Darlington Borough Council

2020 Air Quality Annual Status Report (ASR)

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

June 2020

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Executive Summary: Air Quality in Our Area

Air Quality in Darlington

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.[1,2]

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3]. It is estimated that air pollution nationally contributes to nearly 28,000 deaths per year with an associated loss to the population of 340,000 life years[4].

Darlington Borough Council has formally reviewed and assessed air quality since year 2000, and has produced statutory annual reports to the UK Government. It has done this in co-operation with neighbouring Tees Valley Councils and the Environment Agency to give as broad a picture of air quality as possible, continuing a long history of joint co-operation between councils which recognised that air pollution transcended local authority boundaries.

Consistently, the annual report has concluded that air quality in areas in the Darlington Borough where the public may be exposed is generally good when compared with Government objectives, and there has been no need to declare any Air Quality Management Areas in which adverse health effects may exist. There is no complacency in this; Darlington Council is committed to improving air quality as policy, but the economic options are limited against this background.

Darlington Borough, in contrast with the four neighbouring Tees Valley Councils, does not have large industrial areas and is not close to those industrial areas nearer the coast. It has a densely populated central area, with main arterial roads radiating out to the rural surround, and as such has always provided a measure of air pollution from traffic sources, which with its primary emissions at ground level, is a great concern for public health. A significant portion of traffic flow has always been through-traffic and this has dictated major road improvements over the years. In the 1960s, the A1 Darlington bypass to the west of the town was completed, and in the 1970s, the Darlington inner ring road was completed which gave protection to the town centre. The A66 Southern bypass was completed in 1985. More recently in 2008, the eastern transport corridor was opened, which besides providing access to new development land also alleviated traffic congestion on two of the busiest road corridors in the town, Haughton Road and Yarm Road.

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013
[4] The Committee on the Medical Effects of Air Pollutants. The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom in December 2010

Actions to Improve Air Quality

Road traffic across the UK has increased dramatically this century, most noticeably in respect of car ownership. This is also true within Darlington and neighbouring councils. For Darlington, most through traffic has been channelled onto bypasses; the main impact on public health is along commuter roads, and it has long been understood that action needs to be targeted in this area to alleviate air pollution. Fortunately, most housing along these roads is low rise, and set back from kerbside so that there is good dispersion of air pollutants compared with older UK cities and towns. In 2004, Darlington was one of three towns selected by the Department for Transport to participate in a national sustainable travel project ('Sustainable Travel Demonstration Towns'), looking at ways to tackle traffic congestion. In 2007, pedestrianisation of a large part of the town centre was completed.

National action in terms of reducing emissions from vehicles is a crucial factor in reducing air pollution alongside roads. While significant strides have been made in vehicle engine technology, and on reducing harmful emissions from large diesels engines in buses and HGV's, Government policy has tended to concentrate in recent years on reducing carbon emissions, and this has filtered down into local authority policies. There has been a major shift away from petrol engines in small vehicles to diesel, which, while contributing to lower carbon emissions per mile, has inadvertently escalated those pollutants judged to be most harmful to public health, fine particulates and nitrogen dioxide (NO_2), which cannot easily be reduced as with larger diesel vehicles. This has been compounded by inadequate emission testing regulations, so that actual emissions from small diesel engines in practice can be significantly higher than test. This has meant that the expected benefit of cleaner vehicle technology has not translated into significantly lower air pollution levels, and this has been confirmed by local monitoring. Notwithstanding this there are plans to deal with this, as highlighted in the Road to Zero strategy (published July 2018) and acknowledged in the new Clean Air Strategy 2019 which sets out plans to end the sale of new conventional petrol and diesel cars and vans by 2040. By this date it is expected that the majority of new cars and vans sold will be 100% zero emission and all new cars and vans will have significant zero emission capability, with the transition expected to be industry and consumer led, supported by Government measures[5].

Tees Valley Combined Authority (TVCA) have produced a Strategic Transport Plan (STP) which is the first for the region, for the period up to 2030. The Strategic Transport Plan will act as a Local Transport Plan for all five Tees Valley authorities with each Local Authority producing their own Local Implementation Plan (LIP).

Local actions to reduce the impact of vehicle emissions within Darlington are principally taken in conjunction with neighbouring councils through the TVCA concentrating on the following areas, with further detail in the Local Transport Plan:

- Reducing traffic congestion at peak times through improved network management and road improvements.

[5] The Road to Zero, July 2018

- Encouraging local bus companies to review services with particular emphasis on access to new and emerging employment opportunities, and to renew their fleet on an on-going basis.
- Encouraging wider transport choices by improving pedestrian, cycling and public transport, including rail.
- Encouraging the provision of a low emission vehicle infrastructure through the planning regime.

Over time, these improvements will all contribute to further reduction in air pollution within Darlington.

In relation to other sources of air pollution the Department for Environment Food and Rural Affairs (Defra's) draft Clean Air Strategy which was out for consultation in 2018 highlighted that while road transport and industrial level burning of fossil fuels are two of the central sources of pollution, a recent rise in the popularity of wood burning stoves and open fires is making a significant contribution to particulate matter (especially $PM_{2.5}$) with new goals proposed by the government to cut exposure to particulate matter pollution, as suggested by the World Health Organisation.[6] This was included in the final Clean Air Strategy which was published in January 2019 (Reference 1).

Following a specific article on wood burning stoves/smoke control area requirements in 2018 which was included in last years' report, in 2019 Environmental Health produced a transport related article/poster on air quality which featured in the One Darlington Magazine in 2019 (September issue). The purpose of the article was to raise awareness of the dangers of air pollution and ways to contribute to improving it. A copy can be found in Appendix F. The magazine is distributed every two months to homes and businesses in Darlington.

A full version of the magazine can be found at the following link: https://www.darlington.gov.uk/media/9549/one-darlington-september-2019.pdf (page 29 for the article/poster).

In addition to this, a message on idling of engines when vehicles are parked was shared on the Council's social media pages to raise awareness of idling. The timing of this coincided with the colder weather when people might idle more to keep a vehicle heated up when stationary and the message was targeting people doing school drop offs and pick-ups in particular (see Appendix F).

Conclusions and Priorities

For measured pollutants, this year's Annual Status Report (ASR) concludes that there have been no exceedances of the annual mean objective (40µg/m³) for nitrogen dioxide in areas of relevant public exposure. Previous continuous monitoring results have also consistently shown compliance with the 1 hour mean air quality objective for nitrogen dioxide (200µg/m³ not to be exceeded more than 18 times a year). The annual mean objective and 24 hour (daily) mean objective for PM_{10} has also been met in areas of relevant public exposure.

Although not currently a statutory requirement of the National Air Quality Strategy, Local Air Quality Management Policy Guidance expects local authorities to work towards reducing emissions and/or concentrations of particulate $PM_{2.5}$. The Public Health Outcomes Framework includes particulate $PM_{2.5}$ as an air pollution indicator under domain 3.01 – 'Fraction of mortality attributed to particulate air

[6] Defra Air quality: draft Clean Air Strategy 2018 https://consult.defra.gov.uk/environmental-quality/clean-air-strategy-consultation/

pollution'. Monitoring of particulate $PM_{2.5}$ is carried out within neighbouring Middlesbrough and Stockton-on-Tees Councils through the national network and it is also possible to determine likely levels in all Tees Valley Council areas, including Darlington. Government objectives are easily met where relevant public exposure exists and this is expected to continue. Even so, Darlington Borough Council will continue to co-operate with the four other Tees Valley Councils in trying to identify in more detail sources of fine particles, and see if any local action can cost effectively reduce emissions / concentrations.

Local Engagement and How to get Involved

Let's Go Tees Valley (previously known as Local Motion) promotes and provides information on travelling sustainably in Darlington and the rest of the Tees Valley. Let's Go Tees Valley engages with people across Darlington, Hartlepool, Middlesbrough, Redcar & Cleveland and Stockton Council areas to encourage walking, cycling, and using any public transport that builds a greener, healthier community.

For schools the Let's Go Tees Valley website includes travel maps showing walking times, cycle routes and bus stops near schools. For workplaces to promote 'greener' commuting Let's Go Tees Valley has worked with Arriva Travel club to provide offers to workplaces to make sustainable ways of commuting more accessible and appealing.

For more information visit the Let's Go Tees Valley webpage at:
http://www.letsgoteesvalley.co.uk/lets-go-tees-valley/

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1 Local Air Quality Management

This report provides an overview of air quality in Darlington Borough Council during 2019. 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 an annual requirement showing the strategies employed by Darlington Borough Council to improve air quality and progress that has been made.

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 compliance with the objectives.

Darlington Borough Council currently does not have any AQMAs, and can see no requirement for one. Air quality has been shown, since LAQM started in year 2000, to be consistently and generally good and this has been accepted by Defra.

2.2 Progress and Impact of Measures to address Air Quality in Darlington

Defra's appraisal of last year's 2019 ASR concluded that on the basis of the evidence provided the conclusions reached were acceptable for all sources and pollutants. The additional diffusion tube monitoring was welcomed including in proximity to diffusion tube D7 on the A167 at North Road Station. Monitoring in the four new locations established in 2018 (D12, D13, D14 and D15) also continued for all of 2019. It was also detailed in the 2018 comments that it was no longer necessary to provide QA/QC details for automatic monitoring as there is no automatic monitoring taking place. This has been omitted from Appendix C in this report. Earlier suggestions made (2017 appraisal) in relation to reporting, which included indicating where locations for diffusion tubes were new (Table A.3) and inclusion of trend graphs (with more than 5 years data) and larger scale maps of diffusion tube locations, are also still incorporated into this report and will be going forward.

Darlington Borough Council has had no requirement to declare an AQMA, and cannot economically justify a formal action plan to address air quality issues. However, the Council is committed to improving air quality in general, and does that through joint co-operation with the four neighbouring Tees Valley Councils through the Tees Valley Combined Authority (TVCA) (April 2016, which includes Tees Valley Unlimited), and at the environmental health level through the Tees Valley Environmental Protection Group (TVEPG), which also includes the Environment Agency. The Council also encourages standalone measures that may have a beneficial impact on air quality.

Measures generally impact on vehicle emission reductions, improving the transport network, changing transport attitudes through encouraging cycling and walking, and improving public transport. Examples are:

- In relation to Arriva, who operates the vast majority of bus services in Darlington: Of 89 buses in total, 61 are Euro 5 compliant (14 of which are gas buses) and 13 are Euro 6 compliant fitted with stop-start technology. This means lower levels of harmful exhaust emissions such as nitrogen oxides (NOx), carbon monoxide (CO), hydrocarbons (THC and NMHC) and particulate

matter (PM). The knock-on effects of reducing these can also mean better fuel economy and lower emissions of CO_2.

64 No. buses have an automatic engine cut off time of between 4 and 5 minutes. Timetables do not allow for idling time in the town centre, they are scheduled to leave at particular times, which are registered with the Traffic Commissioner and the time they arrive and depart from the town centre stops is regularly monitored for punctuality and network planning purposes.

- A Licensing Policy which offers a 25% reduction in licensing fees for vehicles that are fuelled by liquid petroleum gas (LPG), electric, petrol-electric and compressed natural gas (NGV). At the time of writing 91% of the taxi fleet in Darlington were Euro 5 emission standard compliant or better (251 out of 277 in total). Euro 5 saw the introduction of particulate filters (DPFs) for diesel vehicles and tightening of NOx limits as well as, for the first time, a particulates limit for petrol engines (direct injection engines only)[7]. The taxi licensing policy is currently under review and it is proposed to include a requirement for all vehicles to be Euro 6 compliant by April 1st 2023 with a maximum vehicle age policy being introduced of 8 years. Euro 6 introduced a further, significant reduction in NOx emissions from diesel engines and established similar standards for petrol and diesel vehicles[7]. Currently 159 of 277 vehicles (57%) meet the Euro 6 requirement.
- Promotion of electric vehicle charging points for any commercial development and public facilities that creates a car parking area with 50 or more spaces. The Feethams Multi Storey Car Park on Beaumont Street which opened in February 2016 has 4 electric charging spaces and there are also 4 electric car charging points at East Street Car Park. The Council's draft Local Plan 2016 – 2036 is proposing to require non-residential development creating over 50 parking spaces to provide at least one double electric vehicle charge point (2 spaces) and a requirement for every new residential property with a garage or dedicated marked out car parking space within its curtilage to include an electric socket suitable for charging electric vehicles.
- Promoting travel alternatives to single occupancy vehicle (SOV) use by encouraging the use of sustainable transport via Let's Go Tees Valley (LGTV) (www.letsgoteesvalley.co.uk). The promotion of travel planning, use of public transport, car sharing, and walking and cycling schemes are delivered across the Tees Valley to residents, workplaces, jobseekers and students. Travel Advisors visited 4,083 residents across the five Local Authorities in 2019/20 with 21.8% indicating potential to change to a more sustainable mode of travel. 985 jobseekers were engaged, and all received individual travel plans showing sustainable routes to interviews, training and potential job search locations. A Darlington EE car share scheme has saved over 20,500 commuting miles during the first year of operation with 4,849 car share journeys logged. A third year of Access funding (a fund to help local authorities to deliver sustainable transport projects that support economic growth) has also enabled the continued support of Active Travel Hubs including Bike Stop in Darlington. Bike maintenance sessions have been delivered to

[7] The AA: Limits to improve air quality and health https://www.theaa.com/driving-advice/fuels-environment/euro-emissions-standards

workplaces and a programme of volunteer led walks are managed by Groundwork. Over 13,000 walking and cycling maps have been distributed across the Tees Valley.

