N/A	54	n/a	n/a	10(9.4)	8	7.3

Notes:

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

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

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

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

Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO_2 2021 Monthly Diffusion Tube Results (µg/m^3)

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted For reference only(1) 0.73	National Bias Adjusted 0.78	Data Capture %
DT1	26.8	16.4	16.6	23.2	18.3	14.3	14.8	20.6	19.2	17.4	19.9	22.5	**19.2**	14	14.9	100
DT2	42.5	27.6	20.0	26.2	28.4	19.8	24.3	26.4	No data	23.7	25.7	30.1	**26.7**	19.5	20.8	83
DT3	39.5	19.8	22	25.9	24.7	18.6	22.1	23.4	28.5	21.1	30.3	31.2	**25.6**	18.7	19.9	100
DT4	44.6	30.5	25.6	33.8	35.2	26.1	29.6	31.7	30.8	30.9	25.1	38.1	**32.8**	23.9	25.6	100
DT5	44.2	26	20.2	31	29.4	20.4	27.0	27.7	28.3	22.5	23.4	30.8	**27.9**	20.4	21.8	100
DT6	24.1	11.5	10.9	No Data	No Data	8.3	9.6	12.1	11.3	11.3	13.6	No Data	**12.4**	9.1	9.7	75
DT7	27.7	21.0	Missing	20.3	24.9	17.6	19.6	23.6	21.3	18.9	22.1	24.9	**21.9**	16	17.1	91

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted For reference only(1) 0.73	National Bias Adjusted 0.78	Data Capture %
DT8	42.7	24.9	25.1	30.2	28.8	23.5	23.8	26.4	28.3	22.3	30.3	25.7	**27.8**	20.3	21.7	100
DT9	35.4	23.1	27.1	20.3	21	20.9	20.9	20.7	23.9	33.4	34.8	31.3	**26.1**	19.1	20.4	100
DT10	30.0	No Data	No Data	17.9	16.7	11.9	15.1	16.3	18.7	15.6	21.2	24.4	**18.8**	13.7	14.7	83
DT11	38.5	21.2	23.3	27	27.9	20.8	No Data	20.3	25.9	29.8	37.8	35.8	**27.5**	20.1	21.5	83
DT12	51.9	24.6	25.8	29.7	28.8	21.6	24.3	15.9	31.7	32.3	No Data	No Data	**27**	19.7	21.1	83
DT13	18.3	11.6	9.0	9.9	9.3	6.1	7.6	7.9	8.8	9.3	12.9	14.7	**10.5**	7.7	8.2	100
DT14	36.9	24.9	21.5	22.6	22.1	19.0	19.1	21.3	24.5	25.4	28.3	30.6	**24.7**	18	19.3	100
DT15	34.7	19.9	20.0	28	25.1	18.9	20.9	25.5	15.7	20.4	25.3	28.9	**23.6**	17.2	18.4	100
DT16	42.8	22.9	26.5	21.7	27.2	23.2	24.3	22.6	23.3	27.1	25.8	33.6	**27.3**	19.9	21.3	100
DT17	30.2	15.1	18.3	15.9	17.8	12.6	14.8	14.8	11.7	19.5	25.0	23.6	**18**	13.1	14	100

Site ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Bias Adjusted For reference only(1) 0.73	National Bias Adjusted 0.78	Data Capture %
DT18	34.0	20.0	18.7	20.1	21.1	17.8	15.7	19.8	15.9	20.3	24.4	28.2	**21.4**	15.6	16.7	100
DT19	33.4	18.4	18.3	23.9	20.1	16.2	19.5	19.5	16.4	19.7	26.0	23.4	**21.1**	15.4	16.5	100
DT20	36.4	25.9	22.1	20.0	21.6	19.3	19.9	20.9	24.2	No Data	17.0	No Data	**23**	16.8	17.9	83
DT21	27.3	14.2	11.9	No Data	13.8	11.5	12.9	12.9	15.9	12.6	17.4	18.1	**15.3**	11.1	11.9	91
DT22	29.9	17.6	14.7	No Data	16.2	12.5	15.5	16.6	17.3	17.9	16.5	19.4	**17.7**	12.9	13.8	91
DT23	32.2	16.0	13.7	No Data	16.5	12.7	12.7	13.7	16.8	13.6	18.7	21.5	**17.3**	12.6	13.5	91

Notes:

(1) See Appendix C for details on bias adjustment

Table B.2 - Historical Monthly Diffusion Tube Results

SITE ID	2017 Raw data	2017 Bias adjusted	2018 Raw data	2018 Bias adjusted	2019 Annual	2019 Bias adjusted	2020 Annual	2020 Bias adjusted	2021 Annual	2021 Bias adjusted
DT1	24	23.3	26.4	21.1	26.9	20.7	12.8	8.7	19.2	14.9
DT2	27	26.2	33.1	26.5	30.1	23.2	18.1	12.3	26.7	20.8
DT3	26.3	25.5	27.7	22.2	28.8	22.2	17.1	11.6	25.6	19.9
DT4	29.3	28.4	35.0	28.0	35.3	27.2	22.8	15.5	32.8	25.6
DT5	27.5	26.7	28.1	22.5	29.4	22.6	19.9	13.5	27.9	21.8
DT6	12.5	12.1	15.1	12.1	15.1	11.6	10.1	6.9	12.4	9.7
DT7	22.8	22.1	25.9	20.7	27	20.8	16.8	11.4	21.9	17.1
DT8	24.6	23.9	25.6	20.5	30.9	23.8	21.9	14.9	27.8	21.7
DT9	26	25.2	28.9	23.1	31.4	24.2	18.5	12.6	26.1	20.4
DT10	19.5	18.9	20.5	16.4	21.8	16.8	12.7	8.6	18.8	14.7
DT11	28.9	28.0	30.6	24.5	34.5	26.6	13.4	9.1	27.5	21.5
DT12	28	27.2	33.2	26.6	34.2	26.3	22.5	15.3	27	21.1
DT13	11	10.7	12.4	9.9	12.3	9.5	8.9	6.1	10.5	8.2
DT14	23.3	31.6	33.6	26.9	32.8	25.3	20.4	13.9	24.7	19.3

SITE ID	2017 Raw data	2017 Bias adjusted	2018 Raw data	2018 Bias adjusted	2019 Annual Raw	2019 Bias adjusted	2020 Annual Raw	2020 Bias adjusted	2021 Annual Raw	2021 Bias adjusted
DT15	26.2	28.1	30.9	24.7	32	24.6	17.3	11.8	23.6	18.4
DT16	25.5	33.9	36.5	29.2	38.2	29.4	20.3	13.8	27.3	21.3
DT17	28.4	25.7	27.2	21.8	25.9	26.7	14.5	9.9	18	14
DT18	26.7	30.6	31.7	25.4	28.6	22	16.9	11.5	21.4	16.7
DT19	12.1	26.5	28.4	22.7	29.1	22.4	13.1	8.9	21.1	16.5
DT20	22.1	30.8	33.3	26.6	32.6	25.1	20.4	13.9	23	17.9
DT21	N/A	N/A	N/A	N/A	16.7	12.9	9.3	6.3	15.3	11.9
DT22	N/A	N/A	N/A	N/A	21.1	16.2	13.3	9.0	17.7	13.8
DT23	N/A	N/A	N/A	N/A	16.9	13.0	11.3	7.7	17.3	13.5

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

New or Changed Sources Identified Within West Lothian Council During 2021

West Lothian Council has not identified any new sources relating to air quality within the reporting year of 2021.

Additional Air Quality Works Undertaken by West Lothian Council During 2021

West Lothian Council has not completed any additional works within the reporting year of 2021.

