Crawley Borough Council

2018 Air Quality Annual Status Report (ASR)

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

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Executive Summary: Air Quality in Our Area

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].

Air Quality in Crawley

As part of the Local Air Quality Management process (LAQM) required by the Environment Act 1995, the council carries out an annual review and assessment of air quality in the borough, which helps identify local air quality hot spots, and relate these to pollution sources. Road traffic is the main source of nitrogen dioxide (NO_2) pollution in Crawley, and our network of monitoring sites records levels along busy roads as well as at background locations and areas of specific interest, in order to give a broad picture of pollution levels across the borough. If the council finds areas where air quality objectives are not being met, it will set out an Air Quality Management Area (AQMA) and produce an action plan (AQAP) showing what steps it will take to improve air quality in that area.

Air Quality in Crawley is mainly good, with national targets being met for all pollutants[(4)], with the exception of nitrogen dioxide (NO_2) at a small number of locations alongside busy roads and within the AQMA, where the Council is targeting actions to improve air quality.

A small reduction in nitrogen dioxide levels was seen at all of Crawley's monitoring site during 2017. This pattern was also seen regionally and is often attributed to climatic influences, rather than local conditions. It is therefore more informative to look at the

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013
[4] Appendix E (The air quality objectives are set out in the Air Quality (England) Regulations 2015)

long term trends. The long term monitoring data for Crawley shows that concentrations of nitrogen dioxide have fallen throughout the borough since around 2008, despite significant housing and commercial development over the same period. However levels have remained broadly consistent over the last five or six years.

In 2017 there were no exceedances of the hourly objective for nitrogen dioxide, but one location close to the busy A2011 dual carriageway in the AQMA exceeded the annual objective for nitrogen dioxide, and a further busy roadside site close to Three Bridges Station, also showed exceedances of the objective levels. (This was a new monitoring site, which will continue to be monitored and reported on next year when there will be sufficient data to draw more reliable conclusions).

2,000 dwellings being developed at the new Forgewood neighbourhood represent a potential source of vehicle pollution which may cause existing and new areas in Crawley to exceed the objective levels. The Council therefore has no current plans to revoke the existing AQMA, and may even need to expand the current AQMA boundaries or create a new AQMA if objective levels are exceeded in other areas.

The council intends to build upon the improving air quality picture across the borough by developing its air quality action plan and continuing to work in partnership with colleagues in Planning, Highways and Sussex air quality partnership as well as engaging its staff, the public and local businesses to further improve air quality in the area.

Actions to Improve Air Quality

Crawley Borough Council has taken forward a number of measures during the reporting year designed to improve local air quality and increase sustainability:

- A strategic priority for Crawley Borough council is to reduce congestion (which contributes to worsening air quality) and enhance sustainable transport within the town. To deliver this, the council has engaged with its partners in the Coast to Capital Local Enterprise Partnership (Crawley Town Centre Partnership, West Sussex County Council, Gatwick Diamond Initiative, Manor Royal BID, Metrobus, Gatwick Airport Limited, Arora Group) to introduce a £60m package of investment known as the Crawley Growth Programme, which will deliver a programme of sustainable transport infrastructure and highway upgrades to

tackle these key concerns, enabling modal shift and helping to improve air quality. In the current reporting year the programme has delivered:

- Worth Park Avenue Cycle Scheme. A 1km-long, shared use cycleway has been built, connecting Three Bridges Station from Station Hill in the west along Worth Park Avenue to Ridley's Corner in the east and along sections of Worth Road. The scheme connects with local schools, and provides improved connectivity to National Cycle Network route 21 at St Mary's Drive and Three Bridges Railway station to benefit the local community and encourage residents and visitors to choose sustainable transport options including walking and cycling rather than using a car.

Pictured: Children and staff from Milton Mount School, Councillors and staff from Crawley Borough Council, and West Sussex County Council

- Haslett Avenue and Worth Park Avenue traffic signals have also been upgraded as part of the scheme to improve traffic flow using the MOVA system and all cycle crossing points are fully Toucan controlled, shared between cyclists and pedestrians.
- Real Time Passenger Information (RTPI) upgrade at bus shelters - £900,000 from the Crawley Growth Programme has been used to provide new RTPI displays and replace older displays which had no audio provision.

  An extra 66 RTPI displays have been installed at bus stops in Crawley, bringing the total in the town with audio capability to 134. Visually-impaired bus passengers can now benefit from the new displays using Royal National

Institute of Blind People approved key fobs that activate an audio message announcing the information shown on the displays

RTPI works by tracking buses using GPS (Global Positioning Systems) and using this information to accurately calculate the predicted time of arrival at the bus stop. This information is then shown on the displays.

Pictured: Demonstration of the audio key fobs at Crawley bus station

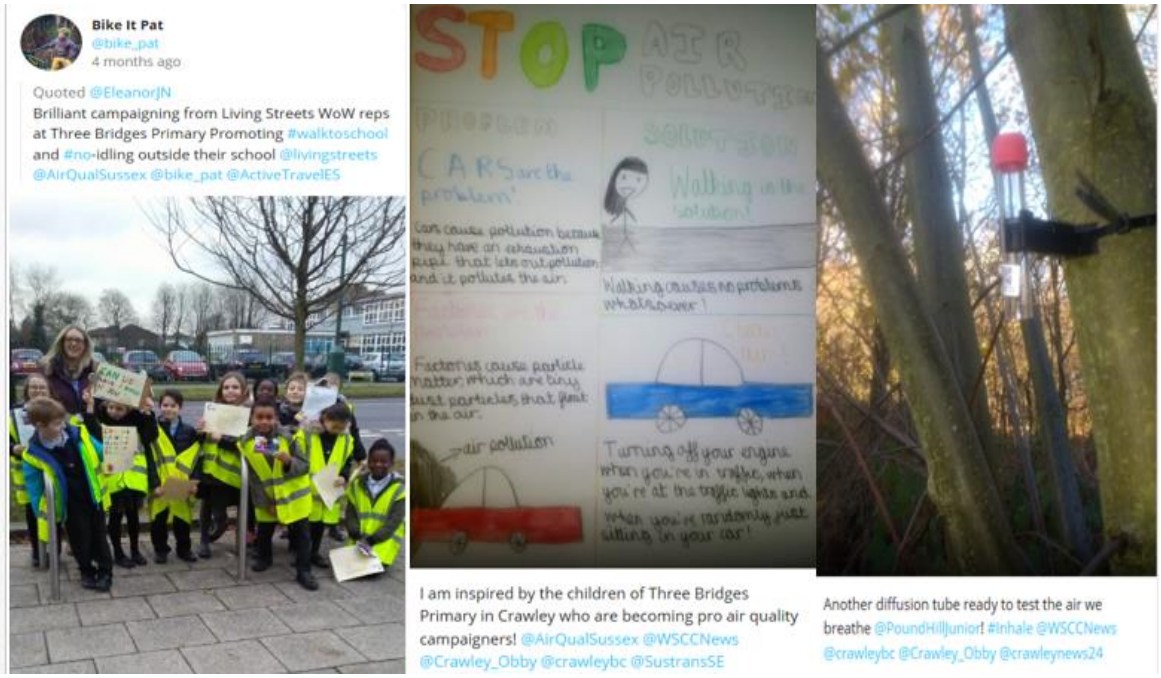
- Sussex Air Quality Partnership (SAQP) successfully secured a bid for Grant funding from the Defra Air Quality Grant Scheme to deliver interventions with schools and businesses in Sussex. The project was aimed at reducing nitrogen dioxide pollution from local traffic in AQMAs where air quality limits are currently being breached. The scheme provided an educational programme on air quality and an anti-idling project at Crawley schools within or close to the AQMA, supported with appropriate marketing materials, delivered by Living Streets including:

  i) a pupil assembly to introduce key messages about air quality, walking and cycling to school, and anti-idling.

  ii) a school gate event at drop off and pick up times, to provide the opportunity for fun and informal engagement with pupils and their parents/carers about air quality and positive actions to avoid idling.

iii) An anti-idling event, to encourage parents/carers to switch off their engines at drop off and/or pick up times, primarily by talking to car drivers.

iv) The business programme will start in February 2019



Pictured: Defra air quality grant project work with Crawley schools

- Crawley, as part of the SAQP, runs airAlert which is a free messaging service informing subscribers when air quality in their area is predicted to be poor. SAQP, working with Sussex Public Health, promotes the services through Clinical Commissioning Groups and organisations working for COPD/asthma/heart conditions such as British Lung Foundation and Breathe Easy groups. This year we ran our main marketing campaign for the airAlert service, during Breathe Easy week in June. The campaign used targeted social media and digital marketing, including paid Facebook advertisements and promotion of the service through Twitter to promote the service across Sussex. The alert service was also publicised through partner events (Crawley's Junior Citizen) and in in-house publications (In Brief magazine, PH Bulletin, e-newsletters).

- Crawley organises an annual Junior Citizen event. This is a 2 week educational programme for all Yr 6 pupils in Crawley to teach them about environmental issues, safety and citizenship. In 2018, air quality in our local area was one of the environmental issues presented. The subject was delivered through an interactive programme using eco-action games and small discussion groups. The sessions covered what air pollution is, how it affects our health, local sources and how we can find ways to help reduce pollution in our area. As part of this programme, the airAlert service was promoted and information leaflets/posters provided to each pupil. Over 1200 children took part in the event.

Pictured: Key Stage 2 Pupils from Crawley schools learning about air quality at Junior Citizen Event with Councillor Geraint Thomas

Conclusions and Priorities

The main conclusions to draw from this year review and assessment of air quality in Crawley is that long-term trends for nitrogen dioxide continue to be downwards at roadside, airport and background sites across the borough, with the exception of the Hazelwick AQMA, where the long term trend is still upwards.

Exceedances of the annual mean objective for nitrogen dioxide were recorded at two busy roadside sites with public exposure: A2011 (within the AQMA) and Worth Park Avenue*, close to Three Bridges rail station. These are in locations where high traffic volumes and congestion combine to create specific local conditions that cause higher pollution levels. All other monitoring locations with public exposure were below the objectives for nitrogen dioxide and no exceedances of the PM_{10} objectives were recorded at the monitoring site east of Gatwick.

[*There was insufficient data (2months) to determine if the annual average objective had been exceeded. The site will continued to be monitored and reported in next year's annual report.]

Crawley Borough Council's priorities for the coming year are:

- To review specific air quality policies and supporting guidance associated with Crawley's Local Plan, with the aim of maintaining, and where possible, improving air quality through the development control process.
- Work with local businesses, WSCC and Sussex-air partners to build on the significant work already achieved through the Crawley Growth Programme's infrastructure upgrades to support sustainable transport options. Including the eco-audit scheme with Manor Royal businesses and a sustainability event to showcase walking, cycling, and EV vehicles.
- Research project to study commuter behaviour/barriers to modal shift in Crawley's commuter population. Draft project brief and identify academic partner and funding stream to support the project.
- Seek government grant funding for air quality projects to implement or supplement our air quality action plan, including Defra's 2019/20 Air Quality Grant through partnership with SAQP, to look at wood burning/provide best practice guidance and a schools particulate monitoring project.

- Continue to run educational/promotional events to raise awareness of air quality issues, including the annual Clean Air day, Breath Easy, and Junior Citizen.
- Identify pollution hotspots and adjust the monitoring network accordingly to respond to local developments and concerns within the borough.

