Mansfield
District 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 the Mansfield District

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].

Historically, the District relied heavily on coal for heating and the pollutants of concern were therefore black smoke and sulphur dioxide. Over a number of years, Smoke Control Orders were introduced to cover the whole district, which produced a major improvement in air quality, both for smoke and SO_2. Following the closure of the coal mines and therefore the massive reduction in residential solid fuel use, the emphasis has shifted to vehicle exhaust emissions (NO_2), and, to a smaller degree, airborne dust (PM_{10}). Currently, the Council does not undertake PM_{10} monitoring, but it does monitor extensively for NO_2, with 16 passive monitoring tubes at roadside locations throughout the District in 2019. The trend for NO_2 generally in the District over the last seven years shows a decline in levels.

The Council has no Air Quality Management Areas at present, but has been continuing to pay greater attention to the northern end of Chesterfield Road North, Pleasley, and the Debdale Lane/Chesterfield Road North junction, Mansfield, where the highest NO_2 levels in the District are experienced. We have a real-time analyser and sixteen diffusion tubes in place throughout the District. In 2019, none of our monitoring sites were exceeding the national Air Quality Objective of an annual mean of 40µgm^3 when the required factors were applied.

[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

A detailed assessment was carried out for Pleasley in 2015[4], using NO_2 diffusion tubes and a real-time analyser, and it was concluded that an Air Quality Management Area was not required, but monitoring would continue. Unfortunately, due to the age and condition of the NO_2 analyser and its enclosure, real-time monitoring had to cease in August 2017. Monitoring began again in the Pleasley area in April 2019, using an NO_2 analyser in a new enclosure at a site about 100m further south of the previous location.

It is difficult for a local Council alone to reduce NO_2 emissions in its District, as these are primarily from vehicle exhausts. Consequently, the Council is reliant on actions also being taken by the County Council, Highways England, vehicle manufacturers and other involved parties.

Actions to improve air quality

Mansfield District Council's Smoke Control Area programme has been a great success in reducing air pollution from domestic heating sources, and the Council has not needed to monitor for 'black smoke' or sulphur dioxide for some twelve years. However, it is necessary to remind residents at intervals about the requirements of the Smoke Control Orders.

Nationwide, there has been a massive increase in the use of wood-burning stoves, and whenever Mansfield's Environmental Health Department becomes aware of people installing these locally, it endeavours to give them advice and assistance. Fortunately, these stoves tend to be scattered about the District rather than concentrated in an area, so effects are usually confined to their immediate surroundings.

In 2015, five old coal-fired group heating systems in Council estates were removed and replaced with individual heating systems in 1,350 individual properties, augmented by air- or ground-source heat pumps. The Council used to receive complaints of airborne dust in the vicinity of the boiler-houses. The boiler-houses are to be demolished and the sites will be grassed over until a decision is made about their future use. Work is still continuing to replace other old solid fuel-fired district heating systems with gas or electric systems in individual Council properties, with another 125 houses being converted in 2019.

A new list of measures being taken by various Council departments to improve local air quality was put together in 2016, with several items on it already completed. This has updated every year since; the latest version can be found in Table 2.1, 'Progress on measures to improve air quality'.

A closer working relationship with other Councils has been achieved through various schemes, including the Local Authority Energy Partnership and the Nottingham City Procurement Unit.

Mansfield is part of the group led by Nottinghamshire County Council that is working to update the Nottinghamshire Air Quality Improvement Strategy.

Conclusions and priorities

Our conclusions from monitoring in 2019 are:

1) The only NO_2 diffusion tube that is exceeding the annual Objective is CRN 2, which is close to the District boundary on the northern end of Chesterfield Road North, Pleasley. The reasons for high levels of NO_2 in this area have been covered in the Pleasley Detailed Assessment Report 2016, but the major factor is that all traffic travelling between Mansfield and M1 Junction 29 has to go through this part of Pleasley. The raw data result only exceeded the annual Objective of 40µg/m^3 by 0.94µg/m^3, which means it is below the Objective when the various correction factors are applied.

2) The detailed report of NO_2 monitoring carried out in the Pleasley area in 2015 concluded that an Air Quality Management Area was not required there, as the evidence suggested a slight but steady reduction in NO_2 concentrations. Monitoring has continued in the area, and the results to date continue to support this conclusion.

3) Although the Council does not monitor for $PM_{2.5}$, we assume that, comparing monitored levels recorded in the centre of Nottingham with Defra's modelled background level for Mansfield, $PM_{2.5}$ levels in the area will not be a cause for concern. No Air Quality Objective has been set to date for $PM_{2.5}$, but the World Health Organisation guideline value is 10µgm^3. Mansfield's levels are thought

likely to be around 8.22µgm^3. The actions identified in Table 2.1 that will help to reduce PM_{10} concentrations should also reduce $PM_{2.5}$.

4) Detailed dispersion modelling was carried out in 2018 by a consultant looking at possible air quality issues from three road junctions and two residential development locations for the proposed Local Plan allocation. The report concluded that, although implementation of the Local Plan would cause an increase in traffic loading at the junctions, it would not have significant impacts on local air quality. Even if the expected improvements in vehicle emissions did not materialise, the impact would still be 'negligible' to 'slight'. Monitoring has been taking place for some years at one of the junctions in question; a diffusion tube will be put in place at a suitable point once one of the residential developments has been completed, as a receptor was identified that might experience an increase in NO_2 levels of up to 3.9µgm^3.

Our priorities for the coming year are:

1) to continue diffusion tube monitoring for NO_2 throughout the District to enable us to have an ongoing indication of levels of this pollutant;

2) to monitor for at least a further year using the NOx real-time analyser in the new location on Chesterfield Road North in Pleasley;

3) to reinstate real-time PM_{10} monitoring in the District;

4) to implement and continue to develop the various measures the Council is taking to improve local air quality; and

5) to adopt and promote the new Nottinghamshire Air Quality Improvement Strategy.

Local engagement and how to get involved

Several of the initiatives detailed in Table 2.1 have been undertaken in partnership with other bodies, usually the County Council or county-wide groups. This helps to achieve both efficiency and consistency.

The Environmental Health Department continues to give advice on air quality issues when requested by the public, particularly in respect of wood-burning stoves and garden bonfires.

The public can help to improve air quality in the district in several ways:

1) If you are using an open fire, burn only solid smokeless fuels on it, not wood or coal. This is a legal requirement under the Clean Air Act 1993 and the Smoke Control Order that covers your property.

2) If you have a closed fire (roomheater), burn only the type of fuel recommended by the manufacturer. Again, this is a legal requirement. Some roomheaters are advertised as 'multi-fuel', but if they are not on the Defra 'approved appliance' list, you can still only burn smokeless fuel on them.