QA/QC of Diffusion Tube Monitoring

- The supplier used for diffusion tubes within 2021 in West Lothian was SOCOTEC and the method of preparation that was used was by spiking Acetone: Triethanolamine (50:50) onto the grids prior to the tubes being assembled. The tubes were desorbed with distilled water and the extract analysed using a segmented flow auto analyser with ultraviolet detection.
- The samples have been analysed in accordance with SOCOTEC's standard operating procedure ANU/SOP/1015. This method meets the guidelines set out in DEFRA's 'Diffusion Tubes for Ambient NO2 Monitoring: Practical Guidance. As set out in the practical guidance, the results were initially calculated assuming an ambient temperature of 11^{o}C, the reported values **have** been adjusted to 20^{o}C to allow for direct comparison with EU limits. This analysis of diffusion tube samples to determine the amount of nitrogen dioxide present on the tube is within the scope of our UKAS schedule. Any further calculations and assessments requiring exposure details and conditions fall outside the scope of our accreditation. In the AIR PT inter comparison

scheme for comparing spiked Nitrogen Dioxide diffusion tubes, SOCOTEC currently holds the highest rank of a **Satisfactory** laboratory.

- The same diffusion tube supplier was used in West Lothian throughout 2021.
- West Lothian changed the diffusion tubes in accordance with the LAQM Nitrogen Dioxide Diffusion tube monitoring calendar throughout 2021 apart from when the tubes were changed one week late at the end of July due to annual leave. The tubes were then changed again three weeks later at the end of August.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within West Lothian Council recorded data capture of 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

Diffusion Tube Bias Adjustment Factors

West Lothian Council calculated both a national and local bias adjustment factor of 0.78 (national) and 0.73 (local) for the 2021 monitoring data, for comparison. A summary of bias adjustment factors used by West Lothian Council over the past five years is presented in

Table C.1.

The data provided in Table A.3 has the national bias adjustment factor applied. It was decided to select the national bias adjustment factor on this occasion, for a number of reasons;

- Diffusion tubes are changed monthly, had they been changed more frequently, this would have swayed us towards the local;
- There are no unusual situations within our co-location sites;
- The diffusion tube study was not less than 12 months;
- The Review and Assessment Helpdesk spreadsheet contains data from *more than* five other studies using the same laboratory and preparation;
- The data capture from the automatic analysers was poor for both Linlithgow and Broxburn

The version of the national spreadsheet used for the national factor was version 03/22 and 23 studies were applicable to this factor.

The automatic monitoring sites used to calculate a local bias factor were Linlithgow and Broxburn as there were no co-located diffusion tubes at Newton during 2021.

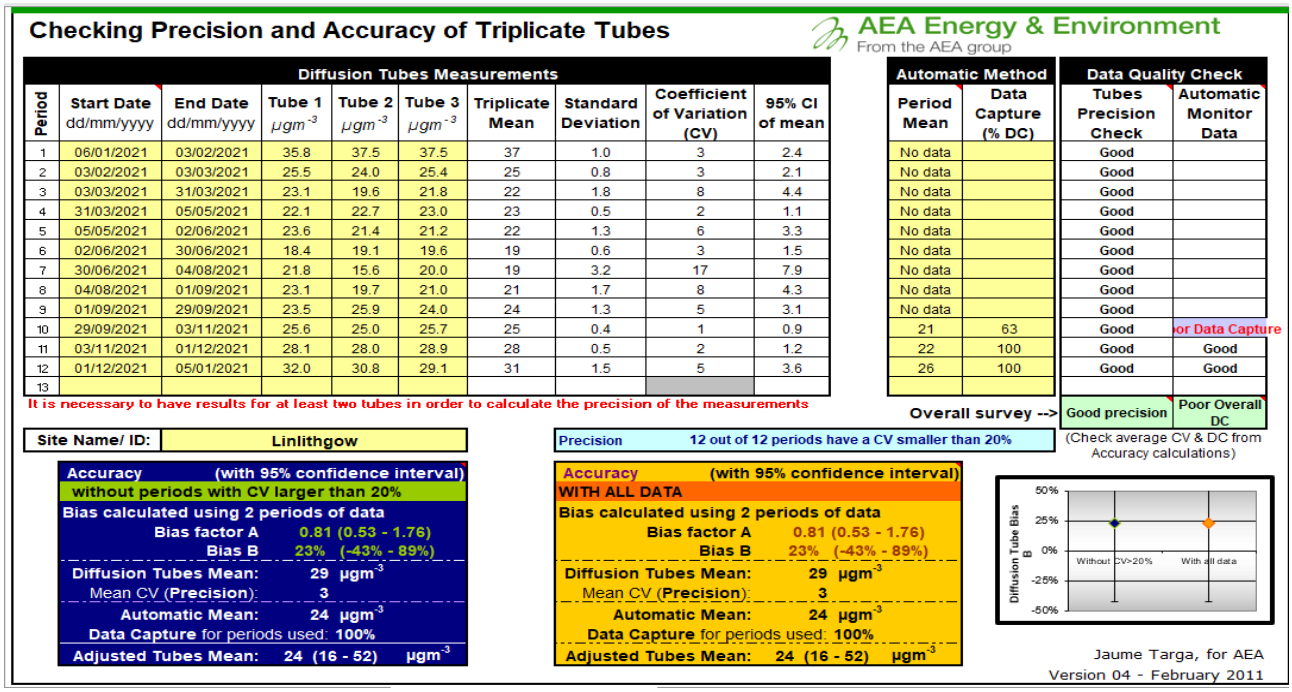
Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	Local	N/A	0.73
2021	National	03/22	0.78
2020	Local	N/A	0.68
2020	National	06/21	0.76
2019	Local	N/A	0.77
2018	Local	N/A	0.8
2017	Local	N/A	0.9

NO_2 Fall-off with Distance from the Road

No diffusion tube NO_2 monitoring locations within West Lothian Council required distance correction during 2021.

Figure 1 - Screenshot from AEA Spreadsheet - Bias Adjustment Factors for Diffusion Tubes - Linlithgow AQ Station



Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Automatic Method: Period Mean	Automatic Method: Data Capture (% DC)	Data Quality Check: Tubes Precision Check	Data Quality Check: Automatic Monitor Data
1	06/01/2021	03/02/2021	35.8	37.5	37.5	37	1.0	3	2.4	No data		Good	
2	03/02/2021	03/03/2021	25.5	24.0	25.4	25	0.8	3	2.1	No data		Good	
3	03/03/2021	31/03/2021	23.1	19.6	21.8	22	1.8	8	4.4	No data		Good	
4	31/03/2021	05/05/2021	22.1	22.7	23.0	23	0.5	2	1.1	No data		Good	
5	05/05/2021	02/06/2021	23.6	21.4	21.2	22	1.3	6	3.3	No data		Good	
6	02/06/2021	30/06/2021	18.4	19.1	19.6	19	0.6	3	1.5	No data		Good	
7	30/06/2021	04/08/2021	21.8	15.6	20.0	19	3.2	17	7.9	No data		Good	
8	04/08/2021	01/09/2021	23.1	19.7	21.0	21	1.7	8	4.3	No data		Good	
9	01/09/2021	29/09/2021	23.5	25.9	24.0	24	1.3	5	3.1	No data		Good	
10	29/09/2021	03/11/2021	25.6	25.0	25.7	25	0.4	1	0.9	21	63	Good	or Data Capture
11	03/11/2021	01/12/2021	28.1	28.0	28.9	28	0.5	2	1.2	22	100	Good	Good
12	01/12/2021	05/01/2021	32.0	30.8	29.1	31	1.5	5	3.6	26	100	Good	Good
13													