In addition travel behaviour change marketing campaigns were carried out across the year including; 'Let's Go Ladies', a cycling campaign encouraging more women to ride bikes confidently with over 20,900 website views; the 'Let's Go Tees Valley Commuter Challenge' that saw over 1,176 participants pledge to use a sustainable method of transport to get to work; the ongoing promotion of walking and cycling on the school run and a young person's bus video campaign that received over 177,000 views.

- Successful funding bids by the authority have enabled highway works at two key junctions and the through-about in Darlington. Extra lanes have been added to the McMullen Road/Yarm Road roundabout to increase capacity, ease congestion and open up access to the proposed Ingenium Parc industrial hub. Lingfield Way junction with Yarm Road is in the final stages of construction. This junction will be signalised to ease access for traffic to and from Yarm Road Industrial Estate and support bus routes in the area. The scheme also includes a new cycle route along Lingfield Way which will connect to a further extension of the cycle network along Allington Way. Work has started on the Tornado Way/Haughton Road through-about. The existing junction signals will be removed to create a conventional roundabout. New signalised 'Toucan' crossings will be provided to connect existing pedestrian and cycle routes in the area.
- The work to improve the cycle network in Darlington has been further progressed by infrastructure improvements secured through the new Amazon development on Morton Park Way. A 3.5m shared use path will run along the spine road connecting cyclists to traffic free paths both north and south of the site. The development will also fund additional bus services linking the site to town centre bus stops, the funds for which have been secured through s106 obligations. Housing development at Stag House/Mount Pleasant Farm, which started construction in 2019 will provide further pedestrian and cycling infrastructure improvements to the west of town.
- Construction is also underway to improve the Stockton and Darlington Railway track bed between Middleton St George and Darlington. Widening, surface, drainage and access improvements will ensure this key pedestrian and cycle route is accessible all year round linking the village of Middleton St George to key employment sites to the east of Darlington.
- A strategy to expand Electric Vehicle Charging Points across the Tees Valley is currently being developed by TVCA and funding applied for. A consistent approach across the Tees Valley is needed to ensure appropriate locations for rapid charging hubs are identified and local schemes prioritised. Funding was secured to develop a road map and delivery model across the five authorities that encompasses the needs of cars, vans, taxis, refuse collection vehicles and electric cargo bikes. This work will be further developed over the next year.
- The Council's Building Services Department has 8 all-electric vehicles (which equates to 1/7 of the Building Services fleet). There are now four double electric charging points at the depot on

Allington Way, with the infrastructure in place to accommodate more. The gardener at South Park also has an electric vehicle.

- Environmental Health did some awareness raising in 2019 including with a transport related article/poster which featured in the One Darlington magazine and with messages on social media platforms including on Clean Air Day (20 June 2019), as well as a message on idling in December 2019 (shown in Appendix F).

Most of these schemes have been implemented in part, and the work will continue. The schemes do not all address specific air quality issues, but all will have a bearing on improving air quality.

Darlington Borough Council's Public Health team support the work done in relation to air quality and will continue to work alongside Environmental Health and other colleagues across the Council.

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Reference 2 - Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Overview

Particulates $PM_{2.5}$ are very fine particulates which are now considered to be a more significant health risk than the larger particulates PM_{10}, as they penetrate further into the respiratory system and are less easily dislodged. Recognising this, the UK Public Health Outcomes Framework (Healthy Lives: Healthy People) includes an indicator relating to fine particulate matter ($PM_{2.5}$). This indicator is 3.01 in Health Protection Domain 3 – 'Fraction of mortality attributed to particulate air pollution' – with the latest factors (2017 and 2018) across the Tees Valley as follows:

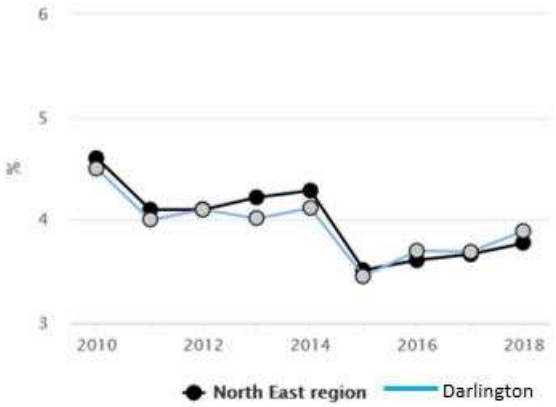
Fraction (%)	England	North East	Darlington	Hartlepool	Middlesbrough	Redcar & Cleveland	Stockton on Tees
2017	5.1	3.7	**3.7**	3.8	4.2	4.0	4.0
2018	5.2	3.8	**3.9**	4.0	4.4	4.0	4.1

For Darlington it is estimated there are 47 deaths per year attributable to particulate air pollution ($PM_{2.5}$) with an associated 481 life-years lost in the population[8].

These are estimates of the percentage of mortality attributable to long term exposure to particulate air pollution. The general range for the UK is between 2.5 and 4.0 for rural areas, up to 8 and higher in certain city areas. The trend in the proportion of adult mortality attributable to particulate air pollution has gone up since 2015, both nationally (in England) and in Darlington (see Figure 1 below).

[8] Public Health England. Estimating Local Mortality Burdens associated with Particulate Air Pollution A M Gowers, B G Miller and JR Steadman, 2014

Figure 1. Fraction of mortality attributable to particulate air pollution - Darlington [9]



Particulate $PM_{2.5}$ is not yet incorporated into LAQM regulation within England. As such there is no statutory requirement on local authorities to review and assess $PM_{2.5}$ for LAQM purposes, and while $PM_{2.5}$ monitoring across the UK is desirable given the links to the Public Health Outcomes Framework, it is recognised that monitoring costs can be prohibitive on local authorities. The latest 2016 Technical Guidance (Reference 3) suggests local authorities use results from the national network of $PM_{2.5}$ monitors to assess levels, and also provides a nationally derived factor of 0.7 that can be used to estimate $PM_{2.5}$ levels from any particulate PM_{10} monitors that local authorities may have installed.

Within the Tees Valley, there are three $PM_{2.5}$ monitors as part of the national network, Middlesbrough Breckon Hill (urban background); Stockton Eaglescliffe (urban background); and Stockton A1035 Nelson Terrace (roadside), all giving direct $PM_{2.5}$ annual means. The Breckon Hill and Eaglescliffe stations have PM_{10} monitors alongside so that a locally derived factor of $PM_{2.5}$ to PM_{10} can be calculated and compared with the national factor and used at local PM_{10} monitors with a similar location. Annual means for $PM_{2.5}$ for within the Tees Valley (Middlesbrough Breckon Hill and Stockton Eaglescliffe, Stockton A1305 Nelson Terrace) for the last five years have ranged between 7.5 and 10.7µg/m^3, with variations year on year likely to be due to weather variations.

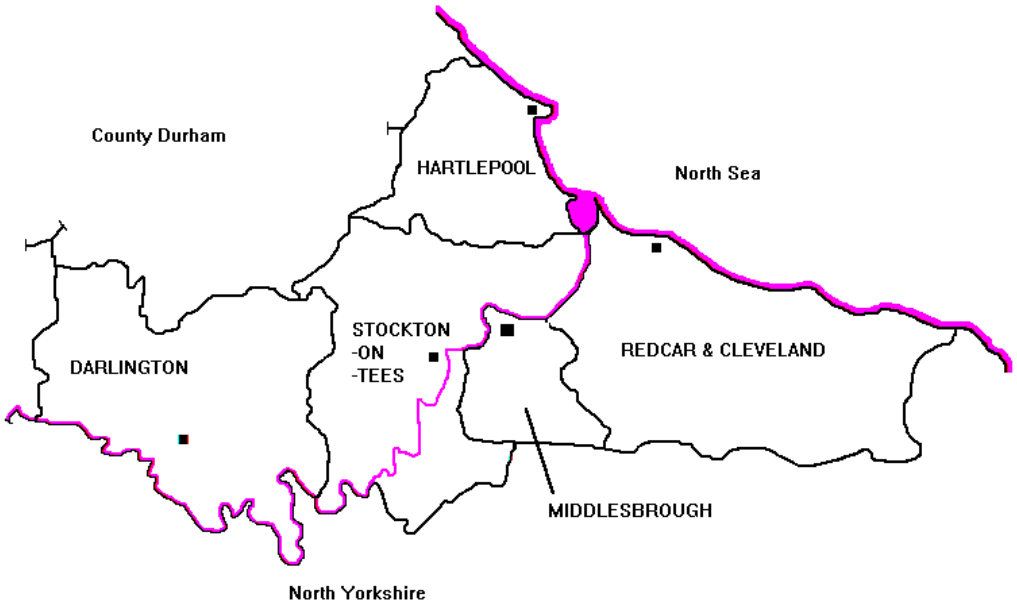
The UK target objective for $PM_{2.5}$ was first introduced in 2008 as an annual mean of 25µg/m^3 (gravimetric) with no exceedances and a target 15% reduction at urban background sites between 2010 and 2020. This has been consistently met across the Tees Valley. The 2016 Technical Guidance has revised this objective to give local authorities in England a new flexible role in working towards reducing emissions and concentrations of $PM_{2.5}$. This will require local authorities to better understand local $PM_{2.5}$ sources and emission levels, data which is currently only available through national estimates.

Technical Guidance recognises that due to its extremely small size, $PM_{2.5}$ can travel for long distances in the air and it is estimated that as much as 40% to 50% of the levels found in any given area can be from sources outside a local authority's direct boundary. Around a quarter of concentrations are thought to be secondary sourced, i.e. reactions between other pollutants in the atmosphere. In addition, coastal and rural areas can have higher proportions of natural sources such as salt, fine sand and pollens, the extent of which will be weather dependent. This means that locally emitted $PM_{2.5}$ will tend to be significantly less than 50% of the total burden, with road traffic, industry and domestic solid fuel burning (wood and coal) the principle sources.

[9] Public Health England. Public Health Outcomes Framework. Fraction of Mortality attributable to particulate air pollution – Darlington. Available at: https://fingertips.phe.org.uk/search/fine%20particulate#page/4/gid/1/pat/6/par/E12000001/ati/102/are/E06000005/iid/30101/age/230/sex/4

Darlington $PM_{2.5}$

Darlington Borough Council is one of five unitary Councils forming the general area known as the Tees Valley. As shown below, it is the most westerly of these Councils and third largest in area, at 198.4 sq. km.



Darlington Borough has a densely populated central area, but is otherwise largely rural. It is a major shopping and commercial centre, and is the main railway centre for the Tees Valley. There is very little heavy industry compared with other Tees Valley Councils, and although some quarrying and other industrial processes lie just outside its boundary, they do not significantly impact on Darlington air quality.

The main A1 motorway (North – South), and the A66 trunk route (East – West) run through the Borough, but are mainly in rural areas, with no areas of relevant exposure. Within the urban area, there are some congested commuter routes, and in the absence of a northern by-pass, some heavy through traffic on the northern outskirts of the town. A major road change, completed in 2008, was the eastern transport corridor, formerly known as the cross-town route (eastern section). The main purpose of this scheme was to provide access to development land to the west of the A66 by-pass, but it has also contributed to significant reductions in traffic on two of the busiest road corridors in the town, Haughton Road and Yarm Road.

The majority of the Darlington urban area is subject to Smoke Control Orders, and natural gas is the main source of heating in all but a few rural villages. As highlighted in last years' report Environmental Health has done some work to raise awareness and educate people more on the use of wood burning stoves and remind them of the Smoke Control Area requirements. A map showing the extent of the Smoke Control Area in Darlington can be found in Appendix G.

The principle source of fine particulate pollution is likely to be from road transport, but even this is limited. Other than along the main commuter routes into the town centre, road traffic is generally light as the significant through routes are in their own transport corridors. This general view of sources is reflected in the national 1 sq km sector model data maps for Darlington produced by DEFRA and the Devolved Administrations based on 2017 emission source estimates (Reference 4). Typical background levels

($PM_{2.5}$) are shown as 6 – 8.2µg/m³/sq. km. The average $PM_{2.5}$ loading per sq. km in 2017 is shown as 6.7µg/m^3, reducing to 6.4µg/m^3 in 2020 as a result of planned Government / EU measures.

These figures are less than the 2015 emission source estimates (Reference 4) included in previous reports where typical background levels are shown as 6.5 – 8.6µg/m^3/sq. km and the average $PM_{2.5}$ loading per sq. km is shown as 7.2µg/m^3, reducing to 6.8µg/m^3 in 2020.

Therefore, at this stage of understanding of local fine particulate emissions, it is difficult to see what positive action can be economically taken by Darlington Borough Council to reduce $PM_{2.5}$ levels over the coming years, other than those actions already identified in section 2.2 of this report. A more significant impact is likely to be made by changes in Government policy with regard to diesel engines in cars and small vans. Since 1995, the proportion of diesel engine cars has risen from below 10% to over 40% today due to concentration on reducing carbon emissions. Diesel engines emit more fine particulates than petrol engines, and it is difficult to fit effective abatement measures. Of as much concern is the higher levels of nitrogen oxides emitted by diesel engines, which are a key factor in secondary fine particulate formation.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

3.1 Summary of Monitoring Undertaken

This section sets out what monitoring has taken place and how it compares with objectives.

3.1.1 Automatic Monitoring Sites

Darlington Borough Council previously had two continuous monitoring stations, however both sites are now closed.

St Cuthbert's Way was a Local station monitoring nitrogen oxides and particulate PM_{10} from traffic, owned and operated by Darlington Council between 2000 and 2014, when the equipment fell into disrepair. The unit was a kerbside site on a busy inner ring road roundabout, on the edge of the main shopping centre, where traffic is generally slow moving. The unit was in an area of relevant public exposure only for the 1 hour nitrogen dioxide objective, and represented a worst case kerbside site for the whole of the Tees Valley.