3) If you are using a wood-burning stove, burn only clean, dry wood. Wood must be left to dry for at least a year before you use it (unless you have bought 'kiln-dried' wood), and it must contain less than 20% moisture. Store your firewood in a place where it will not get damp; failing that, bring wood indoors a few days before you need to use it, to allow it to dry out. Never burn wood that has been painted, varnished or treated in any way (this includes pallets), as it could cause damage to the interior of your stove and release fumes into your house.

4) Since 2005, wood-burning stoves have been required by law to have a Certificate of Compliance from a HETAS-registered engineer (or equivalent), or a Building Notice from a Building Control Officer, to confirm that they have been fitted correctly.

5) Avoid garden bonfires as much as possible. Never burn household waste, furniture, carpets or anything containing plastics, foam rubber, or any other materials likely to cause black smoke and smell. Allow plant and tree cuttings to dry out before burning them.

6) Wherever possible, use alternative forms of transport rather than your car. When changing cars, look for a 'cleaner' vehicle. Have your car serviced regularly, and if the exhaust starts smoking, have it checked.

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1 Local air quality management

This report provides an overview of air quality in the Mansfield District 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 Mansfield District Council to improve air quality and any 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.

Mansfield District Council does not have any AQMAs at present, but has for some years been compiling and updating a list of measures it has been taking to improve air quality. There are currently 23 measures on the list (see Table 2.1). For reference, maps of the Council's monitoring locations are available in Appendix D.

2.2 Progress and impact of measures to address air quality in the Mansfield District

Defra's appraisal of last year's ASR concluded:

"Mansfield District Council currently has no Air Quality Management Areas (AQMA) and as a result the Council is not required to produce an Air Quality Action Plan (AQAP) however, the Council has developed 23 measures to improve Air Quality.

The Council undertook non-automatic NO_2 diffusion monitoring at 15 monitoring locations in 2018. During 2018, no sites recorded NO_2 annual mean concentrations in excess of the annual Air Quality Standard (AQS) of 40µg/m^3. The highest concentration recorded was 37.6µg/m^3 at monitoring location on Debdale Lane that reduced to 35.8µg/m^3 after distance correction. The Council are to commission an automatic monitor in spring 2019 near the new houses on Chesterfield Road North, Pleasley.

A detailed dispersion modelling assessment was carried out in 2018 on three road junctions and two residential developments for the proposed Local Plan allocation. This concluded that the Local Plan would not have a significant impact on local air quality however, there was a moderate impact at a residential receptor at a junction near the

Penniment scheme and as a result additional monitoring is being commissioned at that location.

QA/QC of monitoring data is shown in the report for bias adjustment (where the national factor is used) and distance corrections were completed where necessary.

On the basis of the evidence provided by the local authority the conclusions reached are acceptable for all sources and pollutants."

The new enclosure for the real-time monitors on Chesterfield Road North, Pleasley, has been sited some 100m further south from the previous location at the Landmark Centre, to move it away from the possible influence of vehicles using the car park. This places it near a new housing development, which does not front onto the main road, but it is not possible to locate it near the remaining older houses. These houses are narrow and their front doors open straight onto the pavement, leaving nowhere to site the unit where it would not be intrusive. Please see Figure 2.2 for the location. The unit was put in place in the spring of 2019, and began producing data in April. Although it contains both PM_{10} and NO_2 monitors, only the NO_2 one is in use at present, due to the lack of a data-logger for PM_{10}.

Mansfield District Council has continued to take forward a number of measures during the current reporting year of 2019 in pursuit of improving local air quality. Details of all measures completed, in progress or planned, are set out in Table 2.1.

The measures are ordered in terms of their expected efficacy, which in practice has meant that the measures giving a result over the shorter term are higher up the list than those which are policy-based and are likely to take longer to produce an effect.

Many of the measures are ongoing, either because they are part of a rolling programme or because they are awaiting the outcome of some other project or report.

The column in Table 2.1 headed "Reduction in pollutant/emission from measure" has not been completed, as it is very difficult to quantify the likely reduction in levels that these measures would produce, either individually or taken together. However, we

believe that the road-based measures have already contributed to the steady drop in NO_2 levels that many of our diffusion tubes have been showing over the past few years.

Mansfield District Council is one of the councils who produced the Nottinghamshire Air Quality Improvement Strategy, "A Breath of Fresh Air", and is involved in the updating of this document by a group led by Nottinghamshire County Council. The original strategy has been removed from the websites of the county's various councils, and we are awaiting the new version. (A paper copy of the original can be provided if required).

The District Council's Local Plan was adopted in November 1998 and is in the process of being updated. Most of its policies have been 'saved' until it is superseded by the new document. The Council submitted the proposed Local Plan, together with the representations received and other relevant supporting documents, to the Secretary of State for Housing Communities and Local Government on 19 December 2018 for independent examination. A policy for assessing air quality has already been written for the new plan, to ensure its impact is considered during the planning stage of all new developments. Information about the plan and its progress can be found at http://www.mansfield.gov.uk/local-plan/local-plan-2013-2033-2.

Climate change has been incorporated in Section 8 of the emerging Local Plan.

The Nottinghamshire Local Transport Plan 2011-2026 can be found at https://www.nottinghamshire.gov.uk/media/123040/local-transport-plan-strategy.pdf, and the county's action plans for public transport can be found at www.nottinghamshire.gov.uk/transport/public-transport/plans-strategies-policies.

Much of Mansfield's future approach to air quality issues will be influenced by the actions that are taken in and around the city of Nottingham, which was included in the recent World Health Organisation list of the ten UK cities failing to meet WHO air pollution standards.