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Overall survey --> Good precision | Poor Overall DC

Site Name/ ID: Linlithgow

Precision: 12 out of 12 periods have a CV smaller than 20%

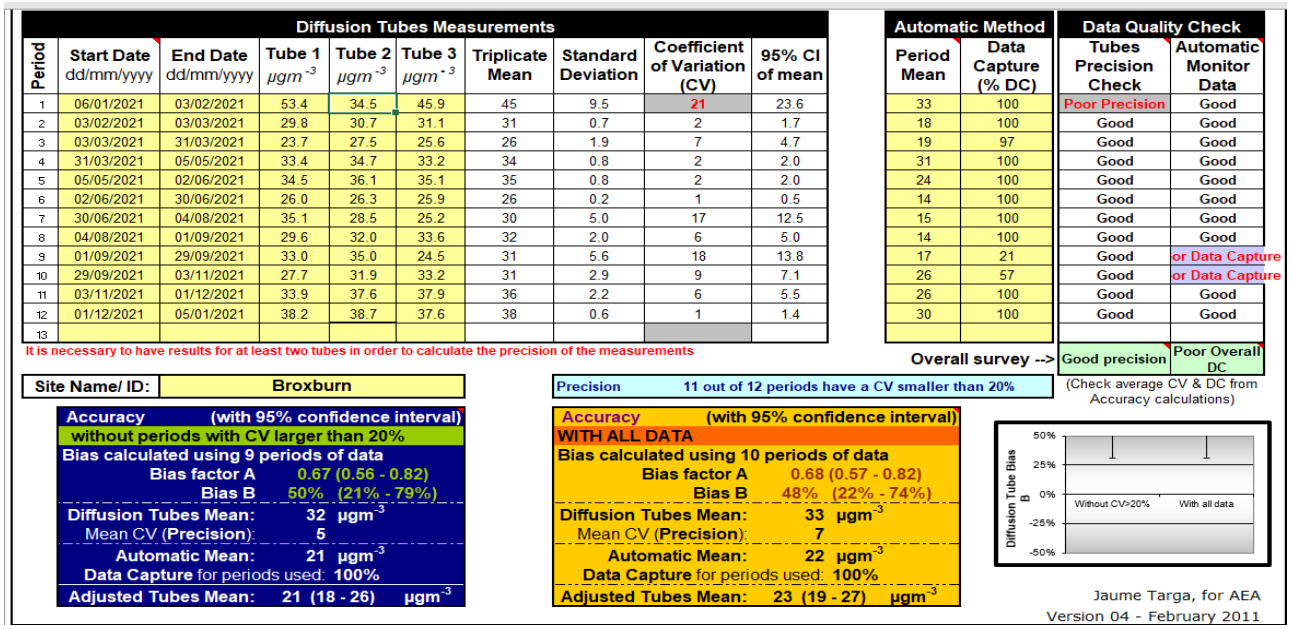
(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 2 periods of data
Bias factor A 0.81 (0.53 - 1.76)
Bias B 23% (-43% - 89%)
Diffusion Tubes Mean: 29 µgm^{-3}
Mean CV (Precision): 3
Automatic Mean: 24 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 24 (16 - 52) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 2 periods of data
Bias factor A 0.81 (0.53 - 1.76)
Bias B 23% (-43% - 89%)
Diffusion Tubes Mean: 29 µgm^{-3}
Mean CV (Precision): 3
Automatic Mean: 24 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 24 (16 - 52) µgm^{-3}

Jaume Targa, for AEA
Version 04 - February 2011

Figure 2 - Screenshot from AEA Spreadsheet - Bias Adjustment Factors for Diffusion Tubes - Broxburn AQ Station



Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Automatic Method: Period Mean	Automatic Method: Data Capture (% DC)	Data Quality Check: Tubes Precision Check	Data Quality Check: Automatic Monitor Data
1	06/01/2021	03/02/2021	53.4	34.5	45.9	45	9.5	21	23.6	33	100	Poor Precision	Good
2	03/02/2021	03/03/2021	29.8	30.7	31.1	31	0.7	2	1.7	18	100	Good	Good
3	03/03/2021	31/03/2021	23.7	27.5	25.6	26	1.9	7	4.7	19	97	Good	Good
4	31/03/2021	05/05/2021	33.4	34.7	33.2	34	0.8	2	2.0	31	100	Good	Good
5	05/05/2021	02/06/2021	34.5	36.1	35.1	35	0.8	2	2.0	24	100	Good	Good
6	02/06/2021	30/06/2021	26.0	26.3	25.9	26	0.2	1	0.5	14	100	Good	Good
7	30/06/2021	04/08/2021	35.1	28.5	25.2	30	5.0	17	12.5	15	100	Good	Good
8	04/08/2021	01/09/2021	29.6	32.0	33.6	32	2.0	6	5.0	14	100	Good	Good
9	01/09/2021	29/09/2021	33.0	35.0	24.5	31	5.6	18	13.8	17	21	Good	or Data Capture
10	29/09/2021	03/11/2021	27.7	31.9	33.2	31	2.9	9	7.1	26	57	Good	or Data Capture
11	03/11/2021	01/12/2021	33.9	37.6	37.9	36	2.2	6	5.5	26	100	Good	Good
12	01/12/2021	05/01/2021	38.2	38.7	37.6	38	0.6	1	1.4	30	100	Good	Good
13													

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Overall survey --> Good precision | Poor Overall DC

Site Name/ ID: Broxburn

Precision: 11 out of 12 periods have a CV smaller than 20%

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 9 periods of data
Bias factor A 0.67 (0.56 - 0.82)
Bias B 50% (21% - 79%)
Diffusion Tubes Mean: 32 µgm^{-3}
Mean CV (Precision): 5
Automatic Mean: 21 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 21 (18 - 26) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 10 periods of data
Bias factor A 0.68 (0.57 - 0.82)
Bias B 48% (22% - 74%)
Diffusion Tubes Mean: 33 µgm^{-3}
Mean CV (Precision): 7
Automatic Mean: 22 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 23 (19 - 27) µgm^{-3}

Jaume Targa, for AEA
Version 04 - February 2011

Figure 3 - Screenshot of Diffusion Tube Bias Adjustment Factors Spreadsheet (DEFRA)

Diffusion Tube Bias Adjustment Factors 03/22 Issue of the Spreadsheet				
			New (03/22) Factor	
Laboratory	Method	Year	No. of Studies	Factor
Aberdeen Scientific Services	20% TEA in water	2021	7	0.75
Edinburgh Scientific Services	50% TEA in acetone	2021	1	0.87
Glasgow Scientific Services	20% TEA in water	2021	6	1.12

Gradko	20% TEA in water	2021	32	0.84
Gradko	50% TEA in acetone	2021	14	0.83
Lambeth Scientific Services	50% TEA in acetone	2021	5	0.97
Milton Keynes Council	20% TEA in water	2021	1	0.74
SOCOTEC Didcot	20% TEA in water	2021	5	0.76
SOCOTEC Didcot	50% TEA in acetone	2021	23	0.78
SOCOTEC Glasgow	20% TEA in water	2021	1	0.78
SOCOTEC Glasgow	50% TEA in acetone	2021	1	0.80
Somerset County Council	20% TEA in water	2021	2	0.77
South Yorkshire Air Quality Samplers	50% TEA in acetone	2021	1	0.77
Staffordshire Scientific Services	20% TEA in water	2021	14	0.86
Tayside Scientific Services	20% TEA in water	2021	1	0.77
Number of Studies Included			**114**	