The second continuous Local monitoring station for nitrogen oxides and particulate PM_{10} operated at **Cockerton Bridge** from 2004 to early April 2012, when the monitors became unserviceable and could not be economically repaired. The unit was a roadside site on one of the main radial routes into the town centre, with heavy, but relatively free flowing traffic. The monitor location was between kerbside and the nearest building façades, and was a worst-case site for all objectives relating to nitrogen oxides and particulate PM_{10} from traffic. It is noted here that a non-continuous nitrogen dioxide diffusion tube (D5 on the map Appendix D) continues to be operated at a nearby roadside location on Woodland Road to provide an on-going measure of nitrogen dioxide trends.

The locations of the two monitoring sites are shown on the map, Appendix D.

3.1.2 Non-Automatic Monitoring Sites

Darlington Borough Council undertook non-automatic (passive) monitoring of NO_2 with diffusion tubes at 15 No. sites during the whole of 2019, with tubes D12 (North Road (2)), D13 (106 High Northgate), D14 (Eldon Street Corner) and D15 (Blackwell (2)) which were put in place temporarily for six months at the end of 2018, remaining in place for the whole of 2019 in order to provide longer term data in these locations.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. "annualisation" and/or distance correction), are included in Appendix C. These diffusion tubes are 50% TEA in acetone, supplied and analysed by Gradko International Ltd. The results are adjusted for bias using factors from the laboratory (Gradko) overall bias factor, as there is no triple tube location study.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, "annualisation" and distance corrected to the nearest point of relevant public exposure. Further details on adjustments are provided in Appendix C.

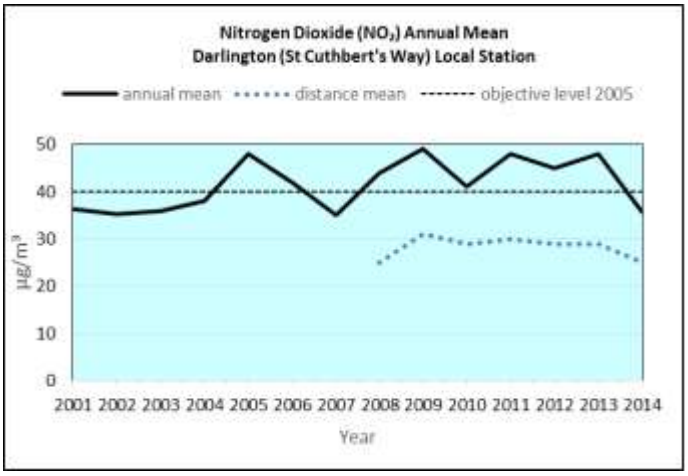
3.2.1 Nitrogen Dioxide (NO_2)

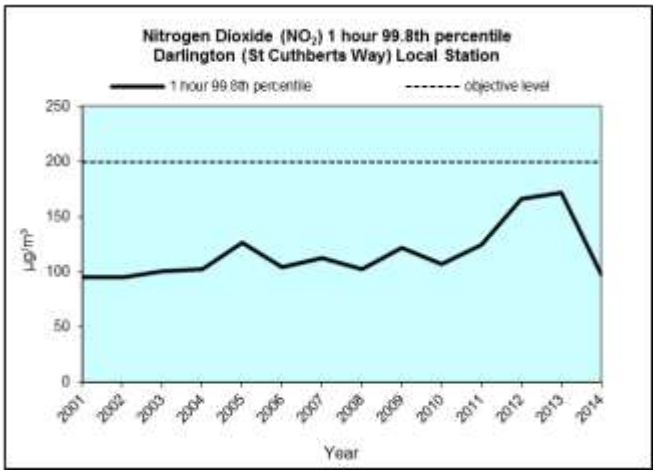
There have been no exceedances of the annual mean (in areas of relevant exposure) or 1 hour mean objectives at any monitoring location.

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations (for diffusion tubes and continuous monitors (when in operation)) for the past 5 years with the air quality objective of 40µg/m$^{3.}$ Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years (when operational) with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year. For diffusion tubes (annual mean), supplementary trend graphs are also provided where more than 5 years' worth of data is available (at same location) and the full 2019 dataset of monthly mean values is provided in Appendix B. Graphs have also been included where there are now two diffusion tubes at the same site (two locations).

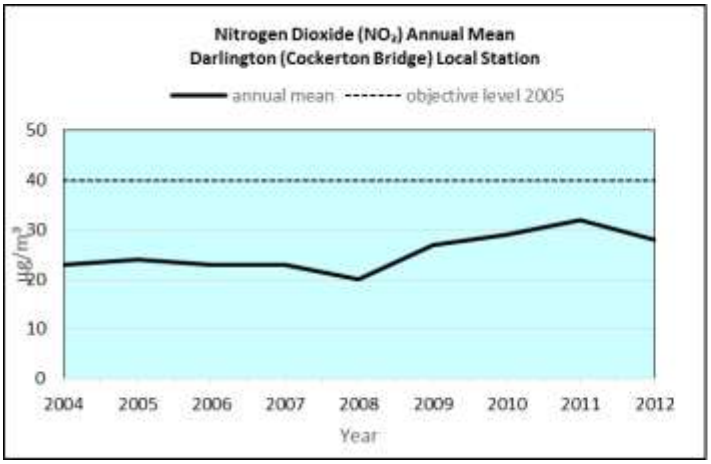
Historical nitrogen dioxide trend graphs at the Darlington St Cuthbert's Way and Cockerton Bridge continuous monitoring stations (when operational) are shown below and overleaf, along with the nitrogen dioxide diffusion tube trends. The blue trend line (distance mean) shown on the St Cuthbert's Way graph is the expected concentration (based on the annual mean) at the nearest point of relevant public exposure 20 metres away, using the fall off with distance method given in the Technical Guidance (Reference 3).

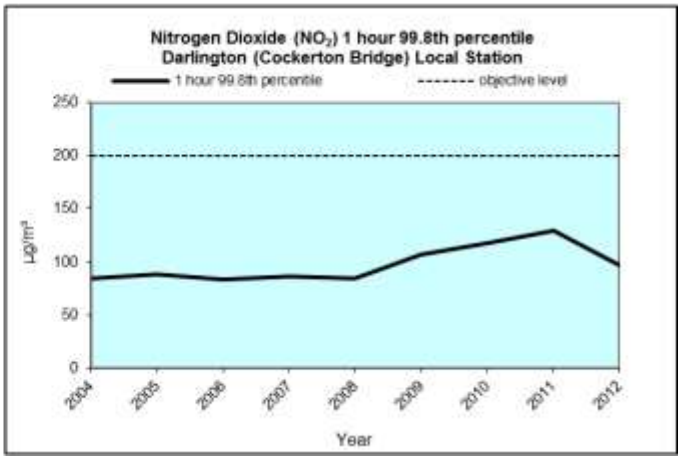
St Cuthbert's Way (no relevant exposure for the annual mean) Closed December 2014



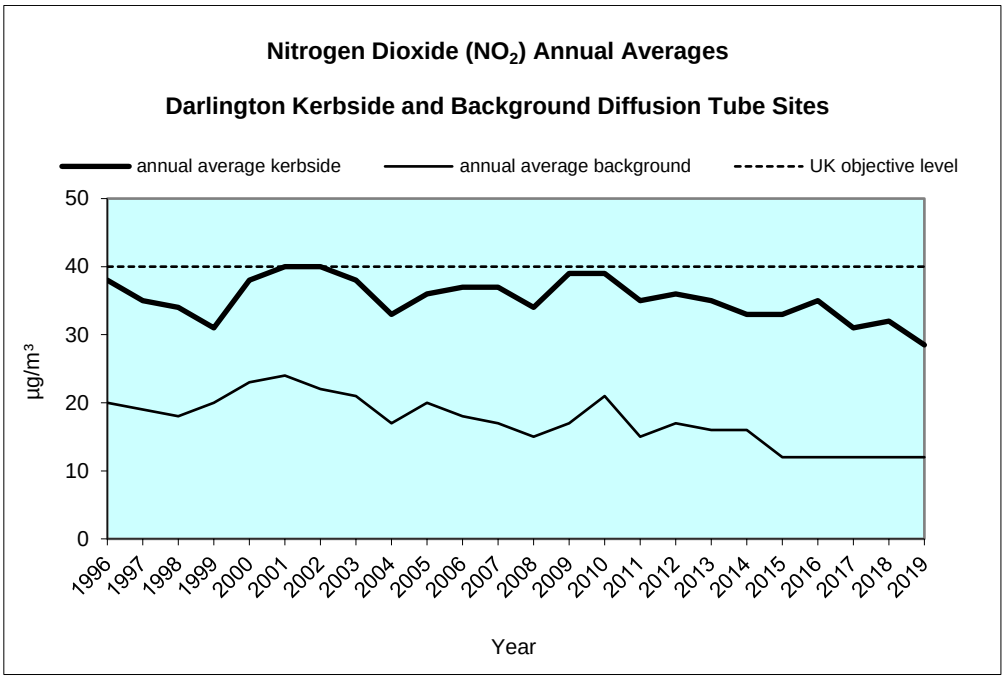


Cockerton Bridge (Closed April 2012)





Diffusion Tube Annual Average Trends



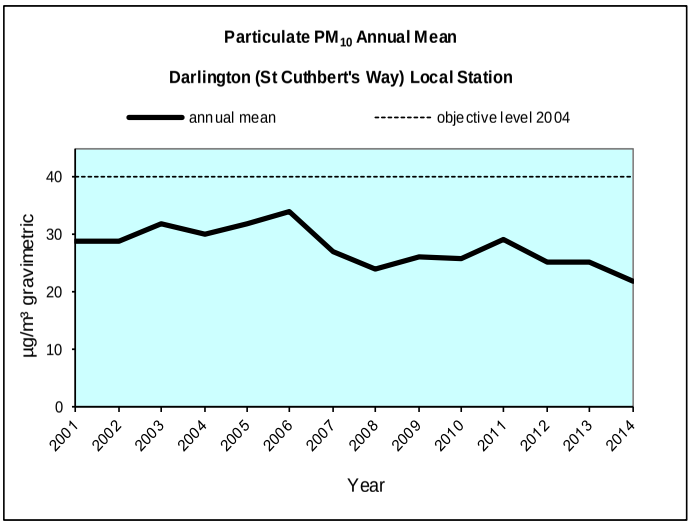
3.2.2 Particulate Matter (PM_{10})

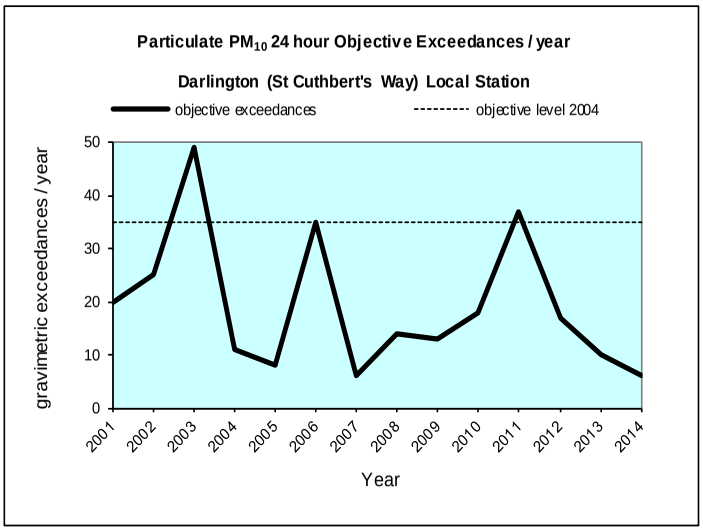
Table A.5 in Appendix A compares the ratified and adjusted continuously monitored PM_{10} annual mean concentrations for the past 5 years (when operational) with the air quality objective of 40µg/m^3.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years (when operational) with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

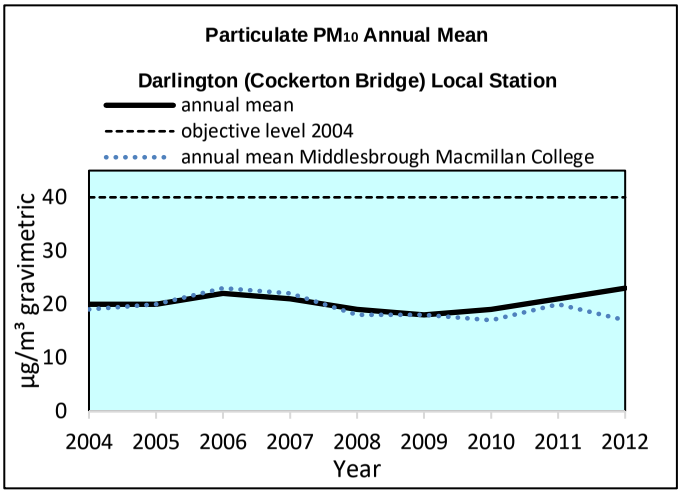
There have been no exceedances of the annual mean or daily mean objective in areas of relevant public exposure. The peaks/variations year on year at the St Cuthbert's Way site are due to weather conditions, with high pressure episodes in winter months causing rapid particulate build-up. Particulate PM_{10} trend graphs at the Darlington St Cuthbert's Way and Cockerton Bridge continuous monitoring stations are shown overleaf.