Table 2.1 – Progress on measures to improve air quality

Measure no.	Measure	EU Category	EU Classification	Date measure introduced	Organisations involved	Funding source	Key performance indicator	Reduction in pollutant/ emission from measure	Progress to date	Estimated / actual completion date	Comments/barriers to implementation
1	Home energy conservation	Policy guidance and development control	Other policy	2011/ 2013/ 2015	MDC Housing	MDC	Percentage reduction in heating costs		Home Energy Conservation Act Report	When all MDC properties reach required standard	A further 125 Council properties converted from district heating systems to gas central heating in 2019 - over 1,800 properties converted since scheme began. Only 62 properties still to convert
2	School travel plans	Promoting travel alternatives	School travel plans		Notts County Council Education Department		Reduction in number of private vehicle "school runs"		Several school travel plans already implemented	Ongoing	One more school travel plan implemented in 2018
3	Cleaner taxis	Promoting low emission transport	Taxi emission incentives	2016	MDC Taxi Licencing	MDC	Increased number of taxi operators using cleaner vehicles		Licence fee for hybrid vehicles reduced by 10%	Ongoing	Monitoring similar projects in neighbouring districts, and will consider review if necessary
4	Cleaner taxis	Promoting low emission transport	Taxi licensing conditions	2016	MDC Taxi Licencing	MDC	Fewer older vehicles operating		No current plans to review age criteria for either new vehicle applications or existing licensed vehicles with MDC	N/K – depends on creation of any national standards	Awaiting the creation of National Standards, and will consider implementation where relevant
5	MDC vehicle fleet efficiency	Vehicle fleet efficiency	Fleet efficiency and recognition schemes		MDC Fleet Management	Internal	Percentage reduction in emissions and fuel usage; increased number of cleaner vehicles		Vehicle replacement scheme in operation, with aim of all vehicles to be Euro 6	When all MDC fleet vehicles are Euro 6	No fleet vehicles are older than 10 years; no Euro 4 vehicles now in use. All existing refuse vehicles are Euro 5 or 6. All newly-purchased commercial vehicles are Euro 6. Scheme permits replacement of 1 refuse vehicle and 10-15 vans per year
6	Alternative fuels	Promoting low emission plant	Shift to installations using low-emission fuels for stationary and mobile sources	2015	MDC Facilities	MDC	Reduction in electricity costs		Solar panels put on Civic Centre roof in March 2016 – savings of some £30,000 to date		Solar panels being put on several new MDC commercial and residential buildings
7	Working from home	Promoting travel alternatives	Encourage/ facilitate home-working	2014	MDC	Internal	Number of people taking up option		Home working policy implemented 2014	Ongoing	Home working being trialled by Finance Department. 13 officers expressed an interest at start of trial
8	LEV parking and charging	Promoting low emission transport	Priority parking for LEVs		MDC Planning		Number of spaces provided alongside demand		Emerging Local Plan (2013-33) policies addressing electric car charging include: Policy IN10 (Car and cycle parking) - promotes inclusion of electric car charging points in development; Policy P5 (Climate Change and new development) – need for new developments to address mitigation and adaptation to climate change. Local Plan	Ongoing	District now has least 30 charging points for electric cars - several stores and public houses have indicated they will be applying for planning permission to provide

									Annual Monitoring Report has recorded number of applications for electric car charging points and renewable energy. Please see https://www.mansfield.gov.uk/planning-policy/annual-monitoring-reports-1 Development Management starting to put conditions on for electric charging points and request information through planning applications. This comes from local plan policy		charging points in their car parks
9	Carbon management plan	Policy guidance and development control	Low Emissions Strategy	2010	MDC Planning Policy		Percentage reduction in emissions. Carbon-neutral status		Full Council declared Climate Emergency on 5 March 2019: Climate emergency declared 'in principle'; council to go carbon-neutral by 2040; Sign up to 'Global Covenant of Mayors'; Ask government to reflect seriousness of situation in national policy and strategy and release funds to LAs to allow them to take necessary measures at local level; Pledge to make Mansfield carbon- neutral by 2040 and work with local business and industry; Mayor to report back to Council in 12 months with Action Plan. Full Council meeting minutes	Ongoing	Cut emissions by 35% from Council activities from 2008/09 baseline in 5 years
10	Warm Homes on Prescription	Policy guidance and development control	Other		MDC Private Sector Housing		Number of homes improved		24 properties improved in 2018/19. 63 properties improved since grant introduced in 2016/17	N/K - when funding exhausted	Health professionals encouraged to refer their patients if they have concerns about heating and insulation of their homes
11	Speed limit reductions	Traffic management	Reduction of speed limits, 20mph zones	Included in Transport Plan 2011-2026	Notts County Council Highways		Reduction in traffic emissions; accident reduction		Some 40mph roads reduced to 30; 20mph zones around several schools. One further 20mph zone put in place outside a school in 2018	Ongoing	Primarily for road safety, but should also improve air quality
12	Delivery management	Freight and delivery management	Quiet & out-of-hours delivery		MDC Planning		Reduction in complaints from nearby residents		Discussions with businesses to reduce frequency of deliveries	Ongoing	Considered during planning process and conditions attached where appropriate
13	"Part B" process controls	Environ-mental permits	Measures to reduce pollution through IPPC permits going beyond BAT		MDC Environmental Health		Reduction in solvent use		Permitted processes reporting on progress every two years	Ongoing	Discussed with businesses during inspection process; also considered in each business's Five Year Review
14	Energy partnership	Policy guidance and development control	Regional groups co-ordinating programmes to develop area-wide strategies to reduce emissions and improve air quality		Local Authority Energy Partnership made up of 20 authorities from Nottinghamshire and Derbyshire				Strategies to being written and programmes developed	Ongoing funding available	Local Energy Partnership has not met for some time (approx. 2012/13). No further progress in MDC since 2017, as Climate Change Officer post deleted
15	Local Plan	Policy guidance and development control	Air quality planning and policy guidance		MDC Planning Policy				Emerging Local Plan (2013-33) has been reviewed by Planning Inspector and recommended for adoption, barring specific modifications. Awaiting Full Council meeting to progress to adoption. See https://www.mansfield.gov.uk/local-plan/local-plan-2013-2033-submission-1	2020	Emerging Local Plan addresses air quality in policies P7 (Amenity) and NE3 (Pollution and land stability). Main modifications (MM15 & MM88) to Emerging Local Plan address the following: 'An Air Quality and Emissions Mitigation