Table C.2 – Local Bias Correction Factor Summary

	Local Bias Adjustment Input 1	Local Bias Adjustment Input 2
Periods used to calculate	2	9
Bias Factor A	0.81	0.67
Bias Factor B	23%	50%
Diffusion Tube Mean	29	32
Mean CV (Precision)	3	5
Automatic Mean (µg/m^3)	24	21
Data Capture	100	100
Adjusted Tube Mean	24	21

Table C.3 – Local Bias Correction Factor Calculation

Automatic Roadside Monitoring Site	Bias B%

Linlithgow	23
Broxburn	50
Mean Bias B	37
Factor + 1	1.37
Inverse	**0.73**

Note Calculation in accordance with LAQM TG16 Chapter 7

QA/QC of Automatic Monitoring

- The data management and LSO duties are carried out by Technical Officer Sarah Gillespie at West Lothian Council.
- Calibrations are automatically performed daily on the NO_X analysers at each of the three automatic monitoring stations. Audits are carried out every 6 months by Ricardo AEA Technology and servicing is also carried out every 6 months by an engineer from Enviro Technology.
- Ratification of the data is carried out by Ricardo AEA, and the monitoring data presented within the APR is ratified;
- Live and historic data is currently available on the Scottish Air quality web-site. This is available at www.scottishairquality.scot.

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

The type of PM_{10}/$PM_{2.5}$ monitors utilised within West Lothian Council do not require the application of a correction factor.

Automatic Monitoring Annualisation

Annualisation was required for two of our automatic monitoring sites in West Lothian located at Linlithgow and Newton, for PM_{10}, $PM_{2.5}$ and NO_2 as the data capture was less than 75%. The results are shown in Table C.4

There were various issues with data capture at the continuous monitoring sites during 2021. The problems encountered at each site are summarised below;

Linlithgow Continuous Monitor issues;

$PM_{10}/PM_{2.5}$ - The Issue with the FIDAS at Linlithgow was first noticed on 28th September 2020. It was discovered that the LED source had expired and would require to be replaced. In January 2021 the FIDAS was sent to Germany for repair and was then re-installed on 12th May 2021. During a routine Service on 12th October 2021, further issues were found with the FIDAS and it had to be sent away for investigative work. These investigations ended up taking some time and due to the lack of a 'hot spare' from the Councils maintenance contractor, a BAM PM_{10} analyser was installed in November 2021 However, the but the data was then found to be flat lining. The maintenance contractor then replaced the BAM with a GRIMM 180 $PM_{10}/PM_{2.5}$ analyser. However, as the Grimm 180 was not recognised by the SAQD Network, the Council were advised that the data was likely to be rejected. As such, the maintenance contractor re-installed the BAM PM_{10} monitor back into the AQ Station at Linlithgow. It was discovered that the BAM measured in mg/m3 and therefore a factor had to be applied to convert the readings to ug/m3. The FIDAS was eventually re-installed after repair on 15th March 2022. The lack of a 'hot spare' from the maintenance contractor meant that this issue proved difficult to resolve quickly.

NO_2 - Issues were found with the NO_X analyser in September 2020 and the Council was advised by our maintenance contractor that the moly converter required replacing. This was replaced, however after a week, there continued to be problems with negative readings and the data was very erratic. It was found that further parts would have to be replaced on the NO_X analyser. As these spare parts had to be shipped from the US, the repair was delayed for some time. In March 2021 the NO_X analyser was finally repaired but unfortunately it was still showing negative and erratic data. The Councils maintenance contractor advised that the analyser would be sent to its workshop in April 2021 for investigative work. Eventually, the NO_X analyser was re-installed on 5th May 2021 but the data was still very erratic and due to the costs and lack of availability of parts, the decision was taken to purchase a new NO_X analyser. It took some time for the new NO_X analyser to be installed after it was purchased, but this finally took place on 7th September 2021.

Newton Continuous Monitor Issues;

$PM_{10}/PM_{2.5}$ - There were issues with the data logger which resulted in data loss in 2021 and some date was deleted due to it being unreliable. During October 2021 water leaked into the AQ Station at Newton resulting in power loss and apparent corruption of the FIDAS analyser. It was sent for repair but the Council was advised that it would be January 2022

before the analyser could be looked at. The FIDAS has now been repaired but due to issues with water leaking into the station, it has not been re-installed. The entire enclosure at Newton is to be replaced along with the NO_X analyser and air-conditioning unit.

NO_2 – There were ongoing problems from July 2020. On the 19th October 2020 it was removed and re-installed on 15th March 2021. Some data was deleted due to it being unreliable. There were further analyser problems from December 2021 – decided in January 2022 that NOX analyser would be replaced due to the repair costs.

Figure 4 - Automatic Monitoring Annualisation Summary (concentrations presented in µg/m3)

Site ID	Annualisation Factor Glasgow Townhead	Annualisation Factor Edinburgh Currie	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
Linlithgow CM1 (NO_2)	0.82	0.88	0.85	23	19.6	
Linlithgow CM1 (PM_{10})	1.0	0.88	0.94	9	8.5	
Linlithgow CM1 ($PM_{2.5}$)	0.95	0.85	0.90	6	5.4	
Newton CM3 (NO_2)	0.99	0.97	0.98	16	15.7	
Newton CM3 (PM_{10})	0.94	0.94	0.94	12	11.3	
Newton CM3 ($PM_{2.5}$)	0.92	0.90	0.91	8	7.3	

As described in the Technical Guidance LAQM-TG-16, annualisation is carried out when data capture is less than 75%. In order to do this, two to four nearby, long-term, continuous monitoring sites, ideally those forming part of the national network require to be identified. The data capture for each of these sites should ideally be at least 85%. These sites should be background (Urban Background, Suburban or Rural) sites to avoid any

localised effects that may occur at Urban Centre, Roadside or Kerbside sites, and should, wherever possible lie within a radius of about 50 miles. If no background sites are available, and the site to be annualised is itself an Urban Centre, Roadside or Kerbside site, then it is permissible to annualise using roadside or kerbside sites rather than background sites, though this should be clearly stated in the annual report.

The next step is to obtain the annual means, **Am**, for the calendar year for these sites. Then work out the period means, **Pm**, for the period of interest (i.e. the period when data capture was poor at your own site), then calculate the ratio, **R**, of the annual mean to the period mean (**Am/Pm**) for each of the sites. Finally, calculate the average of these ratios, **Ra**. This is then the annualisation factor.

The next stage is to multiply the measured period mean concentration **M** by this annualisation factor **Ra** to give the estimate of the annualisation for 2021.

- The period mean for Linlithgow (CM1) for PM_{10} was May to October, for $PM_{2.5}$ was May to October, plus December 2021 and for NO_2 was October to December 2021.
- The period mean for Newton (CM3) for PM_{10} and $PM_{2.5}$ was January to July 2021. The period mean for NO_2 for Newton was April to June and October to December 2021.
- The two sites used to calculate annualisation for Linlithgow and Newton were Glasgow Townhead (Urban Background) and Edinburgh Currie (Suburban site) as there was not enough data available at the 3 West Lothian continuous monitoring sites. Both of the sites used were within a 50 mile radius of the Linlithgow and Newton sites.

NO_2 Fall-off with Distance from the Road

No automatic NO_2 monitoring locations within West Lothian Council required distance correction during 2021.

