

# NORTHUMBERLAND

Northumberland County Council

2017 Air Quality Annual Status Report (ASR)

*Northumberland County Council*

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

Date July 2017

<b>Local Authority Officer</b>	Wendy Stephenson – Principal Environmental Health Officer
<b>Department</b>	Environmental Protection Team
<b>Address</b>	Public Health Protection Unit Fire & Rescue Service Northumberland County Council Northumberland Fire and Rescue Service Headquarters West Hartford Business Park Cramlington Northumberland NE23 3JP
<b>Telephone</b>	01670 623870
<b>e-mail</b>	wendy.stephenson@northumberland.gov.uk
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## Executive Summary: Air Quality in Our Area

This is the local air quality Annual Status Report for Northumberland County Council for 2017. The report fulfils this part of the Council's commitment to the continuing Local Air Quality Management (LAQM) process. The report provides an annual update for air quality issues in Northumberland during 2016, including monitoring results for the calendar year.

The main findings for 2016 are:

- The Council is involved in a number of projects which have the aim of improving air quality either directly or indirectly (ie economic, fuel economy, health benefits etc.)
- The Council has continued to monitor air quality at two monitoring stations in Blyth with three real-time, continuous analysers which have met the national air quality objectives for 2016..
- The Council maintains a network of nitrogen dioxide diffusion tubes across the county which have indicated that none of the monitored locations require more detailed monitoring or investigation.
- The national air quality objectives have been met for annual means and daily exceedances for particulates (PM<sub>10</sub>) and annual mean and hourly exceedances for nitrogen dioxide (NO<sub>2</sub>).
- PM<sub>2.5</sub> meets the unofficial cap limit (and also meets the stricter objective set in Scotland) at one of the busiest roads in Northumberland, with relevant receptors present.
- No further detailed assessment is required for any of the monitored pollutants within Northumberland.
- Northumberland County Council will progress to an LAQM Annual Status Report in 2018.

## Air Quality in Northumberland County

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas<sup>1,2</sup>.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion<sup>3</sup>.

For a number of years in succession, the air quality in Northumberland has continued to meet the national air quality objectives and there appears to be a downward trend in nitrogen dioxide at the Cowpen Road site and the Blyth Library site. A continuous, real-time NO<sub>2</sub> monitor was removed from the Blyth Library site in 2013.

Monitoring from 2016 has indicated a trend of decreasing nitrogen dioxide and particulate levels at our continuous monitoring stations. Nitrogen dioxide monitoring ceased at Blyth Library in 2013. A minor exception to this has been an elevated PM10 level at the Blyth Library site, albeit still well within the objectives for this pollutant.

Air quality objectives for NO<sub>2</sub> and PM<sub>10</sub> continue to be met in Northumberland and potential locations with high traffic volumes and relevant receptors are kept under review as future locations for diffusion tubes.

*All monitoring carried out by Northumberland County Council has shown compliance with the national air quality objectives since 2009.*

Air quality impacts are routinely addressed through engagement with the planning process, particularly where prop developments involve significant changes in road traffic numbers or layout. Generally, compliance with a DMRB air quality screening assessment is required as part of any such application submission.

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<sup>1</sup> Environmental equity, air quality, socioeconomic status and respiratory health, 2010

<sup>2</sup> Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

<sup>3</sup> Defra. Abatement cost guidance for valuing changes in air quality, May 2013

The Morpeth Northern Bypass was completed and opened in April 2017. Diffusion tube assessments of pre-opening background levels have been completed and subsequent assessments in Year 1 (2017) and Year 5 (2021) will be carried out to confirm the prediction model and demonstrate a positive impact for residents within Morpeth. The results of this will be reported in subsequent air quality reports. At present only the baseline data is fully available, which was collected during 2015/16.

Despite, air quality in Northumberland consistently meeting the national Air Quality Objectives for all pollutants, since Local Government Reorganisation (LGR) in April 2009, there has been one exception. This was an anomalous annual mean exceedance for nitrogen dioxide in 2010, which was specifically assessed using a Detailed Assessment and no further action was found to be required.

Our large programme of diffusion tubes (NO<sub>2</sub> and BTEX) has been successively reduced since LGR due to long-term compliance.

The Blyth Air Quality Management Area (AQMA) declared for particulates (PM<sub>10</sub>) was revoked in 2012, as detailed in our 2012 Updating and Screening Assessment. Northumberland currently has no declared Air Quality Management Areas (AQMAs) and there is no positive indication based upon monitoring results, that another one may be required..

Northumberland County Council's Environmental Protection Team participated in a Local Air Quality Partnership with Rio Tinto (and formerly Alcan) who were operators of the only remaining coal-fired power station in Northumberland. The power station was sold to Energetický a Průmyslový Holding (EPH), a Czech-based company, and is currently undergoing conversion to be fuelled by biomass. It is understood that the conversion will be completed by the end of 2017. It is hoped that a new partnership will be revived at that time.

Northumberland has no other individual, major commercial air pollution sources other than those controlled through the Environmental Permitting legislation (ie quarries, surface coal mines, painting/coating etc.)

The main remaining impact upon air quality within Northumberland is road traffic which is monitored at a number of locations with either continuous or non-continuous methods.

Little work has been done collaboratively with other internal agencies or external stakeholders, however, project work aimed at improving travel options, access to those travel options and improving fuel consumption on fleet vehicles is being initiated within the NE Region.

## **Actions to Improve Air Quality**

Below are a summary of some of such actions/projects, although a full list is contained in Table 2.1.

### **Go Smarter Northumberland (GSN) Scheme**

During 2012, Northumberland County Council was successful in its bid for three years of funding through the Department of Transport's local sustainable transport fund (LSTF). Since then, the council has received additional funding to deliver the project (2015/16).

The project was delivered through local sustainable transport funding (LSTF) and aims to:

- Improve sustainable travel to work
- Extend job search horizons
- Support local businesses and local economic development
- Contribute to an increasingly low-carbon travel culture

The project centres around southeast Northumberland, where there are higher proportions of key economic, social and environmental challenges and areas where transport to work barriers can be positively encouraged by greater use of sustainable travel modes.

The project also extends to key employment and development areas within the rest of Northumberland, offering support to young adults in acquiring new employability skills and addressing travel to work barriers in rural areas.

The objectives of the Northumberland LSTF bid are to:

- Enable people to access a wider range of job opportunities, improving connectivity and creating sustainable transport links to jobs and training
- Encourage sustainable commuting for people already in work by making it more attractive to use the bus, walk or cycle. This will reduce traffic congestion and improve safety, health and air quality.
- Create a low-carbon travel culture by giving people a better understanding of available travel options

The Go Smarter Northumberland website can be viewed at;

<http://gosmarter.co.uk/blog/go-smarter-in-northumberland>

### **Clean Vehicle Technology Fund lead by Newcastle City Council**

North East Cleaner Bus KERS (kinetic energy recovery system) Project lead by Newcastle City Council made a successful bid for £472,500 to the Clean Vehicle Technology Fund projects at the end of 2014. The bid was supported by over £700,000 from Go North East bus company. This has improved thirty fleet buses which cover routes to Blyth in Northumberland.

More details are available online at :

<https://www.gov.uk/government/collections/clean-vehicle-technology-fund>

and :

<http://www.simplygo.com/news/greener-cleaner-buses-for-go-north-east/>

### **Taxis**

Northumberland County Council's Licensing Team, require that taxis are upgraded to Euro 5 emission standards.

From 1st April 2017 all new vehicles licensed by the Council must meet the following requirements:

- The Euro V Technology standard in respect of passenger cars.
- The Euro IV Technology standard in respect of light commercial vehicles

One of the larger taxi companies in Blyth (Phoenix) have voluntarily moved to a mostly LPG fleet with some electric vehicles.

### **Biomass**

The Environmental Protection Team, through their engagement with the planning process, identify planning applications which indicate a biomass combustion component (The Clean Air Act, 1993). Although in 2016, only four were highlighted which contained any reference to the installation of biomass plant (see Appendix C).

### **Planning Process**

Air quality assessments for larger developments usually include some assessment of air quality impacts, related to any short-term construction and long-term operation phases. These are assessed using the Design Manual for Roads and Bridges (DMRB) methodology. The trigger for requiring an air quality assessment is contained in:

*“Land-Use Planning & Development Control: Planning For Air Quality - Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes. Environmental Protection UK & IAQM, May 2015 (v1.1)”*

The Environmental Protection Team, recommend the following biomass informative for all relevant planning applications :

*“For solid fuel biomass appliances with a rated output of greater than 50kW, notification, approval of arrestment and chimney height approval is required under Section 14 of The Clean Air Act 1993 with the Public Protection service at Northumberland County Council. Operation of such an appliance, without agreement may be an offence under the Act. An information form is available to download, complete and return from:*

<http://www.northumberland.gov.uk/Protection/Pollution/Pollution.aspx#pollutioncontrol-cleanairactapproval>.

***Please note that this biomass boiler information and requirement does not form part of your application or the decision for your planning permission.”***

### **Fleet Vehicles**

Northumberland County Council’s employs 2 internal driver management systems ( Ashwood’s Lightfoot and Masternaut), which are intend to reduce air emissions by



attempting to improve driving styles in their fleet vehicles. The former gives voice warnings to the driver where inappropriate driving has occurred (poor gear choices, excessive acceleration etc.) and delivers reports to management where a violation occurs. The latter, tracks vehicles movements and for any exceedances of a speed limit and engine idling, reports to management are made.

The Council's vehicle fleet replacement program also requires all new vehicles over 3.5 tonne to conform to either Euro 5 or Euro 6 emission standard.

## **Conclusions, Local Priorities and Challenges**

No exceedances for any objective for NO<sub>2</sub>, PM<sub>10</sub> or the unofficial "cap" limit for PM<sub>2.5</sub> were identified in Northumberland during 2016.

One of the continuous particulate monitors (Blyth Library site) recorded eight exceeds of the 24-hour mean objective but this was well within the limit of 35 in the year.

Northumberland has consistently met national Air Quality Objective limits and as such there has been no impetus to develop any air quality action plans or strategies. Momentum now seems to be growing (in conjunction with other regional Authorities and Agencies), towards improving air quality above and beyond AQS limits. It is envisaged that the Environmental Protection Team will play a pivotal rôle in future co-ordination of projects which have a positive improvement in air quality.

One of these will be to engage with the Director of Public Health for Northumberland, other council departments, agencies and groups to inform and influence decisions where air quality is a consideration.

Areas where further information may be needed are:

- Assessing particulates from Lynemouth Power Station once it become operational as a biomass-fuelled electricity generator.
- Assessing the impact of small biomass appliances including wood burning stoves within the more populated towns in the county.
- Engaging with the Director of Public in raising the awareness of air quality in relation to the Public Health Outcomes Framework.

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- Engaging with other council departments to feed into projects or programmes which have any aspect relating to air quality.
- Raising public awareness of air quality issues through members of the public being able to contact the Environmental Protection Team for information and advice on air quality included on the Council website:

<http://www.northumberland.gov.uk/Protection/Pollution/Air.aspx>

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## **1. Local Air Quality Management**

This report provides an overview of air quality in Northumberland 2016. 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 Status Report (ASR) is a yearly requirement to document and report the strategies employed by Northumberland County Council to improve air quality and any progress that has been made in the year.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

## **2. Actions to Improve Air Quality**

### **2.1 Air Quality Management Areas**

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of the objectives.

Northumberland County Council does not have any Air Quality Management Areas and there is no indication that any would need to be declared in the county.

### **2.2 Progress and Impact of Measures to Address Air Quality in Northumberland County Council**

Northumberland County Council has taken forward a number of measures during 2016 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.1.

Most of the projects listed in Table 2.1 were originated without the involvement of the Environmental Protection Team's direct involvement.

Northumberland County Council's priorities for the coming year are to proactively engage with & influence local decisions where air quality impacts may be relevant.

#### **The Northumberland County Council Local Transport Plan(2011-2026)**

This is available at:

<http://www.northumberland.gov.uk/Highways/Transport-policy/Transport-plan.aspx>

Among other air quality related issues, the LTP commits Northumberland County Council to:

*"...reducing carbon emissions by 2020, however CO2 emissions from road transport in the North East are forecast to increase. The need to maintain the current good air quality in the county and ensure it is not put at risk by transport emissions".*

### **Tall Ships Race**

This major event in Northumberland (26-29th August 2016) attracted approximately half a million visitors, many of whom used public transport or the park-and-ride scheme. Details of the park-and-ride scheme operated at the event can be found at:

<https://4gpsgroup.uk/projects/all-ships-regatta-blyth-2016/>

### **Traffic Regulation Orders for Moving Traffic (TROM)**

Northumberland has imposed a number of speed restrictions and one-way traffic controls in 2016 which should all benefit air Quality. These include:

- Four one-way traffic schemes
- Fifteen 20 mph speed restrictions (many in relation to school locations).
- Six new 30 mph speed restrictions
- Two new 40 mph speed restrictions
- Two new 50 mph speed restrictions &
- Six multiple speed restriction schemes

Details can be found on the following web page:

<http://www.northumberland.gov.uk/Highways/Roads/Traffic.aspx>

### **Ongoing Traffic Projects**

These include:

- specified HGV routing for quarries / surface mines.
- Replacement taxis to meet EURO V emissions limits (mandatory from 1st April 2017).
- Homeworking for staff in council departments.
- Parking enforcement in town centres including rural market towns,
- Fleet vehicles fitted with driving style modifiers / reporting systems (Lightfoot, Masternaut etc.).
- MOT Vehicles emission testing.