											Guidance for Developers Supplementary Planning Document (SPD) will provide further guidance for policy implementation.' Based on guidance from Nottinghamshire County Council which will be used to write Supplementary Planning Guidance Document to support policy implementation in local plan. Writing of this will be led by Planning Policy and require input from Environmental Health. Emerging Local Plan Objectives 9 and 12, and monitoring indicator for NE3, address air quality
16	Sustainable procurement	Policy guidance and development control	Sustainable procurement guidance		Nottingham City Council Procurement Unit		Impact on air quality		Minimise environmental impact of goods, services and works procured	Ongoing compliance with strategy	
17	Personal travel plans	Promoting travel alternatives	Personal travel plans	2017	MDC, Notts County Council	DfT	Number of people taking up option		Target groups identified: jobseekers, school leavers, employees and residents	2019/20	
18	Cycle-to-work scheme	Promoting travel alternatives	Promotion of cycling	2016	MDC		Number of people cycling to work		Implemented cycle-to-work scheme at MDC – wider scheme recently proposed	Ongoing	To be included in new Health and Wellbeing Agenda
19	Cycle network	Promoting travel alternatives	Promotion of cycling	2017/18	MDC, Notts County Council	D2N2 LEP LGF	Increased use of cycle network		Consultation on proposals in early 2017; potential routes identified	2018/19	
20	Promotion of walking	Promoting travel alternatives	Promotion of walking	2016	MDC	Internal	Increased number of people walking; improvements in health		New corporate priorities launched 2016, including actions to help people live healthier lives, and for climate change issues, district heating improvements, energy efficiency, carbon footprint reductions		To be included in new Health and Wellbeing Agenda
21	Bus lane	Traffic management	Strategic highway improvements, re-prioritising road space away from cars, including access management, selective vehicle priority, bus priority, high vehicle occupancy lane	Included in Transport Plan 2011-2026	Notts County Council Highways		Reduction of bus waiting time at one busy traffic-lighted junction		Bus lane on Leeming Lane South has been in place for several years	Complete	Reduced bus waiting time by 2 minutes on average
22	Public information	Public information	Via radio, press, and internet		MDC Public Relations and Communications Team	Internal	Increased number of 'hits', comments and 'likes' recorded from website, Facebook pages, etc.		Positive publicity via social media, MDC website, press releases, etc., and by taking part in national awareness campaigns	Ongoing	

23	Public information	Public information	Via leaflets, radio, and internet		MDC Environmental Health	Internal	Increased number of requests per annum for leaflets and interviews; increased number of “hits” on EH section of website		Various leaflets always available on request; interviews as requested by local radio station; information on MDC website	Ongoing	

2.3 $PM_{2.5}$ – Local Authority approach to reducing emissions and/or concentrations

As detailed in Policy Guidance LAQM.PG16 (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. The Public Health Outcomes Framework Indicator[5] 3.01, 'Fraction of mortality attributable to particulate air pollution' for Nottinghamshire (measured as $PM_{2.5}$ and taken from 2016 data, the latest available) is 5.7%. This is the same as the East Midlands figure, but a little above the figure for the whole of England, which is 5.3%.

Mansfield District Council does not monitor for $PM_{2.5}$ at present, therefore the likely local levels have been predicted from the nearest AURN site that measures $PM_{2.5}$ and the modelled background concentrations from the Defra website. The modelled background level for 2019 from the Defra website for the Mansfield town centre is about 8.22µgm^3, a reduction from 2018, when it was 9.1µgm^3. In 2019, the annual mean concentration at the AURN site in Nottingham Centre was 10.83µgm^3. (Please note that the Mansfield figure is modelled, whereas the Nottingham one is monitored).

The World Health Organisation guideline value[6] for $PM_{2.5}$ is 10µgm^3; no air quality objective has been set to date. It seems very unlikely that the levels in Mansfield town centre would be as high as those in Nottingham city centre, so we must assume that Mansfield's levels are closer to the modelled 8.22µgm^3 (which is below the WHO guideline value) than to 10.83µgm^3, and therefore there is unlikely to be a major problem with $PM_{2.5}$ in the District.

Mansfield District Council does not currently have any measures in place to deal specifically with $PM_{2.5}$. However, the levels of PM_{10} that we were finding in the District up to August 2016 (when real-time PM_{10} monitoring stopped) suggested that we would not have high levels of $PM_{2.5}$, since studies indicate that $PM_{2.5}$ levels tend to be approximately 0.6% of PM_{10} levels. In addition, we believe that the measures we are taking to reduce PM_{10} will have a knock-on effect on $PM_{2.5}$. These measures are detailed in Table 2.1 above.

3 Air quality monitoring data and comparison with Air Quality Objectives and national compliance

3.1 Summary of monitoring undertaken

3.1.1 Automatic monitoring sites

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

Mansfield District Council undertook automatic (continuous) monitoring at one site during 2019. Table A.1 in Appendix A shows the details of the site. National monitoring results are available at https://uk-air.defra.gov.uk/networks/find-sites.

Maps showing the location of the monitoring site is provided in Appendix D. Further details on how the monitor is calibrated and how the data have been adjusted are included in Appendix C.

National monitoring results are also available at https://uk-air.defra.gov.uk/networks/find-sites.

3.1.2 Non-automatic monitoring sites

Mansfield District Council undertook non-automatic (passive) monitoring of NO_2 at 16 sites during 2019, one of which was discontinued during the year. Table A.1 in Appendix A shows the details of the sites.

The locations of two tubes have been changed:

- The diffusion tube at Stopford Associates, which was located at first-floor level, was moved in May 2019 to a drainpipe close to dwelling-houses on Portland Street, on the opposite side of the road to its original site. It is now only 2m above ground level, and has been named PS.

- The diffusion tube on the corner of Poplar Drive and Chesterfield Road North, Pleasley disappeared, along with its fixings, in August 2016. It was decided that the tube should not be replaced on the same site, as it was close to a bus stop. A review of monitoring in the area in late 2018 found a more-suitable location nearby, and a new tube was put on a downpipe at a nearby domestic property

in May 2019. This tube has been named CRN 1, and the other tube on Chesterfield Road North, which has been in position for some years, is now CRN 2.

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.

3.2 Individual pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias[4], annualisation (where the data capture falls below 75%), and distance correction[5]. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Please note that the concentration data presented in Table A.3 represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of a fall-off with distance adjustment).

For diffusion tubes, the full 2019 dataset of monthly mean values is provided in Appendix B. Please note that the concentration data presented in Table B.1 includes distance-corrected values only where relevant.

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

The annual NO_2 mean of 14.21ug/m^3 recorded in 2019 has not exceeded the air quality objective, but there were 47 exceedances of the one-hour mean spread across three days in late November. NO_2 levels began to rise at the monitoring site about 10pm on 18 November, and reduced to normal about 11am on the 24th, although actual

[4] https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html
[5] Fall-off with distance correction criteria is provided in paragraph 7.77, LAQM.TG(16)

exceedences were not experienced until 12 noon on the 22nd. This coincides with exceptional weather conditions across the whole of the country at that time. November 2019 was particularly cold and wet, with Nottinghamshire being the wettest county, recording 189% of its usual rainfall for that month. The heavy rain caused extensive floods in the Worksop area and around the River Trent, and so much fell in Mansfield that sandstone cliffs in two locations collapsed, causing the evacuation of 35 homes. It is considered that these weather conditions prevented NO_2 from being diluted and dispersed in the usual way. Prior to 2019, the Council had not been able to carry out real-time NO_2 monitoring for three years, but results from the period 2012 to 2016 did not not show any hourly exceedances. It should be noted that all the 15 NO_2 diffusion tubes across the District also showed a spike in results for November.