Figure 5 - Pollutant trend graphs over the past 5 years - PM_{10} Trend Graph – 2017 to 2021

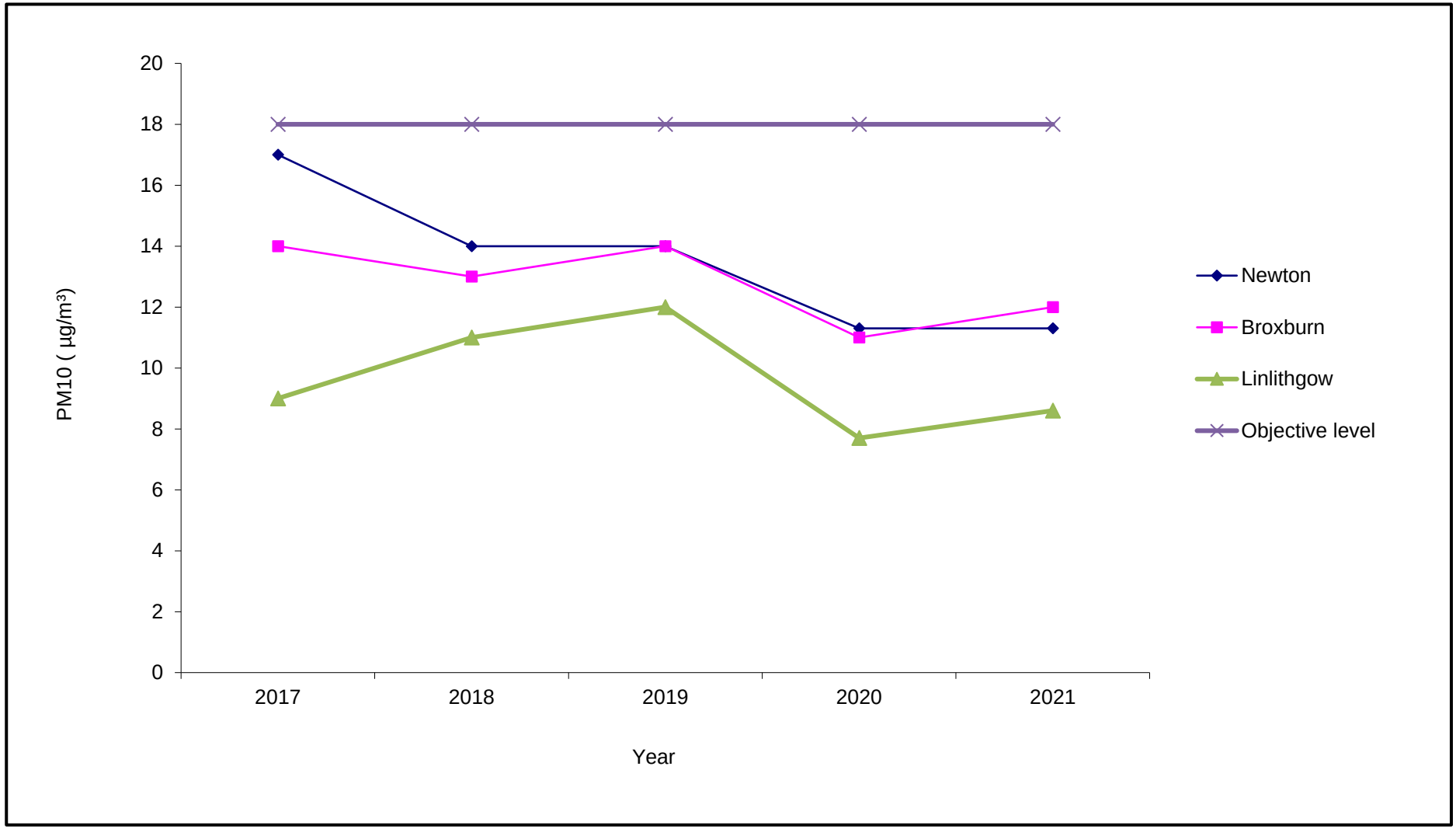


Figure 6 – Pollutant trend graphs over the past 5 years – $PM_{2.5}$ trend graph – 2017 to 2021

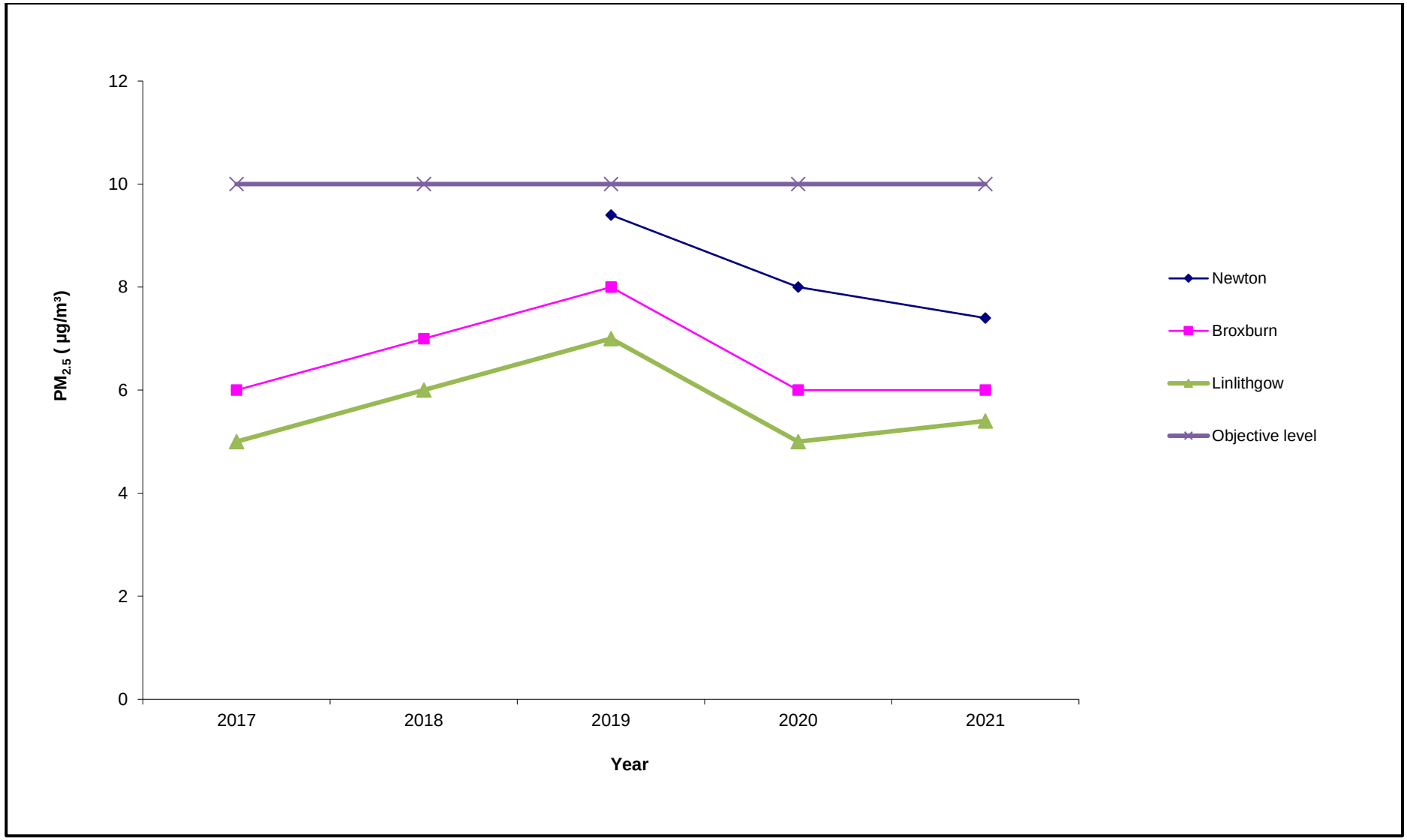


Figure 7 – Pollutant trend graphs over the past 5 years – NO_2 trend graph – 2017 to 2021

