2019 Air Quality Annual Status Report (ASR)

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

June 2019

Local Authority Officer	Tracy Hilton and Lyndsey Gill
Department	Adults and Communities, Public Health, Health Protection Healthcare Quality Service, Environmental Protection Team
Address	Belmont House Rectory Lane Guisborough TS14 7FD
Telephone	01642 774774
E-mail	Environmental.protection@redcar-cleveland.gov.uk
Report Reference number	RCASR2019
Date	27 June 2019

This report is submitted with the approval of joint Director of Public Health for Redcar and Cleveland and Middlesbrough Borough Council, Dr Edward Kunonga.

Executive Summary: Air Quality in Our Area

Air Quality in Redcar and Cleveland

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].

Redcar and Cleveland has been formally undertaking assessments of the Borough's air quality since 2000, resulting in the production of statutory annual reports to the UK Government. These formal reviews have been undertaken independently and in co-operation with neighbouring Tees Valley Authorities to obtain a broader picture of air quality across the region, reaffirming a long history of joint working.

The conclusions from annual Government reports regarding Redcar and Cleveland have consistently shown good air quality in areas where members of the public are regularly exposed to air pollution. Results are below Government objective levels and continue to show a downwards trend each year. There is no requirement to declare an Air Quality Management Area (AQMA), however a commitment to improving air quality for the public continues, using a diffusion tube network since 2014 and via the upcoming South Tees Clean Air Quality Strategy with Middlesbrough Borough Council.

Redcar and Cleveland has an extensive coastline within its boundary which has the potential to be a source of high levels of natural particulates. During times of strong north-easterly weather, this may have health implications for vulnerable members of the public. Further information regarding current air quality and public health notifications can be found using the link below:

https://www.airqualityengland.co.uk/local-authority/?la_id=279

[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

Actions to Improve Air Quality

Redcar and Cleveland, along with the UK Government, continues to address and look for ways to reduce road traffic emissions as these have been highlighted as pollutants of concern. The Borough benefits from an excellent road transport network due to the historical industrial legacy of the area. This enables traffic to be directed away from areas of greatest public exposure using the A66 and A174 roads as major thoroughfares for heavy traffic and commercial vehicle flows.

Joint working with neighbouring authorities in the Tees Valley is used to implement actions to improve air quality. A joint strategic transport plan is due for release late 2019 which will outline priorities until 2026.

The development of a South Tees Clean Air Strategy commenced during late 2018 and will be published late 2019. The strategy will bring air quality to the forefront of decision making across both authorities enabling a stronger consistent approach to improving the long term quality of air we breathe.

Conclusions and Priorities

Redcar and Cleveland continues to demonstrate compliance with the UK Government's National Objectives for air quality pollutants. Compliance is achieved through the use of passive diffusion tube studies, a static continuous air quality station, consultation on large scale planning developments and responses to strategic transport consultations. Redcar and Cleveland have no requirement to declare an AQMA and this position is not envisaged to change in the near future.

Annual reviews of the diffusion tube monitoring network will continue following analysis of existing results and in-line with new areas of exposure being developed or highlighted.

Redcar and Cleveland does not actively monitor $PM_{2.5}$ emissions, however neighbouring authorities in Middlesbrough and Stockton-on-Tees are part of the national Automatic Urban and Rural Network (AURN) which allows calculation of likely levels within the Borough to be established.

Moving forwards, Redcar and Cleveland Borough Council and Middlesbrough Council's planned South Tees Clean Air Strategy will take a strong pro-active approach to address the issues of local decisions necessary to realise further improvements to local air quality by the local authorities and local partners.

Local Engagement and How to get Involved

Redcar and Cleveland is part of the "Let's Go Tees Valley" organisation which aims to change and improve the way members of the public travel around the region, making small changes to their everyday journeys. The organisation developed a Commuter Challenge during August 2018 to change the way you commute to work, encouraging car sharing, alternative modes of transport and health benefits of walking and cycling in the daily commute. Further information is available from:-

https://www.letsgoteesvalley.co.uk/in-your-area/redcar-and-cleveland/

The South Tees Local Delivery Pilot, in conjunction with Sport England, aims to increase the level of physical activity for residents within Redcar and Cleveland and Middlesbrough Council areas incorporating a behaviour change approach to ensure the longevity of these decisions for the future. Further information on the pilot can be accessed below:

https://www.sportengland.org/media/13732/south-tees-sep-18.pdf

The Energy Saving Trust provides advice on fuel saving, driving techniques and considerations when purchasing a new car which all have the added benefits of reducing an individual's contribution to air pollution. Additional information from the Energy Saving Trust can be found at:

https://www.energysavingtrust.org.uk/transport/ecodriving/driving-advice

The public can get involved with air quality by participating in the 2019 Clean Air Day events. Further information regarding the day and ways to be involved can be found at:

https://www.cleanairday.org.uk/Default.aspx

The Environmental Protection Team provides advice to a number of internal departments, external agencies and public enquiries regarding air quality in accordance with relevant legislation.

Redcar and Cleveland Borough Council

Residents of Redcar and Cleveland are increasingly aware of the impact of air quality in the UK and actively report incidents of unauthorised burning from commercial and residential premises. This public knowledge and information sharing is welcomed by officers from Redcar and Cleveland Borough Council. It provides a mechanism for further education and awareness raising with the public regarding individual actions and their impact on local air quality. Additional information and leaflets regarding the work undertaken by the Environmental Protection Team can be found using the web link below:

https://www.redcar-cleveland.gov.uk/resident/environmental-protection/Pages/environmental-protection.aspx

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

This report provides an overview of air quality in Redcar and Cleveland during 2018. 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 Redcar and Cleveland Borough 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.

Redcar and Cleveland Borough Council currently does not have any AQMAs and does not envisage that this will change in the near future. Air quality continues to remain good in Redcar and Cleveland compounded by a long history of monitoring data. For reference, a map of Redcar and Cleveland's monitoring locations is available in Appendix D.

2.2 Progress and Impact of Measures to address Air Quality in Redcar and Cleveland

Defra's appraisal of last year's ASR concluded that the report was well structured, detailed, and provided the information specified in the guidance using the latest template.

- It is noted that the local authority have reviewed the monitoring strategy during 2017. This action is supported.
- To inform the Defra modelling, R27 diffusion tube was placed at the same location as the modelled non-compliance. After being corrected for distance to the nearest relevant receptor, it does not exceed the AQO. This action is supported.
- It is noted that the precision of the diffusion tube network is going to be closely monitored during 2018. This is supported.

Redcar and Cleveland has taken forward a number of direct measures during the current reporting year of 2018 in pursuit of improving local air quality.

Redcar and Cleveland has no formal air quality action plans as the declaration of an AQMA has not been undertaken. However the Authority remains committed to monitoring and improving air quality within the Borough.

The Tees Valley Combined Authority, of which Redcar and Cleveland is a member, ensures that joint working with the other four authorities is undertaken to address air quality. This work will culminate in the production of the Strategic Transport Plan due for publication in 2020.

Redcar and Cleveland identified in the 2018 ASR a number of initiatives that would be implemented. Outlined below are these initiatives and progress with their introduction:

- Carbon Management Funding to assist with projects for increased LED lighting, IT server replacement, heating and convector upgrades, loft and cavity wall insulation, secondary glazing and a new Ecostruxure BMS Platform & Virtual Server Migration. The majority of these projects have been implemented, however the roll-out of LED lighting will continue into the next reporting year.
- Implement EV charging points at Seafield House car park, Grangetown depot, Central depot Dormanstown, Skelton depot, Cat Nab car park Saltburn and Skelton Youth and Community Centre. These charging points have now been successfully installed and are available for use.
- 2 x Euro VI 7.5 tonnes tipper wagons to become operational. Unfortunately these wagons have not yet been acquired by Redcar and Cleveland Council as it has been decided to purchase additional Euro VI vehicles during the next reporting year.