The Council has not had to declare any Air Quality Management Areas, and trend data shows that NO_2 levels are continuing to drop by a small amount each year.

Mansfield has no roads where the traffic count has recorded more than 25,700 vehicles per day. The largest percentage of HGVs on any road is 12%, which was recorded on the outer ring road (the A617), one of the functions of which is to remove such vehicles from the town itself. The nearest receptors on any part of this road are protected by embankments and belts of trees. The largest percentage of buses on any road in the District is 21.5%, on a section of the inner ring road to the north of the town centre (the A6009). There are some houses near this location, backing onto the ring road. Since they are 14m away and at a much higher level than the road, it is considered likely that NO_2 levels will be low due to dilution and dispersion. The latest traffic growth percentage available for the District is for 2018, and indicates a 0.9% increase.

There has been a small drop in cycle use in the Mansfield District of 2.8%, although cycle use is still 34% more than that recorded in the base year of 2010.

3.2.2 Particulate matter (PM_{10})

Mansfield District Council does not currently carry out PM_{10} monitoring, due to the lack of a suitable data-logger for our analyser. We are still hoping to source a data-logger and begin PM_{10} monitoring again.

3.2.3 Particulate matter ($PM_{2.5}$)

Mansfield District Council does not monitor for $PM_{2.5}$. Please see section 2.3 for our approach to this pollutant.

3.2.4 Sulphur dioxide (SO_2)

Mansfield District Council has not needed to carry out any SO_2 monitoring for a number of years. There is now very little domestic emission of SO_2 since the whole District is covered by Smoke Control Areas, and there are no other known sources in the area.

Appendix A: Monitoring results

Table A.1 - Details of automatic monitoring sites

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)
Chesterfield Road North	Roadside	450974	363730	NO_2	N	Real-time chemiluminescence	1	5	2

Notes:

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

(2) N/A if not applicable.

Table A.2 – Details of non-automatic monitoring sites

Site ID	Site name	Site type	X OS grid ref	Y OS grid ref	Pollutant 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)
AR	Abbott Road	Roadside	451854	362436	NO_2	N	8	1	N	2
CRN 1	Chesterfield Road North 1	Roadside	450840	363896	NO_2	N	0	3	N	2
CRN 2	Chesterfield Road North 2	Roadside	450820	364028	NO_2	N	0	1	N	2
DL	Debdale Lane	Roadside	452515	362508	NO_2	N	4	3	N	2
FT1	Forest Town 1	Roadside	457199	362697	NO_2	N	9	5	N	2
FT2	Forest Town 2	Roadside	457407	362701	NO_2	N	11	2	N	2
HL	Hermitage Lane	Roadside	452423	360050	NO_2	N	12	6	N	2
LLS	Leeming Lane South	Roadside	454421	362860	NO_2	N	11	3	N	2.5
NR	Nottingham Road	Roadside	453842	360174	NO_2	N	5	2	N	2.5
OML	Old Mill Lane	Roadside	455834	362101	NO_2	N	11	3	N	2
PS	Portland Street	Roadside	453639	360580	NO_2	N	0	2	N	2
SS	Sherwood Street	Roadside	456928	367423	NO_2	N	8	4	N	2.5
SRE	Southwell Road East	Roadside	458513	358623	NO_2	N	8	3	N	2
SA	Stopford Associates	Roadside	453670	360594	NO_2	N	5	6	N	4
TL	Toothill Lane	Roadside	454072	361102	NO_2	N	6	2	N	2
WT	Warsop Town Hall	Roadside	456663	368019	NO_2	N	7	4	N	2

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.

Please note that monitoring at the Stopford Associates site has now been discontinued and replaced with the site at Portland Street.

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 2019 (%) (2)	NO_2 annual mean concentration ($\mu g/m^3$) (3) (4)				
							2015	2016	2017	2018	2019
Chesterfield Road North	450974	363730	Roadside	Real-time chemiluminescence	100	75	-	-	-	-	14.21
AR	451854	362436	Roadside	Diffusion tube		100	29.55	32.48	31.03	30.60	29.84
CRN 1	450840	363896	Roadside	Diffusion tube	100	75	-	-	-	-	31.16
CRN 2	450820	364028	Roadside	Diffusion tube		92	**41.72**	**42.95**	37.84	35.81	34.39
DL	452515	362508	Roadside	Diffusion tube		100	36.70	**47.26**	37.10	37.56	33.24
FT 1	457199	362697	Roadside	Diffusion tube		92	24.97	36.45	23.29	25.59	23.87
FT 2	457407	362701	Roadside	Diffusion tube		100	19.63	20.76	21.01	19.26	18.37
HL	452423	360050	Roadside	Diffusion tube		100	-	**42.96**	26.01	22.12	25.27
LLS	454421	362860	Roadside	Diffusion tube		83	28.88	31.20	27.94	29.68	27.29
NR	453842	360174	Roadside	Diffusion tube		100	35.42	37.11	37.86	35.46	31.20
OML	455834	362101	Roadside	Diffusion tube		100	-	**48.79**	28.49	30.63	27.88
PS	453639	360580	Roadside	Diffusion tube	78	58	-	-	-	-	37.89
SS	456928	367423	Roadside	Diffusion tube		92	20.04	23.20	21.14	21.57	19.39
SRE	458513	358623	Roadside	Diffusion tube		100	20.01	21.52	20.08	20.90	18.29
SA	453670	360594	Roadside	Diffusion tube	100	33	23.84	37.49	25.18	24.68	*24.76
TL	454072	361102	Roadside	Diffusion tube		100	23.51	24.86	23.05	22.39	20.91
WT	456663	368019	Roadside	Diffusion tube		100	23.20	32.47	24.73	26.47	23.02

☒ 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:

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) 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 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.

* = results not annualised, monitoring discontinued at location in April 2019.