The principal challenges the council anticipates in addressing air quality for the coming year are:

- Budget barriers, including finding funding sources and grant monies to support our action plan measures
- Mitigating the effects of increasing local development and traffic volumes in order to reduce congestion and maintain/improve air quality.
- Identifying and overcoming barriers to modal shift

Local Engagement and How to Get Involved

Crawley is one of the smallest local authorities in Sussex covering an area of 45 km^2. Despite its relative small size, it has the second highest job density in the country outside London and attracts more than 43,000 commuters every day, 80% of which commute by car. In addition to all the incoming commuter traffic, many local car journeys are less than 2km and 58% of car trips are under 5km. These high volumes of traffic on our local roads cause congestion which contributes to worsening air quality. However, since many car journeys are short, this gives us the opportunity to help improve air quality in our area by switching to sustainable transport options such as walking, cycling, public transport or car sharing.

Some examples of how we can take action on a personal level to improve air quality in Crawley are shown below.

Walk or cycle:

Replacing a car journey by walking or cycling helps reduce traffic and traffic emissions. It has proven health and mental health benefits too.

Take public transport or car-share:

For longer journeys consider car share or taking public transport, such as bus, coach or train.

If a car journey is necessary:

- Drive smoothly and try not to accelerate unnecessarily or brake hard. This will ensure your engine will pollute less and also help you save fuel.
- Maintain your car to keep your engine tuned so that it produces less harmful emissions
- Check your tyre pressure is correct. Low tyre pressure increases fuel use, fuel costs and emissions.
- Think about whether you need to use the air conditioning. Air con increases fuel consumption by 30%; driving with windows open only increases it by 5%.
- Turn off your engine when your car is stationary for prolonged periods, particularly at main junctions and level crossings. Idling vehicles release lots exhaust emissions that pollute the air as well as affecting other drivers and pedestrians.
- If you are considering buying a car, you may want to look at electric/hybrid vehicles or look at ultra-low emission vehicle (ULEV) which will use less fuel and produce less exhaust fumes.

Go for local produce:

Buying locally produced goods and foods that are in season means that they don't need to be transported long distances. Long distance transport creates more air pollution.

Local authority engagement with decision makers and the public

The council publishes information on its website and local magazine as well as holding public consultation and focus group meetings in order to keep the public informed and engage them in the measures it is taking to improve local air quality and support public health initiatives concerned with air quality impacts. These include:

- *The Crawley Growth Programme:* a package of sustainable transport infrastructure and highway upgrades that will encourage modal shift and help improve air quality. Public information events and focus group meetings are held ahead of each scheme at the town hall, community centres, library and County Mall. Information is also available online at the council's website and twitter feed (http://www.regeneratingcrawley.org.uk/). For those not online information is

published in Crawley Live, a free council magazine distributed to every household in Crawley four times a year.

- *Sustainable Transport:* Crawley Borough Council's website (www.crawley.gov.uk) has lots of useful information on sustainable transport infrastructure and services in Crawley, including maps, journey planners and advice to help residents, communities, schools, businesses, and developers improve air quality.
  There are also links to other organisations, charities and action groups where the public can find information on how to get involved in activities that can support air quality improvements in their area: http://www.crawley.gov.uk/pw/Streets__Roads_and_Transport/index.htm

- *Information on air quality monitoring in Crawley:* Other sources of information about air quality in the borough including pollution monitoring and air quality management area (AQMA) are available at:
  http://www.crawley.gov.uk/pw/Environment_and_Health/EnvironmentalHealth/Pollution/index.htm
  http://www.crawley.gov.uk/pw/Environment_and_Health/Environmental_Health/Pollution/PUB266051

- *airAlert - Public Health information service on air quality:* Crawley, in partnership with the other Sussex authorities have developed the airAlert service, which is a free subscription service designed to help individuals who suffer from asthma, COPD, emphysema or other respiratory illnesses. The subscriber receives an advanced warning of high pollution levels via either voicemail, email, text or mobile phone app allowing them to take appropriate steps regarding their medication or activities: http://www.sussex-air.net/AirAlert/Default.aspx

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1 Local Air Quality Management

This report provides an overview of air quality in Crawley during 2017/18. 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 Crawley 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.

A summary of AQMA declared by Crawley Borough Council can be found in Table 2.1. Further information related to the AQMA, including maps of AQMA boundaries are available online at:

http://www.crawley.gov.uk/pw/web/PUB266050

http://www.crawley.gov.uk/pw/web/PUB241229

https://uk-air.defra.gov.uk/aqma/details?aqma_ref=1600

(See full list see at: http://uk-air.defra.gov.uk/aqma/list)

Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMA.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan (inc. date of publication)
						At Declaration	Now	
Hazelwick AQMA	09.07.15	NO2 Annual Mean	Crawley	Area surrounding the Hazelwick Roundabout, including land and properties bordering the roads coming on and of the roundabout.	NO	42 µg/m3	42 µg/m3	Crawley Borough Council Air Quality Action Plan

☒ **Crawley Borough Council confirm the information on UK-Air regarding their AQMA(s) is up to date**

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

Defra's appraisal of last year's ASR is summarised below:

The report is well structured, detailed, and provides the information specified in the Guidance. Air quality in Crawley is generally improving, with the exception of two minor exceedances of the annual mean concentration objective for nitrogen in the AQMA. We encourage the Local Authority to ensure the new AQAP includes measures which target the pollution hotspots identified in the Borough, with a view to revoking the Hazelwick AQMA.

> ***Response**: There are a range measures in the action plan which target pollution in these areas. These include Defra funded AQ project which we are delivering in schools in and around the Hazelwick AQMA, and businesses in the Manor Royal Business district in the same area, promoting our business travel plan toolkit to Manor Royal Businesses and infrastructure improvements through the Crawley Growth Programme to deliver train and bus station upgrades.*

Distance correction calculations have only been applied where exceedances have been demonstrated at sites not representative of relevant exposure. In keeping with the LAQM Technical Guidance TG(16), distance correction should be applied to all sites which are not representative of relevant exposure, to ensure that the results accurately reflect the concentrations affecting receptors.

> ***Response:** In the current report fall off with distance corrections have been carried out for all sites not representative of relevant exposure.*

Crawley Borough Council has taken forward a number of direct measures during the current reporting year of 2018 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

Key completed measures are:

- Crawley Growth Programme delivered the following completed sustainable transport infrastructure schemes in the reporting year:
  Worth Park Avenue Cycle Scheme and Toucan controlled traffic signals - shared use pedestrian and cycleway improving connectivity at Three Bridges Station.
  RTPI upgrade at bus shelters across Crawley.
  Upgrades to new super-hub bus shelters

Key outcomes from measure: Encourage modal shift.

- Defra Funded AQ project was delivered to Three Bridges, Pound Hill and Northgate Primary Schools in Crawley located close to the AQMA. The project looked at actions to improve air quality in their area, including anti-idling campaign, Big Pedal event and the walking to school competition (WOW).

Key outcomes from measure: Helping school children understand air quality issues in their local area/wider environment and encourage modal shift.

- Junior Citizen event run by Crawley borough council for all year 6 school children in Crawley.

Key outcomes from measure: Helping school children understand air quality issues in their local area/wider environment and encourage modal shift

- 8 new subscribers to the council's staff Bike to Work scheme. One new applicant for the council's bike loan

Key outcomes from measure: Encourage modal shift. Promote zero emissions transport

- Four new EV charge points installed in the Town Hall carpark and one new EV charge point at the Orchard Road car park in 2018.
  New Nissan Leaf (zero emissions) purchased by CBC Parking services.

Key outcomes from measure: Increase EV charging network. Encourage modal shift. Promote low emissions vehicles.

- Solar Panel installation at CBC property: Ifield Drive Community Centre, Furnace Green Community Centre, Southgate Community Centre, Bewbush Pavilion

Key outcomes from measure: Shift to installations using low emission fuels.

- Annual Living Streets campaign event for CBC staff
- Business Travel Plan development completed
- Draft Workplace Travel Plans for CBC staff.

Key outcomes from measure: Encourage modal shift.

Crawley borough council expects the following measures to be completed over the course of the next reporting year:

- Review of Local Plan – looking at policies and guidance to help improve air quality through the development control process.
- Spring/Summer 2019 - Deliver the business programme element of the Defra–funded air quality project coordinated by SAQP. The business programme (Sussex Eco Grants Scheme), will be targeted, at businesses on Manor Royal Business District which is adjacent to the Hazelwick AQMA. The scheme aims to focus on staff travel, improving plant/machinery, eco driver training and identifying grants to implement suggested AQ improvements.
- Summer 2019 – sustainable transport and EV event to promote sustainable travel alternatives and low/zero emissions transport options for businesses. Guest speakers, exhibition stalls, business travel plan toolkit, low/zero emission vehicle showcase and charge point suppliers/service providers.
- Summer/Autumn 2019 - Replace Crawley council's Port Health van at Gatwick with an EV van.
- Crawley Growth Programme to deliver improved sustainable transport infrastructure upgrades for Manor Royal business district including: selective road space re-prioritising for bus routes through Manor Royal, bus shelter upgrades at Three Bridges station.

Crawley Borough Council's priorities for the coming year are:

- Work with Forward Planning to review air quality policies within Crawley's Local Plan.
- Support and build on the work being done through the Crawley Growth Programme's and Grant funded projects to enhance sustainable transport infrastructure and promote alternative sustainable transport options.
- Seek funding streams to support air quality action plan measures.
- Educational/promotional events to raise awareness of air quality issues, including the annual Clean Air day, Breath Easy, and Junior Citizen.
- Review and update the monitoring network to respond to local developments and identify pollution hotspots across the borough.

The principal challenges and barriers to implementation that the council faces continues to be:

- The scale of local development adjacent to the AQMA which may offset the improvement in vehicle emissions achieved over recent years,
- Funding restrictions to support action plan measures, and
- Identifying and overcoming barriers to modal shift

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Crawley Borough Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of the Hazelwick AQMA.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	Crawley Growth Programme Three Bridges and Gatwick railways stations Interchange improvement schemes	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	Coast to Capital Local Enterprise Partnership WSCC/ CBC	2014	2016-2022 Ongoing	Modal Shift/ Improved traffic flow	Medium/High	Road space re-prioritising for bus routes to Gatwick via Manor Royal delivered. Further upgrades programmed.	Phased delivery, to be completed in stages. Final completion estimated 2022	working with LEP and partners to deliver major interchange improvements at Crawley, Three Bridges and Gatwick railways stations for both buses and cyclists
2	Crawley Growth Programme Upgrade to Super-Hub bus shelters	Transport Planning and Infrastructure	Bus route improvements	Coast to Capital Local Enterprise Partnership WSCC/ CBC	2017	2018/19	Modal shift	low	Still in design	2019	
3	Defra funded AQ project in schools and businesses across Sussex	Promoting Low Emissions Transport	Driver training and ECO driving aids	CBC	2015/16	2017	Modal shift/ Fuel economy/ reduction in vehicle emission	Medium	Primary schools in Crawley(adjacent to AQMA) have completed schools project/anti-idling campaign 2018	2018/19	Buisness project Eco-Audit Scheme/ EV and Sustainable transport Event on Manor Royal 2019
4	Air Quality and Emissions Mitigation Guidance for Sussex	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	CBC with Sussex-air	2011/12	ongoing	Conditions on planning applications to require emissions mitigation/ S.106 funding	Medium/Low	Air Quality and Mitigation Guidance incorporated in Crawley Local Plan referenced to developers in local list	ongoing	Under review - completion due 2019