Priorities and initiatives for the forthcoming year (2019) are:-

- Public campaign to raise awareness and understanding of the correct installation and use of wood and multi-fuel stoves and fireplaces within the Borough. There has been an increase in the use of fireplaces and stoves within domestic properties over recent years and given their potential to increase the release of $PM_{2.5}$ into the atmosphere an education project within the Borough should ensure efficient and correct use of these appliances.
- Publication of a joint air quality strategy with neighbouring authority Middlesbrough Council, the South Tees Clean Air Quality Strategy, to put air quality at the heart of Council decisions and priorities.

- Support and participate in the 2019 Clean Air Day campaign 20th June 2019, the UK's largest air pollution campaign.
- Attendance and participation in The Festival of Thrift 14th and 15th September 2019, whose theme includes Clean Air, to raise awareness and understanding of air pollution.
- Campaign to target industrial areas within the Borough regarding the legal routes for disposal of commercial waste.
- Procurement of 10 fully electric small panel vans with zero emissions to replace 10 diesel Ford Connect vans.
- 8 x 7.5ton Euro VI vehicles to become operational for use within the Highways Team.
- Street Lighting LED replacement programme to be rolled out during 2019 to replace 14,500 lanterns with LED equivalents.
- Request to our electricity supplier that all future electricity supplies are from renewable sources.

Alongside the initiatives outlined above Redcar and Cleveland Borough Council will declare a Borough-wide climate emergency with aspirations to become carbon neutral by 2030. Following a similar approach, sign up to the UK100 will be undertaken to move towards 100% clean energy by 2050. These declarations compound Redcar and Cleveland's commitment to improving air quality and the climate.

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.

2.3.1 Redcar and Cleveland $PM_{2.5}$ Measures

Redcar and Cleveland is taking the following measures to address $PM_{2.5}$:

- Ensure that businesses subject to the Environmental Permitting Regulations maintain a focus on industry best practice for emission control;
- Utilise the planning consultation process to identify sources of $PM_{2.5}$ and provide advice to those working within the construction industry regarding the implementation of adequate dust suppression and materials management;
- Procure more efficient Euro VI fleet vehicles;
- Review use of greenspace maintenance plant vehicles to minimise cross Borough movement and increase efficiency.
- Attendance at the industry, regulator and community supported Industrial Briefing Group to keep informed of progress with emissions, improved technology and information sharing regarding the large scale industrial installations located within the Wilton International complex.
- Close working with the South Tees Development Corporation (STDC) on redevelopment of the former steelworks site located in Redcar to ensure air quality improvements via new technology and industry are incorporated into the "South Tees Regeneration Master Plan".

2.3.2 $PM_{2.5}$ Tees Valley Overview

$PM_{2.5}$ are very fine particulates which are now considered to cause a more significant health risk than the larger PM_{10} particulates previously identified as a cause of concern, due to the ability to penetrate further into the respiratory system and less easily dislodged afterwards. Acknowledging this health risk the UK Public Health Outcomes Framework includes an indicator relating to fine particulate pollution. The 2017 factors across the Tees Valley for the indicator "Fraction of mortality attributed to particulate air pollution" are shown below:-

	England	North East	Darlington	Hartlepool	Middlesbrough	Redcar & Cleveland	Stockton-on-Tees
Fraction	5.1	3.7	3.7	3.8	4.2	4.0	4.0

The values are estimates of the percentage of mortality attributable to long term exposure to particulate air pollution.

Tees Valley has three $PM_{2.5}$ monitors as part of the national AURN network, Breckon Hill within Middlesbrough, Eaglescliffe and A1035 Nelson Terrace both located within Stockton-on-Tees. The annual means measured at these monitoring locations range from 7 to 10 µg.m^3, data has been obtained from colleagues at both councils and from the Defra AURN website, https://uk-air.defra.gov.uk/data/exceedence

2.3.3 Redcar and Cleveland $PM_{2.5}$

Redcar and Cleveland Borough Council is one of the five unitary authorities forming the Tees Valley area. The map below shows the extensive coastline and predominant rural land use. Part of the southern area is within the North Yorkshire National Park.

The Borough has historically been associated with large areas of industrial chemical plants and steel-making. This has reduced significantly in recent years with the closure of a number of plants; however investment into the region is now bringing back some new industrial developments into the Borough with the benefit of advanced technology to continuously improve local air quality.

Prior to the introduction of Smoke Control Areas (SCA's), the focus of air quality improvement was centred on domestic heating appliances as well as industrial emissions. As a result of the 51 SCA's implemented within the Borough, along with regulation of industry, domestic and industrial emissions of air pollutants reduced significantly. Due to the reduction in these areas the focus shifted to vehicular emissions of air pollutants, however due to the areas industrial legacy there is a well-established road network in place to direct the flow of traffic away from the majority of residential areas. The national need for more housing stock has the potential to place additional pressures on these roads by bringing residential properties closer to the networks and increasing the traffic flow on major roads. The development of the Strategic Transport Plan and continued advisory responses to planning consultations will help to ensure that air quality requirements remain focussed in these situations.

More recently, research and evidence has shown that domestic heating appliances such as wood burning stoves are again a source of concern with regards to their pollutant emission potential.

A map identifying the 51 SCA's has been produced in appendix D and a priority for the forthcoming year is to undertake a publicity campaign relating to domestic heating sources.

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.

Redcar and Cleveland Borough Council undertook automatic (continuous) monitoring at one site during 2018 which has a focus on industrial and road traffic emissions. Table A.1 in Appendix A shows the details of the site referenced as 'Dormanstown'. Monitoring results are available at https://www.airqualityengland.co.uk/

A map showing the location of the monitoring site is provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

The continuous suburban monitoring site is located within school grounds, in an area of relevant public exposure, and continues to be a key site within the Tees Valley. The continuous monitoring site is affected by light traffic, is subjected to the prevailing wind direction for 75% of the year and is within 4km of the Borough's main industrial and chemical complexes. These industrial areas are undergoing a period of current and future re-development, compounding the need for the continued use of the monitoring location.

The site monitors oxides of nitrogen (NO_x), particulate matter (PM_{10}), sulphur dioxide (SO_2) and ozone (O_3). During 2018 a number of age related factors affected the data capture efficiency at the site; failure of the internal air conditioning system and issues obtaining replacement parts meant that the monitors had to be turned off for periods of time while a new air conditioning unit was installed and a replacement ozone monitor was purchased. Downtime has been documented in the 'valid data capture' boxes of Tables A3 to A8 and when compared to the 2017 figures, capture rates are consequently lower.

3.1.2 Non-Automatic Monitoring Sites

Redcar and Cleveland undertook non-automatic (passive) monitoring of NO_2 at 16 sites during 2018 including three co-location studies at the continuous monitoring site in Dormanstown. Table A.2 in Appendix A provides the details of the sites. In the 2017 report the co-location tubes presented with a wide range of measured values. During 2018 this pattern has not been repeated, however a re-design of the diffusion tube holders will be undertaken in 2019.

A travel blank diffusion tube was also deployed as part of the non-automatic diffusion tube strategy for use as a quality checking mechanism relating to the transportation of the tubes. This travel blank confirmed that the transportation of the diffusion tubes placed a negligible effect on the final reported results; non-bias adjusted results are shown in the table below.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
R00	0.29	0.71	0.40	0.41	0.10	0.33	0.16	0.33	0.04	0.12	0.18	0.18	0.30

The diffusion tubes deployed in the study are 50% trimethylamine (TEA) in acetone and the results have been bias adjusted using the national bias factor, further information relating to this has been outlined in Appendix C. During January 2018 due to an error from the diffusion tube supplier 11 of the tubes deployed were a 20% TEA in water analysis tube. This error was raised with the supplier and no further tubes of this nature were supplied.