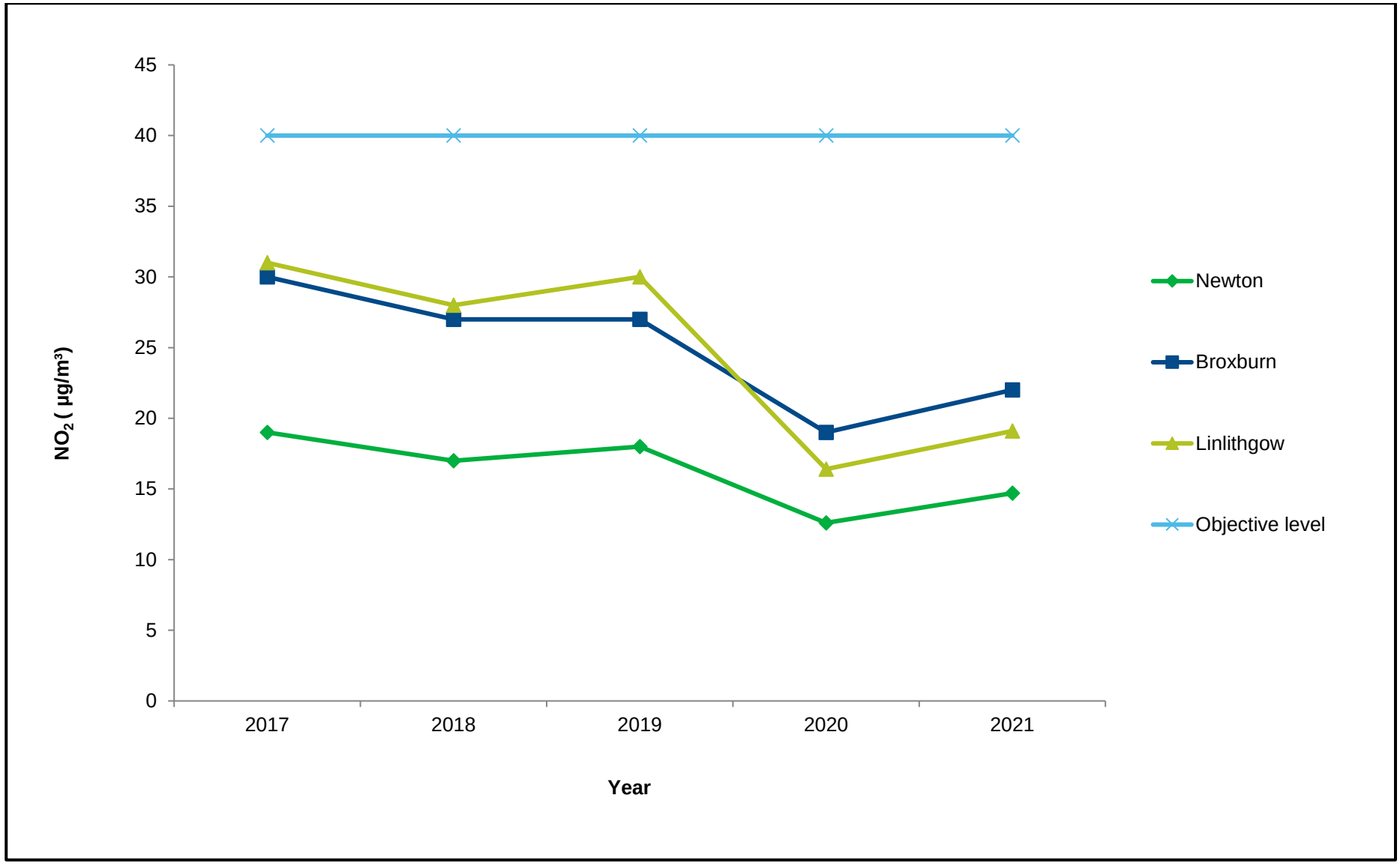


Figure 8 – Air Quality Management Area Maps – Linlithgow Air Quality Management Area