Figure A.1 – Trends in annual mean NO_2 concentrations

NB trends for the real-time analyser, and the tubes at sites CRN 1 and PS, are not shown, as they only came into operation in April 2019

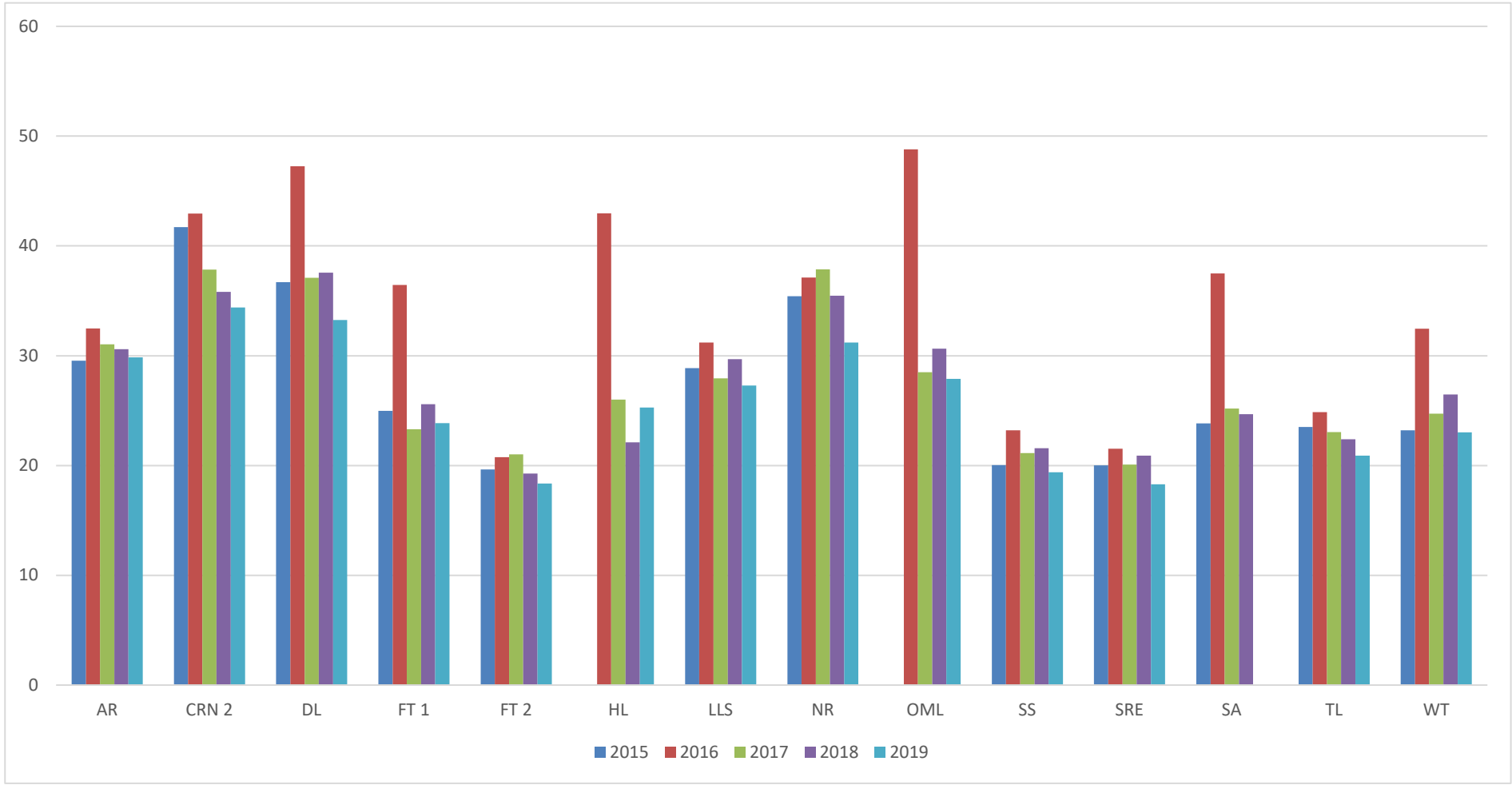


Table A.4 – 1-hour mean NO_2 monitoring results

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 2019 (%) (2)	NO_2 1-hour means >200µg/m³ (3)				
							2015	2016	2017	2018	2019
Chesterfield Road North	450974	363730	Real-time chemiluminescence	Automatic	100	75	-	-	-	-	**47** (99.8th percentile 351.64)

Notes:

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) 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 99.8th percentile of 1-hour means is provided in brackets.

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 (µg/m^3)														
													Annual mean		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw data	Bias-adjusted and annualised (1)	Distance-corrected to nearest exposure (2)
AR	46.11	51.35	35.29	27.08	25.47	25.81	40.02	30.31	27.29	37.71	42.90	36.91	35.52	29.84	22.60
CRN 1					31.78	30.64	34.38	32.95	34.03	44.38	45.19	43.40	37.09	31.16	31.20
CRN 2	54.26	54.96	41.94	41.97	37.42	31.92	29.36	34.04	35.79	TM	47.81	40.91	**40.94**	34.39	34.40
DL	52.96	57.68	44.99	30.68	32.99	27.83	33.46	34.41	27.78	45.89	43.37	42.75	39.57	33.24	34.80
FT 1	TM	46.21	26.18	22.86	23.47	21.57	19.35	24.87	23.46	27.57	39.12	37.87	28.41	23.87	21.17
FT 2	30.93	36.15	22.01	13.97	17.69	14.91	16.06	15.86	17.05	22.96	29.44	25.36	21.87	18.37	15.70
HL	41.38	41.76	28.37	29.59	25.56	21.88	22.53	22.39	24.32	32.84	40.15	30.18	30.08	25.27	23.00
LLS	40.26	44.79	31.85	29.71	24.06	TM	26.27	24.54	BDL	34.05	42.81	32.48	33.08	27.79	23.20
NR	48.83	52.48	43.52	28.33	29.39	30.73	31.67	21.75	30.58	38.23	49.86	40.30	37.14	31.20	28.00
OML	44.61	41.54	33.54	33.77	27.47	25.71	26.03	23.43	26.84	34.49	47.50	33.38	33.19	27.88	23.00
PS					32.70	31.56	33.14	35.98	TM	TM	53.38	47.81	39.10	37.89	32.80
SA	35.03	35.26	26.25	21.35	DISC								*29.47	*24.76	*23.20
SS	34.43	33.97	22.70	15.44	15.59	14.84	15.15	14.84	TM	27.12	32.09	27.74	23.08	19.39	17.20
SRE	32.11	29.61	21.35	22.23	16.84	16.66	16.15	15.37	17.78	23.14	31.05	19.00	21.77	18.29	17.80
TL	38.71	35.82	24.02	21.62	16.40	17.18	16.68	18.87	21.00	24.07	33.98	30.36	24.89	20.91	19.70
WT	19.58	37.93	30.84	26.05	22.86	24.74	21.52	20.30	24.29	32.34	38.14	30.25	27.40	23.02	21.00

☐ Local bias adjustment factor used.

☒ National bias adjustment factor used (0.84).

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

☒ Where applicable, data has been distance-corrected for relevant exposure in the final column.

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.**

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

(2) Distance-corrected to nearest relevant public exposure.

(3) TM = tube missing; BDL = result below detection limit.

* Result not annualised as location discontinued and tube moved to PS site.