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.

The diffusion tube network has been in operation since 2014 across the Borough to target areas of potentially reduced air quality due to road traffic emissions and industrial sources. The tube network is reviewed each calendar year to ensure the most appropriate areas are targeted for monitoring and to open up opportunities for areas that have previously been unmonitored. Redcar and Cleveland also look to prioritise areas of relevant exposure close to schools within the district to ascertain if

there is any influence of the 'school run' on emission levels. The influence of this activity has not been identified during diffusion tube studies undertaken to date outside school locations.

During 2010 Defra modelling identified one area on the main A66 thoroughfare as being non-compliant with the EU annual mean limit for nitrogen dioxide. Monitoring undertaken at this site, since 2014, consistently shows actual emissions below the air quality objective for the UK. Diffusion tube R27 (West Lane) recorded an annual level of 23.6µg/m^3 for 2018 when subject to bias adjustment and distance correction.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, "annualisation" and distance correction. 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 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2018 dataset of monthly mean values is provided in Appendix B. These figures have been subject to national bias adjustment and distance correction for two sites (R27 and R41) in the study. Additional detail on this bias adjustment and distance correction can be found in Appendix C.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

During 2018 there have been no exceedances of the annual mean or 1 hour mean objective level at any monitoring location.

Figure A.1 depicts trend graphs for the Dormanstown monitoring site, incorporating historical data from the previous continuous monitoring site at Corporation Road, this identifies that since 1998 levels have continued in a downwards trend.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years 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 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 PM_{10} concentration at the monitoring site, due to a level of 12µg/m^3 being recorded for 2018. No exceedances of the PM_{10} daily mean objective level have been recorded during 2018.

Figure A.2 identifies the trends in PM_{10} emissions since 1998 from the current Dormanstown site and previous Corporation Road location, showing a downwards reduction in concentrations.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

Although Redcar and Cleveland do not monitor $PM_{2.5}$ estimation using actual PM_{10} data has been undertaken using the nationally derived correction factor of 0.7. Results have remained the same as in 2017 (8.4µg/m^3) and this may be attributable to gradual redevelopment of industrial areas in the vicinity of the monitoring site. This figure will be reviewed during 2019 to ascertain if there has been any other identified change in levels.

$PM_{2.5}$ monitoring is undertaken at two authorities within the Tees Valley, Middlesbrough and Stockton-on-Tees, which form part of the national AURN system and are located in areas of large urban traffic flow as the main pollutant source. These sites ranged between 7 to 10µg/m^3 during 2018.

3.2.4 Sulphur Dioxide (SO_2)

Table A.8 in Appendix A compares the ratified continuous monitored SO_2 concentrations for 2018 with the air quality objectives for SO_2.

Results show no exceedances of the three air quality objectives and the annual mean at the site is 1µg/m^3 for the monitoring period. This downwards trend in actual

SO_2 levels is depicted in Figure A.3 incorporating historical data from the former Corporation Road site and existing Dormanstown location since 1998.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
Redcar Dormanstown	Dormanstown from 2012	Suburban	458379	523486	NO2, PM10, SO2, O3	N	NO2 - Chemiluminescence, PM10 – BAM from 2013, SO2 – UV fluorescence, O3 – UV Absorbtion	1	150	2.5
Redcar Corporation Road – Historic	Corporation Road 1997 – 2011	Suburban	459900	524600	NO2, PM10, SO2, O3	N	NO2 - Chemiluminescence, PM10 – TEOM (vcm correction), SO2 – UV fluorescence, O3 – UV Absorption	1	20	2.5

Notes:

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

(2) N/A if not applicable.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
R17	Dormanstown	Suburban	458379	523486	NO_2	NO	-	150	YES	2.5
R18	Dormanstown	Suburban	458379	523486	NO_2	NO	-	150	YES	2.5
R19	Dormanstown	Suburban	458379	523486	NO_2	NO	-	150	YES	2.5
R33	Zetland Primary School	Roadside	460818	524938	NO_2	NO	0	5	NO	2.5
R26	South Bank, Trunk Road	Roadside	453142	520836	NO_2	NO	42	11	NO	2.5
R27	West Lane, Grangetown	Roadside	454712	520678	NO_2	NO	42	1	NO	2
R36	Rectory Lane	Roadside	461211	515667	NO_2	NO	6	4	NO	2
R37	Lingdale Pharmacy	Roadside	467369	516404	NO_2	NO	3	1.8	NO	2.5
R38	Skelton High Street	Roadside	465640	518819	NO_2	NO	0	6.6	NO	2
R39	Arlington Street	Roadside	472403	518211	NO_2	NO	0	2.3	NO	2.5
R40	Keilder Close	Roadside	459909	522873	NO_2	NO	0.8	3.2	NO	2.5
R41	Mersey Road	Roadside	459695	524553	NO_2	NO	17	3.7	NO	2.5
R42	Primrose Court	Roadside	453834	519869	NO_2	NO	0	9.6	NO	2
R43	Normanby Road	Roadside	453964	519621	NO_2	NO	0	11.6	NO	2
R44	Normanby Road	Roadside	454648	518546	NO_2	NO	0	7.9	NO	2
R45	The Crescent	Roadside	453922	515096	NO_2	NO	11.2	3.7	NO	2.5

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2014	2015	2016	2017	2018
Redcar Dormanstown	Suburban	Automatic	100	92.03	12.8	12.7	11	12	10
R01	Roadside	Diffusion Tube	-	-	16.7	15	-	-	-
R02	Roadside	Diffusion Tube	-	-	12.8	12.2	9.9	-	-
R03	Roadside	Diffusion Tube	-	-	13.9	12.9	11.2	-	-
R04	Suburban	Diffusion Tube	-	-	8.9	7.8	-	-	-
R05	Roadside	Diffusion Tube	-	-	19.8	14.2	11.7	-	-
R06	Roadside	Diffusion Tube	-	-	11.4	11	8.9	-	-
R07	Roadside	Diffusion Tube	-	-	15.3	14.5	11.6	-	-
R08	Roadside	Diffusion Tube	-	-	12.5	12.3	-	-	-
R09	Roadside	Diffusion Tube	-	-	33.1	29.8	24.1	-	-
R10	Roadside	Diffusion Tube	-	-	22.6	23	-	-	-
R11	Roadside	Diffusion Tube	-	-	18.6	17.2	14.2	-	-
R12	Roadside	Diffusion Tube	-	-	22.1	18.4	-	-	-
R13	Roadside	Diffusion Tube	-	-	22.8	21.4	15.2	-	-
R14	Industrial	Diffusion Tube	-	-	15.6	13	10.5	-	-

R15	Suburban	Diffusion Tube	-	-	16.4	15.4	-	-	-
R16	Suburban	Diffusion Tube	-	-	16.2	15.9	11.6	-	-
R17	Suburban	Diffusion Tube	100	100	-	12.7	13.5	13.9	17.9
R18	Suburban	Diffusion Tube	100	100	-	12.5	12.9	14.2	17.3
R19	Suburban	Diffusion Tube	100	100	-	12.2	13.2	14.8	17.5
R20	Suburban	Diffusion Tube	-	-	12.7	10.5	-	-	-
R21	Suburban	Diffusion Tube	-	-	13.4	14	-	-	-
R22	Suburban	Diffusion Tube	-	-	14.4	13.2	10.8	-	-
R23	Roadside	Diffusion Tube	-	-	21.9	17.6	16.2	-	-
R24	Suburban	Diffusion Tube	-	-	14.7	12.9	10.2	-	-
R25	Roadside	Diffusion Tube	-	-	14.5	12.7	-	-	-
R26	Roadside	Diffusion Tube	100	100	23.1	21.9	20.5	19.8	24.7
R27	Roadside	Diffusion Tube	100	100	30.6	30	26.4	25.5	29.8
R28	Roadside	Diffusion Tube	-	-	10.9	8	-	-	-
R29	Roadside	Diffusion Tube	-	-	-	-	11.5	-	-
R30	Background	Diffusion Tube	-	-	-	-	6.3	6.2	-
R31	Roadside	Diffusion Tube	-	-	-	-	-	12.9	-
R32	Roadside	Diffusion Tube	-	-	-	-	-	10.2	-