### **Difficulties Encountered**

Our Director of Public Health (DPH) at Northumberland County Council left their post towards the end of 2016. The Environmental Protection Team Unit had previously established a meaningful dialogue with the post holder. A key performance indicator for the team in 2017 will be the re establishment of this relationship with the newly appointed DPH in respect of health and air quality.

### **Forecast of Progress**

Northumberland County Council will continue with its established network of air quality monitoring. Diffusion tubes used to monitor the first operational year of the Morpeth Northern Bypass have been deployed and will be reported on.

### **Funding Sources**

No external sources of funding are used in the management of our local air quality management function.



## 2.3 PM<sub>2.5</sub> – Local Authority Approach to Reducing Emissions and or Concentrations

under the provisions of the LAQM Policy Guidance (LAQM.PG16 Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of PM<sub>2.5</sub> (particulate matter with an aerodynamic diameter of 2.5  $\mu\text{m}$  or less). There is clear evidence that PM<sub>2.5</sub> has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Northumberland County Council area comfortably meets the annual “cap” limit of 25  $\mu\text{g}/\text{m}^3$  at the roadside of one of the county’s busiest urban roads (A193 - Cowpen Road, Blyth).

The Authority has invested in new monitoring equipment (2013) in anticipation that monitoring of PM<sub>2.5</sub> was to become a mandatory requirement of LAQM. However, as TG16 states:

*“...PM<sub>2.5</sub> is still not incorporated into LAQM Regulations, and therefore there is no statutory requirement to review and assess PM<sub>2.5</sub> for LAQM purposes.”*

Northumberland County Council is taking the following measures to address PM<sub>2.5</sub>:

- Continue to monitor PM<sub>2.5</sub> at specific locations in Northumberland
- Report the levels of PM<sub>2.5</sub> at these location on an annual basis.
- Monitor for any exceedance of the “cap” limit of 25  $\mu\text{g}/\text{m}^3$ .
- Continue to instigate and support initiatives which directly or indirectly improve air quality within Northumberland.
- Initiate a dialogue with the Director of Public Health in Northumberland and look towards better integration of air quality and the Public Health Outcomes Framework.

Three years of PM<sub>2.5</sub> monitoring data adjacent to Cowpen Road has shown compliance with the the “cap” limit of 25  $\mu\text{g}/\text{m}^3$  and compliance with the stricter 10  $\mu\text{g}/\text{m}^3$  objective imposed in Scotland.

DEFRA background maps for PM<sub>2.5</sub> (2016) slightly over-estimate the measured levels at Cowpen Road and the Blyth Library site, although they do provide a useful tool for

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looking at the rest of the County which correlates with our view that there is no significant PM<sub>2.5</sub> levels and no modelled levels above 10 µg/m<sup>3</sup>.

This position may be revised, the reviewing and assessing of PM<sub>2.5</sub> become a statutory requirement .

Table 2.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barrier to Implementation
1	For special events (Morpeth Gathering & Fair Day, Tall Ships at Blyth)	Bus based Park & Ride	Alternatives to private vehicle use	NCC	Various	Various	N/A	Reduced vehicle emissions	N/A	On going	/
2	HGV routing used by the LPA for some quarries / surface mine schemes	Route Management Plans/ Strategic routing strategy for HGV's	Freight and Delivery Management	NCC	Various	Various	N/A	Reduced vehicle emissions	N/A	On going	/
3	Bids for funding to improve bus fleet vehicles	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	Policy Guidance and Development Control	NECA	/	/	/	Reduced vehicle emissions	/	Completed	Bid by Newcastle and Sunderland city councils – however bus fleet enters Northumberland
4	All taxis to be EURO 5	Taxi emission incentives	Promoting Low Emission Transport	NCC	N/A	Up to 2017	Complete conversion of taxi fleets to Euro 5	Reduced vehicle emissions	/	1 April 2017	<a href="http://www.northumberland.gov.uk/Business/Licences/Taxi.aspx">http://www.northumberland.gov.uk/Business/Licences/Taxi.aspx</a>
5	Home working some departments (such as IT)	Encourage / Facilitate home-working	Promoting Travel Alternatives	NCC	/	/	/	Reduced vehicle emissions	/	On going	/
6	Go Smarter	Personalised Travel Planning	Promoting Travel Alternatives	NCC	/	2012	/	Reduced vehicle emissions	/	2015/16	From LSTF funding. <a href="http://gosmarter.co.uk/">http://gosmarter.co.uk/</a>
7	Go Smarter, Cyclescheme offering VAT free cycles with up to 50% of prices with salary sacrifice scheme	Promotion of cycling	Promoting Travel Alternatives	NCC	/	/	/	Reduced vehicle emissions	/	On going	<a href="http://gosmarter.co.uk/">http://gosmarter.co.uk/</a>
8	Go Smarter promoting Modeshift STARS	School Travel Plans	Promoting Travel Alternatives	NCC	/	/	/	Reduced vehicle emissions	/	On going	<a href="http://modeshiftstars.org/">http://modeshiftstars.org/</a>
9	Travel planner and cycle routes	Via the Internet	Public Information	NCC	/	/	/	Reduced vehicle emissions	/	On going	<a href="http://www.northumberland.gov.uk/Highways/Cycling.aspx">http://www.northumberland.gov.uk/Highways/Cycling.aspx</a>
10	Informal anti-idling policy through taxi licensing	Anti-idling enforcement	Traffic Management	NCC	/	/	/	Reduced vehicle emissions	/	On going	/

11	20mph zones imposed in many residential areas especially surrounding schools	Reduction of speed limits, 20mph zones	Traffic Management	NCC	/	/	/	/	On going	<a href="http://www.northumberland.gov.uk/highways/Roads/Traffic.asp#4traicregulationorderprepared">http://www.northumberland.gov.uk/highways/Roads/Traffic.asp#4traicregulationorderprepared</a>
12	Parking enforcement on highways carried out by Council	Workplace Parking Levy, Parking Enforcement on highway	Traffic Management	NCC	/	/	/	N/A	On going	<a href="http://www.northumberland.gov.uk/highways/Parking.asp#civilparkingforcement">http://www.northumberland.gov.uk/highways/Parking.asp#civilparkingforcement</a>
13	Several cycle networks, including; Coast & Castles, Pennine Cycleway, Reivers Route and Hadrian's Cycleway. Several others which aren't part of the Sustrans network.	Cycle network	Transport Planning and Infrastructure	NCC	/	/	/	/	On going	<a href="http://www.northumberland.gov.uk/Highways/Cycling.aspx">http://www.northumberland.gov.uk/Highways/Cycling.aspx</a>
14	Over 110 fleet vehicles fitted with Ashwoods Lightfoot to encourage more efficient driving styles.	Driver training and ECO driving aids	Vehicle Fleet Efficient	NCC	N/A	/	N/A	Estimated 7% saving in fuel costs from use of system	On going	<a href="https://www.lightfoot.co.uk/case-studies/northumberland-county-council">https://www.lightfoot.co.uk/case-studies/northumberland-county-council</a>
15	Over 800 fleet vehicles fitted with Masternaut vehicle tracking	Driver training and ECO driving aids	Vehicle Fleet Efficient	NCC	N/A	/	N/A	Reduced vehicle emissions	On going	<a href="http://www.masternaut.com/">http://www.masternaut.com/</a>
16	Bid for Euro 6 buses	Promoting Low Emission Public Transport	Vehicle Fleet Efficient	NECA	/	/	/	Reduced vehicle emissions	On going	<a href="http://www.simplygo.com/news/greener-cleaner-buses-for-go-north-east/">http://www.simplygo.com/news/greener-cleaner-buses-for-go-north-east/</a>
17	Vehicle emission testing as part of fleet MOT testing, all taxis and service to public	Testing Vehicle Emissions	Vehicle Fleet Efficient	NCC	N/A	N/A	N/A	Reduced vehicle emissions	On going	<a href="http://www.northumberland.gov.uk/highways/Roads/Commercial.asp#mottesting">http://www.northumberland.gov.uk/highways/Roads/Commercial.asp#mottesting</a>
18	Proactively engage with internal and external partners to raise awareness of Local Air Quality Management			NCC			Internal KPI / Stakeholder Engagement Day		Annual	
19	Liaise with the Directory for Public Health for Northumberland on issues and measures to improve AQ	Other Policy	Policy Guidance and Development Control	NCC	N/A	N/A	N/A	Reduced vehicle emissions	On going	<a href="http://www.northumberland.gov.uk/northumberlandcountyCouncil/mplia/ISNA/strategy%20documents/PH-Annual-Report-Northumberland-2016-3.pdf">http://www.northumberland.gov.uk/northumberlandcountyCouncil/mplia/ISNA/strategy%20documents/PH-Annual-Report-Northumberland-2016-3.pdf</a>

NCC refers to Northumberland County Council  
NECA refers to the North East Combined Authority

## **3. Air Quality Monitoring Data / Comparison with Air Quality Objectives and National Compliance**

### **3.1 Summary of Monitoring Undertaken**

#### **3.1.1 Automatic Monitoring Sites**

Northumberland County Council continued automatic (continuous) monitoring at two sites during 2016. Table A.1 in Appendix A shows the details of the sites.

The Authority also act as LSOs on behalf of DEFRA for a poly-aromatic hydrocarbon (PAH) Digitel (solid phase) monitor on the AURN network at Lynemouth. National monitoring results for this PAH sampler is available at:

[https://uk-air.defra.gov.uk/networks/site-info?uka\\_id=UKA00556](https://uk-air.defra.gov.uk/networks/site-info?uka_id=UKA00556)

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**

Northumberland County Council undertook passive diffusion tube monitoring for NO<sub>2</sub> at 19 sites during 2016.

Table A.2 in Appendix A shows the details of these non-automatic sites.

Maps showing the location of all monitoring sites are provided in Appendix D.

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

### **3.2 Individual Pollutants**

The air quality monitoring results presented in this section are, where relevant, “annualised” and/or adjusted for bias. Further details on these adjustments are provided in Appendix G.

#### **3.2.1 Nitrogen Dioxide (NO<sub>2</sub>)**

Northumberland County Council maintains one continuous nitrogen dioxide monitor at the Cowpen Road site. No service contract is in place for this instrument as the intention is to decommission this instrument should it malfunction at any point. Data

capture for this instrument in 2016 was 97.9 % and therefore there was no need to annualise the data or present the relevant percentile in place of actual measured data.

Table A.3 in Appendix A compares the monitored NO<sub>2</sub> annual mean concentrations for the past six years with the air quality objective of 40 µg/m<sup>3</sup>.

For diffusion tubes, the full 2016 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the monitored NO<sub>2</sub> annual mean concentrations for the past six years with the annual mean objective of 40 µg/m<sup>3</sup>.

Table A.5 in Appendix A compares the ratified continuous monitored NO<sub>2</sub> hourly mean concentrations for the past six years with the hourly mean objective of 200 µg/m<sup>3</sup>, not to be exceeded more than 18 times per year.

### **3.2.2 Particulate Matter (PM<sub>10</sub>)**

Northumberland County Council maintains two continuous particulate monitors at the Cowpen Road and Blyth Library sites, both instruments have comprehensive service contracts in place and are returned to Turnkey Instruments for service and calibration annually. Data capture for these instruments in 2016 was 88.2 and 74.9 % respectively. The data from the Blyth Library monitor has been annualised and the relevant percentiles presented.

Table A.6 in Appendix A compares the ratified and adjusted monitored PM<sub>10</sub> annual mean concentrations for the past six years with the annual mean objective of 40 µg/m<sup>3</sup>.

Table A.7 in Appendix A compares the ratified continuous monitored PM<sub>10</sub> daily mean concentrations for the past six years with the daily mean objective of 50 µg/m<sup>3</sup>, not to be exceeded more than 35 times per year.

### **3.2.3 Particulate Matter (PM<sub>2.5</sub>)**

Table A.8 in Appendix A presents the monitored PM<sub>2.5</sub> annual mean concentrations for the past three years.

## Northumberland County Council

The annual mean in 2016 has been 6 and 7  $\mu\text{g}/\text{m}^3$  respectively for the two monitoring sites (Blyth Library & Cowpen Road). These results are very similar to 2015 i.e. substantially below the “cap” limit of 25  $\mu\text{g}/\text{m}^3$  and below the limit set in Scotland for  $\text{PM}_{2.5}$ .

### 3.2.4 Sulphur Dioxide ( $\text{SO}_2$ )

Northumberland County Council no longer monitors for sulphur dioxide.

## Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	OS Grid Ref	Pollutants Monitored	Monitoring Technique	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure) <sup>(1)</sup>	Distance to kerb of nearest road (N/A if not applicable) <sup>(2)</sup>	Inlet Height (m)
BL	Blyth Library	Urban Centre / Roadside	X43153 6	PM <sub>10</sub>	NEP	N	Y (3m)	3m	3
CR	Cowpen Road	Roadside	X42881 7	NO <sub>2</sub> , PM <sub>10</sub>	CL, NEP	N	Y (3m)	3m	3

CL = chemiluminescent  
NEP = nephelometer

- (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	OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road <sup>(2)</sup>	Tube collocated with Continuous Analyser??	Height (m)
B8N	Bondgate Without, Alnwick	Roadside	Y613074 X419025	NO <sub>2</sub>	N	20	1	N	3
B1	Waterloo Road, Blyth	Urban Centre	Y581537 X431537	NO <sub>2</sub>	N	5	1	N	3
B3	Cowpen Rd. West, Blyth	Roadside	Y581813 X428815	NO <sub>2</sub>	N	6	1	Y	3
B5	Cowpen Rd. East, Blyth	Roadside	Y581947 X429850	NO <sub>2</sub>	N	25	1	N	3
B11	Blyth YMCA, Blyth	Urban Centre	Y581415 X431160	NO <sub>2</sub>	N	2	1	N	3
B12	Bridge St, Blyth	Urban Centre	Y581586 X431612	NO <sub>2</sub>	N	1	1	N	3
B15	South Newsham Road	Roadside	Y578950 X430552	NO <sub>2</sub>	N	6	2	N	3
C1	High Pit Road, Cramlington	Roadside	Y576555 X427593	NO <sub>2</sub>	N	1	1	N	3
C9	Trebor, Cramlington	Roadside	Y577173 X424456	NO <sub>2</sub>	N	30	3	N	3
C10	Bay Horse (B1505)	Roadside	Y576145 X427527	NO <sub>2</sub>	N	13	1	N	3
C11	Storey Street (B1505)	Roadside	Y575361 X427214	NO <sub>2</sub>	N	10	1	N	3
CM2	Newgate St, Morpeth	Roadside	Y586380 X419525	NO <sub>2</sub>	N	2	2	N	1.5
CM4	Bridge St, Morpeth	Roadside	Y585937 X419947	NO <sub>2</sub>	N	2	2	N	3
CM5	Thorpe Ave. Morpeth	Roadside	Y586329 X420134	NO <sub>2</sub>	N	1	1.5	N	2
CM6	Telford Bridge, Morpeth	Roadside	Y585614 X420077	NO <sub>2</sub>	N	1	1	N	2.5
CM7	Greystoke Cottage, Clifton	Roadside	Y582724 X420371	NO <sub>2</sub>	N	3	2	N	1.5
W17	Front Street East, Bedlington	Urban Centre	Y426014 X581879	NO <sub>2</sub>	N	25	1	N	3
W21	Newbiggin Road, Ashington	Roadside	Y586210 X427939	NO <sub>2</sub>	N	4.5	1	N	2.5
SD1	Salvation Army, Seaton Delaval	Roadside	Y575433 X430387	NO <sub>2</sub>	N	1	1	N	3

(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<sub>2</sub> Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>					
					2011	2012	2013	2014	2015	2016
CR	Roadside	Automatic	N/A	97.9	29	28	27 (28 <sup>5</sup> )	24 (22)	25	18
8N	Roadside	Diffusion Tube	N/A	83	33	30	28	30	30	31
B1	Urban Centre	Diffusion Tube	N/A	100	30	31	29	27	29	31
B3	Roadside	Diffusion Tube	N/A	100	28	28	33	32	32	23
B5	Roadside	Diffusion Tube	N/A	100	21	20	24	24	23	25
B11	Urban Centre	Diffusion Tube	N/A	100	26	27	25	26	26	27
B12	Urban Centre	Diffusion Tube	N/A	100	26	27	25	24	24	21
B15	Roadside	Diffusion Tube	N/A	100	19	20	21	20	19	24
C1	Roadside	Diffusion Tube	N/A	100	25	25	24	25	23	20
C9	Roadside	Diffusion Tube	N/A	92	27	21	21	22	20	26
C10	Roadside	Diffusion Tube	N/A	100	N/A	20 (23)	28	27	23	20
C11	Roadside	Diffusion Tube	N/A	100	N/A	18 (21)	19	22	19	20
CM2	Roadside	Diffusion Tube	N/A	100	19	22	22	23	19	24
CM4	Roadside	Diffusion Tube	N/A	100	25	28	28	26	22	21
CM5	Roadside	Diffusion Tube	100	100	N/A	N/A	N/A	N/A	21	26
CM6	Roadside	Diffusion Tube	100	100	N/A	N/A	N/A	N/A	25	26
CM7	Roadside	Diffusion Tube	100	100	N/A	N/A	N/A	N/A	26	27
W17	Urban Centre	Diffusion Tube	N/A	100	27	24	27	28	20	23
W21	Roadside	Diffusion Tube	N/A	100	N/A	N/A	N/A	21 (19)	24	25
SD1	Roadside	Diffusion Tube	N/A	100	33	34	26	25	25	27

Notes: Exceedances of the NO<sub>2</sub> annual mean objective of 40 µg/m<sup>3</sup> are shown in **bold**.

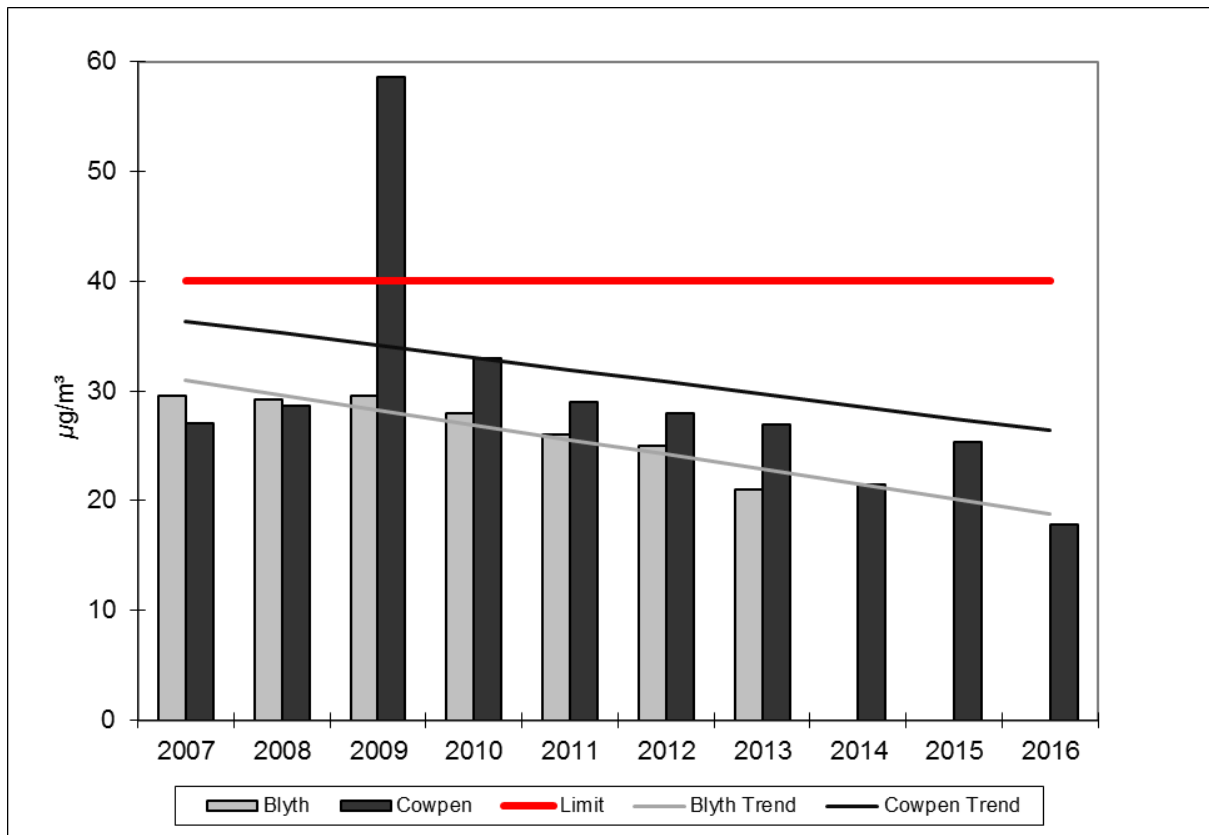
NO<sub>2</sub> annual means exceeding 60 µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

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

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

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Technical Guidance LAQM-TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.1 – Trends in Annual Mean NO<sub>2</sub> Concentrations



**Table A.4 – Annual Mean Objective NO<sub>2</sub> Monitoring Results**

**Table A.5 – 1-Hour Mean Objective NO<sub>2</sub> Monitoring Results**

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture for Monitoring Period (%) <sup>(2)</sup>	Annual mean concentrations (mg/m <sup>3</sup> )					
					2011	2012	2013	2014	2015	2016
CR	Roadside	Automatic	N/A	97.9	29	28	27 (28 <sup>3</sup> )	24 (22 <sup>3</sup> )	25	18

Notes: Exceedances of the PM<sub>10</sub> annual mean objective of 40 µg/m<sup>3</sup> are shown in **bold**.

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

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

(3) All means have been "annualised" as per Technical Guidance LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> 1-Hour Means > 200µg/m <sup>3</sup> <sup>(3)</sup>					
					2011	2012	2013	2014	2015	2016
CR	Roadside	Automatic	N/A	97.9	0	3	0 (113 <sup>3</sup> )	0 (107 <sup>3</sup> )	0	0

Notes: Exceedances of the NO<sub>2</sub> 1-hour mean objective (200 µg/m<sup>3</sup> not to be exceeded more than 18 times/year) are shown in **bold**.

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

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

(3) If the period of valid data is less than 85%, the 99.8<sup>th</sup> percentile of 1-hour means is provided in brackets.

**Table A.6 – Annual Mean Objective PM<sub>10</sub> Monitoring Results**

**Table A.7 – 24-Hour Mean Objective PM<sub>10</sub> Monitoring Results**

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	PM <sub>10</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>					
					2011	2012	2013	2014	2015	2016
BL	Roadside	Automatic	N/A	74.9	30 (30)	30	36 (35)	15	13	17.9 (17.6 <sup>*</sup> )
CR	Roadside	Automatic	N/A	88.2	19 (19)	16	25 (24)	14 (14)	14 (13)	15.0

Notes: Exceedances of the PM<sub>10</sub> annual mean objective of 40 µg/m<sup>3</sup> are shown in **bold**.

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

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

(3) All means have been "annualised" as per Technical Guidance LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	PM10 24-Hour Means > 50µg/m <sup>3</sup> (3)					
					2011	2012	2013	2014	2015	2016
BL	Roadside	Automatic	N/A	74.9	24 (49)	22	11 (42)	6	2	8 (32 <sup>*</sup> )
CR	Roadside	Automatic	N/A	88.2	4 (32)	0	9 (36)	2 (22)	2 (22)	0

Notes: Exceedances of the PM<sub>10</sub> annual mean objective of 40 µg/m<sup>3</sup> are shown in **bold**.

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

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

(3) If the period of valid data is less than 85%, the 90.4<sup>th</sup> percentile of 24-hour means is provided in brackets. See Appendix C for details.

Table A.8 – Annual Mean PM<sub>2.5</sub> Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	PM <sub>2.5</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>					
					2011	2012	2013	2014	2015	2016
BL	Roadside	Automatic	N/A	74.9	N/A	N/A	N/A	6.5	6.0	7.1
CR	Roadside	Automatic	N/A	88.2	N/A	N/A	N/A	6.5	6.1	5.8

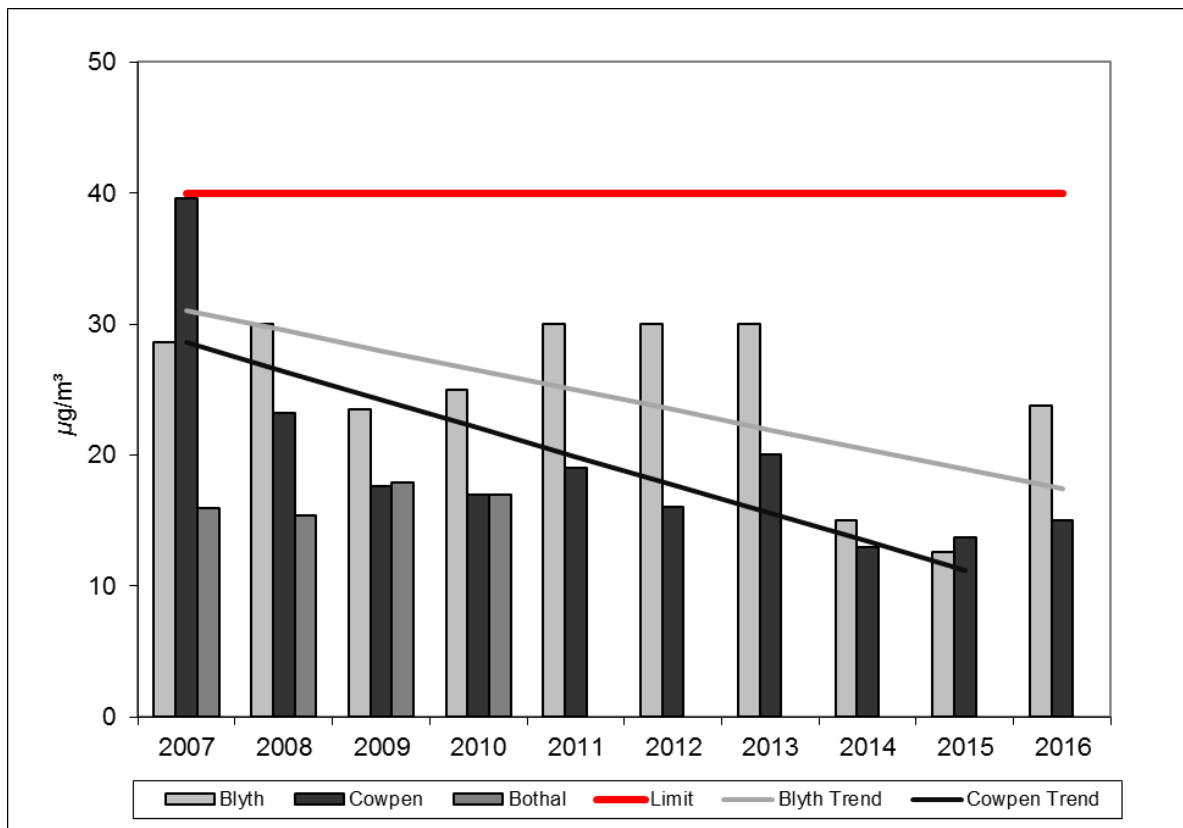
Notes: Exceedances of the PM<sub>10</sub> annual mean objective of 40 µg/m<sup>3</sup> are shown in **bold**.