Appendix C: Supporting technical information/air quality monitoring data QA/QC

Proposed new diffusion tube monitoring location

Last year, the Council reported on the results of modelling air quality at three junctions and two residential development locations, as part of the Local Development Plan. The consultant's conclusion was that the impact on air quality would be 'negligible' to 'slight' at 48 of the 49 receptors. One receptor, at a junction near the Penniment housing development on Abbott Road, was predicted to experience a 'moderate' impact, with an increase in NO_2 levels of 3.9µg/m^3.

The Council decided that a diffusion tube would be put in place at a suitable location near the highlighted receptor to check these conclusions. The development is still being built, and no houses are occupied at the time of writing.

Quality assurance/quality control of monitoring data

Factor from local co-location studies (if available)

Mansfield District Council does not have any co-located tube results available for 2019, so a local factor cannot be calculated.

Diffusion tube bias adjustment factors

The Gradko diffusion tube bias adjustment factor, from studies carried out in 2019, is 0.84. This is the factor for tubes prepared using 20% TEA in water. 66 studies were used, only four of which were not of 'good' precision. The spreadsheet version 03/20 was consulted.

Discussion of choice of factor to use

Since a local factor was not available for 2019 for comparison, the Gradko bias adjustment factor of 0.84 has been used for the diffusion tube data.

Annualisation process

In 2019, nine months' data was recorded at the real-time monitoring site, so the data has not required annualisation. The Stopfords Associates diffusion tube had only four months' data, but it has not been annualised as monitoring was discontinued at this location and the tube was moved to Portland Street, a more suitable site for traffic emissions monitoring and human exposure. Consequently the data for the Portland Street diffusion tube has been annualised, as although seven out of nine months' data was obtained (78%), this is only equates to 58% of a calendar year.

Two of the long-term monitoring sites used by the Council for annualisation purposes since 2016 did not have a good rate of data capture in 2019 for the period in which Mansfield's monitoring took place. Consequently, we have used the 2019 data from Burton-on-Trent Horninglow (56km away) and Chesterfield Loundsley Green (23km away).

Table C.1 Short-term to long-term monitoring data adjustment

Nitrogen dioxide

Site	Site type	Annual mean (µg/m^3)	Period mean (µg/m^3)	Ratio
Burton-on-Trent Horninglow	Urban background	28.89	24.30	1.189
Chesterfield Loundsley Green		16.78	14.75	1.138
Nottingham Centre		44.99	39.72	1.133
			Average	**1.153**

Distance correction

Only two of Mansfield's monitoring tubes are attached to downpipes on the facades of properties – all the others are on lamp-posts and have therefore been corrected for fall-off with distance.

QA/QC of diffusion tube monitoring

All the Local Authorities in Nottinghamshire have a contract with Gradko International for the supply and analysis of NO_2 diffusion tubes, so that there is consistency throughout the county. Gradko has a very strict QA procedure which involves analysing, once a month, a certified solution supplied by AEA Technology. Gradko also

takes part in the NO_2 Network Field Intercomparison Exercises carried out by AEA Technology, in which it is rated as 'good'.

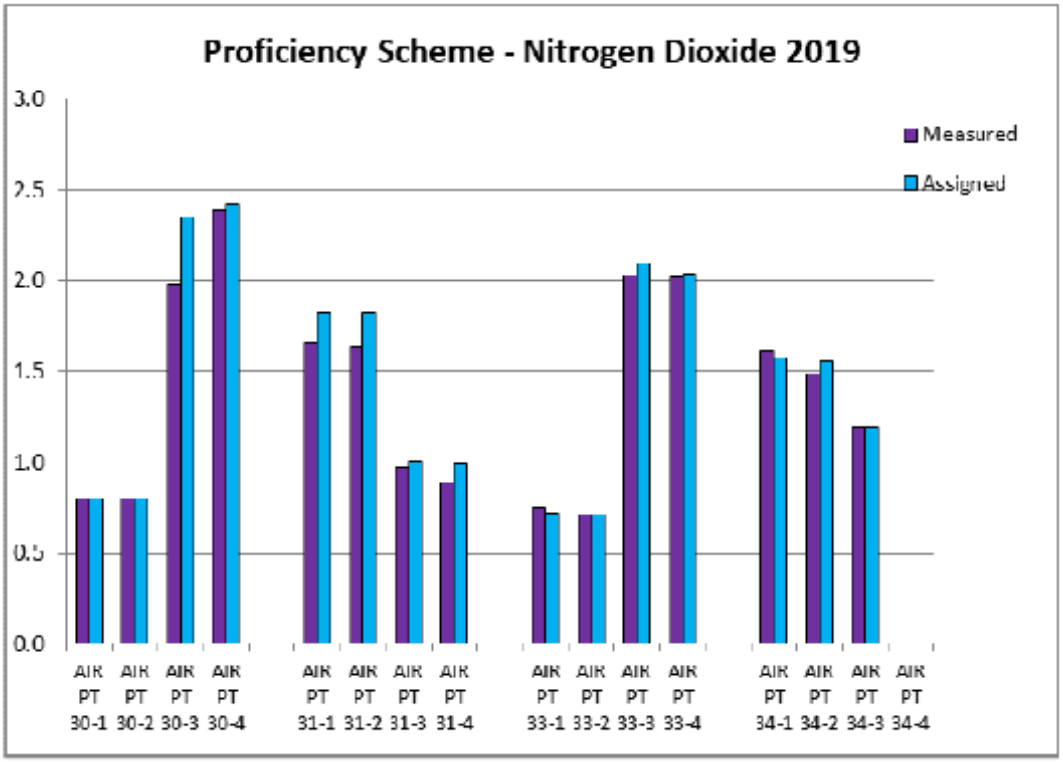
Mansfield's diffusion tubes are stored under refrigeration prior to use, and are used within the specified expiry dates. Upon changing the tubes, the date, site and exposure times are recorded and they are put into a sealed bag. They are forwarded to Gradko for analysis along with a sealed 'travel blank' tube.