R33	Roadside	Diffusion Tube	100	100	-	-	-	16.6	18.6
R34	Roadside	Diffusion Tube	-	-	-	-	-	12.9	-
R35	Suburban	Diffusion Tube	-	-	-	-	-	12.0	-
R36	Roadside	Diffusion Tube	100	100	-	-	-	-	17.8
R37	Roadside	Diffusion Tube	100	100	-	-	-	-	10.9
R38	Roadside	Diffusion Tube	100	100	-	-	-	-	15.6
R39	Roadside	Diffusion Tube	100	100	-	-	-	-	20.0
R40	Roadside	Diffusion Tube	100	75	-	-	-	-	16.5
R41	Roadside	Diffusion Tube	100	100	-	-	-	-	20.2
R42	Roadside	Diffusion Tube	100	100	-	-	-	-	16.6
R43	Roadside	Diffusion Tube	100	100	-	-	-	-	16.1
R44	Roadside	Diffusion Tube	100	92	-	-	-	-	15.7
R45	Roadside	Diffusion Tube	100	100	-	-	-	-	15.2

☒ **Diffusion tube data has been bias corrected**

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

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.

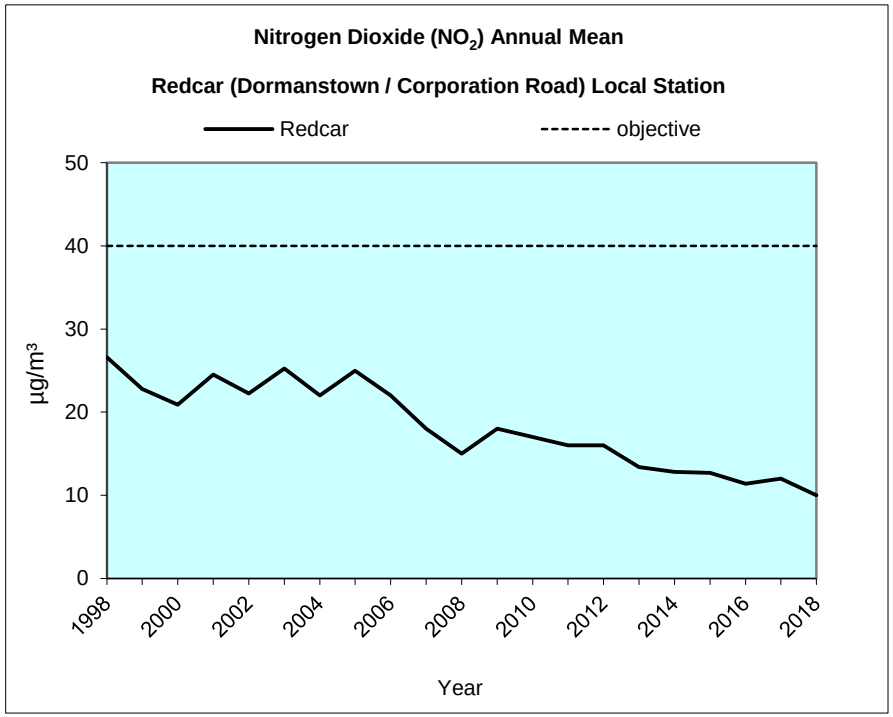
Redcar and Cleveland Borough Council Notes: Annual mean figures for the Redcar Dormanstown site in 2016 have been added for this year's ASR as copies of historic Air Quality Reports from our third party data analyser have been obtained. These historic reports also detail figures for 2015 and 2014 of 13µg/m^3.

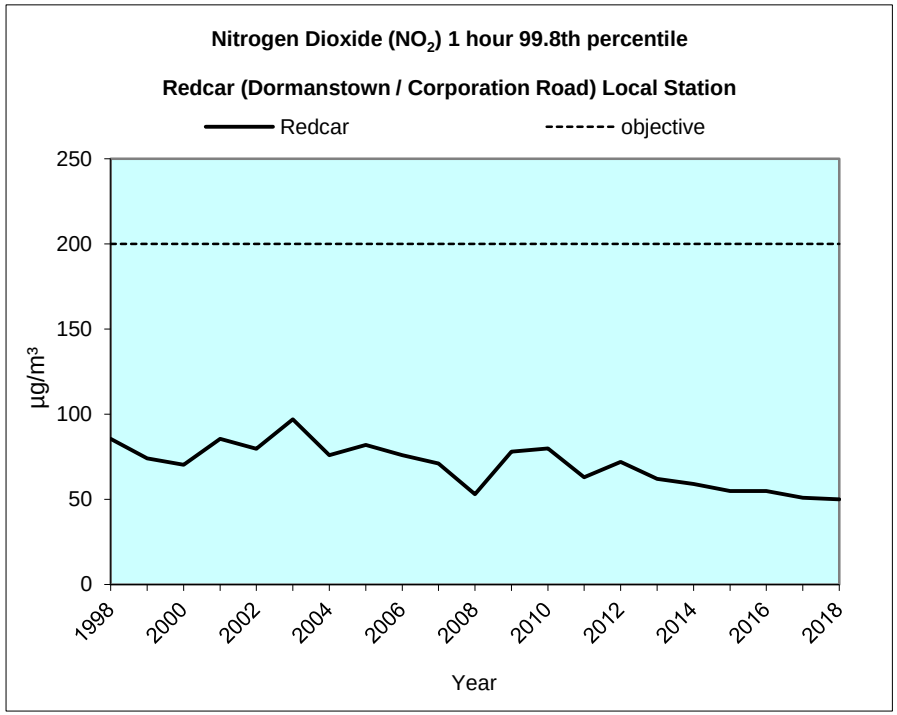
Monitoring was carried out for a full calendar year at all sites, this is represented in Column 'Valid Data Capture for Monitoring Period (%)[(1)]'. Column 'Valid Data Capture[(2)]' represents the data capture during the 12 month period.

Figure A.1 – Trends in Annual Mean NO_2 Concentrations

REDCAR (Dormanstown & Corporation Road) Local Station

(suburban industrial site classification)





Station relocated to Dormanstown from Corporation Road January 2012

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2014	2015	2016	2017	2018
Redcar Dormanstown	Suburban	Automatic	100	92.03	0	0	0	0	0

Notes:

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 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.

Redcar and Cleveland Borough Council note: The figures for 2014 and 2015 have been amended from previous submissions as the valid data capture was above 85% and therefore no requirement to report the 99.8th percentile of 1-hour means is required. This data was historically completed by a third party consultant until 2015 who was responsible for the data submission of the five Tees Valley Authorities.

Monitoring was carried out for a full calendar year at all sites, this is represented in Column 'Valid Data Capture for Monitoring Period (%)$^{(1)'}$. Column 'Valid Data Capture$^{(2)'}$ represents the data capture during the 12 month period.