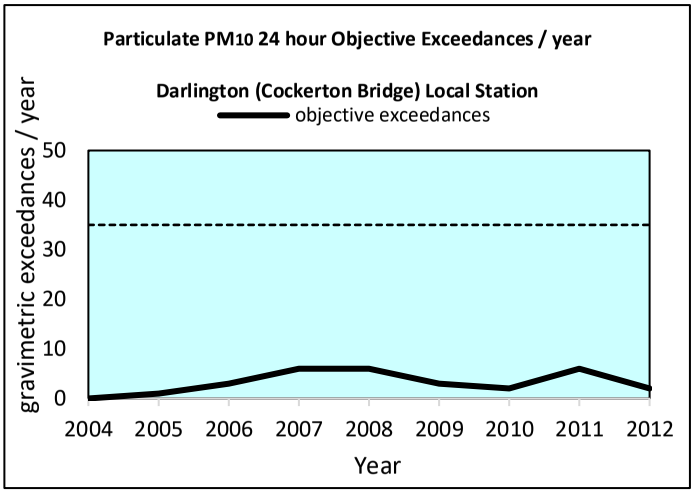
St Cuthbert's Way (no relevant public exposure for the annual mean or daily mean) (Closed December 2014)





Cockerton Bridge (Closed April 2012)





(Middlesbrough MacMillan College data added to indicate probable trend)

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A presents the derived $PM_{2.5}$ annual mean concentrations as available for the past 5 years (when operational) using the nationally derived factor of 0.7 applied to the particulate PM_{10} results at the St Cuthbert's and Cockerton Bridge sites. Also shown are the annual means recorded at the Middlesbrough and Stockton AURN sites, which are located in areas of relevant public exposure, and indicative of Darlington locations. This data has been obtained from the DEFRA UK Air data selector resource (Reference 5).

The derived annual mean for St Cuthbert's has fallen from 20.5µg/m^3 in 2011 to 15.6µg/m^3 in 2014. This site is a kerbside site, and fully reflects road traffic emissions. There is insufficient data at the Cockerton Bridge site. The actual monitored levels at the Middlesbrough and Stockton sites range between 10.1µg/m^3 and 13.1µg/m^3 over the same period (2011-2014) and more recently from 2015-2019 ranged between 7.5µg/m^3 and 10.7µg/m^3. These stations are more representative of urban traffic and relevant

public exposure locations. Weather conditions are thought to be the major influence on year by year variations.

3.2.4 Sulphur Dioxide (SO_2)

Darlington Borough Council no longer monitors sulphur dioxide concentrations, and there is no requirement in the absence of industrial sources or significant domestic coal burning. For many years, Darlington did monitor sulphur dioxide concentrations in the town centre using an 8 port sampler, but this site was closed in 2004 when sulphur dioxide concentrations fell below the limit of detection.

Sulphur dioxide monitoring results from other Tees Valley Councils with significant emissions from the chemical and steel industries, consistently show the objectives being met, and this will be the case within the Darlington Council area.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
StC (closed December 2014)	St Cuthbert's Way (Local)	Kerbside	429032	514818	NO_2, PM_{10}	NO	NO_2 - Chemiluminescence PM_{10} - TEOM (vcm correction)	20	0.5	NO_x 1.9 TEOM 2.0
Co (closed April 2012)	Cockerton Bridge (Local)	Urban Centre	427528	515309	NO_2, PM_{10}	NO	NO_2 - Chemiluminescence PM_{10} - TEOM (vcm correction)	20	10	2.9

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 (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
D1	Northgate	Kerbside	429026	514898	NO_2	NO	N/A	<1 (0.6)	NO	2.6
D2	Haughton Road	Roadside	429351	514819	NO_2	NO	1	2.2	NO	2.5
D3	Platform 1 - Middleton St George	Roadside	434205	514165	NO_2	NO	4	2.2	NO	2.4
D4	Salters Lane	Roadside	429478	517375	NO_2	NO	5	1	NO	2.8
D5	Woodland Rd	Roadside	428152	514966	NO_2	NO	20	1.6	NO	2.9
D6	Blackwell Bridge	Roadside	427734	512591	NO_2	NO	10	2.5	NO	2.6
D7	North Road Station	Roadside	429007	515504	NO_2	NO	3	1.6	NO	3.0
D8	Haughton Green	Kerbside	430905	515918	NO_2	NO	20	<1 (0.79)	NO	2.5
D9	Yarm Road	Roadside	431299	514137	NO_2	NO	20	1	NO	2.6
D10	St Cuthbert's	Kerbside	429170	514534	NO_2	NO	N/A	<1 (0.73)	NO	2.4
D11	Whinfield Road	Kerbside	430981	516584	NO_2	NO	30	<1	NO	2.3
D12	North Road Station (2)	Roadside	429007	515504	NO_2	NO	3	1.6	NO	3.0
D13	106 High Northgate	Kerbside	429028	515523	NO_2	NO	2.7	<1	NO	2.4
D14	Eldon Street Corner	Kerbside	429183	516223	NO_2	NO	5.5	<1	NO	2.7
D15	Blackwell Bridge (2)	Roadside	427734	512591	NO_2	NO	10	2.5	NO	2.6

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). Distance to relevant exposure from monitoring position.

(2) N/A if no near relevant exposure. Distance to kerb of nearest road from monitoring position.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3) (4)				
							2010	2011	2012	2013	2014
StC (closed Dec 2014)	429032	514818	Kerbside	Automatic	100	81	**41.1** (29.3)	**48.0** (30.2)	**44.6** (28.8)	**48.4** (28.8)	35.7(24.8)
							2008	2009	2010	2011	2012
Co (closed April 2012)	427528	515309	Urban Centre	Automatic	53	19	20.2	26.6	29.3	33.4	27.8
							2015	2016	2017	2018	2019
						Bias factor	0.96	1.01	0.97	0.92	0.87
D1	429026	514898	Kerbside	Diffusion Tube	100	92	32.8	35.7	27.9	38.7	35.8
D2 (new loc Jan 2016)	429351	514819	Roadside	Diffusion Tube	100	92	12.9	30.1	29.9	30.9	27.8
D3 (new loc Jan 2017)	434205	514165	Roadside	Diffusion Tube	100	83	10.8	12.0	12.1	15.3	14.2
D4	429478	517375	Roadside	Diffusion Tube	100	75	29.8	34.8	29.4	34.0	31.4
D5	428152	514966	Roadside	Diffusion Tube	100	100	24.9	23.0	25.1	23.9	24.9
D6	427734	512591	Roadside	Diffusion Tube	100	92	38.0	33.7	34.8	35.3	30.8
D7	429007	515504	Roadside	Diffusion Tube	100	67	35.4	37.6	**41.9**	**41.5**	36.3
D8	430905	515918	Kerbside	Diffusion Tube	100	92	33.2	34.0	33.2	33.8	31.1
D9	431299	514137	Roadside	Diffusion Tube	100	58	24.2	26.2	27.7	28.6	25.0
D10 (new loc Jan 2016)	429170	514534	Kerbside	Diffusion Tube	100	92	8.3	35.0	31.0	34.1	31.6
D11 (new site Jan 2018)	430981	516584	Kerbside	Diffusion Tube	100	92	-	-	-	24.0	18.8
D12 (duplicate June 2018)	429007	515504	Roadside	Diffusion Tube	100	75	-	-	-	**40.0**	33.2
D13 (new site June 2018)	429028	515523	Kerbside	Diffusion Tube	100	67	-	-	-	32.5	28.8
D14 (new site June 2018)	429183	516223	Kerbside	Diffusion Tube	100	100	-	-	-	29.4	24.8
D15 (duplicate June 2018)	427734	512591	Roadside	Diffusion Tube	100	92	-	-	-	35.7	32.1

Figures in brackets for St Cuthbert's Way automatic monitor are the projected public exposure concentration annual means derived from the NO_2 fall off with distance calculator at 20 metres, the nearest point of relevant public exposure.)

☒ **Diffusion tube data has been bias corrected** ☒ **Annualisation has been conducted where data capture is <75%**

☒ **Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance adjustment**

Notes:

For Darlington automatic sites data is from last 5 years where monitoring data is available i.e. when sites were operational

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.**

(1) For last year monitored. Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year. (100% - monitoring was carried out for full year)

(2) For last year monitored. 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 Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

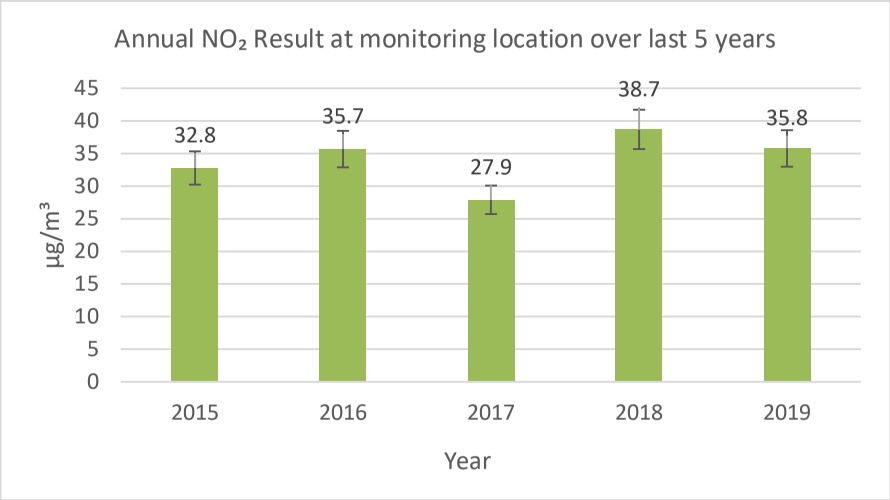
(4) Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

New location – indicates when tube has moved location but the same tube reference has been used from previous years and in similar/representative area

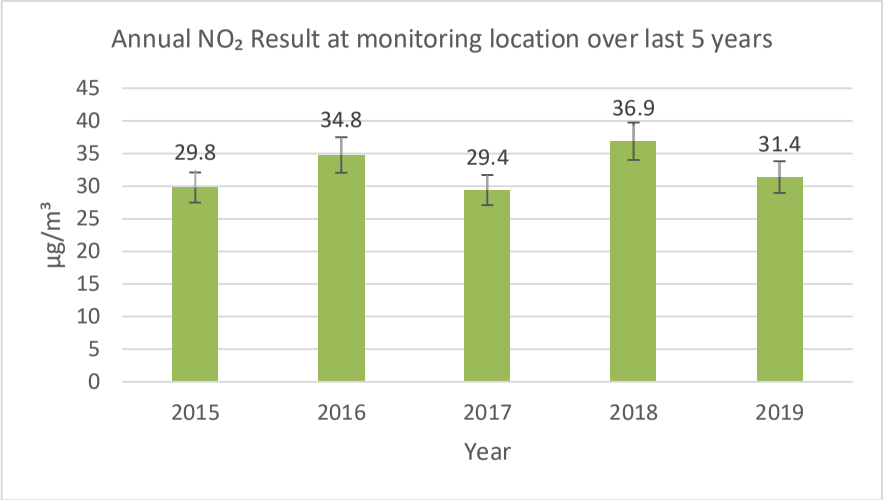
New site – indicates completely new monitoring location/new reference assigned

Diffusion tube trend graphs (locations where 5 years' worth of monitoring data)