5	Crawley Cycle Network	Transport Planning and Infrastructure	Cycle Network	CBC - S106 funding	Completed	ongoing	Modal shift	No Target set - Medium/low	New cycle schemes and improvements to existing schemes including: Town Centre – County mall, Manor Royal Road, Fleming Way	Phased delivery, to be completed in stages. Final completion estimated 2018/19	
6	Manor Royal Business Park Travel Plans	Promoting Travel Alternatives	Workplace Travel Planning	Crawley Borough Council (CBC)	complete	ongoing	Modal shift/ staff travelling by sustainable means	No Target set Medium/low	Guidance Travel pack completed 2018. Planning requirement for Travel plans to be integrated into new development on MR Business District	ongoing	Sustainability officer promoting Travel pack to businesses operators
7	School Travel plans	Promoting Travel Alternatives	School Travel Plans	West Sussex County Council (WSCC)	complete	ongoing	Modal Shift %children travelling to school by sustainable means	No Target set Medium/low	Increase % Uptake	Ongoing	Helps reduce emissions during morning rush hour
8	CBC Travel Plans	Promoting Travel Alternatives	Workplace Travel Planning	CBC	complete	2018	% staff travelling by sustainable means	No Target set Medium/low	Draft Travel plan produced	2018/19	Time priorities
9	easit discount(15 %) on staff commuting on rail and bus - available to CBC and business across Crawley.	Promoting Travel Alternatives	Promote use of rail and bus	easit/CBC	Completed	ongoing	% staff travelling by sustainable means	No Target set Medium/low	Currently, 111 easitMembers Organisations, 4,848 registered individuals and 3,674. individuals with valid easitCARD across Crawley	Ongoing	Council originally involved in funding the setting up of the scheme
10	Crawley car club scheme with private sector partner	Promoting Travel Alternatives	Personalised Travel Planning	CBC	2015	2018	Reduction in private vehicle ownership	No Target set Medium/low	Procurement due 2018/ Launch 2019	2019	Procurement delayed launch now due 2019
11	Cycle Crawley campaign	Promoting Travel Alternatives	Promotion of Cycling	CBC	2011	ongoing	Modal shift	No Target set Medium/low	Events, activities and materials that support uptake and promotion of cycling in Crawley.	Ongoing	Undertaken in partnership with the Crawley Cycle Forum

12	Living Streets campaign	Promoting Travel Alternatives	Promotion of Walking	CBC	2014	ongoing	Modal shift	No Target set Medium/low	campaign event January 2017 for CBC staff (approximately 100 pledges from staff for modal shift)	Ongoing	Information, events, and activities to promote walking amongst council staff and local businesses
13	Residential travel plans	Promoting Travel Alternatives	Residential travel plans	CBC	2015	ongoing	% residents using sustainable transport modes	No Target set	Developments of certain size required to implement Travel Plan	Ongoing	Implemented through Planning process - each application has its own target plan
14	New Manor Royal bus Route	Promoting Travel Alternatives	Bus route improvements	MetroBus	2017	2018/19	Improved journey times and timetable accuracy / Modal shift	No Target set Medium/low	Still in design	2018/19	
15	Council Vehicle procurement code requires information on vehicle emissions and consideratio n of LEVs	Promoting Low Emissions Transport	Company/publ ic Vehicle Procurement - Prioritising uptake of low emission vehicles	CBC	Completed	ongoing	Minimum CO2 level of < 150 g/kg.	No Target set Medium/low	100% uptake for vehicle procurement and staff car loan applications	Ongoing	
16	Council Vehicle Fleet LEVs	Promoting Low Emissions Transport	Prioritising uptake of low emission vehicles	CBC	2016	ongoing	Modal shift to LEV (zero emissions)	medium	Parking Services New Nissan Leaf 2018 And Nissan e-NV200 (zero emissions) to replace diesel van	ongoing	2019/20 vehicle replacement programme expect to replace both Community warden cars and Port Health Van with EV
17	CBC Staff Bicycle Loan Scheme	Promoting Low Emissions Transport	Prioritising uptake of low emission vehicles	CBC	2015	ongoing	Modal shift from private vehicle to bicycle	low	1 new loan awarded 2017/18	ongoing	CBC staff loan to buy Bike
18	CBC Staff Bike to Work Scheme	Promoting Low Emissions Transport	Prioritising uptake of low emission vehicles	CBC	2016	ongoing	Modal shift from private vehicle to bicycle	low	8 new applicants 2017/18	ongoing	Bike Hire Scheme CBC/Partnership with Evans Cycle

19	Town Hall Rapid Charging Point (50 kWh) for electric vehicles	Promoting Low Emissions Transport	Procuring alternative refuelling infrastructure to promote Low Emission Vehicles, EV recharging, gas fuel recharging	CBC	2014	2017/18	kWh of electricity supplied indicating EV usage.	High depending on uptake of LEV (zero emissions)	3 new rapid chargers installed Continuing increase in demand since installed	Ongoing	
20	Council has home-working Policy	Promoting Travel Alternatives	Encourage / Facilitate home-working	CBC	Completed	completed	% annual working from home	No Target set low	Positive staff uptake (numbers variable)	ongoing	
21	Taxi License Fee Discount Scheme for LEVs	Promoting Low Emissions Transport	Taxi emission incentives	CBC	Completed	ongoing	% uptake	No Target set	Gatwick Cars currently using 5 Tesla Electric vehicle taxis will be adding 2 more in 2019 and planning on 100% hybrid/electric vehicle fleet by 2020	ongoing	
22	Solar Panel Installation Program	Promoting Low Emission Plant	Shift to installations using low emission fuels	CBC	2010	2011-18	20% Reduction in CO2 Emissions by 2020 100% Reduction in CO2 Emissions by 2050	CO2 Savings from 4 new installations 2018: 14,000 Kg pa 25% reduction in last 5 years	Solar panels installed at CBC properties in 2018: Ifield Drive CC Furnace Green CC Southgate CC Bewbush Pavilion	Ongoing (2050)	2019/20 aim to install at Tilgate Nature Centre, K2 leisure center, The Hawth Theatre, Waterlea and Millpond Play Centres
23	airAlert Pollution Warning Service for vulnerable groups	Public Information	Via other mechanisms SMS/ Mobile phone App/ Email	CBC with Sussex Air Quality Partnership SAQP /CBC	2008	ongoing	Uptake: Number of people receiving forecasting alert	No Target set	Over 800 registered subscribers	ongoing	
24	Energise Network	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging,	SAQP/CBC	2011	2013/14	Uptake: Number of charges	No Target set	Refuelling infrastructure Network throughout East and West Sussex	completed	

			Gas fuel recharging								
25	Sussex Air Website upgrade/improvements	Public Information	Via the Internet	SAQP	2017	ongoing	Number of views/visits accessed by partners/public to keep up to date with air quality locally.	No Target set	Draft technical specification/service level agreement	2019	update to the website planned for 2019, subject to resources

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.

There is no direct monitoring of $PM_{2.5}$ in Crawley. However, using the correction factor in TG (16) it is possible to estimate concentrations from our local monitoring of PM_{10} (see Appendix C).This method suggests that 2017 $PM_{2.5}$ levels in Crawley are estimated at 10.4µg/m^3. The annual average EU limit for $PM_{2.5}$ is 25µg/m^3 so the risk of exceedance is negligible. However, the council is still committed to reducing emissions and exposure to this pollutant and is taking the following measures to address $PM_{2.5}$:

1. Regulation of Industrial Process through the environmental permitting regime to control emissions of $PM_{2.5}$ from mineral processes such as concrete batching, concrete rushing and road-stone coating.
2. Working in partnership with other authorities in Sussex through the Sussex Air Quality working group to set up the Energise Network of electric vehicle charging points throughout the county.
3. Policy measures to which will help reduce $PM_{2.5,}$ including planning policy, local transport planning and the development of the Air Quality Action Plan.

- Local Plan Policy: Requirement to adhere to the Sussex Air Quality and Emissions Mitigation Guidance document
- Local Transport Plan: Traffic management measures to reduce congestion and improve traffic flow, which should also bring about a reduction in road traffic pollutant emissions (including $PM_{2.5}$ emissions).
- Air Quality Action Plan: the emerging action plan will include the promotion of low emission travel alternatives (e.g. cycling, walking, electric vehicles, lift sharing etc).

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

3.1 Summary of Monitoring Undertaken

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

NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem.

3.1.1 Automatic Monitoring Sites

Crawley Borough Council undertook automatic (continuous) monitoring at one site on the eastern border of Gatwick airport (CA2) during 2017. Table A.1 in Appendix A shows the details of the site. National monitoring results are available at https://uk-air.defra.gov.uk/. Monitoring results for Sussex authorities are also available at www.sussex-air.net/.

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

3.1.2 Non-Automatic Monitoring Sites

Crawley Borough Council undertook non- automatic (passive) monitoring of NO_2 at 37 sites during 2017. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D (Figs D.1 – D.4). 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, “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. This is for both diffusion tube and continuous monitored data.

For diffusion tubes, the full 2017 dataset of monthly mean values is provided in Appendix B.

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

The data in Table B.1 shows that air quality in Crawley is mainly good, with national targets being met at most monitoring sites with the exception of some sites close to busy roads. Exceedances of the nitrogen dioxide 40 µg/m^3 annual mean objective were found at six roadside sites in 2017 (CR 55, 62, 63, 64, 69 and 76) . All of these sites are within the Hazelwick AQMA.

Two of these sites were located at the façade of the houses, but the remaining sites were located closer to the road than the houses and therefore were not truly representative of residential exposure because pollution concentrations decrease with distance from the source. In order to account for this falling off in pollution concentration, an adjustment was made. After calculating the effect of fall off with distance from the road, to provide a more representative estimation of exposure, it was found that there were still exceedances at the point of relevant public exposure at two locations (CR 62 and 69). These measured values indicate that nitrogen dioxide levels within the AQMA remain high and still has the potential to exceed.

The rationale for the choice of bias adjustment factor is discussed fully in Appendix A, however, its effect on the reported results is explained in more detail here.
Following Guidance from LAQM Guidance (TG.16) and the laqm helpdesk, the local adjustment factor (1.0) was chosen to take into account the effect of the airport and

provide a conservative approach to the monitoring data. However, at busy road locations such as in the AQMA, the influence of road traffic sources is more dominant and the use of the national bias adjustment factor (0.89) may have been more appropriate. If the national factor had been applied to the data, this would have resulted in no exceedances of the objective within the AQMA. However, it is not appropriate to apply two different adjustments within the same report.

Ultimately which ever factor had been chosen, the results at these locations would have been within +/- 10% of the air quality objective of 40ug/m^3 and therefore, with the potential to exceed, would have resulted in the same conclusions being drawn, that is: That the AQMA should remain in place and we should continue to implement the actions drawn up for the AQAP.

Diffusion tubes cannot provide hourly measurements of NO_2; however, Defra Technical Guidance (TG (16)) states that where annual mean NO_2 concentrations measured by diffusion tubes exceed 60 µg/m^3 there is a likelihood that the 1-hour objective may be exceeded. A new site (CR93) set up at November 2017 measured extremely high concentrations of NO_2 in exceedance of the 60 µg/m^3 indicator level. This site was located at a busy road junction in the three bridges area of Crawley and has relevant public exposure within 1.5m of the monitoring site. Extensive roadworks at this junction has led to increased congestion, which will have increased vehicle pollution in the area, however these levels are very high and will continue to be monitored over the next year to determine if the annual/hourly objectives are being exceeded. These results may result in the declaration of a new AQMA or the extension of the existing AQMA.