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2014	2015	2016	2017	2018
Redcar Dormanstown	Suburban	100	94.2	15.7	15.7	12.7	12	12

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

Notes:

Exceedances of the PM_{10} annual mean objective of 40$\mu g/m^3$ are shown in **bold.**

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

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

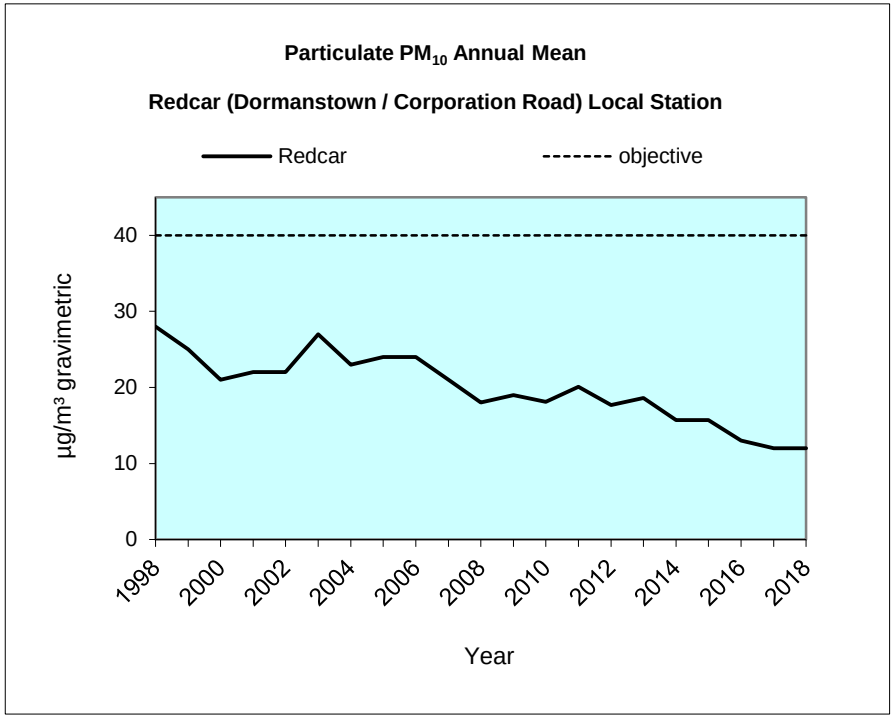
(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

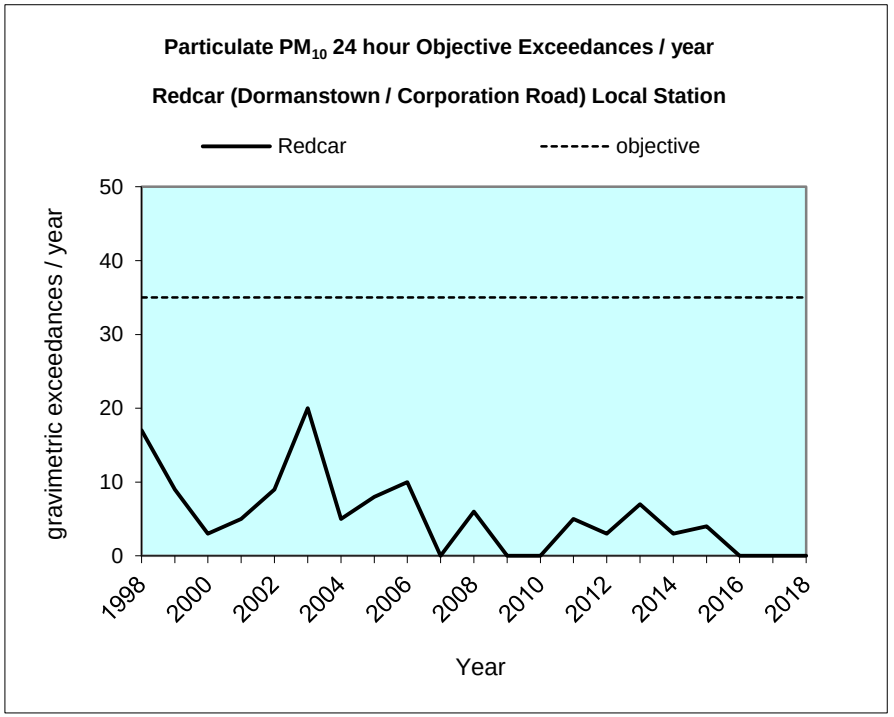
Redcar and Cleveland Borough Council Notes: Monitoring was carried out for a full calendar year at all sites, this is represented in Column 'Valid Data Capture for Monitoring Period (%)[(1)]'. Column 'Valid Data Capture[(2)]' represents the data capture during the 12 month period.

Figure A.2 – Trends in Annual Mean PM_{10} Concentrations

REDCAR (Dormanstown & Corporation Road) Local Station

(suburban industrial site classification)





Station relocated to Dormanstown from Corporation Road January 2012

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2014	2015	2016	2017	2018
Redcar Dormanstown	Suburban	100	94.2	3	4	0	1	0

Notes:

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

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

(3) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Redcar and Cleveland Borough Council notes: The figures for 2014, 2015 and 2017 have been amended from previous submissions as the valid data capture was above 85% and therefore no requirement to report the 99.8th percentile of 1-hour means is required. This data was historically completed by a third party consultant until 2015 who was responsible for the data submission of the five Tees Valley Authorities.

Monitoring was carried out for a full calendar year at all sites, this is represented in Column 'Valid Data Capture for Monitoring Period (%)$^{(1)'}$. Column 'Valid Data Capture$^{(2)'}$ represents the data capture during the 12 month period.

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3) (3)				
				2014	2015	2016	2017	2018
Redcar Dormanstown	Suburban	100	94.2	11	11	8.9	8.4	8.4
Middlesbrough Breckon Hill	Urban Background	100	92	13.1	10.5	10.2	7	8.9
Middlesbrough Macmillan College	Urban Background	100	93	12.3	11.9	11.0	6.7	7.0
Stockton Eaglescliffe	Roadside	100	96	10.9	10.7	9.2	8	10
Stockton A1305 Nelson Terrace	Roadside	100	95	-	-	9.5	8	9

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

Notes:

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

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

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Redcar and Cleveland Borough Council Notes: Monitoring was carried out for a full calendar year at all sites, this is represented in Column 'Valid Data Capture for Monitoring Period (%)[(1)]'. Column 'Valid Data Capture[(2)]' represents the data capture during the 12 month period.

The "Middlesbrough Macmillan College" site does not monitor $PM_{2.5}$ therefore these values have been calculated using PM_{10} actual values. These values have been amended from previous years reports as the figures previously quoted in brackets related to notes underneath and not measurements.

Table A.8 – SO_2 Monitoring Results

Site ID	Site Type	Valid Data Capture for monitoring Period (%) [1]	Valid Data Capture 2018 (%) [2]	Number of Exceedances 2018 (percentile in bracket) [3]		
				15-minute Objective (266 µg/m^3)	1-hour Objective (350 µg/m^3)	24-hour Objective (125 µg/m^3)
Redcar Dormanstown	Suburban	100	94.28	0	0	0
Middlesbrough Breckon Hill	Urban Background	100	98	0	0	0

Notes:

Exceedances of the SO_2 objectives are shown in **bold** (15-min mean = 35 allowed a year, 1-hour mean = 24 allowed a year, 24-hour mean = 3 allowed a year)

(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%).