Gradko has confirmed that the laboratory complies with the procedures detailed in the Defra Harmonisation Practical Guidance. Their proficiency scheme results for 2019 are as follows:

Table C.2 AIR PT Nitrogen Dioxide Proficiency Scheme Results 2019

Method – GLM7-CARY 60 spectrophotometer

AIR PT Proficiency Scheme - Nitrogen Dioxide 2019					
Date	Round	Assigned value	Procedure GLM 7		
			Measured concentration	z-Score	% Bias
Feb-19	AIR PT 30-1	0.8	0.8	0	0.0%
Feb-19	AIR PT 30-2	0.8	0.8	0	0.0%
Feb-19	AIR PT 30-3	2.35	1.98	-2.1	-15.7%
Feb-19	AIR PT 30-4	2.42	2.39	-0.16	-1.2%
May-19	AIR PT 31-1	1.82	1.65	-1.24	-9.3%
May-19	AIR PT 31-2	1.82	1.64	-1.31	-9.9%
May-19	AIR PT 31-3	1.01	0.97	-0.53	-4.0%
May-19	AIR PT 31-4	0.99	0.89	-1.35	-10.1%
Aug-19	AIR PT 33-1	0.72	0.75	0.56	4.2%
Aug-19	AIR PT 33-2	0.71	0.71	0	0.0%
Aug-19	AIR PT 33-3	2.09	2.03	-0.38	-2.9%
Aug-19	AIR PT 33-4	2.04	2.02	-0.13	-1.0%
Oct-19	AIR PT 34-1	1.57	1.61	0.38	2.5%
Oct-19	AIR PT 34-2	1.56	1.49	-0.56	-4.5%
Oct-19	AIR PT 34-3	1.19	1.19	0	0.0%
Oct-19	AIR PT 34-4	Sample wasted not submitted			


Proficiency Scheme - Nitrogen Dioxide 2019
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Measured
Assigned
AIR PT 30-1
AIR PT 30-2
AIR PT 30-3
AIR PT 30-4
AIR PT 31-1
AIR PT 31-2
AIR PT 31-3
AIR PT 31-4
AIR PT 33-1
AIR PT 33-2
AIR PT 33-3
AIR PT 33-4
AIR PT 34-1
AIR PT 34-2
AIR PT 34-3
AIR PT 34-4

Appendix D: Map(s) of monitoring locations

Please note that this document was compiled during lockdown for the Covid-19 virus, and we have been unable to update maps 2.1a and 2.1c via the remote access system. The maps will be updated as soon as possible during 2020.

Figure 2.1a Map of non-automatic monitoring sites in central Mansfield

Figure 2.1b Location map of non-automatic monitoring sites in northern Mansfield

Figure 2.1c Location map of non-automatic monitoring site in Pleasley

Please note that the distance to the M1 junction should read 4 miles

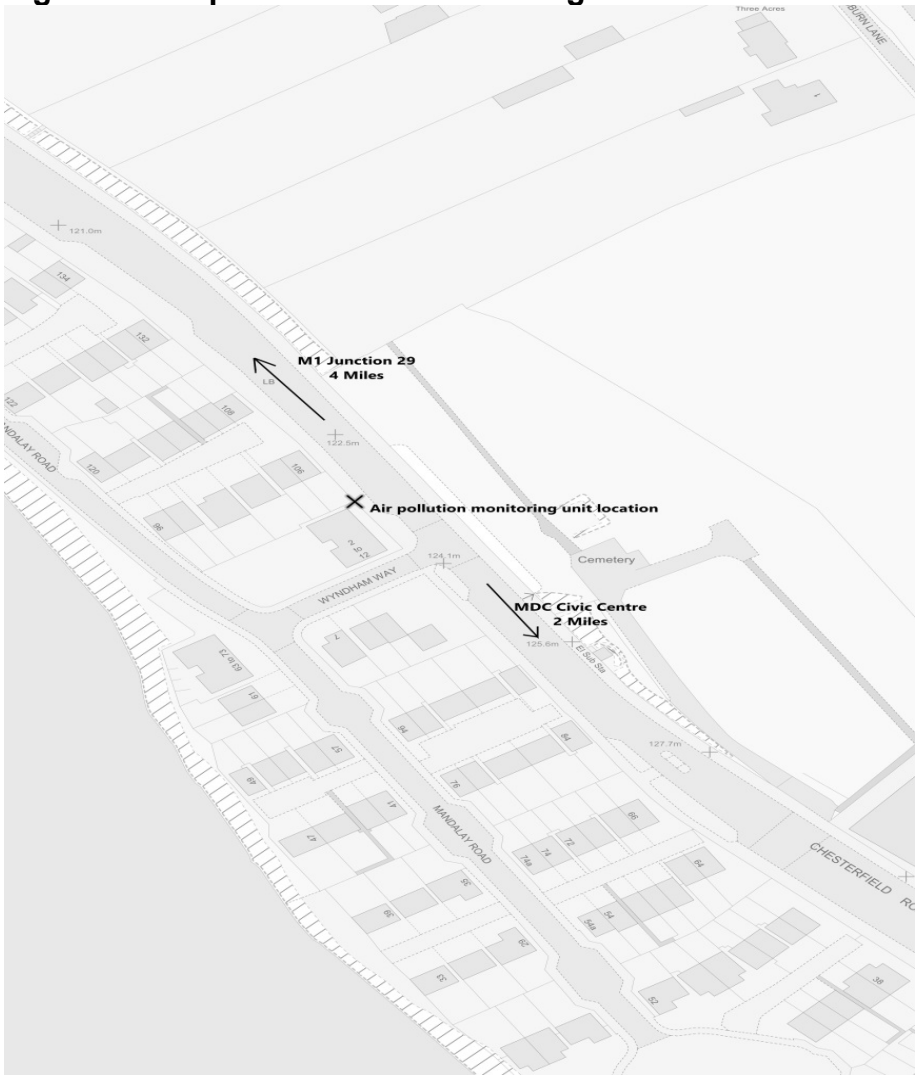
Figure 2.1d Location map of non-automatic monitoring site in Mansfield Woodhouse

Figure 2.1e Location map of non-automatic monitoring sites in Forest Town

Figure 2.1f Location map of non-automatic monitoring sites in Warsop

Figure 2.1g Location map of non-automatic monitoring site in Rainworth

Figure 2.2 Map of real-time monitoring location



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[6]	
	Concentration	Measured as
Nitrogen dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40µg/m^3	Annual mean
Particulate matter (PM_{10})	50µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40µg/m^3	Annual mean
Sulphur dioxide (SO_2)	350µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

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

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
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
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur dioxide

References

1 Environmental equity, air quality, socioeconomic status and respiratory health: a linkage analysis of routine data from the Health Survey for England. BW Wheeler and Y Ben-Schlomo, *Journal of Epidemiology & Community Health* 2005; **59:** 948-954.
2 Air quality and social deprivation in the UK: an environmental inequalities analysis. Final report to Defra, AEAT/ENV/R/2170, June 2006.
3 Abatement cost guidance for valuing changes in air quality. Defra, May 2013.
4 Pleasley Detailed Assessment Report. Mansfield District Council, 2016.
5 Public Health Outcomes Framework Indicators. Public Health England, 2014 + updates.
6 Air Quality Guidelines. Global update 2005. Particulate matter, ozone, nitrogen dioxide and sulphur dioxide. World Health Organisation, 2005.