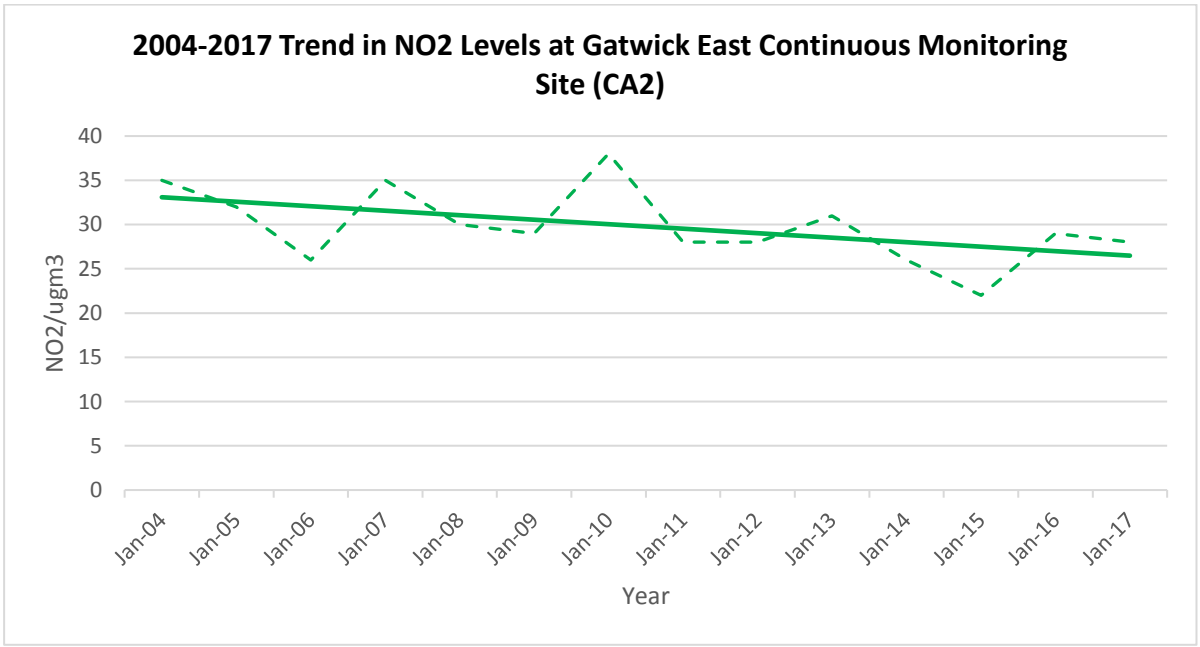
Trends in Annual Mean NO_2

In 2017 there was a slight decrease in NO_2 levels across Crawley. This pattern was also seen regionally in 2017 and can be attributed to climatic influences in this year rather than local conditions across Crawley. However, the long term trends for NO_2 at roadside, background and airport sites in Crawley are downwards indicating that levels of nitrogen dioxide have generally fallen over time. Despite this, levels have remained broadly consistent over the last five or six years suggesting pollution levels have plateaued. The only exception for this is within the AQMA when the long term trend continues to be upwards.

Trends in NO_2 at Gatwick

A slight decrease in annual mean NO_2 levels was measured at the Gatwick East continuous monitoring site in 2017. There were no exceedances of the annual or hourly mean objectives and the long term trend continues to be downwards (Fig 3.1). The co-located diffusion tube data at this site shows a very good correlation with the continuous data, recording the same annual mean, a slight decrease in 2017 levels and the same trend pattern for the long term data.

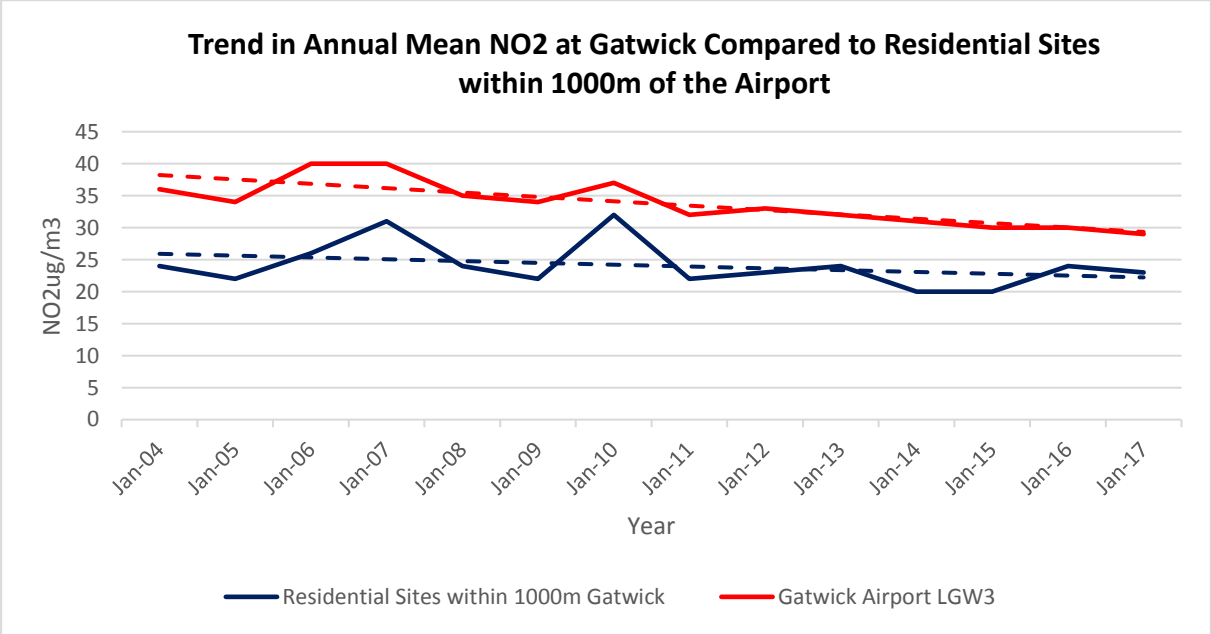
Fig 3.1



Determining relevant exposure at residential properties within 1000m of the airport is one of the assessment criteria required for authorities with a major airport within their boundary. In 2017 there were no exceedances of annual mean NO_2 at any of these residential receptors (CR 48, 49, 50, 51, 74, 75).

In Fig 3.2 the levels of nitrogen dioxide from the airport's LGW3 site located at the eastern end of the runway (and therefore considered to be worst case) are compared to residential receptors in Crawley within 1000m of the airport. The long term trend at these sites is also shown to be downwards.

Fig 3.2



Trends in Roadside NO_2 in Crawley

Fig 3.3 shows the long term trend in roadside NO_2 in Crawley continues to be downwards indicating that overall levels have fallen despite increases in traffic volumes over the same period (Fig 3.4). A range of measures at European, national and local level, such as improvements in engine technologies, and gradual shift to more sustainable forms of transport have helped reduce vehicle emissions, which, over time have resulted in reductions in NO_2 both regionally and locally.

Fig 3.3

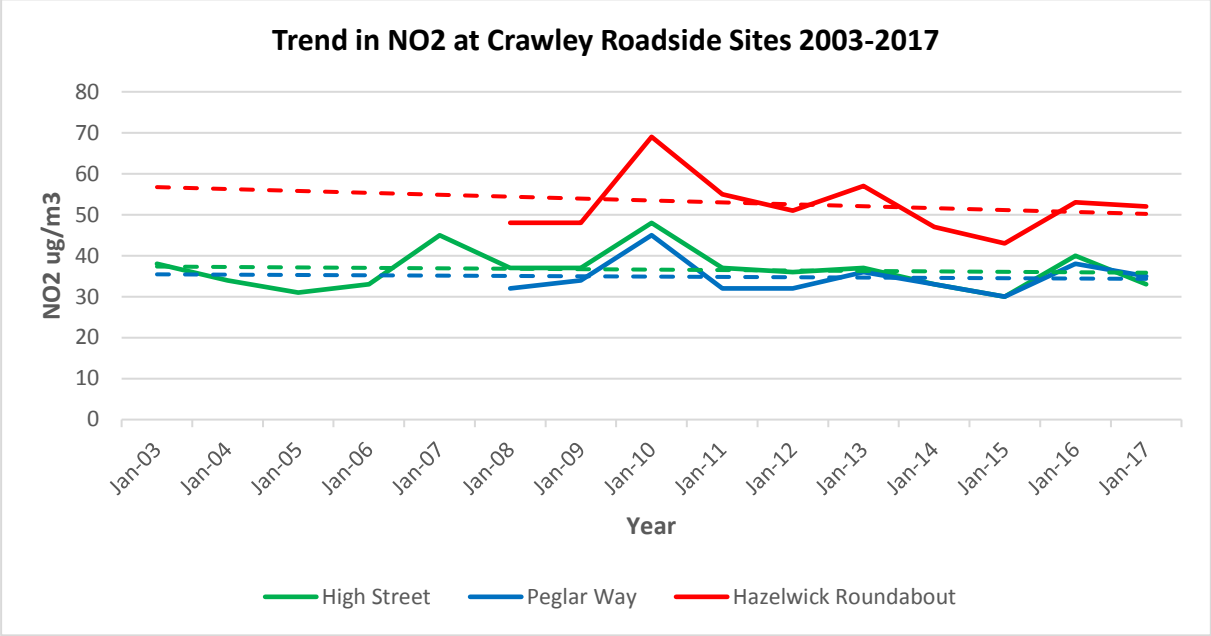
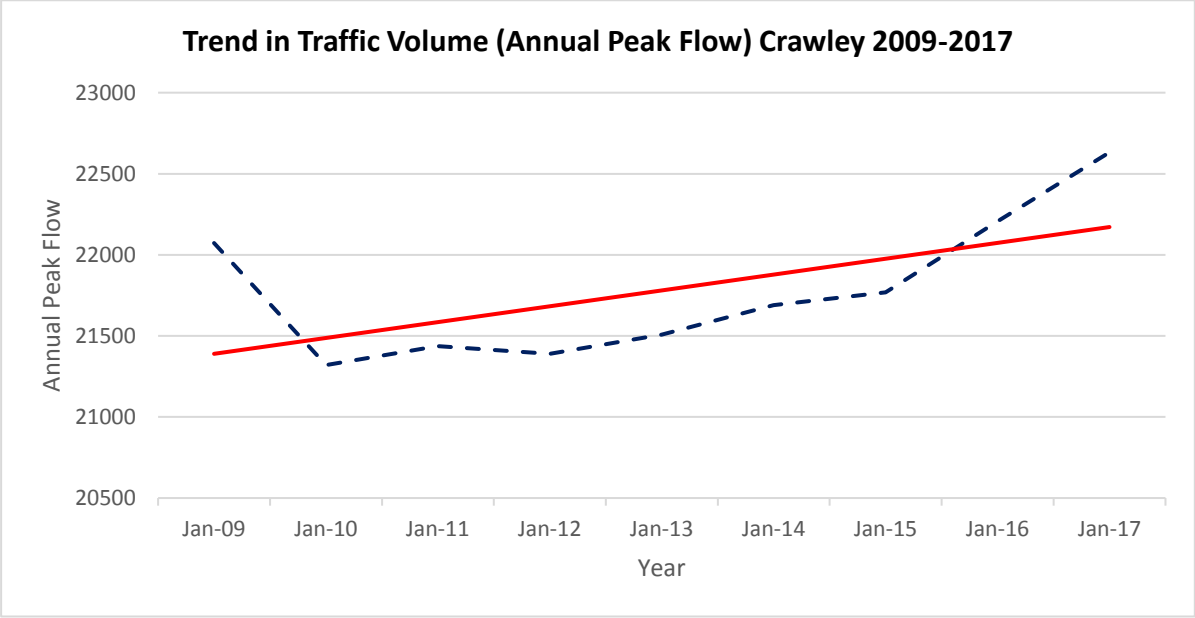