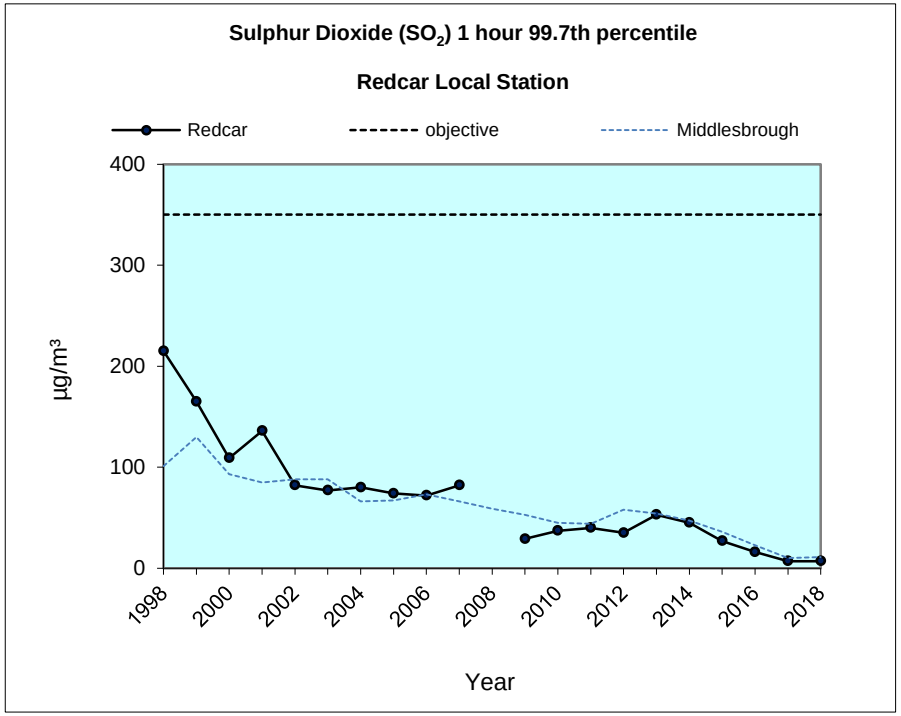
(3) If the period of valid data is less than 85%, the relevant percentiles are provided in brackets.

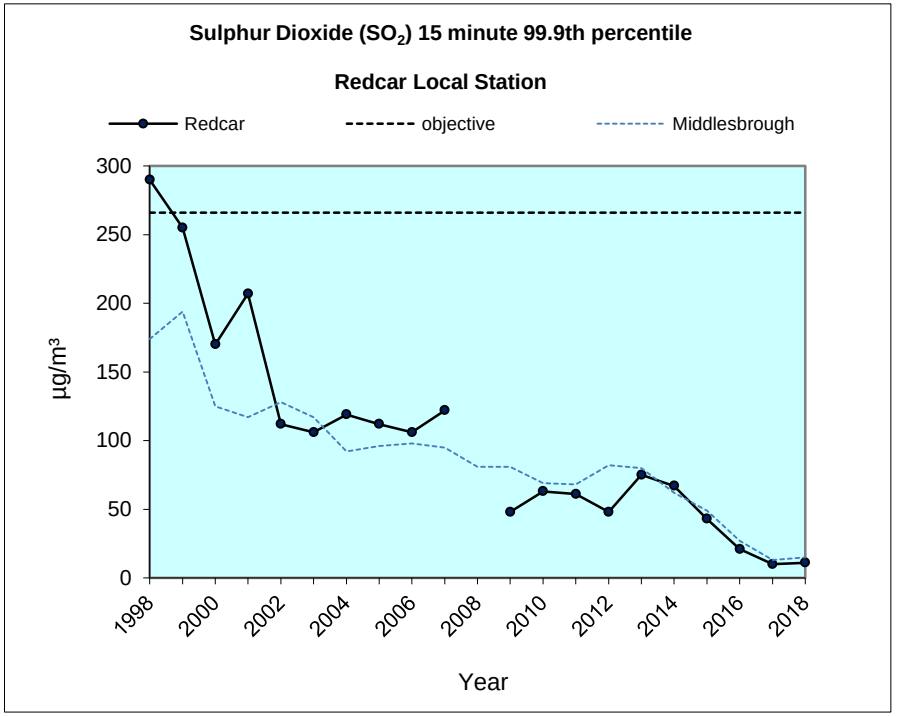
Redcar and Cleveland Borough Council Note: Monitoring was carried out for a full calendar year at all sites, this is represented in Column 'Valid Data Capture for Monitoring Period (%)[1]'. Column 'Valid Data Capture[2]' represents the data capture during the 12 month period.

Figure A.3 – Trends in SO_2 Concentrations

REDCAR (Dormanstown & Corporation Road) Local Station

(suburban industrial site classification)





Station relocated to Dormanstown from Corporation Road January 2012

Middlesbrough Breckon Hill AURN station trend line added for comparison

Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO_2 Monthly Diffusion Tube Results – 2018

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 (0.92) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
R17	29.8	20.1	17.0	15.3	12.7	11.8	12.3	18.9	14.8	26.5	28.2	26.9	19.5	17.9	-
R18	28.4	22.9	17.6	16.4	10.1	11.2	12.0	17.1	17.1	22.2	27.3	23.4	18.8	17.3	-
R19	30.87	20.66	17.7	15.53	10.22	11.23	12.54	14.68	18.31	24.13	23.92	27.92	19.0	17.5	-
R26	28.68	29.63	30.35	27.49	32.25	25.12	23.45	20.79	17.47	28.64	28.78	28.7	26.8	24.7	-
R27	33.78	31.31	32.86	33.57	41.72	38.82	33.54	25.29	23.48	33.01	32.37	29.57	32.4	29.8	23.6
R33	24	17.29	20.58	18.79	18.21	16.54	18.59	16.9	18.61	21.26	25.77	26.09	20.2	18.6	-
R36	23.9	22.71	19.51	17.65	17.24	15.07	19.19	15.57	15.32	18.96	23.17	24.5	19.4	17.8	-
R37	15.28	13.87	12.47	11.23	8.82	8.44	9.56	9.67	10.61	11.44	18.24	13.62	11.9	10.9	-
R38	19.47	20.37	19.05	18.18	15.6	13.12	14.65	13.31	13.3	15.1	21.29	20.24	17.0	15.6	-
R39	23.29	24.53	21.16	22.48	21.39	18.24	18.53	19.07	21.6	22.63	22.55	25.15	21.7	20.0	-
R40	25.08	20.14		13.84	11.46		11.67		17.68	20.32	16.67	24.39	17.9	16.5	-
R41	35.69	27.1	21.57	17.42	15.82	14.2	13.79	18.45	23.72	26.1	28.14		22.0	20.2	19.6
R42	22.42	20.93	19.58	17.3	19.72	15.87	12.79	11.19	13.14	17.33	23.77	21.64	18.0	16.6	-
R43	20.9	23.96	13.01	17.41	20.61	17.93	13.44	12.04	11.15	18.23	21.25	20.24	17.5	16.1	-
R44	24.03		16.11	15.42	15.24	11.97	12.21	13.34	14.36	19.06	24.54	21.46	17.1	15.7	-

R45	21.66	17.9	17.44	12.82	16.49	13.78	11.66	11.32	14.57	19.05	19.41	21.5	16.5	15.2	-

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

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

☒ **Where 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.**

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

(2) Distance corrected to nearest relevant public exposure.

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

AC.1 Diffusion Tube Bias Adjustment Factors

The diffusion tubes are supplied and analysed by Gradko International Ltd. The majority of tubes used in 2018 are 50% TEA in acetone, the exception to this was during January 2018 when 11 tubes were 20% TEA in water due to an error on shipment from the supplier. The nationally derived bias adjustment factor has been used for results, a figure of 0.92. The Gradko International Ltd bias figure uses results from the national database of 8 co-location studies. The local bias adjustment factor (0.55) for 2018 has been derived using triplicate co-location tubes, however it has not been utilised as the data quality check showed poor data capture for one month due to a breakdown in the continuous monitoring system during October 2018 which provided a data capture for that month of only 41%.

AC.2 PM Monitoring Adjustment

The Dormanstown monitor is BAM gravimetric equivalence for particulate matter. The Ricardo-AEA monitoring tool has been used to adjust the figures using a value of 0.833 to produce a direct gravimetric equivalence.