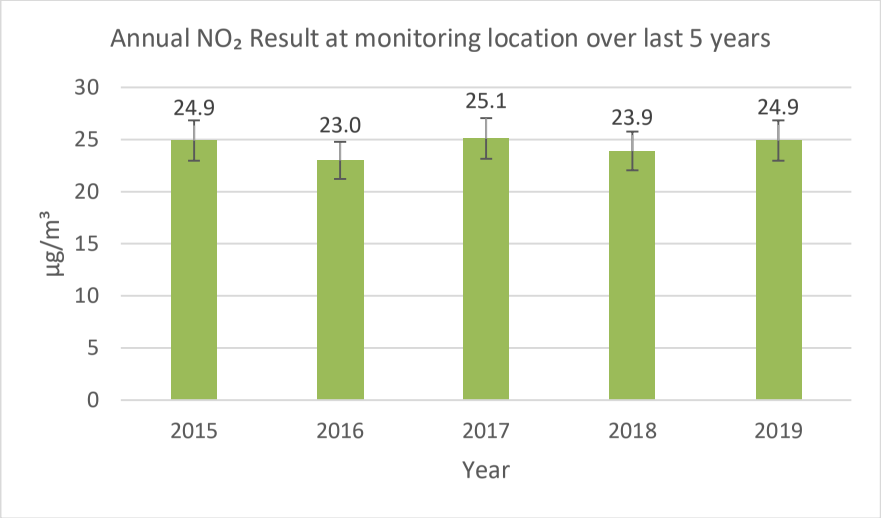
D1 Northgate



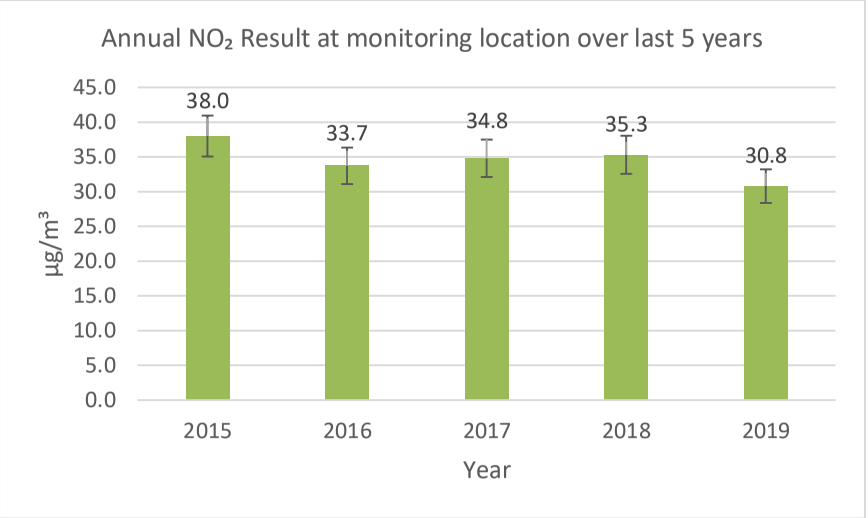
D4 Salters Lane



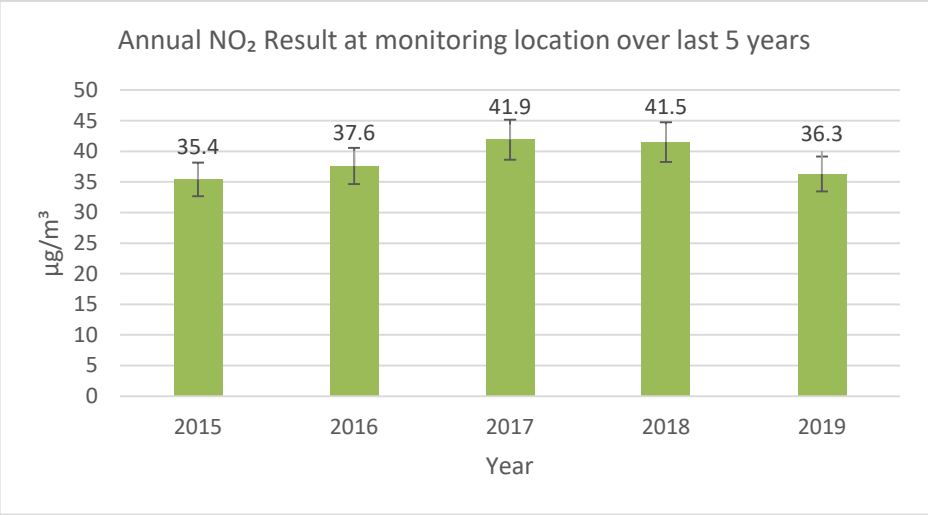
D5 Woodland Road



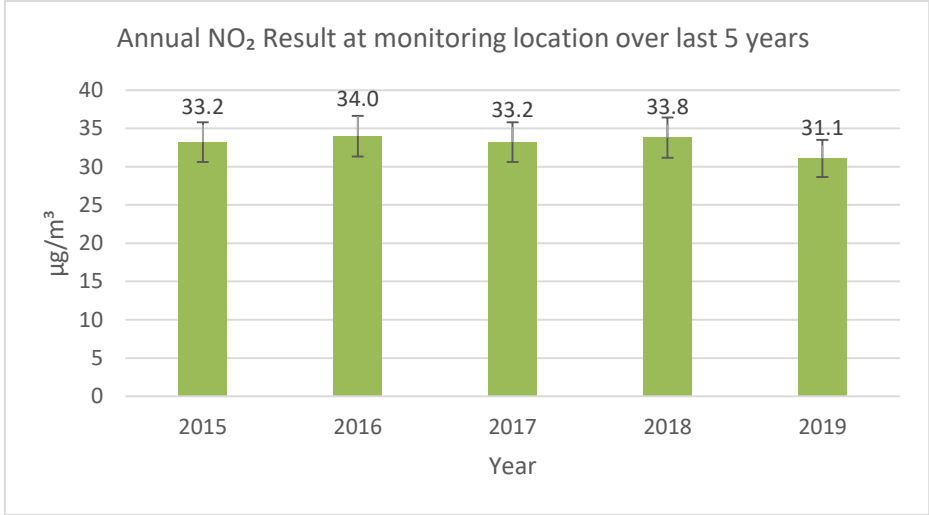
D6 Blackwell Bridge



D7 North Road Station



D8 Haughton Green



D9 Yarm Road

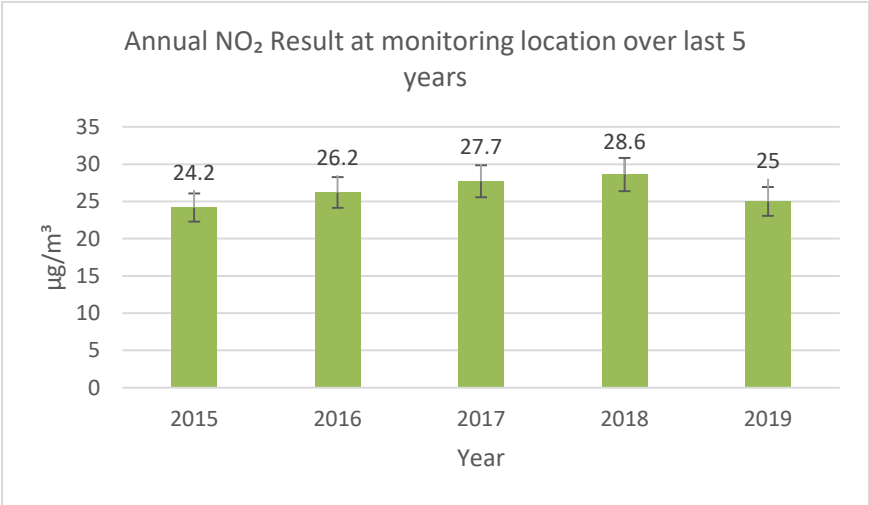
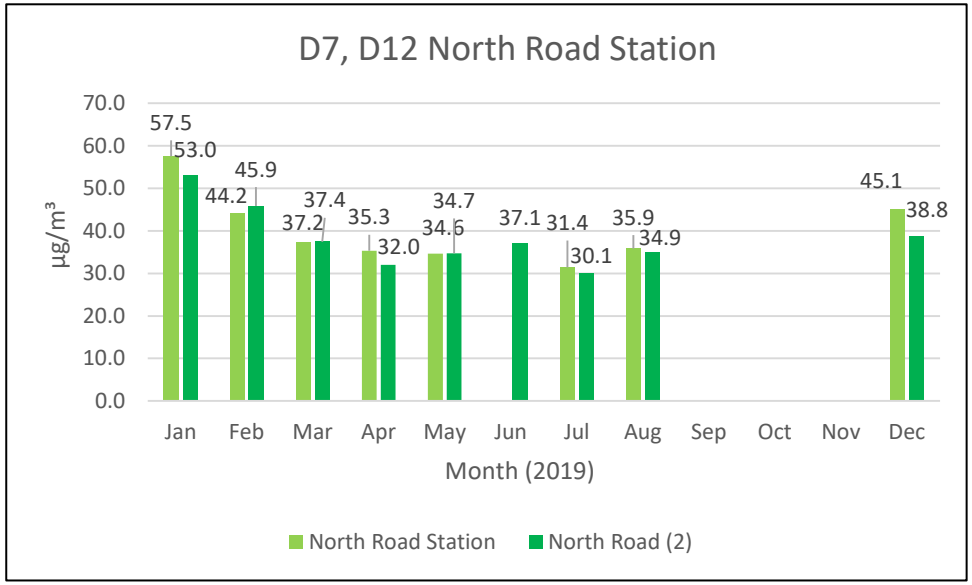


Figure quoted is actual result (annualised (where appropriate) and bias adjusted but not distance corrected)

Error bars show overall measurement uncertainty (M.U.) as detailed on laboratory analysis report provided by Gradko International (±9.7%) for latest year (2019)

Diffusion tube trend graphs (locations where two tubes)



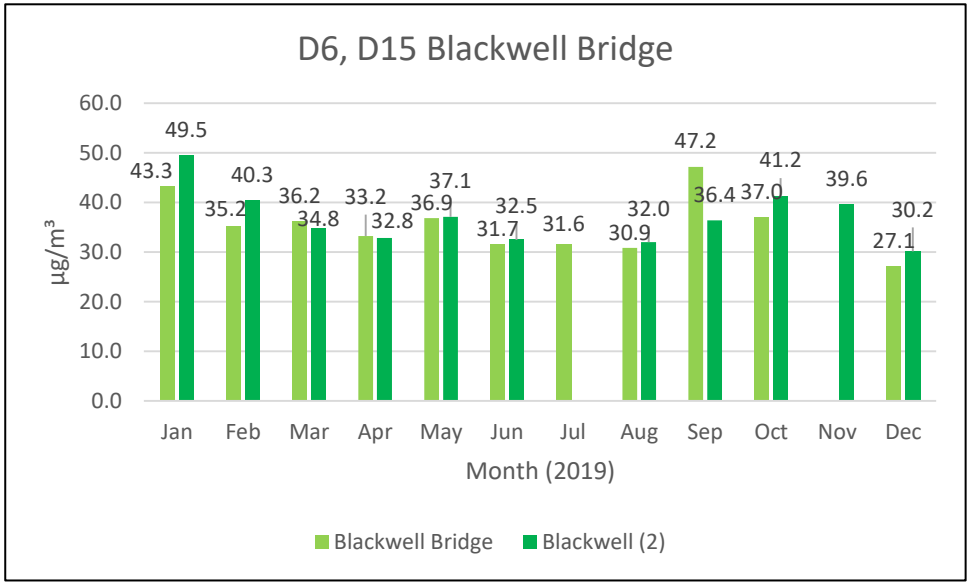


Figure quoted is actual result
from laboratory analysis sheet

Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture (%) (2)	NO_2 1 Hour Means > 200µg/m³ (3)				
							2010	2011	2012	2013	2014
StC (closed December 2014)	429032	514818	Kerbside	Automatic	100	81	0 (107)	1 (125)	1 (166)	4 (172)	0 (98)
							2008	2009	2010	2011	2012
Co (closed April 2012)	427528	515309	Urban Centre	Automatic	53	19	0 (84)	0 (107)	0 (118)	1 (129)	0 (97)

Notes:

Data is from last 5 years where monitoring data is available i.e. when sites were operational

Exceedances of the NO_2 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold.**

(1) For last year monitored. Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year. (100% - monitoring was carried out for full year)

(2) For last year monitored. 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 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture (%) (2)	PM_{10} Annual Mean Concentration (µg/m³) (3)				
						2010	2011	2012	2013	2014
StC (closed December 2014)	429032	514818	Kerbside	100	82	25.8	29.2	25.2	25.3	22.8
						2008	2009	2010	2011	2012
Co (closed April 2012)	427528	515309	Urban Centre	66	18	18.5	18.1	18.5	21.4	22.8

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

Data is from last 5 years where monitoring data is available i.e. when sites were operational

Exceedances of the PM_{10} annual mean objective of 40µg/m³ are shown in **bold.**

(1) For last year monitored. Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year. (100% - monitoring was carried out for full year)

(2) For last year monitored. 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 Boxes 7.9 and 7.10 in LAQM.TG16, if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture (%) (2)	PM_{10} 24 Hour Means > 50µg/m^3 (3)				
						2010	2011	2012	2013	2014
StC (closed December 2014)	429032	514818	Kerbside	100	82	18 (42)	37 (51)	17 (43)	10 (40)	6 (37)
						2008	2009	2010	2011	2012
Co (closed April 2012)	427528	515309	Urban Centre	66	18	6 (32)	3 (29)	2 (33)	6 (38)	2 (39)

Notes:

Data is from last 5 years where monitoring data is available i.e. when sites were operational

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

(1) For last year monitored. Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year. (100% - monitoring was carried out for full year)

(2) For last year monitored. 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 90.4th percentile of 24-hour means is provided in brackets.

Table A.7 – $PM_{2.5}$ Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
						2010	2011	2012	2013	2014
StC (closed December 2014)	429032	514818	Kerbside	100	82	18.1	20.4	17.6	17.7	16.0
						2008	2009	2010	2011	2012
Co (closed April 2012)	427528	515309	Urban Centre	66	18	13.0	12.7	13.0	15.0	16.0
						2015	2016	2017	2018	2019
Stockton-on-Tees Eaglescliffe	441623	513674	Urban Background	100	93	10.7	9.2	8.5	10.1	8.4
Stockton-on-Tees A1305 Nelson Terrace	444331	519164	Roadside	100	92	N/A	9.5	8.1	9.4	8.5
Middlesbrough Breckon Hill	450506	519620	Urban Background	100	96	10.5	10.2	7.5	8.9	10.3

The Stockton-on-Tees Eaglescliffe and Middlesbrough Breckon Hill sites are national network AURN stations within Tees Valley council areas. The stations are at locations of relevant public exposure and will be representative of such locations in Darlington.

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

Data is from last 5 years where monitoring data is available i.e. when sites were operational

(1) For last year monitored. Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year. (100% - monitoring was carried out for full year)

(2) For last year monitored. 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 Boxes 7.9 and 7.10 in LAQM.TG16, if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

*NB. Data for Stockton and Middlesbrough (2017) from UK AIR data selection csv files downloaded on 06/06/2018. Other data was provided from the Local Authorities themselves.

Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 – NO_2 Monthly Diffusion Tube Results – 2019

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.87) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
D1	48.9	46.1	34.1	45.3	38.9	39.6	31.6	-	37.2	48.0	49.0	33.5	**41.1**	35.8	N/A
D2	-	38.4	29.0	38.9	28.2	28.0	25.6	26.2	31.1	37.6	39.7	29.0	32.0	27.8	26.4
D3	24.5	24.8	11.4	14.3	11.6	-	10.8	10.8	13.0	-	21.8	20.7	16.4	14.2	13.7
D4	43.7	44.0	34.3	-	-	27.7	-	27.2	36.0	34.0	41.5	36.6	36.1	31.4	24.4
D5	40.4	34.6	25.6	23.6	20.2	17.3	17.2	52.2	23.4	28.6	30.2	30.4	28.6	24.9	17.4
D6	43.3	35.2	36.2	33.2	36.9	31.7	31.6	30.9	47.2	37.0	-	27.1	35.5	30.8	23.3
D7	57.5	44.2	37.2	35.3	34.6	-	31.4	35.9	-	-	-	45.1	**40.2**	36.3	30.6
D8	52.6	44.2	33.5	33.9	28.9	33.1	-	30.3	36.5	38.0	22.2	39.8	35.7	31.1	19.1
D9	37.3	37.3	27.3	-	25.8	23.5	-	-	27.3	16.7	-	-	27.9	25.0	17.0
D10	38.6	48.8	26.8	46.5	34.1	36.8	32.8	32.0	35.1	39.0	-	29.3	36.3	31.6	N/A
D11	27.4	23.6	15.7	26.5	19.7	18.6	27.9	13.1	20.8	21.1	-	23.8	21.6	18.8	14.1
D12	53.0	45.9	37.4	32.0	34.7	37.1	30.1	34.9	-	-	-	38.8	38.2	33.2	28.2
D13	-	39.0	26.5	-	35.0	36.2	25.5	-	-	29.5	45.5	30.3	33.5	28.8	24.4
D14	37.3	38.5	23.6	29.7	22.3	20.4	21.4	21.7	26.6	31.4	35.5	34.0	28.5	24.8	20.0
D15	49.5	40.3	34.8	32.8	37.1	32.5	-	32.0	36.4	41.2	39.6	30.2	36.9	32.1	24.1

☒ **National bias adjustment factor used**

☒ **Annualisation has been conducted where data capture is <75%**

☒ **If applicable, data has been distance corrected for relevant exposure**

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.**

(-) indicates where tube has been missing from location or results may have been compromised

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure. N/A if no near relevant exposure.

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

Air Quality Monitoring Data QA/QC

Diffusion Tube Bias Adjustment Factors

Gradko International Ltd supply and analyse nitrogen dioxide diffusion tubes for Darlington Borough Council. Tube preparation is 50% TEA in acetone. The bias adjustment factor for 2020 has been obtained from the Diffusion Tube Bias Adjustment Factors Spreadsheet collated by DEFRA, and in March/April 2020, was 0.87 (Reference 6). Darlington does not have a co-location study.

PM Monitoring Adjustment

All measurements for PM_{10} at the Local stations are TEOM based. Results since 2008 have been adjusted by the vcm method to provide gravimetric equivalence.

Short-term to Long-term Data adjustment

The St Cuthbert's continuous monitoring station had 10 months data only in 2014 (the last monitoring year). The nitrogen dioxide and particulate PM10 annual means were annualised using three Tees Valley continuous monitor datasets. Calculations were included within the Darlington 2015 Updating and Screening report.

Three of the fifteen diffusion tubes (D7, D9, D13) had less than 75% data capture (less than 9 months' worth of data). The data has been annualised using the results at three Tees Valley continuous monitoring sites, all of which are background sites (two urban background and one suburban) in accordance with LAQM.TG16 box 7.9. The annualisation is performed using data from the continuous monitors which is averaged over the same period the diffusion tubes have been exposed.

Calculations are shown below in table C1. The annualisation toolkit was released after the calculations had been carried but the toolkit was used to check a sample of the data.

QA/QC of diffusion tube monitoring

The Darlington Borough Council nitrogen dioxide diffusion tube programme is operated through an approved laboratory (Gradko International Ltd) with formal accreditation to BS standards, and one that participates in the AIR-PT programme. Particular attention is paid to proper installation of the tubes at the site, and reliable exposure duration.

Tube precision for this laboratory is shown as good for 2019 for tube preparation 50% TEA in acetone (Reference 7). Gradko International Ltd also demonstrated 100% satisfactory performance in the AIR-PT scheme for the majority of 2019 (with 75% satisfactory performance Jan-Feb 2019 only i.e. AIR PT AR030) (Reference 8).

Tables C1 & C2 - Data Adjustment for NO_2 Diffusion Tubes

Darlington Diffusion Tube Annualisation 2019

C1. Data from continuous monitors Stockton, Redcar & Cleveland and Middlesbrough

Month	Stockton Eaglescliffe	R&C Dormanstown	Middlesbrough Breckon Hill
	Monthly averages (µg/m³)		
Jan	17.2	8.5	23.1
Feb	14.5	16.5	19.0
Mar	6.4	10.1	11.3
Apr	16.8	7.4	19.9
May	10.5	6.3	14.7
Jun	8.5	4.9	11.3
Jul	8.6	5.9	11.4
Aug	6.1	8.5	10.1
Sep	9.5	9.4	13.3
Oct	15.2	10.2	18.0
Nov	23.4	12.8	25.3
Dec	11.9	12.2	16.0
Annual mean (µg/m³)	12.4	9.4	16.1

C2. Darlington diffusion tubes requiring annualisation

Tube reference	Period means	Ratios	Average Ratio
	= an average of the months with data for specific Darlington tubes	= annual mean/period mean	=average of the ratios
D7 (8 mths)	11.5; 9.4; 15.7	1.08; 1.0; 1.03	**1.04**
D9 (7 mths)	11.7; 9.4; 15.8	1.06; 1.0; 1.02	**1.03**
D13 (8 mths)	12.4; 9.9; 15.9	1.0; 0.95; 1.01	**0.99**

Table C3 - Distance correction for NO_2

Tube reference	Distance of measurement position from kerb (m)	Distance of receptor from measurement position (m)	Distance of receptor from kerb (m)	Local annual mean background NO_2 concentration (µg/m³) (measured)	Measured annual mean NO_2 concentration (µg/m³)*	Predicted annual mean NO_2 concentration at receptor (µg/m³)
D1	<1 (0.6)	N/A	N/A	12.0	35.8	N/A
D2	*2.2*	1	*3.2*	*12.0*	*27.8*	26.4
D3	*2.2*	4	*6.2*	*12.0*	*14.2*	13.7
D4	*1*	5	*6*	*12.0*	*31.4*	24.4
D5	*1.6*	20	*21.6*	*12.0*	*24.9*	17.4
D6	*2.5*	10	*12.5*	*12.0*	*30.8*	23.3
D7	*1.6*	3	*4.6*	*12.0*	*36.3*	30.6
D8	*<1 (0.79)*	20	*20.79*	*12.0*	*31.1*	19.1
D9	*1*	20	*21*	*12.0*	*25.0*	17.0
D10	<1 (0.73)	N/A	N/A	12.0	31.6	N/A
D11	*<1*	30	*31*	*12.0*	*18.8*	14.1
D12	*1.6*	3	*4.6*	*12.0*	*33.2*	28.2
D13	*<1*	2.7	*3.7*	*12.0*	*28.8*	24.4
D14	*<1*	5.5	*6.5*	*12.0*	*24.8*	20.0
D15	*2.5*	10	*12.5*	*12.0*	*32.1*	24.1

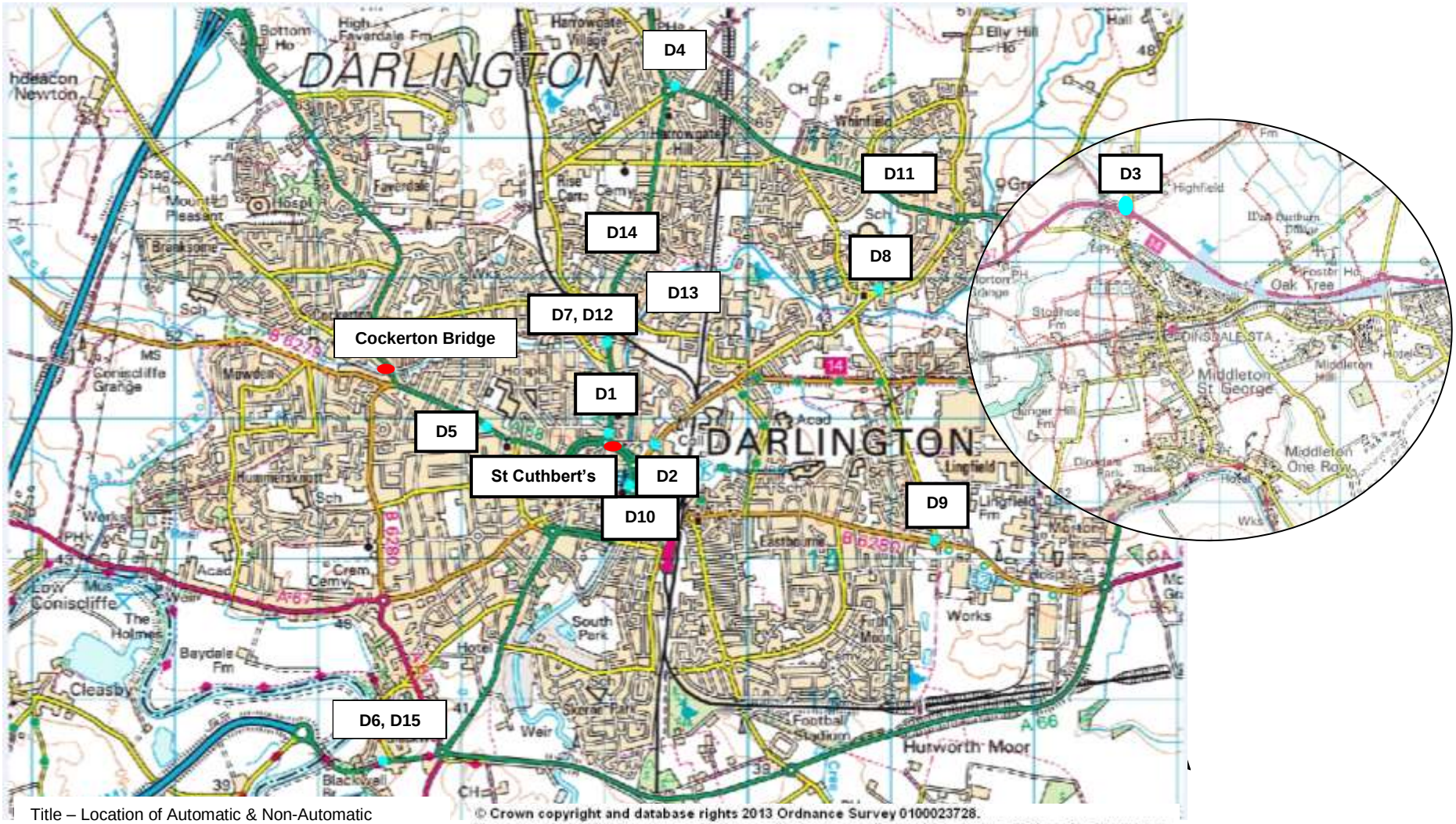
* Figures take into account annualisation (where appropriate) and bias adjustment

The predicated annual mean concentration at the receptor was calculated using the Nitrogen Dioxide fall off with distance calculator provided by DEFRA (Reference 9). *Data inputted is shown in green and italics.*

Background data used was for the last available background site in Darlington (Swinburne Road site (2016)). The annual NO_2 concentration here was 12.0 µg/m³. The online background maps show the level to be 7.6 µg/m³ for 2017 (latest available) (Reference 4).
Using 12.0 µg/m³ for the purpose of the distance calculations represents worst-case.

Appendix D: Map(s) of Monitoring Locations and AQMAs

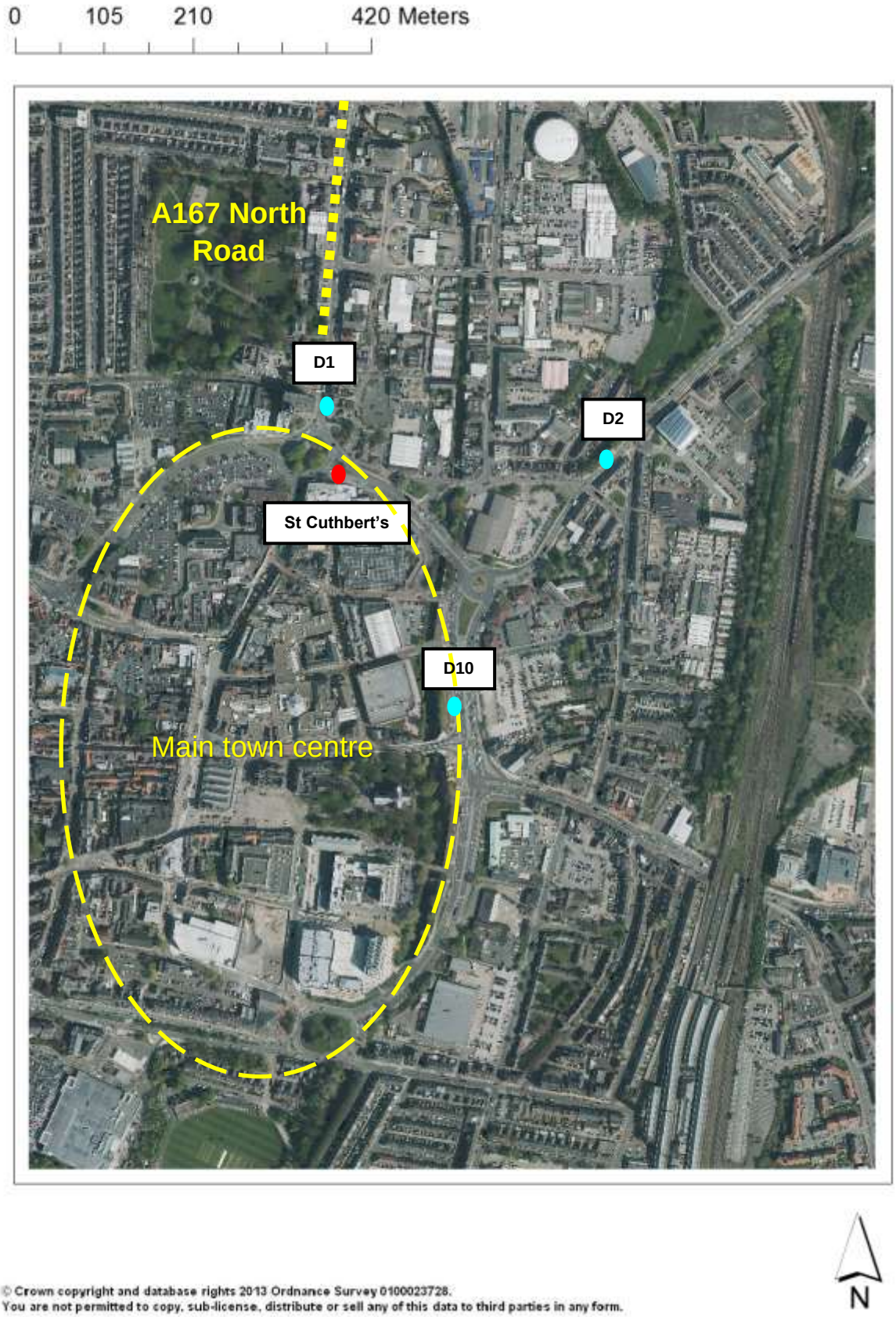
Figure D.1 Map of Automatic ● and Non-Automatic ● Monitoring Sites in Darlington Borough Council Area