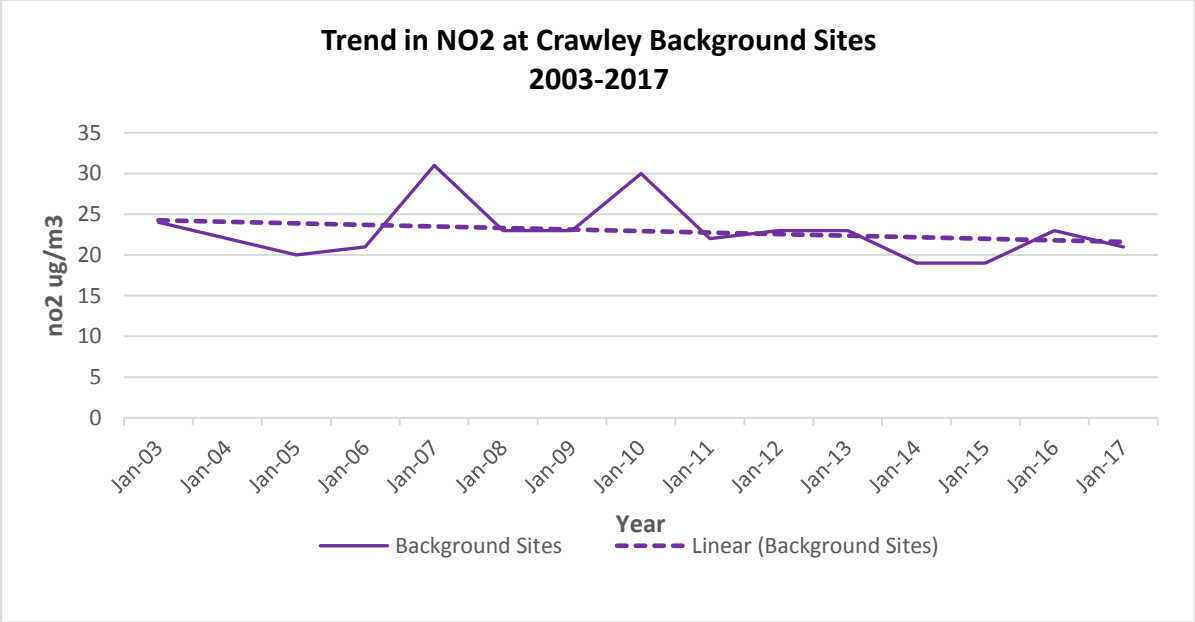
Fig 3.4



Trends in Background NO_2 in Crawley

The following graph (Fig 3.5) shows the trend in NO_2 at long term background sites in Crawley gives a similar picture to that at roadside and airport sites, with the long term trend downwards confirming that background levels of NO_2 have also been falling over the last decade. The steeper downward slope indicates that background levels have shown greater improvement in air quality over the last decade than at sites close to busy roads and helps to demonstrate the contribution vehicle emissions make to poor air quality at these roadside location. These comparison help evidence the argument for restricting residential development close to busy roads.

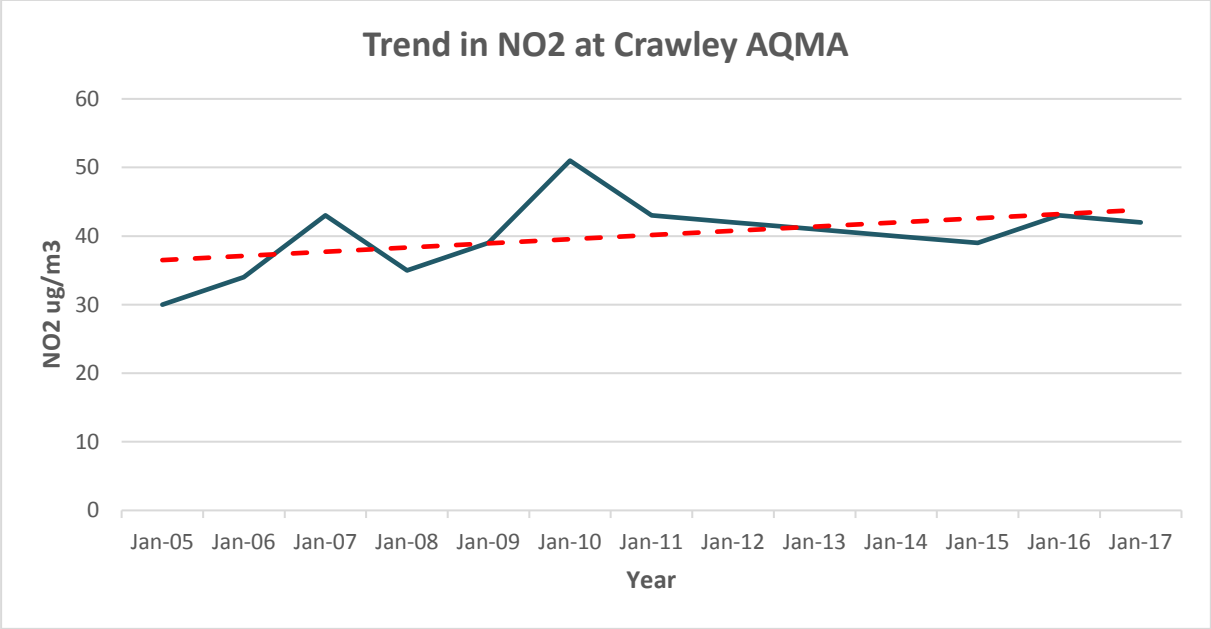
Fig 3.5



Trends in AQMA NO_2 in Crawley

Although the general trend for both background and roadside sites in Crawley is down, this is not seen at receptor sites within the AQMA where the long term data is still showing an upwards trend (Fig 3.6). As a result, the council has no current plans to amend the AQMA.

Fig 3.6



Outside of the AQMA, a new site set up at a busy road junction in the Three Bridges area of Crawley at the end of 2017. Initial results from this site have shown very high NO_2 concentrations in exceedance of the 60 µg/m^3 indicator level for breaching the hourly NO_2 limit. If these levels continue it is expected that a new AQMA or an extension of the existing AQMA, will be necessary.

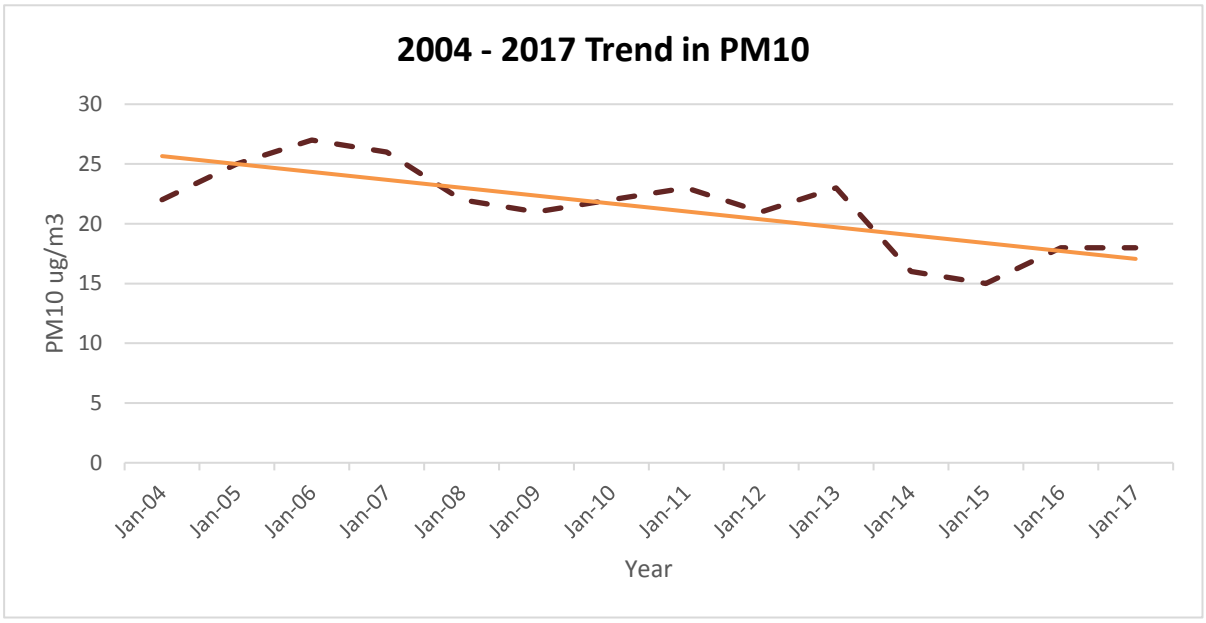
3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and vcm 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.

The 2017 results show that annual mean PM_{10} concentrations remained the same in 2017 as the previous year (18µg/m^3 vcm corrected). There were no exceedances of the annual mean or daily mean objectives measured at the Crawley automatic monitoring site and the long-term trend for PM_{10} continues to decline (Fig 3.7). No recommendation for an AQMA is required for this pollutant.