AC.3 Short-term to Long-term Data Adjustment

The Redcar Dormanstown continuous monitoring site for 2018 had a data capture range of 84.36% to 94.28% therefore no data adjustment has been required. During 2018 a number of the continuous monitors had some downtime due to age related failings in the equipment. This resulted in the ozone monitor being replaced for a newer model. The air conditioning unit at the continuous monitoring location was replaced during 2018 due to failure, again this contributed to downtime at the station as all monitors had to be switched off whilst a replacement unit was obtained.

During 2018 no diffusion tube had a data capture of less than 75% therefore no data annualisation has been required for completion.

AC.4 QA/QC of Automatic Monitoring

The Redcar and Cleveland fixed continuous local monitoring station (NO_x, PM_{10}, SO_2, O_3) is operated under a comprehensive service contract with the supplier. Operators of the site have received supplier training. All data since 2012 has been collected and rescaled by Ricardo-AEA.

Redcar and Cleveland are committed to achieving accuracy, precision, data capture, traceability and long term consistency to ensure that data is representative of ambient air quality. Redcar and Cleveland has a documented quality assurance and control programme, which includes an established schedule of regular site calibrations, validation of data and documentation of all procedures. Details are as follows:

Calibration	Daily 'automatic' calibration with frequent (usually fortnightly) manual checks. Calibration gas obtained from approved gas standard suppliers.
Equipment	Comprehensive service agreement with the supplier.
Data Capture	Site operators are experienced and trained personnel. Monitoring data capture is inspected on a daily basis where possible by Ricardo-AEA to ensure that faults are detected and corrected quickly.
Ratification	Data verification is carried out on an ongoing basis, to check for unusual measurements. Data ratification reviews all calibration data, information from analyser services and repairs and any other information available for the particular site or analyser over the whole ratification period. In addition, the results from the independent QA/QC audits are incorporated to take account of any problems detected during the QA/QC audits such as: •Long-term drift in an ozone instrument calibration. •Faulty NOx converters. •Drifts in calibration cylinder concentrations.

•Instrument leaks or flow faults.

•Faulty instrument configuration.

Incorporation of the QA/QC audits ensures that ratified data are traceable to UK national and international gas calibration standards

Redcar Dormanstown data can be found on Ricardo Energy & Environment web address,

http://www.airqualityengland.co.uk/local-authority/?la_id=279

AC.5 QA/QC of Diffusion Tube Monitoring

Redcar and Cleveland operate the nitrogen dioxide diffusion tube study 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 given to correct installation of the tubes at site and a reliable exposure duration.

Tube precision for this laboratory is shown as good in all eight of the tube preparation 50% TEA in acetone. Gradko have also demonstrated 100% performance in the AIR-PT scheme for 2018, taken from the scheme results at the following web address,

https://laqm.defra.gov.uk/assets/laqmno2performancedatauptofebruary2019v1.pdf

Table C.1 – Triplicate NO_2 Diffusion Tube Bias Calculation 2018

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	03/01/2018	31/01/2018	29.76	28.42	30.87	30	1.2	4	3.0	15.53	99.7	Good	Good
2	31/01/2018	26/02/2018	20.05	22.94	20.66	21	1.5	7	3.8	13.66	97.76	Good	Good
3	26/02/2018	28/03/2018	16.97	17.6	17.7	17	0.4	2	1.0	12.58	99.58	Good	Good
4	28/03/2018	02/05/2018	15.27	16.43	15.53	16	0.6	4	1.5	10.45	76.07	Good	Good
5	02/05/2018	06/06/2018	12.7	10.11	10.22	11	1.5	13	3.6	6.49	99.76	Good	Good
6	06/06/2018	04/07/2018	11.84	11.17	11.23	11	0.4	3	0.9	5.75	99.55	Good	Good
7	04/07/2018	01/08/2018	12.25	11.99	12.54	12	0.3	2	0.7	6.92	99.85	Good	Good
8	01/08/2018	05/09/2018	18.94	17.06	14.68	17	2.1	13	5.3	9.00	95.6	Good	Good
9	05/09/2018	03/10/2018	14.81	17.06	18.31	17	1.8	11	4.4	8.30	94.79	Good	Good
10	03/10/2018	31/10/2018	26.52	22.22	24.13	24	2.2	9	5.4	10.25	41.37	Good	or Data Capture
11	31/10/2018	05/12/2018	28.22	27.26	23.92	26	2.3	9	5.6	11.85	99.52	Good	Good
12	05/12/2018	09/01/2018	26.86	23.38	27.92	26	2.4	9	5.9	12.78	99.76	Good	Good
13													
										Overall survey -->		Good precision	Good Overall DC

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

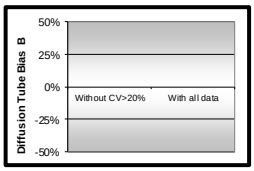
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

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

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 11 periods of data	
Bias factor A	0.55 (0.5 - 0.61)
Bias B	81% (63% - 98%)
Diffusion Tubes Mean:	19 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	10 µgm^{-3}
Data Capture for periods used:	97%
Adjusted Tubes Mean:	10 (9 - 11) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	0.55 (0.5 - 0.61)
Bias B	81% (63% - 98%)
Diffusion Tubes Mean:	19 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	10 µgm^{-3}
Data Capture for periods used:	97%
Adjusted Tubes Mean:	10 (9 - 11) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Calculations were undertaken using the AEA Energy and Environment tool and data supplied by Ricardo Energy and Environment to obtain a local bias factor. As one of the data quality results had a 'poor data capture' it was decided that the national bias adjustment figure would be reported for Redcar and Cleveland during 2018. The national bias adjustment figure also provides a more conservative adjustment of the NO_2 figures, as shown in Table C3.

Table C.2 – National NO_2 Diffusion Tube Bias Calculation 2018

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/19

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2019

LAQM Helpdesk Website

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

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

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List. If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List. If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List. If a year is not shown, we have no data[2]

Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[5] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m^3)	Automatic Monitor Mean Conc. (Cm) (µg/m^3)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	50% TEA in acetone	2018	R	City of London	12	84	94	-10.7%	G	**1.12**
Gradko	50% TEA in acetone	2018	B	City of London	10	38	32	20.9%	G	**0.83**
Gradko	50% TEA in acetone	2018	R	RBWM	12	39	36	7.8%	G	**0.93**
Gradko	50% TEA in acetone	2018	R	RBWM	12	35	34	2.2%	G	**0.98**
Gradko	50% TEA in acetone	2018	SU	Redcar and Cleveland Borough Council	9	18	10	83.3%	G	**0.55**
Gradko	50% TEA in acetone	2018	R	West Berkshire	10	40	37	10.5%	G	**0.91**
Gradko	50% TEA in acetone	2018	KS	Marylebone Road Intercomparison	11	91	85	6.5%	G	**0.94**
Gradko	50% TEA in acetone	2018	UB	Reading Borough Council	12	20	26	-22.6%	G	**1.29**
Gradko	50% TEA in acetone	2018		**Overall Factor[3] (8 studies)**				**Use**		**0.92**

Table C.3 – Comparison of National and Local Bias Adjustment

Site ID	NO_2 Raw Data	Local bias adjustment (0.55)	National bias adjustment (0.92)
R17	19.5	10.73	17.9
R18	18.8	10.34	17.3
R19	19.0	10.45	17.5
R26	26.8	14.74	24.7
R27	32.4	17.82	29.8
R33	20.2	11.11	18.6
R36	19.4	10.67	17.8
R37	11.9	6.55	10.9
R38	17.0	9.35	15.6
R39	21.7	11.94	20.0
R40	17.9	9.85	16.5
R41	22.0	12.10	20.2
R42	18.0	9.90	16.6
R43	17.5	9.63	16.1
R44	17.1	9.41	15.7
R45	16.5	9.08	15.2