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

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

(3) All means have been "annualised" as per Technical Guidance LAQM-TG16, valid data capture for the full calendar year is less than 85%. See Appendix C for details.

Figure A.2 – Trends in Annual Mean PM<sub>10</sub> Concentrations



# Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.1 – NO<sub>2</sub> Monthly Diffusion Tube Results - 2016

Site ID	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )												Data Capture (%)	Annual Mean		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		Raw Data	Bias	Bias Adjusted <sup>(1)</sup>
8N	35.8	36.1	36.3		31.4	26.3	32.9	33.7	24.3		44.0	44.1	83	34	0.78	27
B1	50.0	48.7	46.3	33.3	37.6	27.1	36.5	25.5	36.9	40.2	49.8	52.0	100	40	0.78	31
B3	53.5	47.1	36.2	19.3	28.0	32.2	34.3	35.0	42.0	43.4	45.5	59.7	100	40	0.78	31
B5	34.7	36.7	32.1	29.2	24.3	20.8	21.9	19.4	24.2	29.5	35.9	41.9	100	29	0.78	23
B11	32.6	37.7	36.5	36.2	34.2	27.2	26.8	20.1	23.7	31.0	43.7	38.8	100	32	0.78	25
B12	43.6	34.1	39.0	33.4	28.0	23.9	26.5	20.0	31.7	36.0	46.1	49.7	100	34	0.78	27
B15	35.0	29.1	26.0	23.6	24.6	18.1	19.5	20.1	21.5	24.4	34.6	39.6	100	26	0.78	21
C1	36.7	29.1	34.4	31.1	30.9	31.1	18.0	18.7	30.5	41.3	37.1	37.5	100	31	0.78	24
C9	32.2	34.2	27.7	25.9	22.7	22.7	20.2	16.1	23.4	29.5		32.3	92	26	0.78	20
C10	40.2	33.5	31.0	28.4	28.9	29.4	20.0	26.0	31.0	43.1	35.7	47.0	100	33	0.78	26
C11	27.2	24.9	28.1	27.0	23.7	26.5	16.0	19.1	22.5	36.7	27.6	31.6	100	26	0.78	20
CM2	30.3	31.0	32.3	27.7	20.2	19.1	14.6	17.0	23.6	33.1	28.6	30.0	100	26	0.78	20
CM4	31.5	33.1	34.8	35.0	31.5	32.7	20.0	20.3	25.8	41.6	34.8	32.4	100	31	0.78	24
CM5	30.3	31.6	29.2	26.6	27.4	24.5	18.6	18.9	24.1	33.3	26.8	32.8	100	27	0.78	21
CM6	38.2	44.1	38.7	38.2	32.4	27.5	24.1	19.8	29.0	34.7	38.6	36.8	100	34	0.78	26
CM7	38.9	31.1	33.8	33.9	34.0	30.2	25.2	23.5	31.2	37.2	41.4	38.7	100	33	0.78	26
W17	43.0	46.0	39.5	24.7	31.1	28.0	29.6	29.7	33.6	32.8	35.8	42.9	100	35	0.78	27
W21	39.8	30.2	28.7	26.2	24.5	20.0	20.8	19.7	29.4	28.9	36.5	43.2	100	29	0.78	23
SD1	41.4	37.5	33.9	32.6	27.5	23.4	25.2	21.4	24.3	32.6	42.2	39.2	100	32	0.78	25

(1) See Appendix C for details on bias adjustment



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

### **Biomass**

Sixty nine applications for biomass appliances have been identified via our engagement with the planning process since 2007. The vast majority of these were widely spread across the more rural parts of the county. Only eight were within the more densely populated south-east area, which is almost entirely subject to smoke control area provisions.

Of the eight biomass appliances within the south-east area, only one formed part of a permitted process (I-PPC) and the remaining were all DEFRA exempt appliances. The average distance between each of these appliances is approximately 6 kilometres. The closest being 1.2 kilometres apart. The cumulative impacts on air quality are therefore assumed to be negligible

In 2016, four biomass applications were identified indicating that a biomass boiler was to be installed. Three of these were in very rural locations (seven dwellings within 300 metres & eleven within 300 metres typically). These met the screening criteria for particulates and NO<sub>x</sub> using the AEA Biomass Screening Tool (22 Dec 2008).

### **Factor from Local Co-location Studies (if available)**

Northumberland County Council did not carry out any co-location studies in 2016.

### **Diffusion Tube Bias Adjustment Factors**

The tubes are prepared and analysed by Environmental Scientifics Group Didcot. The method used involves the reaction of gaseous nitrogen dioxide with 50% triethanolamine (TEA) contained on grids within the diffusion tubes prepared with 50% acetone. This is then reacted with reagents to produce a stable coloured complex, which can then be compared to standards prepared from sodium nitrite and analysed using visible spectroscopy.

The ESG laboratory follows the procedures set out in the Harmonisation Practical Guidance.

## Northumberland County Council

Northumberland County Council has not compared the diffusion tubes with the reference method in a co-location study.

The bias factor is calculated by the using data from the DEFRA Website:

<http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

National Diffusion Tube Bias Adjustment Spreadsheet Version Number: 03/16. The bias factor was calculated to be 0.78 for ESG (Didcot).

The results of the laboratory performance scheme (AIR PT) are included below; the Environmental Scientifics Group received a 100 per cent performance for the first and last quarters of 2016 but 75 per cent for the other two quarters.

**Figure A.1 – National Diffusion Tube Bias Adjustment Spreadsheet for 06/17 showing results for ESG (Didcot) using 50% TEA in acetone.**

National Diffusion Tube Bias Adjustment Factor Spreadsheet				Spreadsheet Version Number: 06/17					
<p>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 spreadsheet will be updated every few months; the factors may therefore be subject to change. This should not discourage their immediate use.</p> <p>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.</p>				<p>This spreadsheet will be updated at the end of September 2017.</p> <p><a href="#">Local Helpdesk Website</a></p> <p>Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.</p>					
Step 1: Analysed By	Step 2: Step 2: Step 2: Step 2: Step 2:	Step 3: Step 3: Step 3: Step 3: Step 3:	Step 4: Step 4: Step 4: Step 4: Step 4:	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m <sup>3</sup> )	Automatic Monitor Mean Conc. (Dm) (µg/m <sup>3</sup> )	Bias (B)	Tube Precision n*	Bias Adjustment Factor (A) (Cmf/Dm)
Method	Site Type	Local Authority	Year						
ESG Didcot	50% TEA in acetone	R	2016	11	33	29	15.3%	G	0.87
ESG Didcot	50% TEA in acetone	KS	2016	9	66	55	20.1%	S	0.83
ESG Didcot	50% TEA in acetone	KS	2016	12	104	79	30.8%	G	0.76
ESG Didcot	50% TEA in acetone	R	2016	11	43	40	6.7%	G	0.94
ESG Didcot	50% TEA in acetone	UB	2016	11	38	30	26.5%	G	0.79
ESG Didcot	50% TEA in acetone	UB	2016	12	34	29	19.6%	G	0.84
ESG Didcot	50% TEA in acetone	R	2016	12	57	44	30.6%	G	0.77
ESG Didcot	50% TEA in acetone	R	2016	10	49	37	32.6%	G	0.75
ESG Didcot	50% TEA in acetone	R	2016	12	44	39	13.5%	G	0.88
ESG Didcot	50% TEA in acetone	R	2016	11	53	43	22.7%	G	0.81
ESG Didcot	50% TEA in acetone	B	2016	12	31	23	33.5%	G	0.75
ESG Didcot	50% TEA in acetone	R	2016	12	40	30	36.1%	G	0.73
ESG Didcot	50% TEA in acetone	R	2016	12	35	27	30.3%	G	0.77
ESG Didcot	50% TEA in acetone	R	2016	11	33	29	12.2%	G	0.89
ESG Didcot	50% TEA in acetone	R	2016	10	34	25	34.0%	G	0.75
ESG Didcot	50% TEA in acetone	B	2016	11	15	12	25.3%	G	0.80
ESG Didcot	50% TEA in acetone	R	2016	12	35	26	36.6%	G	0.73
ESG Didcot	50% TEA in acetone	B	2016	9	21	11	88.1%	G	0.53
ESG Didcot	50% TEA in acetone	KS	2016	12	43	37	17.3%	G	0.85
ESG Didcot	50% TEA in acetone	UB	2016	9	22	16	38.6%	G	0.72
ESG Didcot	50% TEA in acetone	R	2016	12	39	29	34.1%	G	0.75
ESG Didcot	50% TEA in acetone	R	2016	12	33	25	39.4%	G	0.75
ESG Didcot	50% TEA in acetone	R	2016	12	41	27	51.2%	G	0.66
ESG Didcot	50% TEA in acetone	KS	2016	9	66	55	20.1%	S	0.83
ESG Didcot	50% TEA in acetone	R	2016	12	57	44	27.6%	S	0.78
ESG Didcot	50% TEA in acetone	R	2016	9	35	31	12.7%	G	0.89
ESG Didcot	50% TEA in acetone	R	2016	10	36	30	20.0%	G	0.83
ESG Didcot	50% TEA in acetone	R	2016	10	57	42	37.3%	G	0.73
ESG Didcot	50% TEA in acetone	R	2016	11	44	29	52.0%	G	0.66
ESG Didcot	50% TEA in acetone	SU	2016	12	27	20	33.6%	G	0.75
ESG Didcot	50% TEA in acetone	B	2016	12	20	17	20.7%	G	0.83
ESG Didcot	50% TEA in acetone	KS	2016	11	42	33	27.6%	G	0.78
ESG Didcot	50% TEA in acetone	R	2016	9	20	18	8.2%	G	0.92
ESG Didcot	50% TEA in acetone	Overall Factor* (38 studies)						Use	0.78

## LAQM Helpdesk – March 2016

### Summary of Laboratory Performance in AIR NO<sub>2</sub> Proficiency Testing Scheme (April 2015 – February 2017).

LAQM Helpdesk – March 2017

#### Summary of Laboratory Performance in AIR NO<sub>2</sub> Proficiency Testing Scheme (April 2015 – February 2017).

*Reports are prepared by LGC for BV/NPL on behalf of Defra and the Devolved Administrations.*

#### Background

AIR is an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT is a new scheme, started in April 2014, which combined two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme.

AIR offers a number of test samples designed to test the proficiency of laboratories undertaking analysis of chemical pollutants in ambient indoor, stack and workplace air. One such sample is the AIR NO<sub>2</sub> test sample type that is distributed to participants in a quarterly basis.

AIR NO<sub>2</sub> PT forms an integral part of the UK NO<sub>2</sub> Network's QA/QC, and is a useful tool in assessing the analytical performance of those laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM). With consent from the participating laboratories, LGC Standards provides summary proficiency testing data to the LAQM Helpdesk for hosting on the web-pages at <http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html>. This information will be updated on a quarterly basis following completion of each AIR PT round.

Defra and the Devolved Administrations advise that diffusion tubes used for Local Air Quality Management should be obtained from laboratories that have demonstrated satisfactory performance in the AIR PT scheme. Laboratory performance in AIR PT is also assessed, by the National Physical Laboratory (NPL), alongside laboratory data from the monthly NPL Field Intercomparison Exercise carried out at Marylebone Road, central London.

The information is used to help the laboratories to identify if they have problems and may assist devising measures to improve their performance and forms part of work for Defra and the Devolved Administrations under the Local Air Quality Management Services Contract.

#### AIR NO<sub>2</sub> PT Scheme overview

##### Purpose of scheme

The AIR PT scheme uses laboratory spiked Palmes type diffusion tubes to test each participating laboratory's analytical performance on a quarterly basis and continues the format used in the preceding WASP PT scheme. Such tubes are not designed to test other parts of the measurement system e.g. sampling. Every quarter, roughly January, April, July and October each year, each laboratory receives four diffusion tubes doped with an amount of nitrite, known to LGC Standards, but not the participants. At least two of the tubes are usually duplicates, which enables precision, as well as accuracy, to be assessed. The masses of nitrite on the spiked tubes are different each quarter, and reflect the typical analytical range encountered in actual NO<sub>2</sub> ambient monitoring in the UK.

NO<sub>2</sub> PT Summary – AIR PT Rounds AR007, 8, 10, 12, 13, 15, 16 and 18

## LAQM Helpdesk – March 2017

### Preparation of test samples

Diffusion tubes are spiked using a working nitrite solution prepared from a stock solution. The concentration of this stock solution is initially assayed using a titrimetric procedure. All steps in the subsequent test sample production process, involving gravimetric and volumetric considerations, are undertaken using calibrated instruments employing traceable standards. As an additional cross check, 12 spiked Palmes tubes are picked at random from each spike loading level and submitted to a third party laboratory which is accredited to ISO 17025 to undertake this analysis using an ion chromatographic procedure.