Title – Location of Automatic & Non-Automatic Monitoring Sites
Scale – 1:24,000

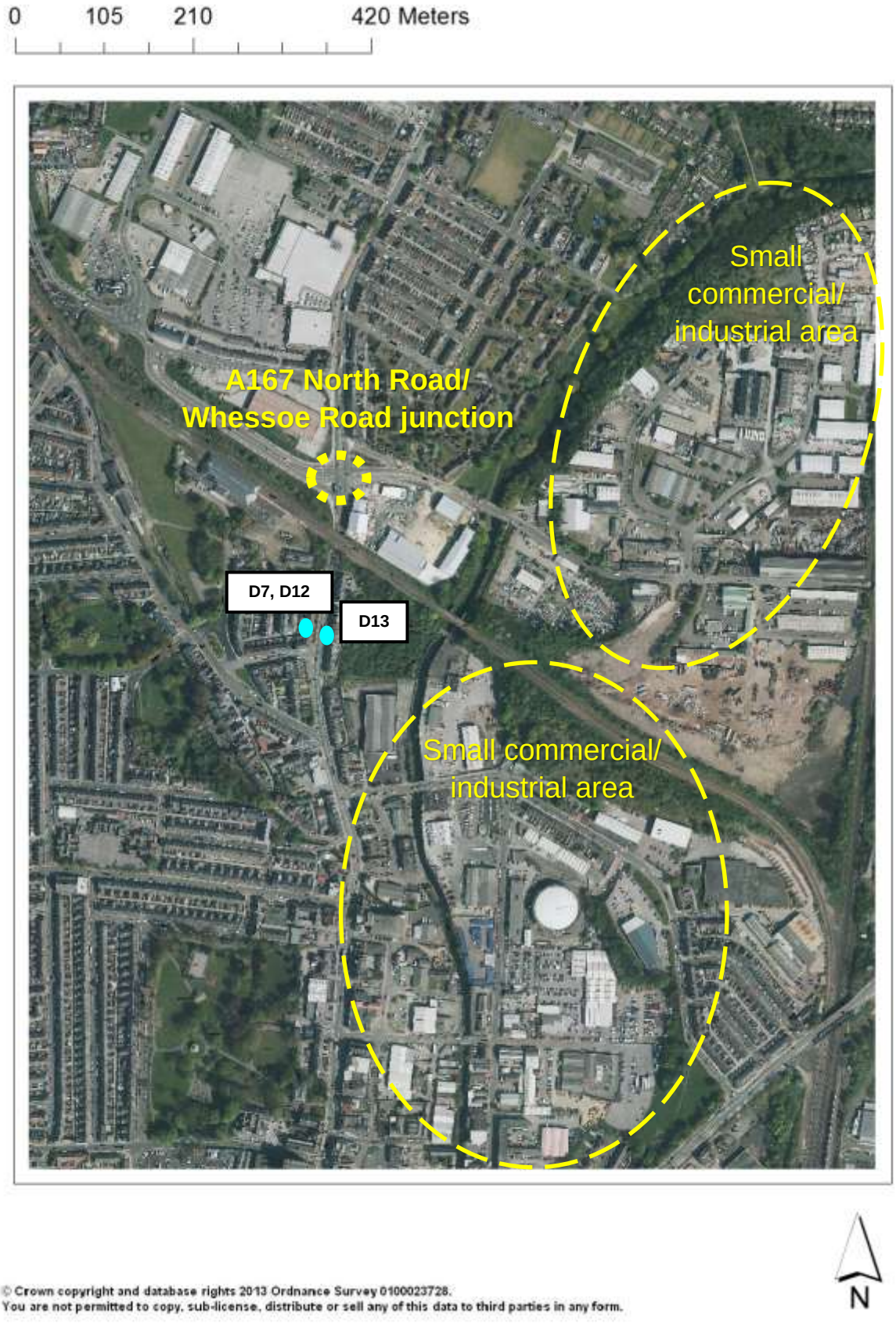
Darlington Borough Council

Larger scale maps showing diffusion tube locations
D1 Northgate, D2 Haughton Road, D10 St Cuthbert's, St Cuthbert's (automatic)