Fig 3.7



Appendices

Appendix A: Monitoring Results

Appendix B: Full Monthly Diffusion Tube Results for 2017

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

Appendix D: Map of Monitoring Locations/ AQMA

Appendix E: Summary of Air Quality Objectives in England

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)
CA2	Gatwick East	Other/Suburban Industrial(AQD2008)	529417	141496	NO_2; PM_{10}	NO	Chemiluminescent; TEOM	63m	27m	1.8

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)
CR1	High Street	Roadside	526799	136785	NO_2	N	19.42m	0.5m	N	2.5
CR3	Birch Lea	Urban background	528438	138392	NO_2	N	6.85m	0.5m	N	2.5
CR4	Headley Close	Urban background	529864	138204	NO_2	N	14.80m	0.5m	N	2.5
CR48	Lynhurst Cottage	Urban background	527110	139530	NO_2	N	0m	21m	N	2.5
CR49	Charlwood Nursery	Urban background	526320	139860	NO_2	N	0m	36m	N	2.5
CR50	Rowley Cottage	Urban background	527810	139929	NO_2	N	0m	75m	N	2.5
CR51	Balcombe Road	Urban background	529490	141460	NO_2	N	0m	21m	N	2.5

CR52 - CR54	Gatwick East, (Tri-location)	Other/Suburban Industrial (AQD2008)	529417	141496	NO_2	N	50m	27m	Y	1.8
CR 55	Tinsley Close Fence (11)	Roadside	528446,	138085	NO_2	Y	1.13m	5.7m	N	2.5
CR 60	Peglar Way	Roadside	526740	136934	NO_2	N	6.5m	2.31m	N	2.5
CR62	Tinsley Close (10)	Urban background	528438	138088	NO_2	Y	0m	13.6m	N	2.5
CR63	Woodfield Lodge (R'bout)	Roadside	528153	137912	NO_2	Y	30m	7.4m	N	2.5
CR64	Woodfield Lodge (N'gateAve)	Roadside	528153	137871	NO_2	Y	10m	3.8m	N	2.5
CR66	Brighton Rd (Rail crossing)	Roadside	526743	136346	NO_2	N	0.5m	1.2m	N	2.5

CR69	Tinsley Close Facade(11)	Urban background	528443	138082	NO_2	Y	0m	9.3m	N	2.0
CR72	Burlands	Urban background	525530	138472	NO_2	N	6.75m	1.3m	N	2.5
CR73	Cherry Lane	Urban background	526285	138495	NO_2	N	9.5m	0.9m	N	2.5
CR74	Tinsley Green Radford Road	Urban Background	528978	139599	NO_2	N	31.5m	0.5m	N	2.5
CR75	Steers Lane	Urban Background	529335	139589	NO_2	N	18.6m	2m	N	2.5
CR76	Hazelwick Court	Urban background	528303	137800	NO_2	Y	10.3m	4.96m	N	2.5
CR77	Hazelwick Ave (Bays)	Urban background	528362	137812	NO_2	Y	6.34m	2.3m	N	2.5
CR78	Ferndown	Urban background	530037	138553	NO_2	N	0m	40m	N	2.5

CR79	St Hildas Close	Urban background	529312	138534	NO_2	N	0m	12m	N	2.5
CR80	Saxon Road	Urban background	530424	136521	NO_2	N	0m	8.7m	N	2.5
CR81	Bolton Road	Urban background	529047	134474	NO_2	N	0m	12.8m	N	2.5
CR85	Tinsley Lane Flats	Urban background	528286	138019	NO_2	Y	13m	32m	N	2.5
CR86	Crown Buildings The Boulevard	Roadside	526876	136819	NO_2	N	13.8m	0.5m	N	2.5
CR87	Broadway bus shelter	Roadside	526908	136754	NO_2	N	1.2m (planned residential)	0.5m	N	2.5
CR88	Filbert Crescent	Urban background	525489	136573	NO_2	N	0m	5.4m	N	2.5
CR89	Dalewood Garden	Urban background	527715	137893	NO_2	y	0m	13.8m	N	2.5

CR90	Costa County Oak, Way	Roadside	526953	138658	NO_2	N	2m	1.8m	N	2.5
CR91	Ocean Hse, Hazelwick Ave	Roadside	528683	137174	NO_2	Y	4.7m	0.5m	N	2.5
CR93	St Marys Drive	Urban background	528895	173115	NO_2	N	1.5m	1.8m	N	2.5
CR 99	Furnace Farm Road	Urban background	528397	135579	NO_2	N	12.1m	1.5m	N	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 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2013	2014	2015	2016	2017
CR1	Roadside	Diffusion Tube	n/a	100	37	33	30	**40**	**33**
CR3	Urban background	Diffusion Tube	n/a	100	23	20	20	24	22
CR4	Urban background	Diffusion Tube	n/a	92	26	21	21	25	23
CR48	Urban background	Diffusion Tube	n/a	100	27	23	24	28	27
CR49	Urban background	Diffusion Tube	n/a	100	21	17	16	19	18
CR50	Urban background	Diffusion Tube	n/a	100	24	18	19	25	21
CR51	Urban background	Diffusion Tube	n/a	100	24	21	21	25	24

CR52	Urban background	Diffusion Tube	n/a	100	29	25	25	30	30
CR53	Urban background	Diffusion Tube	n/a	100	29	26	24	29	29
CR54	Urban background	Diffusion Tube	n/a	100	29	26	25	29	29
CR52 – CR54 Mean Trilocated	Other/Suburban Industrial (AQD2008)	Diffusion Tube	n/a	100	29	26	25	29	28
CR 55	Roadside	Diffusion Tube	n/a	100	**41**	**40**	39	**42**	**41**
CR 60	Roadside	Diffusion Tube	n/a	100	36	33	31	38	35
CR62	Urban background	Diffusion Tube	n/a	100	39	36	31	**40**	**40**
CR63	Roadside	Diffusion Tube	n/a	100	**57**	**47**	**44**	**53**	**52**
CR64	Roadside	Diffusion Tube	n/a	100	**40**	37	37	**41**	**41**
CR66	Roadside	Diffusion Tube	n/a	100	35	31	27	35	34
CR69	Urban background	Diffusion Tube	n/a	100	**41**	37	36	**43**	**42**
CR72	Urban background	Diffusion Tube	n/a	100	-	14[(1)]	13	16	15

CR73	Urban background	Diffusion Tube	n/a	100	-	17(1)	16	21	19
CR74	Urban background	Diffusion Tube	n/a	100	-	30 (1)	26	37	37
CR75	Urban background	Diffusion Tube	n/a	92	-	20 (1)	20	25	23
CR76	Urban background	Diffusion Tube	n/a	92	-	**40**(1)	36	**43**	**40**
CR77	Urban background	Diffusion Tube	n/a	100	-	35(1)	36	**42**	39
CR78	Urban background	Diffusion Tube	n/a	100	-	-	-	29	26
CR79	Urban background	Diffusion Tube	n/a	100	-	-	-	30	27
CR80	Urban background	Diffusion Tube	n/a	100	-	-	-	32	27

CR81	Urban background	Diffusion Tube	n/a	100	-	-	-	28	25
CR85[1]	Urban background	Diffusion Tube	n/a	58% (7/12months)	-	-	-	-	27[1]
CR86[1]	Roadside	Diffusion Tube	n/a	58% (7/12months)	-	-	-	-	22[1]
CR87[1]	Roadside	Diffusion Tube	n/a	58% (7/12months)	-	-	-	-	38[1]
CR88[1]	Urban background	Diffusion Tube	n/a	58% (7/12months)	-	-	-	-	18[1]
CR89[1]	Urban background	Diffusion Tube	n/a	58% (7/12months)	-	-	-	-	19[1]
CR90[2]	Roadside	Diffusion Tube	n/a	2/12months	-	-	-	-	25[2]
CR91[2]	Roadside	Diffusion Tube	n/a	3/12months	-	-	-	-	39[2]
CR93[2]	Urban background	Diffusion Tube	n/a	2/12months	-	-	-	-	**65[2]**
CR 99	Urban background	Diffusion Tube	n/a	100	20	20	16	20	20
CA2	Other/Suburban Industrial	Automatic	n/a	97	31	31	25*	29	28

	(AQD2008)								

☒ **Diffusion tube data has been bias corrected local Bias correction factor 1.0**

☒ **Annualisation[1] has been conducted where data capture is <75%**

☒ **New site - data[2] capture reported as indicative only (full year's data will be available in next year's ASR)**

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.

* Values taken from tri-located diffusion tube as no valid data available from automatic monitor due to equipment failure

Table A.3.1 Automatic Monitoring for Nitrogen Dioxide at Gatwick Sites: CA2 (Crawley Gatwick East) and LGW3 (Adjacent to Runway Gatwick airport) Objective

Site ID	Location	% Data Capture for monitoring period 2017	Annual mean concentrations (µg/m^3)													
			2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
CA2	Gatwick East	97	35	32	26	35	30	29	38*	(28)*	28	31	(26)*	22	29	28
LGW3	Gatwick Airport	99	36	34	**40**	**40**	35	34	37	32	33	32	31	30	30	29

* Analyser failure – adjusted value in brackets taken from tri-located tubes

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 2016 (%) (2)	NO_2 1-Hour Means > 200µg/m³ (3)				
					2013	2014	2015	2016	2017
CA2	Other/Suburban Industrial	Automatic	N/A	96	0	0	0	0	0

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.

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2013	2014	2015	2016	2017
CA2	Other/Suburban Industrial	N/A	96	23	16[3]	15	18	18

☒ **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.

(4) All means have been VCM corrected. See Appendix C for details.

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2013	2014	2015	2016	2017
CA2	Other/Suburban Industrial	N/A	96	**5**	0	1	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.

Appendix B: Full Monthly Diffusion Tube Results for 2017

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2017

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (1.0) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
CR1	43.11	50.71	37.08	32.57	32.77	25.34	29.98	27.16	27.43	23.99	34.06	36.85	33.42	**33**	N/A No relevant exposure
CR3	30.16	38.15	21.87	20.91	18.73	14.22	14.56	15.99	18.21	19.45	25.16	27.19	22.05	22	21
CR4	30.80	41.15	22.47	23.45	20.47	15.19	14.62	15.48	18.90	18.60	28.80	26.58	23.04	23	20
CR48	30.94	36.42	27.17	29.95	28.40	20.12	23.79	21.84	23.49	22.35	30.32	31.18	27.16	27	27
CR49	17.88	29.78	17.13	19.19	19.47	11.79	13.90	11.98	12.60	15.62	20.92	19.20	17.45	18	18
CR50	30.18	37.02	22.57	21.28	21.67	13.38	15.24	14.45	16.92	16.84	23.93	22.04	21.29	21	21
CR51	25.16	33.59	26.78	22.52	20.00	19.92	21.50	20.78	22.42	21.47	28.53	30.16	24.40	24	24
CR52	27.72	42.00	29.18	27.19	23.67	22.03	23.84	23.36	26.68	26.42	31.72	33.06	28.07	28	25
CR53	33.78	41.43	26.11	25.60	24.31	22.13	25.15	22.49	25.46	27.78	28.39	29.62	27.69	28	25
CR54	34.30	42.07	26.86	23.96	25.98	21.72	25.37	22.87	27.09	26.60	32.75	32.10	28.47	29	26
	38.50	54.63	40.13	35.75	37.55	50.02	41.94	38.14	38.03	36.76	40.19	34.67	**40.53**	**41**	**40**

CR 55															
CR 60	40.34	48.48	35.06	34.50	30.29	37.56	30.24	23.63	32.28	31.99	36.10	33.71	34.52	35	29
CR62	43.64	52.74	36.32	38.63	40.83	47.81	35.25	33.67	44.86	37.31	42.72	29.35	**40.26**	**40**	**40**
CR63	64.92	78.02	44.60	49.87	44.83	43.18	47.23	37.89	47.64	43.80	71.29	54.88	**52.35**	**52**	38
CR64	47.08	54.67	41.64	37.73	38.55	36.36	34.12	34.86	37.51	37.39	40.81	45.84	**40.55**	**41**	36
CR66	41.19	46.32	32.98	34.70	29.99	28.63	30.04	29.90	31.33	31.74	39.43	29.92	33.85	34	33
CR69	46.33	54.36	37.00	36.20		43.06	38.97	40.80	41.76	39.67	45.42	33.93	**41.59**	**42**	**42**
CR71	40.25	44.25	29.33	28.62											Site Discontinued
CR72	19.54	27.88	15.64	13.33	11.72	9.02	10.37	9.96	10.63	14.05	17.68	17.16	14.75	15	14
CR73	27.93	37.34	21.50	17.96	15.16	12.27	12.93	12.56	14.26	15.35	19.94	19.77	18.91	19	17
CR74	41.69	46.75	35.78	35.51	38.02	30.45	34.90	29.76	34.63	32.99	38.46	36.64	36.30	37	27
CR75	30.83	37.85	21.34	24.49	17.38	17.43	22.56	16.45	19.73	17.99	28.39	26.17	23.38	23	19
CR76	47.73	52.86	38.61	41.94	38.40	30.55	37.16	32.98	37.14		37.96	39.77	39.56	**40**	36
CR77	48.59	54.68	36.01	39.72	31.13	30.48	37.55	34.44	36.89	36.32	41.70	44.12	39.30	39	35
CR78	31.84	44.30	23.75	25.15	27.41		21.77	17.82	21.69	20.81	28.75	22.84	26.01	26	26
CR79	31.89	39.85	24.35	26.82	28.44	21.05	25.07	19.84	23.27	22.03	27.76	27.76	26.51	27	27
CR80	33.70	45.55	23.59	26.40	32.60	25.59	23.28	18.03	23.86	22.07	27.17	21.86	26.97	27	27
CR81	31.71	37.40	24.28	24.82	22.07	22.59	23.22	21.51	24.13	22.17	27.34	24.48	25.48	25	25
CR85						24.92	27.06	27.92	29.30	28.11	37.84	31.94	29.59	27[1]	31