In summary, the tube spiking precision is calculated to be better than 0.5 %, expressed as a standard deviation, and this is derived from repeat gravimetric checking of the pipette device used to spike the test samples. The calculated spike values, derived from titrimetric, gravimetric and volumetric considerations, are found to be typically within  $\pm 3$  % of results obtained by the third party laboratory using an ion chromatographic analytical procedure.

### Scheme operation

The participants analyse the test samples and report the results to LGC Standards via their on-line PORTAL data management system. LGC Standards assign a performance score to each laboratory's result, based on how far their results deviate from the assigned values for each test samples. The assigned values are best estimates of the levels of nitrite doped onto the test sample tubes and are calculated from the median of participant results, after the removal of test results that are inappropriate for statistical evaluation, e.g. miscalculations, transpositions and other gross errors. At the completion of the round, laboratories receive a report detailing how they have performed and how their results relate to those of their peers.

### Performance scoring

The z-score system is used by LGC to assess the performance of laboratories participating in the AIR PT NO<sub>2</sub> scheme.

The  $Z_{score}$  may be defined as:

$$Z_{score} = \frac{(x_{lab} - \bar{x}_{assigned})}{\sigma_{SDPA}}$$

Where:

- $x_{lab}$  = participant result from a laboratory
- $\bar{x}_{assigned}$  = assigned value
- $\sigma_{SDPA}$  = standard deviation for performance assessment (currently set at 7.5 % of  $\bar{x}_{assigned}$ )

NO<sub>2</sub> PT Summary – AIR PT Rounds AR007, 8, 10, 12, 13, 15, 16 and 18

## LAQM Helpdesk – March 2017

### Performance score interpretation

A  $Z_{score}$  is interpreted as described below:

$|Z_{score}| \leq 2$  indicates satisfactory laboratory performance

$2.0 < |Z_{score}| < 3$  indicates questionable (warning) laboratory performance

$|Z_{score}| \geq 3$  indicates unsatisfactory (action) laboratory performance

As a general rule of thumb, provided that a laboratory does not have systematic sources of bias in their laboratory measurement system, then on average, 19 out of every 20 z-scores should be  $\leq \pm 2$ . In this scheme each laboratory receives 4 test samples per round and therefore submits 4 z-scores per round. Hence over 5 rounds laboratories would receive 20 test samples and report 20 z-scores.

### Assessing the performance of a laboratory

End users that avail of analytical services from laboratories should satisfy themselves that such laboratories meet their requirements. A number of factors ideally need to be considered including

- Expertise and skills of staff within the laboratory?
- Does the laboratory follow accepted measurement standards, guidance?
- Does the laboratory operate a robust internal quality control system?
- Is the laboratory third party accredited to relevant standards such as ISO 17025?
- Does the laboratory successfully participate in relevant external proficiency testing schemes?
- How good is their customer care (communication, turnaround times, pricing etc)?

Participation therefore, in an external proficiency-testing scheme such as AIR PT, represents but one factor in such considerations.

Participation in a single round of an external proficiency-testing scheme represents a "snap-shot" in time of a laboratory's analytical quality. It is more informative therefore to consider performance over a number of rounds.

Following on from above, therefore over a rolling five round AIR PT window, one would expect that 95 % of laboratory results should be  $\leq \pm 2$ . If this percentage is substantially lower than 95 % for a particular laboratory, within this five round window, then one can conclude that the laboratory in question may have significant systematic sources of bias in their assay.

A summary of the performance, for each laboratory participating in the AIR PT scheme, is provided in Table 1. This table shows the percentage of results where the absolute z-score, for each laboratory, was less than or equal to 2, i.e. those results which have been assessed as satisfactory.

NO<sub>2</sub> PT Summary – AIR PT Rounds AR007, 8, 10, 12, 13, 15, 16 and 18

**LAQM Helpdesk – March 2017**

**Contacts**

Further **specific** information on the LGC AIR NO<sub>2</sub> PT scheme is available from LGC proficiency testing on 0161 7622500 or by email at [customerservices@lgcgroup.com](mailto:customerservices@lgcgroup.com).

For **general** questions about the scheme within the context of wider LAQM activities please contact Nick Martin at NPL on 0208 943 7088 or [nick.martin@npl.co.uk](mailto:nick.martin@npl.co.uk).

Table 1: Laboratory summary performance for AIR NO<sub>2</sub> PT rounds AR007, 9, 10, 12, 13, 15, 16 and 18

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent AIR NO<sub>2</sub> PT rounds and the percentage (%) of results submitted which were subsequently determined to be satisfactory based upon a z-score of  $\leq \pm 2$  as defined above.

AIR PT Round	AIR PT AR007	AIR PT AR009	AIR PT AR010	AIR PT AR012	AIR PT AR013	AIR PT AR015	AIR PT AR016	AIR PT AR018
Round conducted in the period	April – May 2015	July – August 2015	October – November 2015	January – February 2016	April – May 2016	July – August 2016	September – October 2016	January – February 2017
Aberdeen Scientific Services	100 %	75 %	100 %	100 %	100 %	100 %	100 %	100 %
Cardiff Scientific Services	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Edinburgh Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Environmental Services Group, Didcot [1]	100 %	100 %	100 %	100 %	75 %	75 %	100 %	100 %
Exova (formerly Clyde Analytical)	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Glasgow Scientific Services	100 %	100 %	100 %	75 %	100 %	0 %	100 %	100 %
Gracko International [1]	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Kent Scientific Services	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Kirklees MBC	100 %	100 %	100 %	100 %	100 %	100 %	NR [2]	NR [2]
Lambeth Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	75 %	100 %
Milton Keynes Council	100 %	100 %	100 %	50 %	100 %	100 %	75 %	100 %
Northampton Borough Council	100 %	100 %	100 %	50 %	100 %	NR [2]	75 %	0 %
Somerset Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
South Yorkshire Air Quality Samplers	100 %	100 %	75 %	100 %	100 %	75 %	100 %	100 %
Staffordshire County Council	100 %	75 %	75 %	75 %	75 %	100 %	NR [2]	100 %
Tayside Scientific Services (formerly Dundee CC)	NR [2]	NR [2]	NR [2]	100 %	NR [2]	100 %	NR [2]	100 %
West Yorkshire Analytical Services	75 %	75 %	75 %	75 %	100 %	NR [2]	50 %	100 %

[1] Participant subscribed to two sets of test samples (2 x 4 test samples) in each AIR PT round.

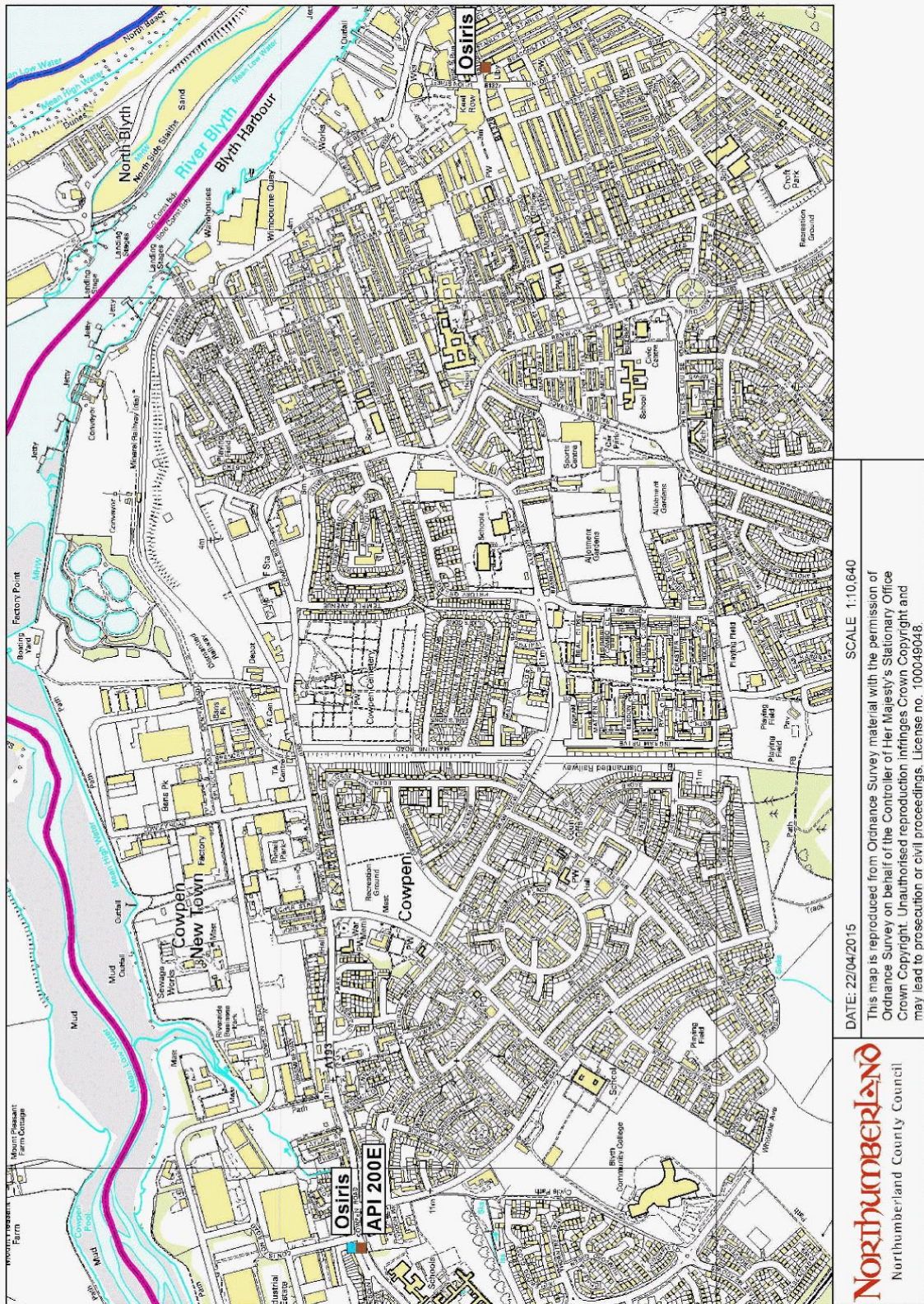
[2] NR No results reported

[3] Kent Scientific Services, Cardiff Scientific Services and Exova (formerly Clyde Analytical) no longer carry out NO<sub>2</sub> diffusion tube monitoring and therefore did not submit results.



# Appendix D: Map(s) of Monitoring Locations

Figure D.1 – Blyth and Cowpen Automatic Monitoring Station Locations



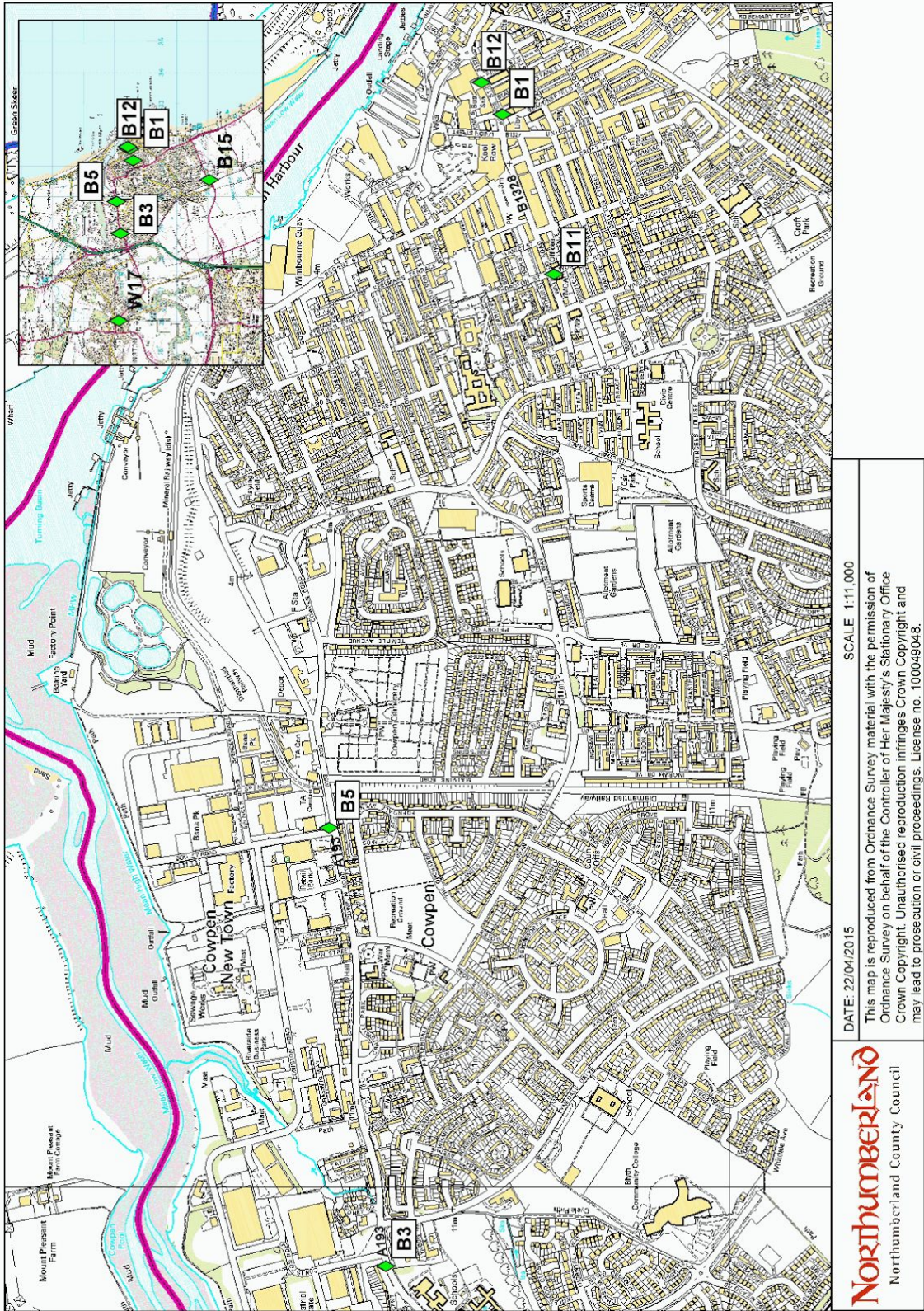
DATE: 22/04/2015  
 SCALE 1:10,840  
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Figure D.2 – Alnwick NO<sub>2</sub> Diffusion Tube Monitoring Locations