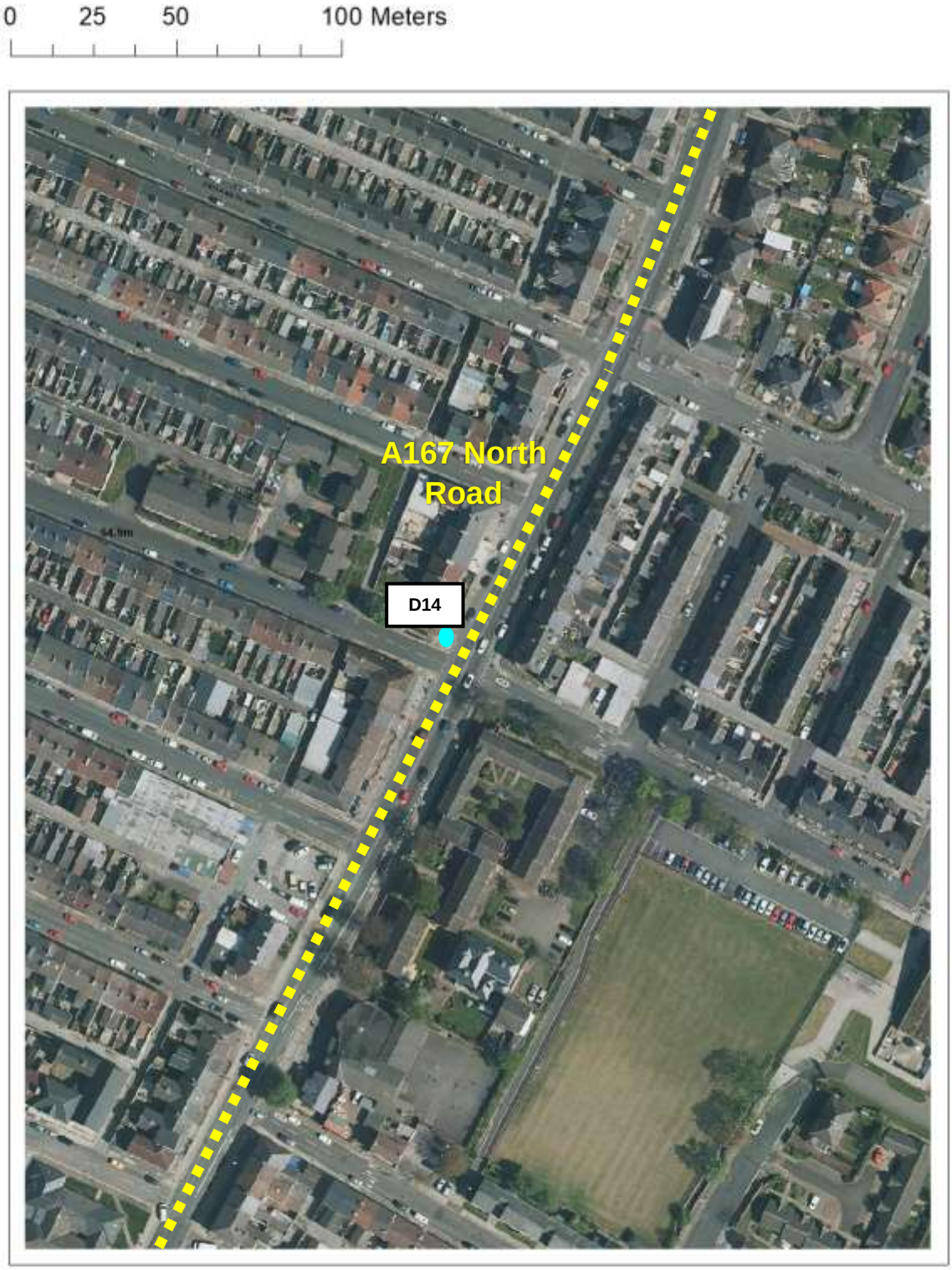
Darlington Borough Council

D7, D12 North Road Station and D13 106 High Northgate



Darlington Borough Council

D14 Eldon Street Corner

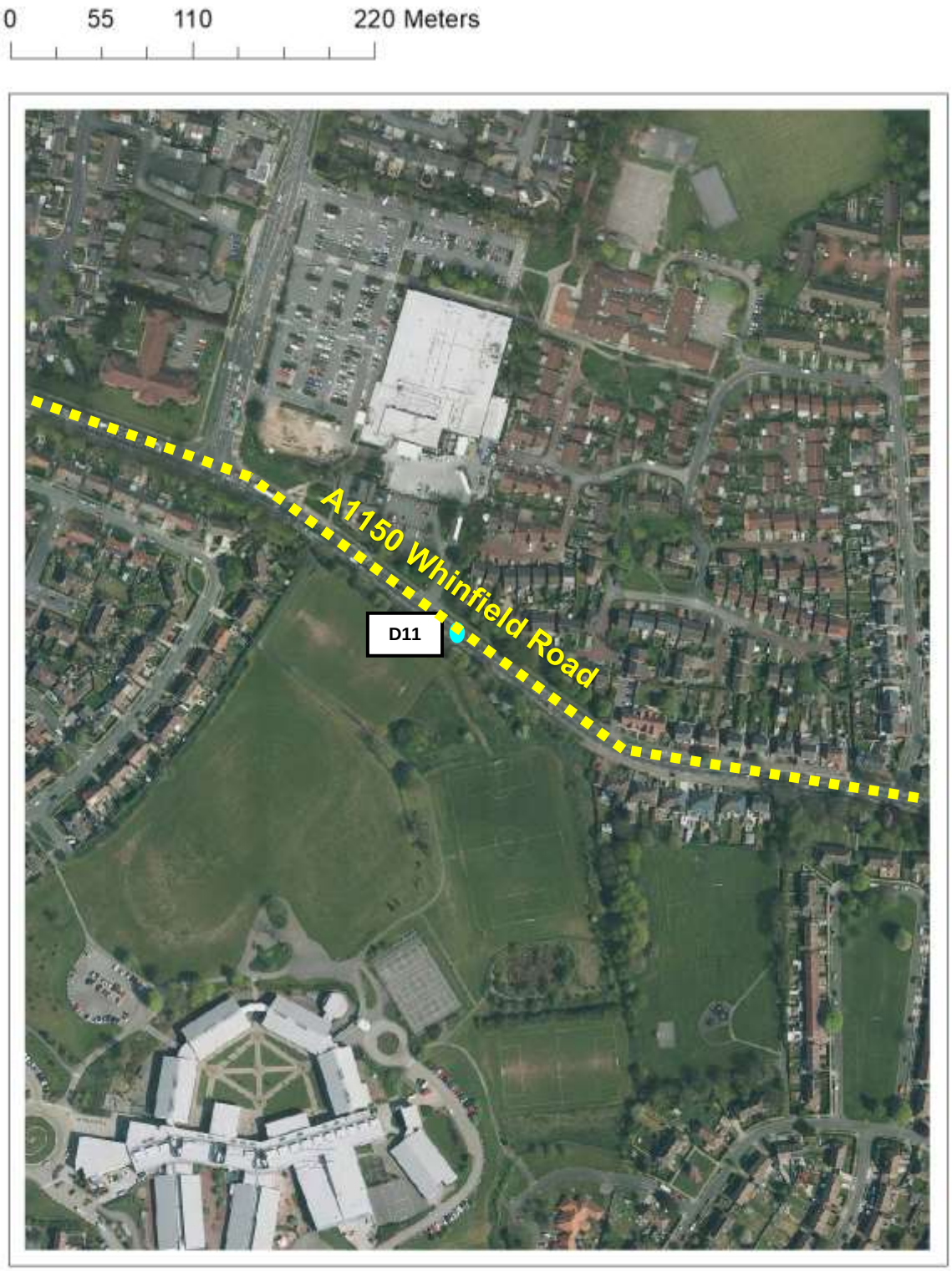


Darlington Borough Council

D4 Salters Lane North

Darlington Borough Council

D11 Whinfield Road

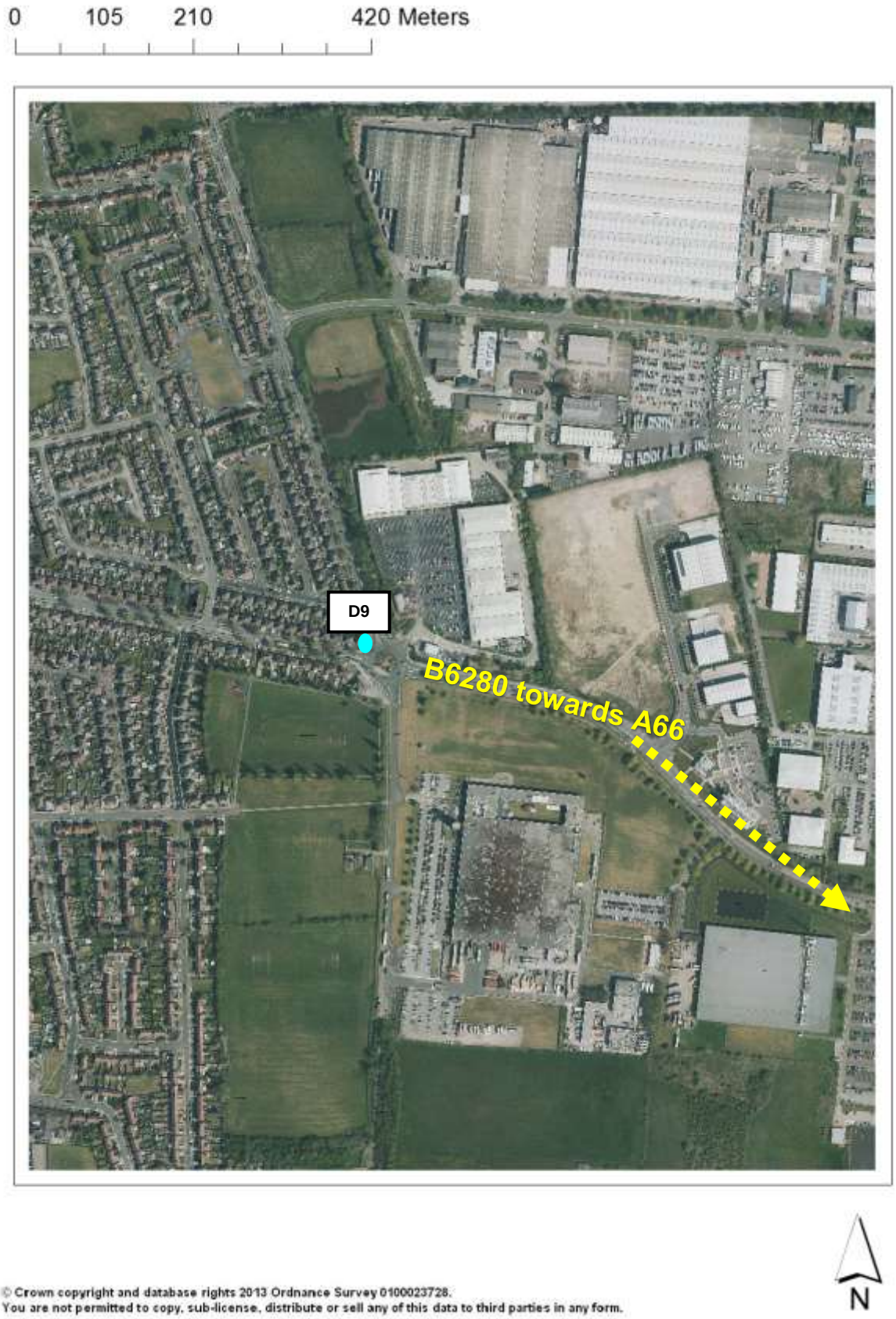


Darlington Borough Council

D8 Haughton Green

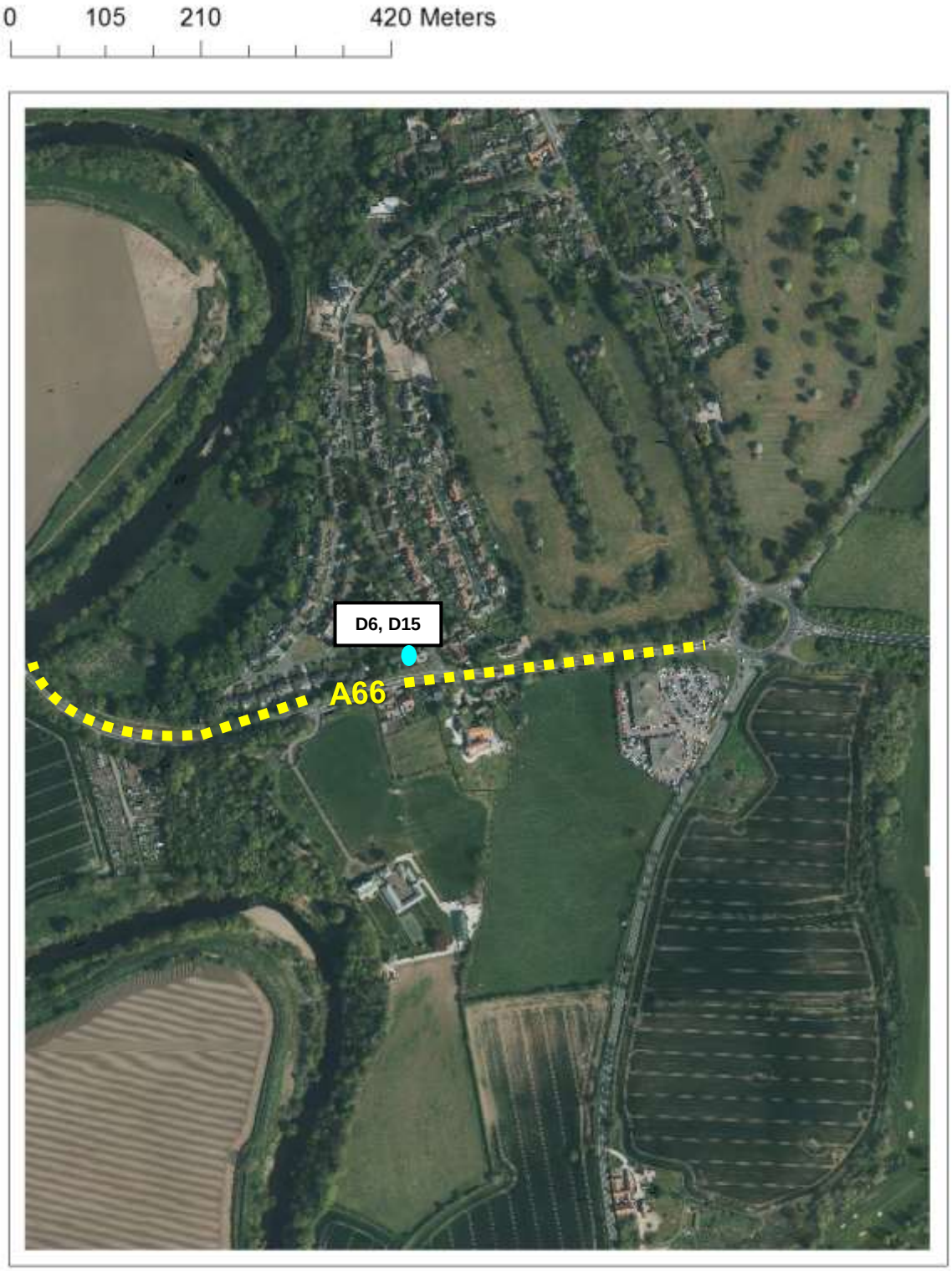
Darlington Borough Council

D9 Yarm Road



Darlington Borough Council

D6, D15 Blackwell Bridge



Darlington Borough Council

D5 Woodland Road, Cockerton Bridge (automatic)

Darlington Borough Council

D3 Platform 1 Middleton St George

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[10]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

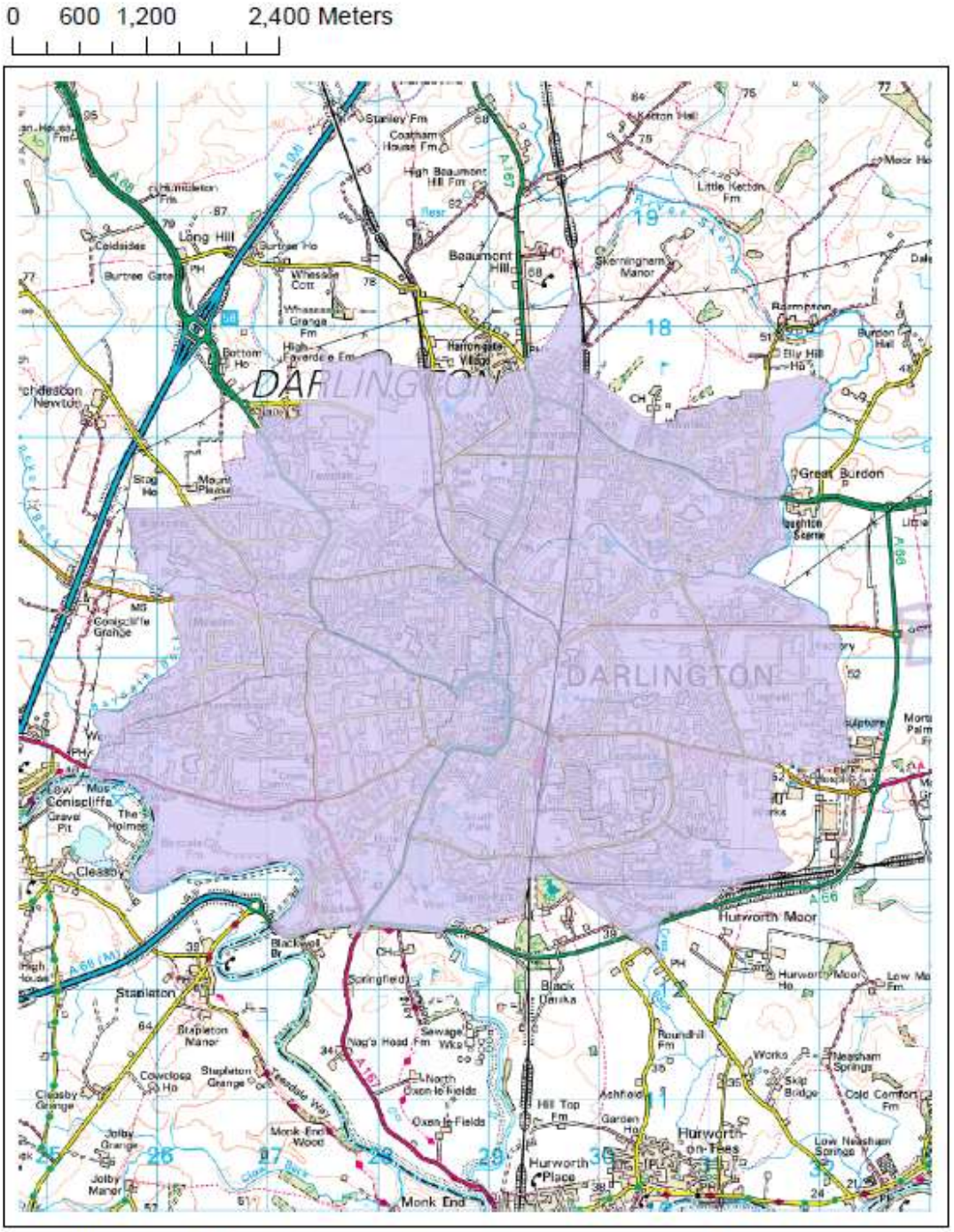
[10] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Appendix F: Air quality project work

Clean Air Day 2019

Idling message

Appendix G: Darlington Smoke Control Area



Glossary of Terms

Abbreviation	Description
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
ASR	Air Quality Annual Status Report
CO	Carbon Monoxide
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
DPF	Diesel Particulate Filter
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
LGTV	Let's Go Tees Valley
LIP	Local Implementation Plan
LPG	Liquid Petroleum Gas
LTP	Local Transport Plan
NGV	Natural Gas Vehicle
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM	Particulate Matter
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
SOV	Single Occupancy Vehicle
STP	Strategic Transport Plan
TVCA	Tees Valley Combined Authority
TVEPG	Tees Valley Environmental Protection Group

References

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   Department for Environmental, Food and Rural Affairs
   Available at: https://www.gov.uk/government/publications/clean-air-strategy-2019

2. LAQM Policy Guidance 2016
   Published by the Department for Environment, Food and Rural Affairs, April 2016
   Available at: https://consult.defra.gov.uk/communications/laqm_changes/supporting_documents/LAQM%20Policy%20Guidance%202016.pdf

3. LAQM Technical Guidance 2016
   Published by the Department for Environment, Food and Rural Affairs, April 2016
   Available at: https://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf

4. Particulate PM2.5 and NO_2 Background Data for Darlington (2015 and 2017)
   Department for Environment, Food and Rural Affairs, Data Archive
   Available at: https://uk-air.defra.gov.uk/data/laqm-background-home

5. UK Air Data Selector
   Department for Environment, Food and Rural Affairs
   Available at: https://uk-air.defra.gov.uk/data/data_selector

6. National bias adjustment factors (Diffusion Tube Bias Adjustment Factors spreadsheet)
   Department for Environment, Food and Rural Affairs
   Available at: https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

7. LAQM Precision and Accuracy (Precision Summary Results – Summary of Diffusion Tube Precision 2008-2019)
   Department for Environment, Food and Rural Affairs
   Available at: https://laqm.defra.gov.uk/diffusion-tubes/precision.html

8. LAQM QA QC Framework AIR-PT Rounds 24 to 34 (Jan 2018 – Nov 2019)
   Department for Environment, Food and Rural Affairs
   Available at: https://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html

9. LAQM Nitrogen Dioxide fall off with distance calculator
   Department for Environment, Food and Rural Affairs
   Available at: https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html