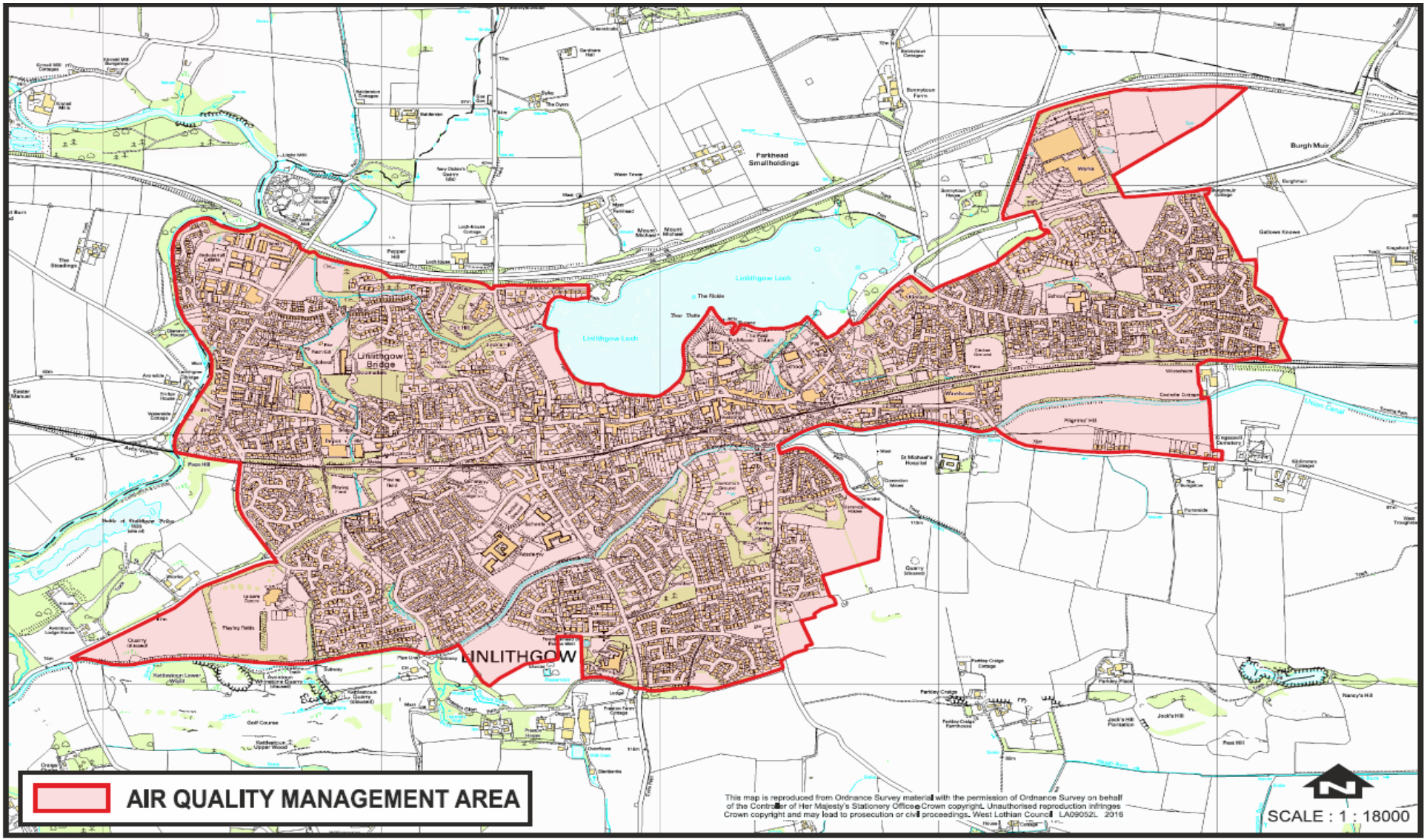


Figure 9 – Broxburn Air Quality Management Area

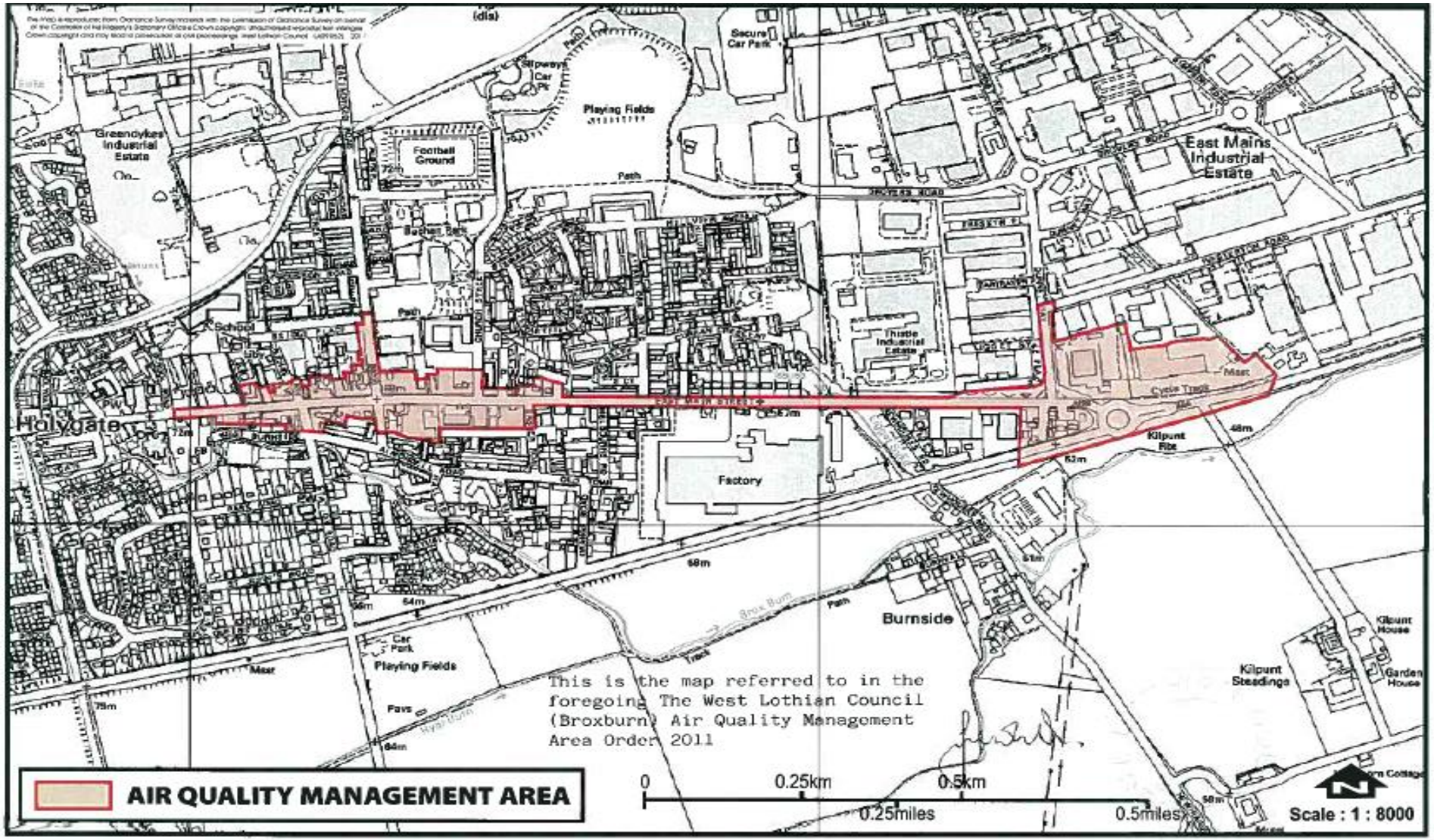


Figure 10 – Newton Air Quality Management Area

Figure 11 – Diffusion Tube Locations Map

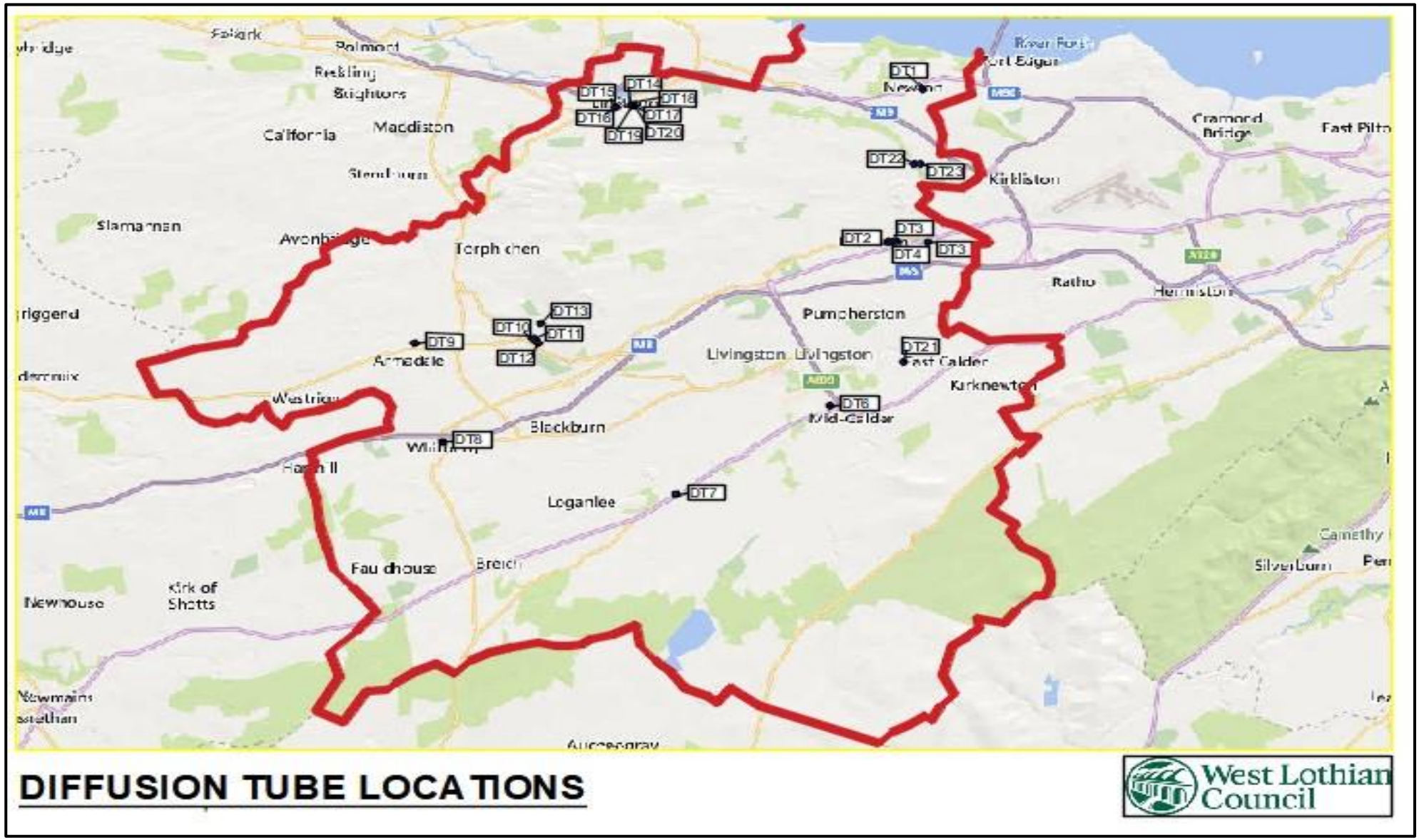
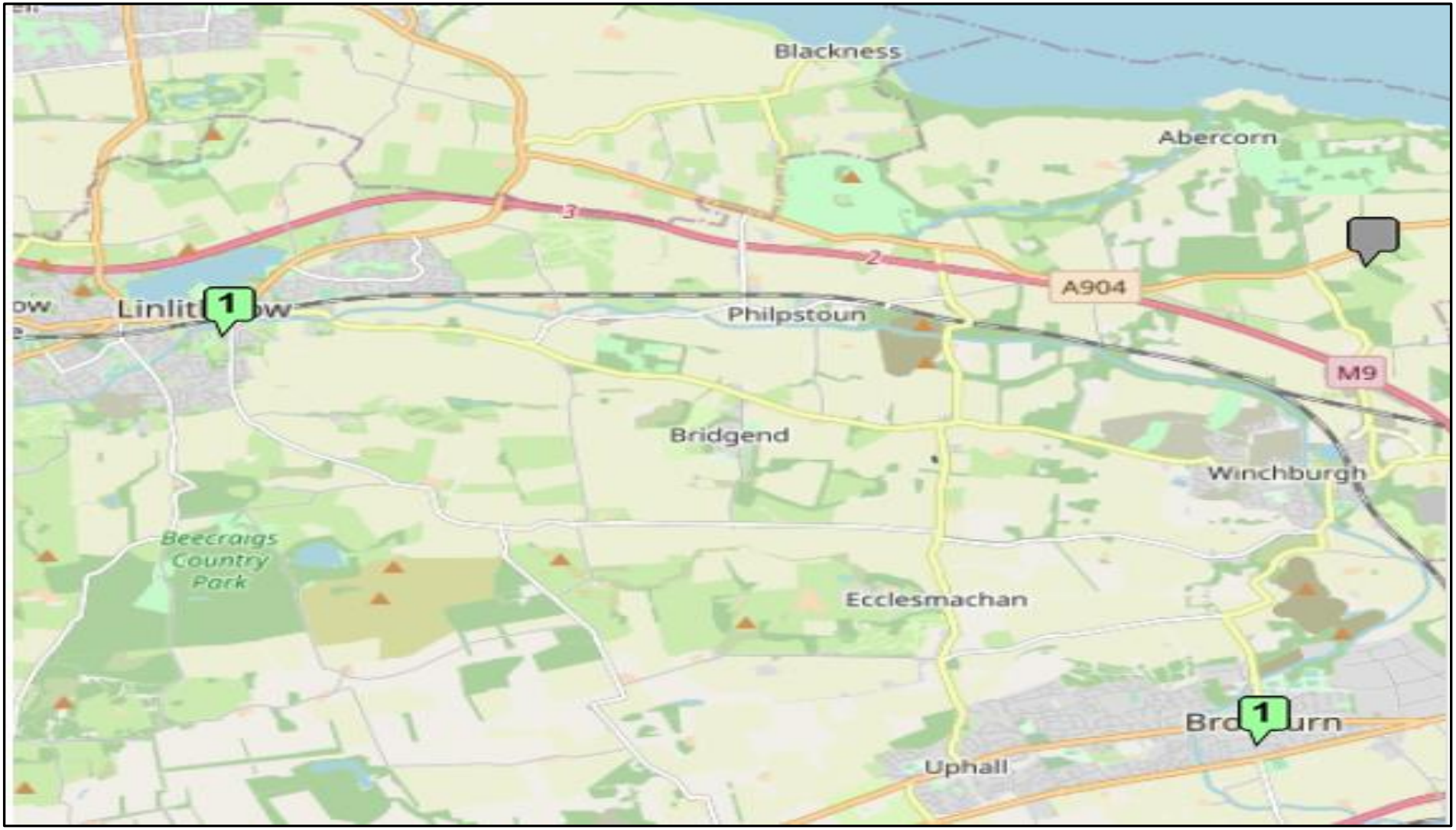


Figure 12 – Map of Continuous Monitoring Locations in West Lothian



Glossary of Terms

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

References

1. Broxburn AQAP webpage:
https://www.westlothian.gov.uk/media/17039/2017-Broxburn-Air-Quality-Action-Plan-Approved/pdf/2017_Broxburn_Air_Quality_Action_Plan_final_for_consultation.pdf

2. West Lothian Council Air Pollution Webpage:
http://www.westlothian.gov.uk/article/2216/Air-Pollution

3. DEFRA AQMA map webpage:
https://uk-air.defra.gov.uk/aqma/maps

4. Cleaner Air For Scotland (CAFS) Webpage:
http://www.gov.scot/Publications/2015/11/5671/17

5. West Lothian Council Carbon Management Plan:
https://www.westlothian.gov.uk/media/10480/West-Lothian-Council-Carbon-Management-Plan-2015-20/pdf/Carbon_Management_Plan_2015-2020.pdf

6. West Lothian Council Active Travel Plan:
https://www.westlothian.gov.uk/media/12492/West-Lothian-Active-Travel-Plan-2016-21-Making-Active-Connections/pdf/West_Lothian_Active_Travel_Plan_2016-212.pdf

7. West Lothian Council Renewable Energy Strategy:
https://www.westlothian.gov.uk/media/2612/Renewable-Energy-Strategy-in-2012/pdf/renewable-energy-strat.pdf

8. Air Quality in Scotland webpage:
http://www.scottishairquality.co.uk/

9. Air Quality Scotland Diffusion tube map webpage:
http://www.scottishairquality.scot/latest/diffusion-sites

10. West Lothian Council Air Quality Supplementary Planning Guidance Webpage:

https://www.westlothian.gov.uk/media/33857/Air-Quality-PG/pdf/Air_Quality_-_Planning_Guidance.pdf

11. Bureau Veritas Diffusion Tube Data Processing Tool

https://laqm.defra.gov.uk/wp-content/uploads/2021/10/Diffusion_Tube_Data_Processing_Tool_v1.2.xlsb

12. AEA Diffusion Tube users Spreadsheet re: precision and Accuracy

https://laqm.defra.gov.uk/documents/AEA_DifTPAB_v04.xls

13. Diffusion Tube National Bias Adjustment Factors Spreadsheet

https://laqm.defra.gov.uk/wp-content/uploads/2021/10/Database_Diffusion_Tube_Bias_Factors_v09_21-FINAL-v2.xlsx

14. West Lothian Local Development Plan

https://www.westlothian.gov.uk/media/38765/West-Lothian-Local-Development-Plan-Adopted-2018/pdf/West_Lothian_Local_Development_Plan_-__Adopted_final_Web_Version_Amended_-_2020-01-08.pdf?m=637140907284930000

15. West Lothian Council Climate Change Strategy

https://www.westlothian.gov.uk/media/52423/Climate-Change-Strategy-2021-2028/pdf/WLC_Climate_Change_Strategy_2021-28_FINAL.pdf?m=637816379267070000

16. West Lothian Council Local Outcomes Improvement Plan

https://www.westlothian.gov.uk/media/17003/West-Lothian-Local-Outcomes-Improvement-Plan-2013-2023/pdf/West_Lothian_Local_Outcomes_Improvement_Plan_2013-2023.pdf?m=636402870095500000

17. DEFRA's Diffusion tubes for ambient NO2 monitoring: Practical Guidance

https://laqm.defra.gov.uk/documents/0802141004_NO2_WG_PracticalGuidance_Issue1a.pdf