Figure D.3 – Blyth NO<sub>2</sub> Diffusion Tube Monitoring Locations



DATE: 22/04/2015

SCALE: 1:11,000

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Figure D.4 – Morpeth NO<sub>2</sub> Diffusion Tube Monitoring Locations

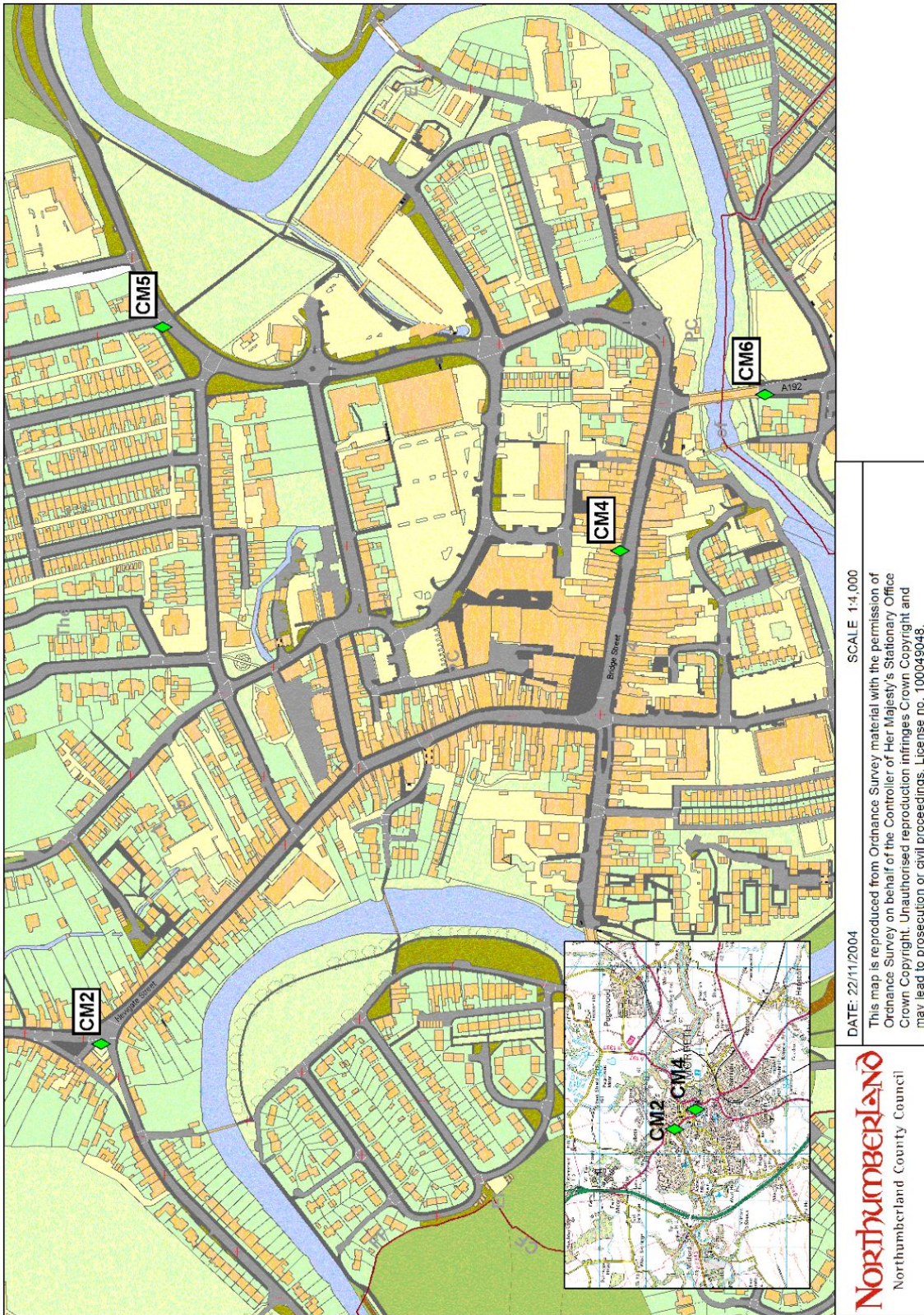


Figure D.5 – Cliffwell NO<sub>2</sub> Diffusion Tube Monitoring Location

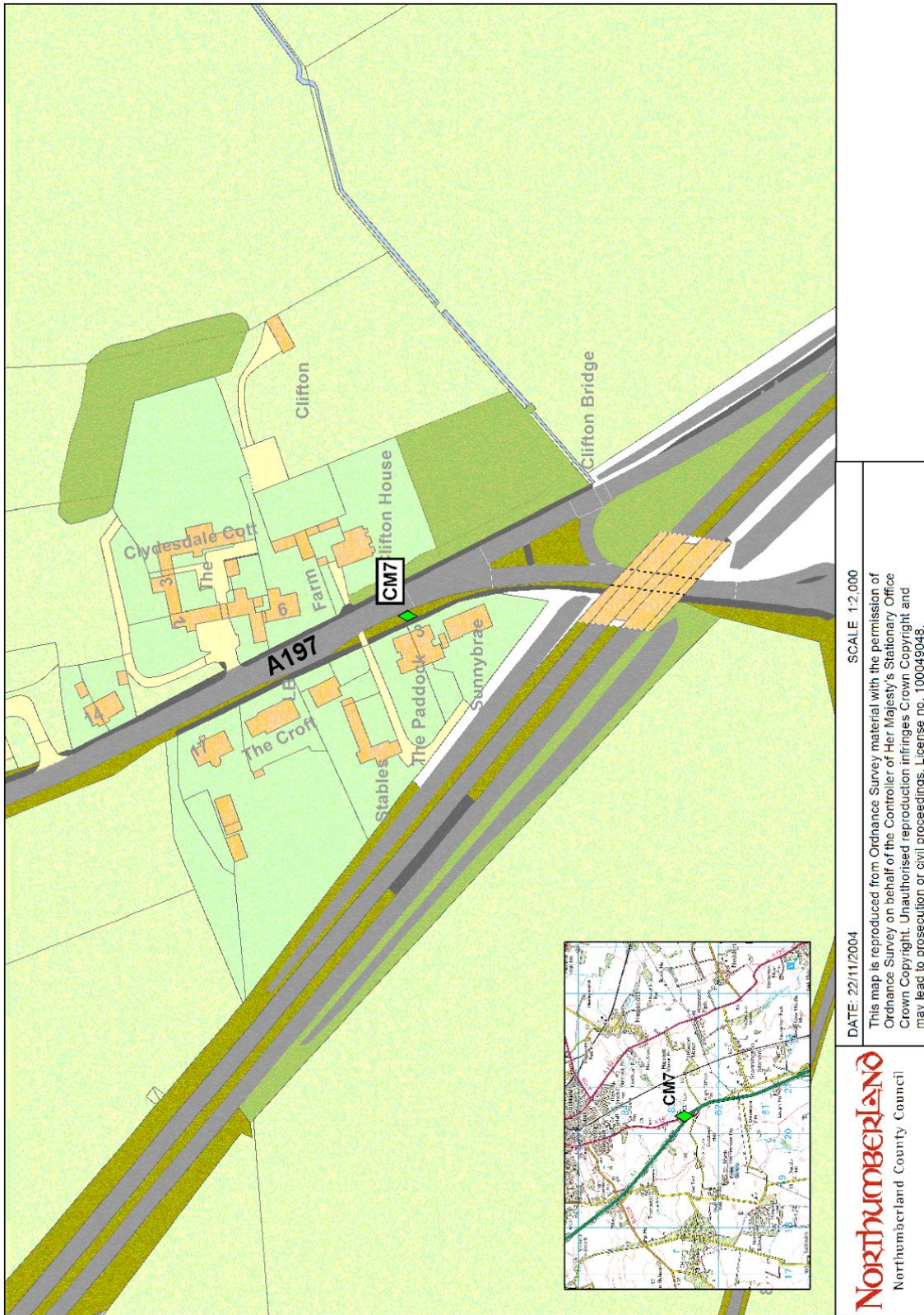




Figure D.7 – Ashington NO<sub>2</sub> Diffusion Tube Monitoring Locations

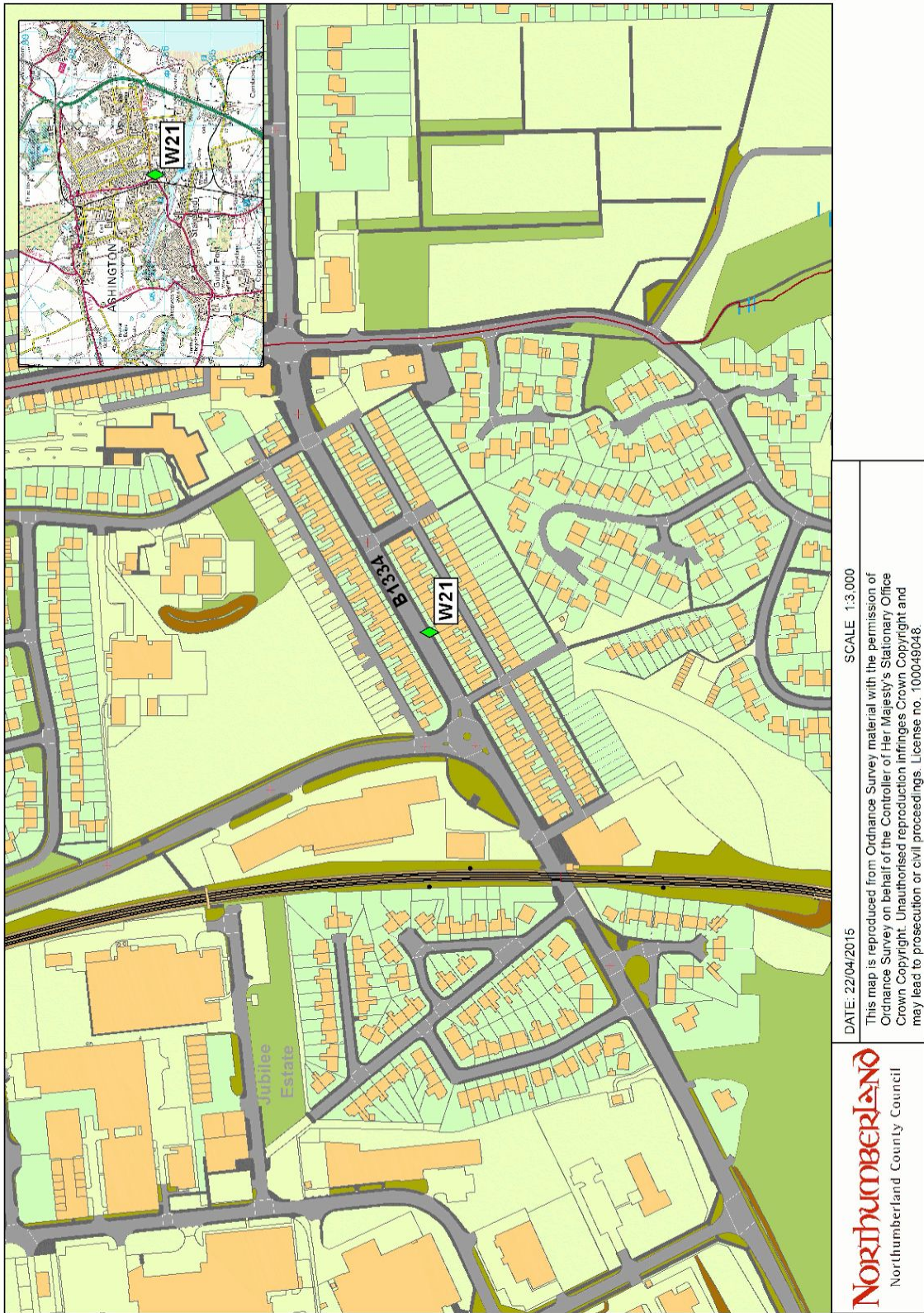
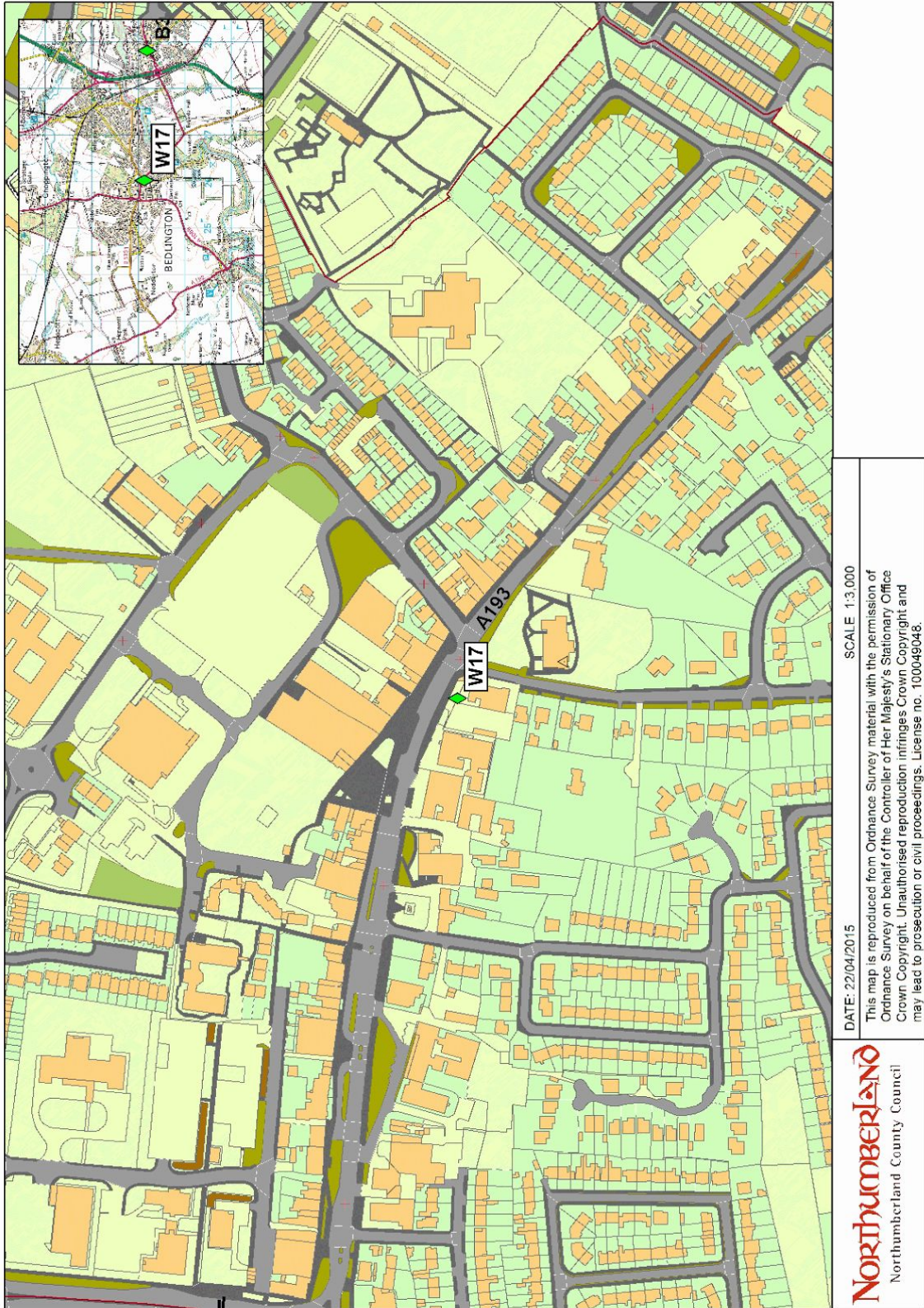