CR86						22.47	21.57	22.18	23.99	24.78	31.97	30.85	25.40	22[1]	18
CR87						36.53	38.64	37.58	39.28	36.23	61.68	43.63	**41.94**	38[1]	33
CR88						19.55	19.40	16.54	19.21	21.02	25.41	19.61	20.10	18[1]	18
CR89						17.36	20.94	16.56	19.60	21.35	26.76	26.38	21.28	19[1]	19
CR90										25.95		24.84	25.39	25[2]	[2]New site - data reported as indicative only
CR91									35.93	38.10	41.64		38.56	39[2]	ditto
CR93											68.96	61.53	**65.25**	**65[2]**	ditto
CR 99	23.59	32.46	21.50	19.98	15.53	10.30	12.61	11.36	13.84	4.54	22.10		17.07	17	15

☒ **Local bias adjustment factor used**

☒ **Annualisation[1] has been conducted where data capture is <75%**

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

☒ **New site - data[2] capture reported as indicative only (full year's data will be available in next year's ASR)**

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

C.1: QA/QC Diffusion Tube Monitoring Data (NO_2)

All diffusion tube monitoring data has been ratified following the methods described in LAQM.TG(09) A quality assurance/quality control (QA/QC) programme including field duplicates and blanks and instrument calibration with standard gases has been followed (AEAT, 2000).

The NO_2 diffusion tube analysis was carried out and analysed by Gradko Environmental (part of Gradko International Ltd) .The QA/QC methodology for Gradko Environmental Ltd is given below:

Tube Preparation: The preparation of the tubes is done using 20% Triethanolamine / 80% Deionised Water. The preparation procedures adhere to the guidance detailed in the document 'Diffusion Tubes for Ambient NO2 Monitoring: Practical Guidance for Laboratories and Users', Issue 1a Feb.2008 (issued by AEA Energy and Environment).

Analysis Methods: Analysis of the NO_2 diffusion tubes is carried out using colorimetric techniques in accordance with Gradko International Ltd UKAS accredited (ISO/IEC 17025) internal laboratory procedures. The details in these procedures adhere to the DEFRA 'Diffusion Tubes for Ambient NO2 Monitoring: Practical Guidance for Laboratories and Users, Issue 1a Feb 2008', issued by AEA Energy and Environment.

Quality Control Procedures: All tube components are maintained in a high state of cleanliness. New absorbents are prepared by the Laboratory and checked for levels of contamination.

The diffusion tubes are prepared in a dedicated clean laboratory and stored under refrigerated conditions to maintain stability. A sample of each batch of tubes prepared is checked by the analyst for blank levels. If the tubes are stored for more than one week, a further sample is taken and checked for any increases in blank levels. If the levels reach a pre-determined value, the batch of tubes is discarded.

Method Calibration: A full five to seven (dependant on range of concentrations being measured) point calibration is carried out monthly using NIST certified nitrite standards. The linear graph acceptance is $r^2 = 0.999$. At the start of every batch of tubes analysed, two nitrite standards are run to check the accuracy of the calibration graph, this is repeated at the end of the analysis run. Statistical graphs are maintained using the plots of the daily standard results and the acceptance criteria achieved before an analysis run is made. An instrument calibration is run every two months using certified optical filters plus an annual preventative maintenance programme carried out by an external engineer is in operation.

Quality Assurance: The laboratory has a fully documented Quality Management System which has been assessed and accredited by UKAS (Accreditation No. 2187). A copy of the Quality Manual Contents Index is available on request.

Quality Control Procedures are supplemented by the use of external proficiency schemes such as W.A.S.P administered by Health and Safety Laboratories at Buxton and the NETCEN U.K. NO2 Field Inter-comparison project administered by National Physical Laboratories (NPL), Teddington.

C.2: NO_2 Diffusion Tube Precision, Accuracy and Bias Correction

Diffusion tube monitoring has inherent errors. In order to minimise these, a bias-adjustment factor is applied to the measurements to improve the accuracy of the results. This factor is obtained by co-locating three diffusion tubes at a continuous monitoring site.

The co-location study in Crawley is at the Gatwick East Site (CA2), where triplicate tubes (prepared and analysed by Gradko) are located next to the inlet of the chemiluminescence analyser. Using the results of this study, the average values from the monthly exposed tubes for a given year can be compared directly to the corresponding continuously monitored values; allowing the local authority to calculate the precision of their tubes as well as the bias.

Precision of the Crawley Co-location Site Diffusion Tubes: Precision is the ability of a measurement to be consistently reproduced; and the diffusion tube precision is therefore calculated by determining the coefficient of variation CV. Where the CV is <20% for 8 or more periods in a year, then the Tube Precision is considered to be "Good". Tube precision was calculated using the calculator tool (version 04) on the laqm review and assessment support website (www.airquality.co.uk/archive/laqm/tools.php). The results for the Crawley co-location study are shown in Table C.1 and C.2 below. Overall Precision was "Good"

Table C 2.1 2017 Precision Assessment of Triplicate Tubes (from calculator tool (version 04) on the LAQM Review and Assessment Support Website)

Site Name/ ID:	GATWICK EAST SITE (CA2)								
2017 Co-Location Diffusion Tubes Measurements									
Period	Start Date	End Date	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	01/01/2017	31/01/2017	27.7	33.8	34.3	32	3.7	11	9.1
2	01/02/2017	28/02/2017	42.0	41.4	42.1	42	0.4	1	0.9
3	01/03/2017	31/03/2017	29.2	26.1	26.9	27	1.6	6	4.0
4	01/04/2017	30/04/2017	27.2	25.6	24.0	26	1.6	6	4.0
5	01/05/2017	30/05/2017	23.7	24.3	26.0	25	1.2	5	3.0
6	01/06/2017	31/06/2017	22.0	22.1	21.7	22	0.2	1	0.5
7	01/07/2017	31/07/2017	23.8	25.2	25.4	25	0.8	3	2.1
8	01/08/2017	31/08/2017	23.4	22.5	22.9	23	0.4	2	1.1
9	01/09/2017	30/09/2017	26.7	25.5	27.1	26	0.8	3	2.1
10	01/10/2017	31/10/2017	26.4	27.8	26.6	27	0.7	3	1.8
11	01/11/2017	30/11/2017	31.7	28.4	32.8	31	2.3	7	5.7
12	01/12/2017	31/12/2017	33.1	29.6	32.1	32	1.8	6	4.4
13	01/01/2018	31/01/2018	33.1	29.6	32.1	32	1.8	6	4.4
Precision	**13 out of 13 periods have a CV smaller than 20%**								

Table C 2.2 2017 Co-location Overall Tube Precision and data Capture (from calculator tool (version 04) on the LAQM Review and Assessment Support Website)

2017 Automatic Monitoring Data (Gatwick East CA2)		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data Capture Check
39.35	81	Good	Good
33.88	100	Good	Good
24.28	100	Good	Good
26.78	100	Good	Good
21.05	100	Good	Good
20.19	100	Good	Good
19.95	94	Good	Good
24.45	100	Good	Good
27.2	100	Good	Good
26.03	100	Good	Good
36.88	100	Good	Good
40.82	100	Good	Good
28.96	94	Good	Good
Overall survey		**Good precision**	**Overall Good Data Capture**

Diffusion Tube Bias Adjustment Factors: Bias represents the overall tendency of the diffusion tubes to depart from the true value, ie to under or over-read relative to the reference method (chemiluminescence analyser). The bias can be corrected, using the appropriate bias correction factor, to improve the accuracy of the diffusion tube results. Local bias adjustment factors are obtained by co-locating three diffusion tubes at a continuous monitoring site in the local authority and national factors are derived from the mean value of a number of different local authority studies. The derivation of the National and Local bias adjustment factors are shown below. (Tables C.3 – C.6).

Local Bias Adjustment factor for Crawley: Crawley has a co-location study located at the Gatwick East Site (CA2). A local bias adjustment factor was calculated using data from triplicate tubes (prepared and analysed by Gradko) mounted next to the inlet of the analyser during 4-week periods throughout the year. The 2017 local bias correction for Crawley was calculated using the method described in LAQM.TG(09) Section 3 and the spread sheet tool provided in www.airquality.co.uk/archive/laqm/tools.php . The bias value (B) derived from the tube data *without* CV > 20% was used to calculate the locally derived bias adjustment factor for Crawley (following the method in foot note 4 on this web-page).

Table C 2.3: Bias and Accuracy - Calculated without periods with CV > 20% (with 95% confidence interval)	
Bias calculated using 13 periods of data Bias factor A Bias B	 1 (0.92 – 1.11) 0% (-10% - 9%)
Diffusion Tube Means Mean CV (Precision)	28 µg/m^3 5
Automatic Mean Data capture for periods used	28 µg/m^3 98%
Adjusted Tubes Mean	30(26-31) µg/m^3

Table C 2.4: Bias and Accuracy - Calculated with all data including periods with CV > 20% (with 95% confidence interval)	
Bias calculated using 13 periods of data Bias factor A Bias B	 1 (0.92 – 1.11) 0% (-10% - 9%)
Diffusion Tube Means Mean CV (Precision)	28 µg/m^3 5
Automatic Mean Data capture for periods used	28 µg/m^3 98%
Adjusted Tubes Mean	38(26-31) µg/m^3

Table C 2.5 Local Bias Correction Factor for NO_2 diffusion Tube from 2017 Co-location Data Following foot note [4] of the Precision and Accuracy calculator tool LAQM Helpdesk Website (version 03/16)	
Bias (B) value	**= 0%**
Bias value expressed as a factor	**= 0.00**
Bias value, expressed as a factor + 1	**= 0.00 + 1 = 1**
The inverse of 1.0 = The Bias Adjustment Factor	**= 1/1**
2017 Local Bias Correction Factor for Crawley	**= 1.0**

National Bias Adjustment Factor: Data from co-location studies are used to calculate the Bias Adjustment Factor. Not all local authorities carry out their own co-location studies, therefore Defra collates the UK co-location study results, and from these calculated the mean value for each laboratory, to provide a national bias adjustment value for the users of each laboratory. The National Bias Adjustment Factor (Gradko) is shown below.