An example of the calculation used to derive the above results is shown below:

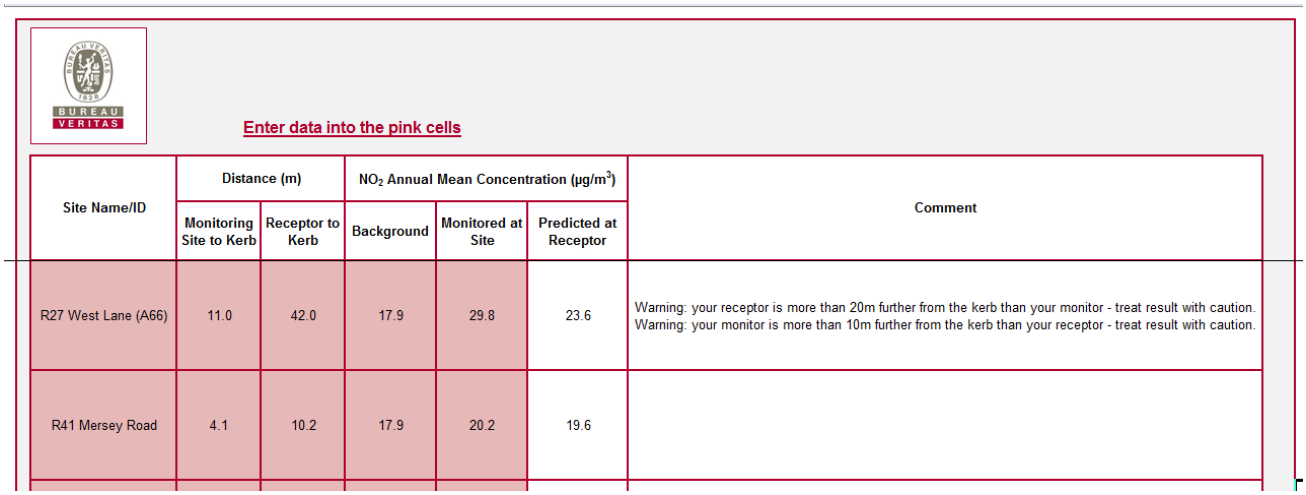
Bias Adjusted Figure = Raw data x bias adjustment figure

= 19.5 x 0.55

= **10.73**

Table C.4 – Distance Correction Calculation

Distance correction calculations were undertaken for sites R27 and R41 due to their proximity from sensitive receptors. The Bureau Veritas NO_2 fall off calculator methodology was used to make these adjustments, as shown in the image below.



Enter data into the pink cells

Site Name/ID	Distance (m)		NO_2 Annual Mean Concentration (µg/m^3)			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
R27 West Lane (A66)	11.0	42.0	17.9	29.8	23.6	Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution. Warning: your monitor is more than 10m further from the kerb than your receptor - treat result with caution.
R41 Mersey Road	4.1	10.2	17.9	20.2	19.6	

AC.6 – Estimating $PM_{2.5}$ Concentrations from PM_{10} Monitoring

As detailed Redcar and Cleveland Borough Council do not monitor $PM_{2.5}$ therefore PM_{10} measurements are used to estimate $PM_{2.5}$ concentrations. These estimates have been calculated using the National Factor figure, an example of the calculation is shown below.

$PM_{2.5}$ Estimation = Annual Mean PM_{10} concentration x National correction factor

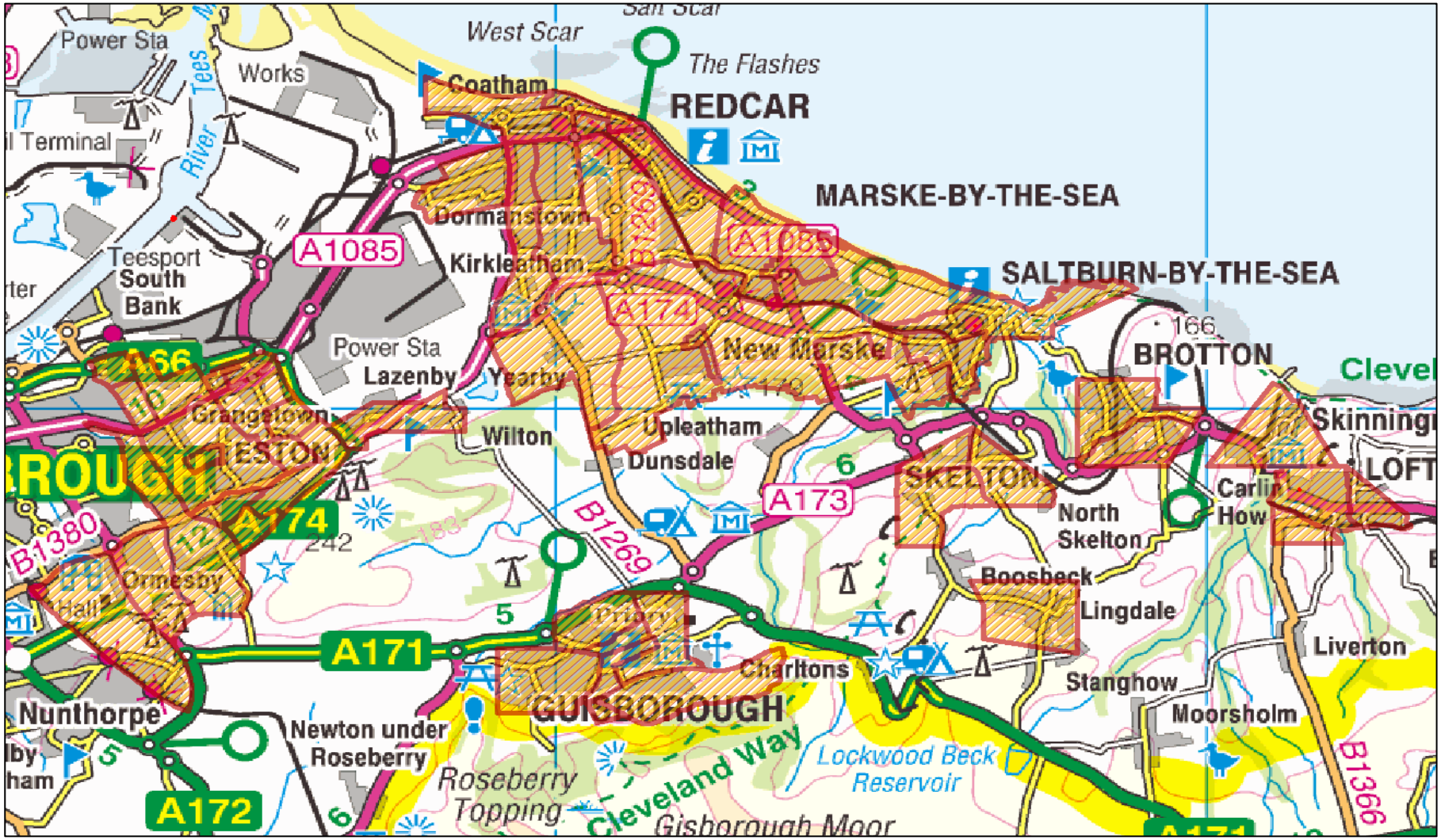
= 12 x 0.7

= **8.4µg/m^3**

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

Appendix D.1: Diffusion Tube Monitoring Network 2018

Appendix D.2: Smoke Control Areas within Redcar and Cleveland



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	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

[4] 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
AURN	Automatic Urban and Rural Network
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
SCA's	Smoke Control Areas
SO_2	Sulphur Dioxide
TEA	Triethylamine