Figure D.8 – Bedlington NO<sub>2</sub> Diffusion Tube Monitoring Locations





## Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective <sup>4</sup>	
	Concentration	Measured as
Nitrogen Dioxide (NO <sub>2</sub> )	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m <sup>3</sup>	Annual mean
Particulate Matter (PM <sub>10</sub> )	50 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m <sup>3</sup>	Annual mean
Sulphur Dioxide (SO <sub>2</sub> )	350 µg/m <sup>3</sup> , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m <sup>3</sup> , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	15-minute mean

<sup>4</sup> The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).

## Appendix F: Data Summaries and Time Series Plots

**Table F.1 – Cowpen Road AQ Monitoring Station - Air Quality Data Summary**

	PM2.5	PM10	NO	NO2	NOx
Number Very High	0	0	0	0	0
Number High	0	0	0	6	3
Number Moderate	0	9	0	146	51
Number Low	319	310	8597	8443	8540
Maximum 15-minute Mean	70.3 $\mu\text{g m}^3$	407.6 $\mu\text{g m}^3$	472.9 $\mu\text{g m}^3$	580.9 $\mu\text{g m}^3$	1053.8 $\mu\text{g m}^3$
Maximum Hourly Mean	63.7 $\mu\text{g m}^3$	148.6 $\mu\text{g m}^3$	434.8 $\mu\text{g m}^3$	92.9 $\mu\text{g m}^3$	489.2 $\mu\text{g m}^3$
Maximum running 8-hour Mean	34.3 $\mu\text{g m}^3$	66.8 $\mu\text{g m}^3$	278.3 $\mu\text{g m}^3$	73.8 $\mu\text{g m}^3$	327.0 $\mu\text{g m}^3$
Maximum running 24-hour Mean	26.0 $\mu\text{g m}^3$	46.8 $\mu\text{g m}^3$	166.1 $\mu\text{g m}^3$	48.2 $\mu\text{g m}^3$	200.8 $\mu\text{g m}^3$
Maximum Daily Mean	26.3 $\mu\text{g m}^3$	47.2 $\mu\text{g m}^3$	172.2 $\mu\text{g m}^3$	50.1 $\mu\text{g m}^3$	207.5 $\mu\text{g m}^3$
90.4th Percentile (PM)	-	-	-	-	-
99.8th Percentile (NO2)	-	-	-	-	-
Average	5.8 $\mu\text{g m}^3$	15.0 $\mu\text{g m}^3$	33.0 $\mu\text{g m}^3$	17.8 $\mu\text{g m}^3$	49.3 $\mu\text{g m}^3$
Data Capture	88.2 %	88.2 %	97.9 %	97.9 %	97.9 %

### Hourly Time Series Plots

**Figure F.1 – Cowpen Road Nitrogen Dioxide (NO<sub>2</sub>) Time Series Plot**

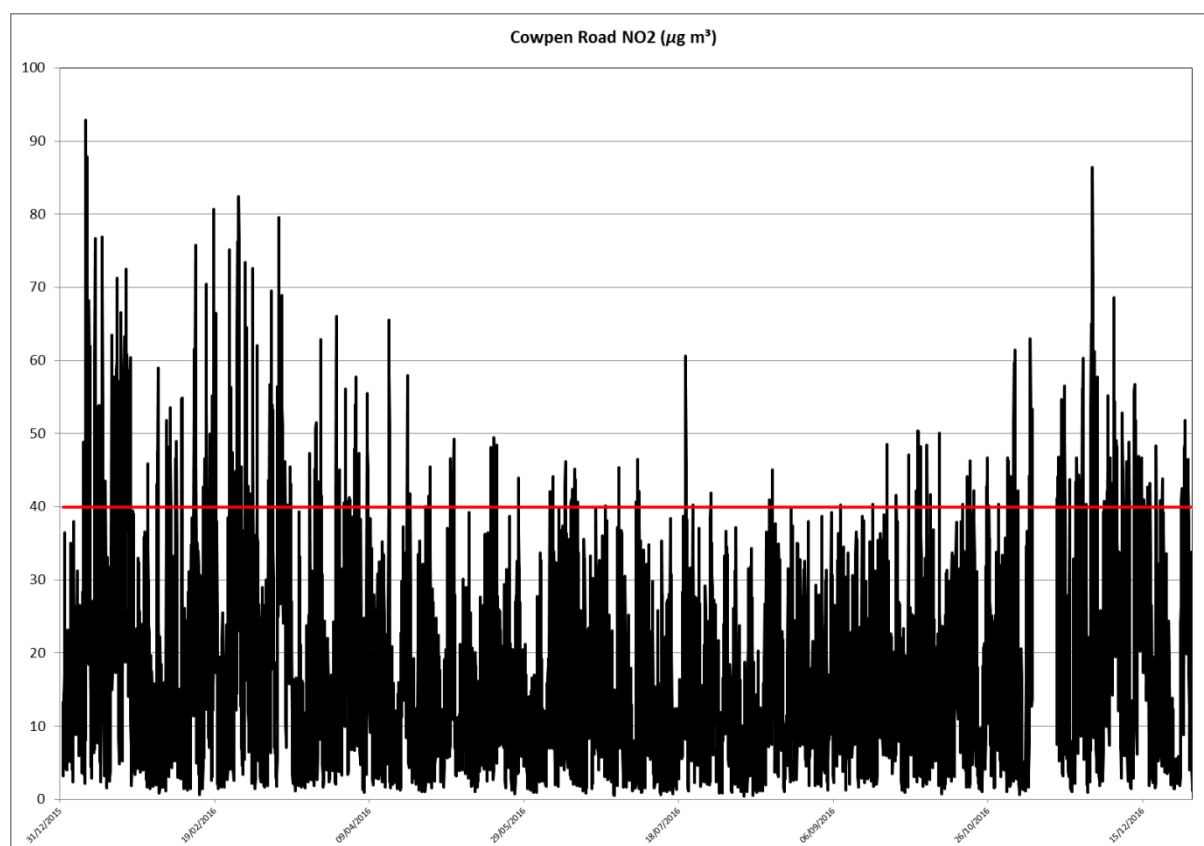


Figure F.2 – Cowpen Road Particulates (PM<sub>10</sub>) Time Series Plot

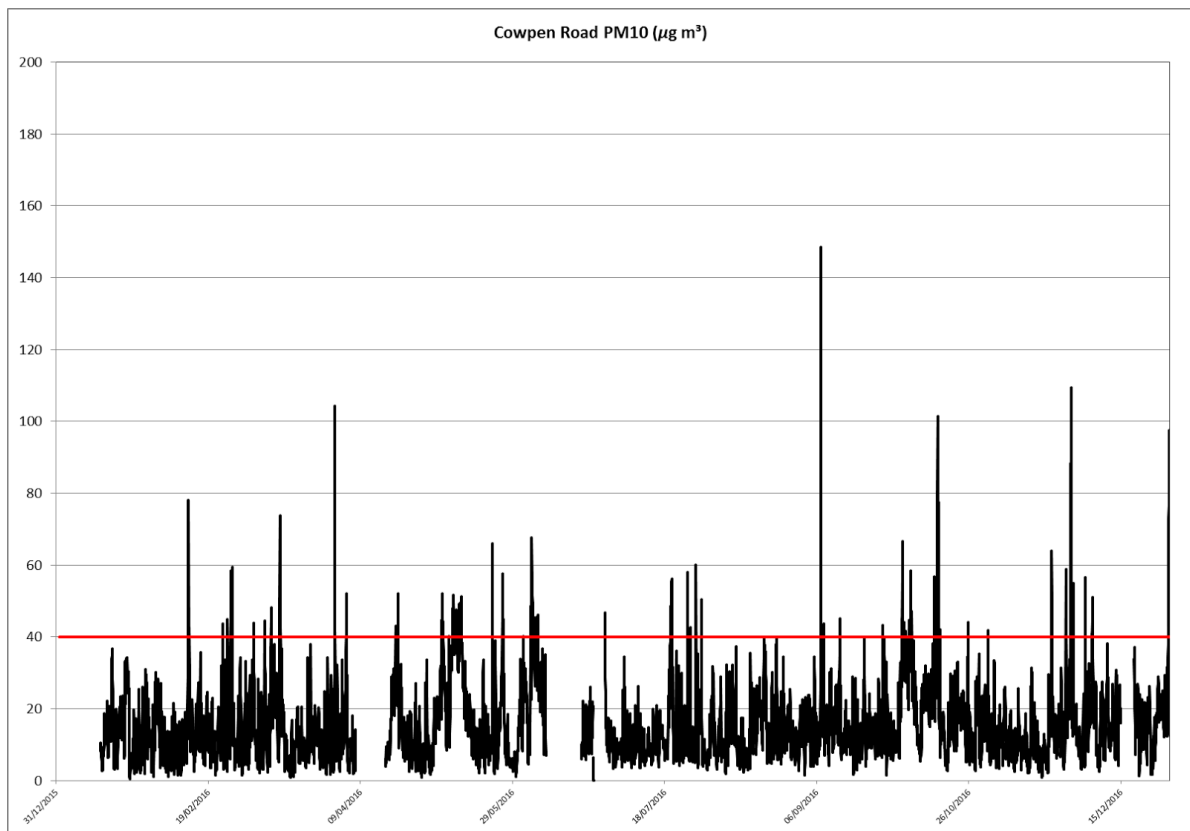
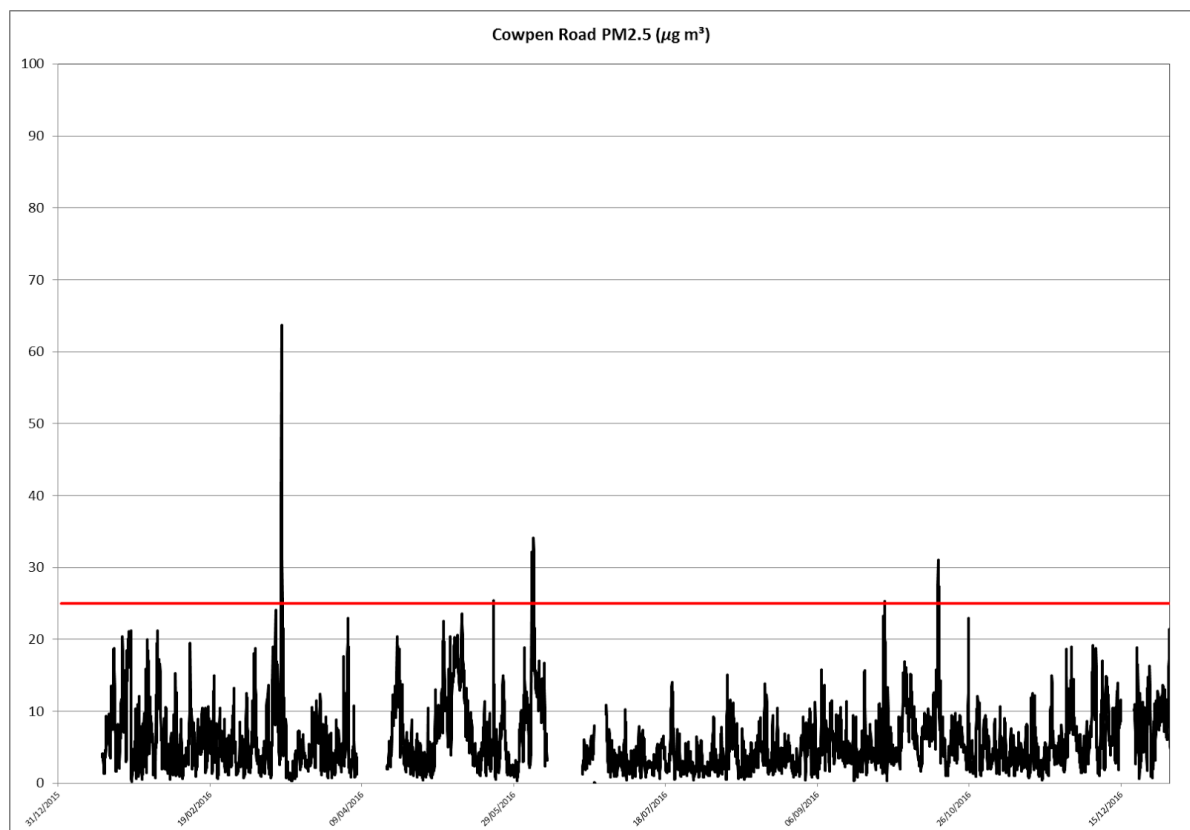


Figure F.3 – Cowpen Road Particulates (PM<sub>2.5</sub>) Time Series Plot



**Table F.2 – Blyth Library / Town Centre AQ Monitoring Station - Air Quality Data Summary**

	PM2.5	PM10
Number Very High	0	3
Number High	0	4
Number Moderate	0	16
Number Low	276	253
Maximum 15-minute Mean	282.5 $\mu\text{g m}^3$	665.3 $\mu\text{g m}^3$
Maximum Hourly Mean	119.0 $\mu\text{g m}^3$	111.2 $\mu\text{g m}^3$
Maximum running 8-hour Mean	54.6 $\mu\text{g m}^3$	315.3 $\mu\text{g m}^3$
Maximum running 24-hour Mean	26.1 $\mu\text{g m}^3$	154.9 $\mu\text{g m}^3$
Maximum Daily Mean	25.9 $\mu\text{g m}^3$	144.9 $\mu\text{g m}^3$
90.4th Percentile (PM)	-	32.6
Average	7.1 $\mu\text{g m}^3$	17.9 $\mu\text{g m}^3$
Data Capture	74.9 %	74.9 %

**Hourly Time Series Plots**

**Figure F.4 – Blyth Library Particulates (PM<sub>10</sub>) Time Series Plot**

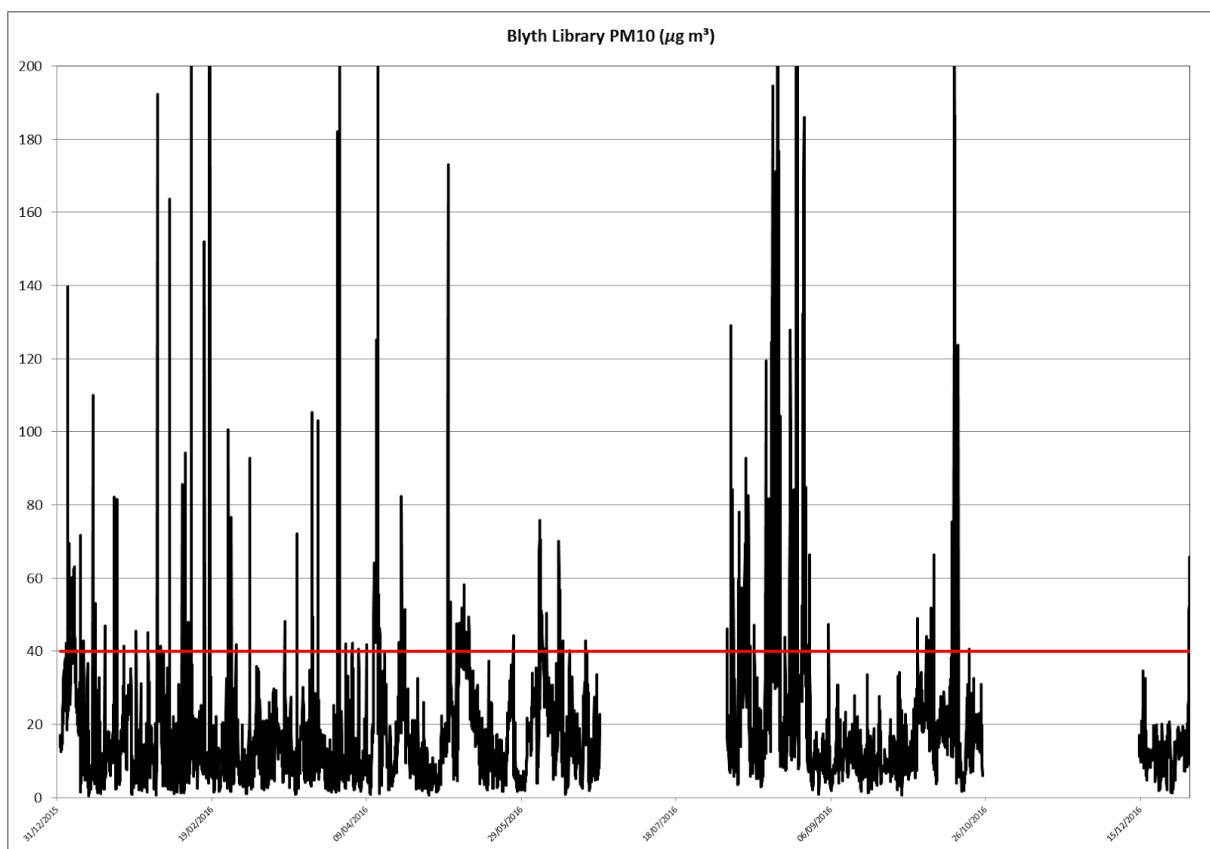
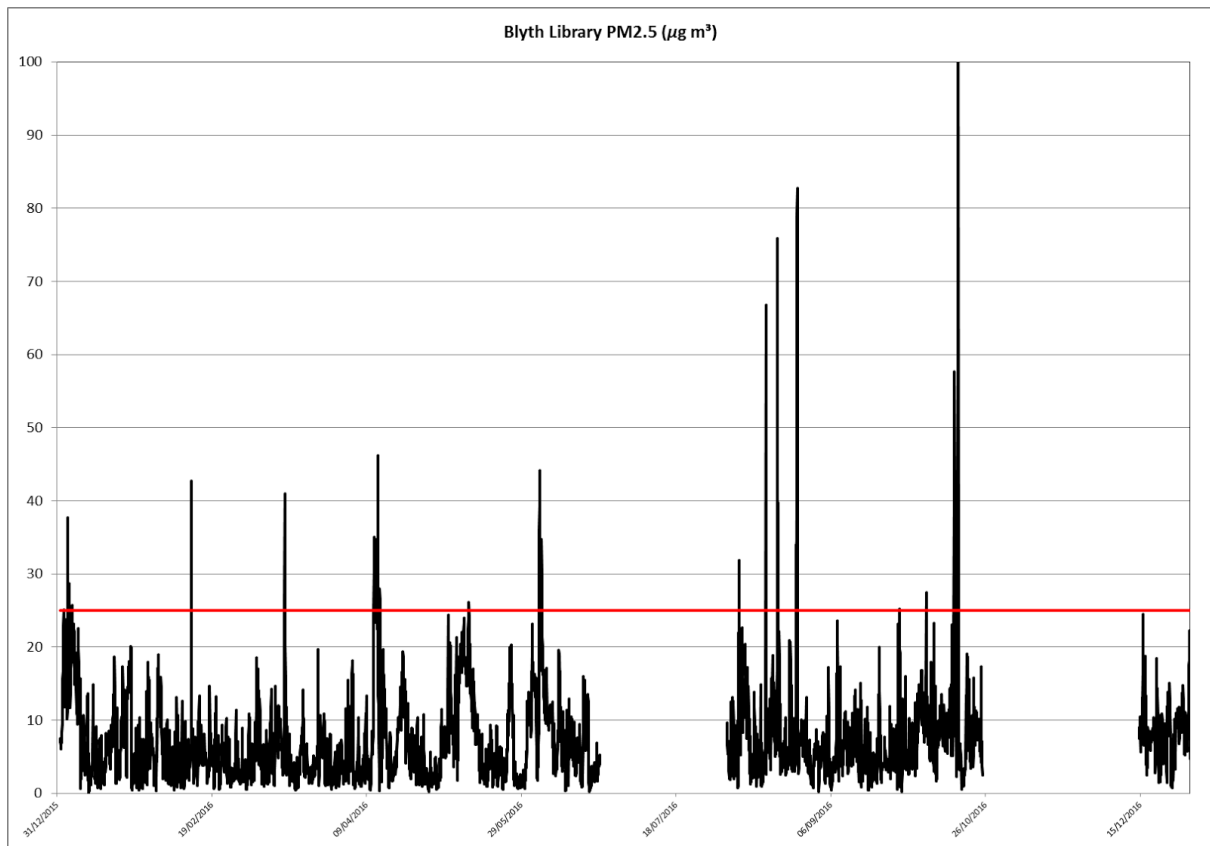


Figure F.5 – Blyth Library Particulates (PM<sub>2.5</sub>) Time Series Plot



## Appendix G: Annualising Data

The data capture for the Blyth Library Osiris particulate monitor was 74.9 per cent in 2016, being less than 75 per cent this requires annualising under the guidance and percentiles shown for being below 85 per cent data capture. Data was “missing” in two blocks from 0900 on the 23 June until 1500 on the 3 August 2016 and from 0000 on the 25 October to 1400 on the 14 December 2016 (2204 hours of data).

The only particulate monitors on the AURN network within 50 miles of the Blyth Library site is Newcastle City Centre and Middlesbrough.

For added accuracy therefore, data from a Banks Mining Topas ( a commercially operated) monitor located at the Milkhope Centre, Blagdon (NZ2176) and the Council’s other Osiris monitor located on Cowpen Road - TNO3314 (NZ2881) have also been included in the annualising process, being much closer than the stations on the AURN network.

**Table G.1 – Annualising Calculation**

	<i>Data Capture (%)</i>	<i>Annual Mean 2016 (AM)</i>	<i>Period Mean 2016 (PM)</i>	<i>Annualised Value</i>
Blyth Library Osiris (PM10)	74.9	17.9	17.9	<b>17.6</b>
Long Term Site		<i>Annual Mean 2016 (AM)</i>	<i>Period Mean 2016 (PM)</i>	<i>Ratio (AM/PM)</i>
Newcastle City centre	94.4	11.4	11.8	0.97
Middlesbrough	97.3	13.9	14.2	0.98
Cowpen Road - TNO3314	88.2	15.0	15.7	0.96
Banks TEOM				
			Average (Ra)	0.97

The ratio of the annual mean and period mean for all sites was almost identical. The range of corrected values using each individual ratio would have either been 17.2 or 17.5  $\mu\text{g}/\text{m}^3$ .

The result is that the annualised value for the Blyth Library Osiris was brought down by 0.3, and the resulting “annualised” annual mean is reduced to 17  $\mu\text{g}/\text{m}^3$  when rounded to an integer

## Glossary of Terms

Abbreviation	Description
AM	Annual Mean
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority 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
AQO	Air Quality Objectives
ASR	Annual Status Report for air quality
AURN	Automatic Urban Rural Network
BAM	Beta Attenuation Monitor
DEFRA	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
LSO	Local Site Operatives
NO	Nitrous Oxide
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
PM	Period Mean
PM <sub>10</sub>	Airborne particulate matter with an aerodynamic diameter of 10 µm (micrometres or microns) or less
PM <sub>2.5</sub>	Airborne particulate matter with an aerodynamic diameter of 2.5 µm or less
QA/QC	Quality Assurance / Quality Control
SO <sub>2</sub>	Sulphur Dioxide
...	...

## References

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