Table C 2.6 National Bias Correction Factor for 2017 NO_2 diffusion Tube data from Gradko Co-location Studies. The full spread sheet data for all 34 studies can be view at the LAQM Review and Assessment Support Website http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html)	
2017 National Bias Adjustment Factor (Gradko 34 Studies)	**0.89**

Choice of Factor for Bias Adjustment: The annual mean NO_2 for the triplicate co-located tubes was the same value as the annual mean NO_2 measured at the automatic analyser for the CA2 Gatwick site in 2017. This was reflected in the locally derived bias adjustment figure of 1.0, indicating a very good correlation in the tube data relative to the reference method (chemiluminescence analyser), over the data capture period. The national bias adjustment value for 2017 was 0.89, which also showed good correlation and was based on a large number of studies (34).

In deciding which Bias adjustment value to use, the following factors were taken into account in accordance to the guidance in TG (16):

Box 7.11 advises that: **"**If the co-location site is unusual in some way: for example, affected by specific large NOX sources other than road traffic, such as local industrial installations, this is a strong indication in favour of using a locally-derived factor"

The co-location site is situated on the eastern boundary of the Gatwick Airport and therefore affected by NOX sources from the Airport. The site is only 60m from the nearest residential property, and there are many other residential properties within 1000m of the airport. Determining relevant exposure within 1km of the airport boundary is one of the assessment criteria required for authorities with a major airport within their boundary. This would therefore favour using the locally derived factor.

However, in paragraph 7.197 the guidance says that: “care should be taken to avoid applying a bias adjustment factor derived from a local co-location study carried out for concentrations that are very different to those being measured in the wider survey”

Although the effect of the airport as an area source should be considered it may be less of an influence at roadside locations where traffic sources will be the major consideration. At these locations the nationally derived factor may be more relevant.

It was considered that using two factors within the report was not appropriate. After consulting the laqm helpdesk and given that the precision and accuracy of the local co-location study was very good (AEA precision and accuracy spreadsheet v04), it was decided to use the more conservative locally derived bias factor of 1.0. Consequently all conclusions and recommendations made in this report were based on monitoring results adjusted with the 2017 bias adjustment figure of 1.0.

C.3: Annualising NO_2 Diffusion Tube Monitoring Data (where data capture is < 9 months)

Where data capture is below 75%, it is necessary to annualise the data as described in Box 7.9 of the LAQM Technical Guidance TG (16). The reason for annualisation is that the concentration varies throughout the year, and the instrument may have been operational for a period of above or below average concentrations.

For those sites with fewer than 9 months' worth of data, it is necessary to perform annualisation. This was undertaken for five sites (CR85, 86, 87, 88 and 89) using the technique discussed in Box 7.9.

Methodology:

- Data was available for 7 full calendar months from June – December 2017.
- The measured mean concentration **M** for this period was calculated.
- Two nearby, long-term, continuous monitoring sites: Gatwick East (CA2) and Poles Lane (RG3), with ≥ 85% data capture were identified.
- Annual means, $\mathbf{A_m}$, for 2017 were calculated for these sites (CA2 and RG3)
- Period means, $\mathbf{P_m}$, were calculated for the period of interest, (June - Dec)
- The ratio, **R**, of the annual mean to the period mean ($\mathbf{A_m/P_m}$) for each of the sites was calculated
- The average of these ratios, $\mathbf{R_a}$ was calculated. This is then the annualisation factor.
- The measured period mean concentration **M** multiplied by this annualisation factor $\mathbf{R_a}$ to give the estimate of the annual mean for 2017.

Table C 3.1 Annualising Diffusion Tube Monitoring data where data capture <9 months

Background Site	Annual Mean 2017 (A_m)	Period Mean 2017 (P_m)	Ratio (A_m/P_m)
Gatwick East, Crawley (CA2))	28	28	28/28= 1.0
Poles Lane, Crawley (RG3)	14	11	11/14 =0.79
		Average (R_a)	0.895

The estimated annualised mean for the five sites with less than 9 months of data was calculated using the annualized factor R_a. The results are given in Table C.8 below

Table C 3.2 Estimated Annualised Mean NO_2 Diffusion Tube Data 2016

Site	Measured Period Mean M	Annualisation Factor (Ra)	Estimated Annual Mean
CR85	30	0.895	**26.85**
CR86	25	0.895	**22.375**
CR87	42	0.895	**37.59**
CR88	20	0.895	**17.9**
CR89	21	0.895	**18.795**

C.4: Fall off with Distance Calculator for NO_2 Annual Mean

This calculation allows the prediction of annual mean NO_2 concentration for a location "receptor" that is close to a monitoring site, but further from the road than the monitor. Often, for practical reasons, the monitoring site is not located at the façade of the receptor property. Where concentrations are measured closer to the source than the receptor, a fall off with distance calculation is used to check if measured concentrations are representative of exposure.

Where measurements have been carried out at the receptor/façade no fall-off calculation is necessary since the measurement is already representative of relevant public exposure.

Tables C4.1- C4.20 show the results of the adjusted concentrations. These fall-off concentrations are reported in Table B.1

Table C 4.1: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 3 – Birch Lea (528438,138392)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	0.5	7.35	20	22	**21**

Table C 4.2: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 4 – Headley Close (529864, 138204)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	0.5	14.8	18	23	**20**

Table C 4.3: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 52 – Gatwick East Schlumberger Hse (529417,141496)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	27	50	21	28	**25**

Table C 4.4: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 53 – Gatwick East Schlumberger Hse (529417,141496)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	27	50	21	28	**25**

Table C 4.5: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 54 – Gatwick East Schlumberger Hse (529417,141496)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	27	50	21	28	**26**

Table C 4.6: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 55 - 11Tinsley Close (Fence) (528446 138085)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	5.7	6.67	20	**41**	**40**

Table C 4.7: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 60 – Peglar Way (526740, 136934)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	2.31	8.8	215	**35**	**29**

Table C 4.8: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 63 – Woodfield Lodge, Hazelwick Roundabout (528153, 137912)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	7.4	37.4	26	**52**	**38**

Table C 4.9: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 64 - Woodfield Lodge, Northgate Avenue (528153, 137871)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	3.8	13.8	26	**41**	36

Table C 4.10: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 66 – Brighton Road Level Crossing (526743,136346)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	1.2	1.7	15	34	33

Table C 4.11: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 72 - Burlands (525530, 138472)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	1.3	8	12	15	14

Table C 4.12: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 73 – Cherry Lane (526285, 138495)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	3.8	13.8	14	19	17

Table C 4.13: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 74 – Radford Road, Tinsley Green (528978, 139599)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	0.5	11.9	19	37	27

Table C 4.14: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 75 – Steers Lane (529335, 139589)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	2	20.6	16	23	19

Table C 4.15: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 76 - Hazelwick Ave slip road, (528303, 137800)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	4.96	12	26	**40**	36

Table C 4.16: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 77 - Hazelwick Ave The Bays, (528362, 137812)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	2.3	8.77	26	39	35

Table C 4.17: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 85 – Tinsley Lane Flats, (528286, 138019)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	32	15	20	27	31

Table C 4.18: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 86 – The Boulevard, Flats, (526876, 136819)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	0.5	13.8	15	22	18

Table C 4.19: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 87 - The Broadway bus shelter, (526908, 136754)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	0.5	1.7	15	38	33

Table C 4.20: Fall off with Distance Adjustment for NO_2 Annual Mean					
Site with potential for Exceedance	**CR 99 - Furnace Farm Rd , (528397, 135579)**				
Year	**Distance of Monitoring Site from Receptor**		**Local Annual Mean Background Concentration ($\mu g/m^3$)**	**Measured Annual Mean NO_2 at Mon Site (bias adjusted) C_Y ($\mu g/m^3$)**	**Estimated Annual Mean NO_2 at Receptor (adjusted for fall off with distance)**
	Dist (m) Mon Site to Kerb D_Y	**Dist (m) Receptor to Kerb D_Z**			
2017	1.5	13.6	12	17	15

C.5: Adjustment of PM_{10} Monitoring Data Using Volatile Correction Model (VCM)

For the TEOM data the Volatile Correction Model (VCM) was used to adjust the data for the gravimetric equivalent concentration. VCM corrected data for the Gatwick East data is shown in Table C5.1 below.

Table C 5.1: Gatwick East PM_{10} Monitoring Adjustment using Volatile Correction Model (VCM) (from Kings College London ERG vcm web portal)

Local Measurement Data for VCM correction		**2017 Measured Data**	
Site	Gatwick East, Crawley	TEOM Annual Mean PM_{10} (uncorrected) $\mu g/m^3$	14.88
Year	2017 (1/01/17-31/12/17)		
Timescale	Daily Mean		
Monitor	TEOM		
EPA Constant A	3		
EPA Constant B	1.03		
Instrument Temp ^oC	25		
Instrument Pressure mbar	1013		
Reports to local ambient readings	No	No of exceedances of the 50µg/m^3in Daily Mean in 2017	0
Pressure Site	Reigate and Banstead – Horley (RG1)	VCM Corrected Annual Mean PM_{10} $\mu g/m^3$	18.15
Temperature Site	Horley		
FDMS Sites	1. Reigate and Banstead (RG5) 2. Greenwich - Blackheath (GR7) 3. Average of remaining sites*. * Correction includes unratified data		

C.6: Estimating $PM_{2.5}$ Concentrations from Nationally Derived Correction Ratio - TG (16) Method

Where no appropriate local sites measuring both PM10 and PM2.5 are available, then it may not be possible to use a locally derived ratio. In this situation, a nationally derived correction ratio of 0.7 can be used.

This factor was calculated as the average of all ratios of PM2.5/PM10 found for years 2010 to 2014 for forty sites within the AURN where both PM10 and PM2.5 are measured on an hourly basis.

Crawley 2017 Annual Average PM_{10} (CA2 site Gatwick East) = 14.875 µg/m^3 (VCM)
$PM_{2.5}$ = 14.875 x 0.7µg/m^3

$PM_{2.5}$ = 10.4µg/m^3.

C.7: New Pollution Sources and New Developments

There are a number of significant ongoing new developments within the borough which may cumulatively contribute to pollution sources in the area. These include:

- Manor Royal Business District: major redevelopment works, including Former BOC Edwards site, Manor Royal (Jaguar Land Rover), expansion of the Elekta site, Land off London Road and Fleming Way and the Eezehaul distribution unit, The Drive. Manor Royal Business District is adjacent to the Hazelwick AQMA

- Forgewood Residential neighbourhood: Ongoing development of new neighbourhood, including 2000 new residential units, local shops, amenities, community centre, school and realignment of surrounding roads. The Forgewood development is adjacent to the Hazelwick AQMA. It was decided on planning appeal before the AQMA was designated. The development is still in the building phase (Phase 1 of 4 has been completed), but the full impact of the development won't be known until fully operational.

- Crawley Growth Programme: £60m investment programme (public and private) to deliver infrastructure improvements and growth/regeneration to sites in the town centre and Manor Royal business district, including: delivery of 11,300m^2 office/industrial space at the Nova site London Road, 1,000 new homes in

Crawley town centre by 2030, new Crawley railway station and sustainable transport infrastructure (bus, cycle routes and pedestrian walkways)

All new developments are examined through the planning system and where necessary air quality assessments and mitigation are required in order to offset the impacts of existing and new sources of pollution on future residents.

In addition, diffusion tube monitoring within the AQMA and surrounding areas will measure the effects of new developments and new pollution sources, allowing the council to identify pollution hotspots and assess long term trends. These results are reported annually through the LAQM process.

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

Fig D.1 Hazelwick AQMA

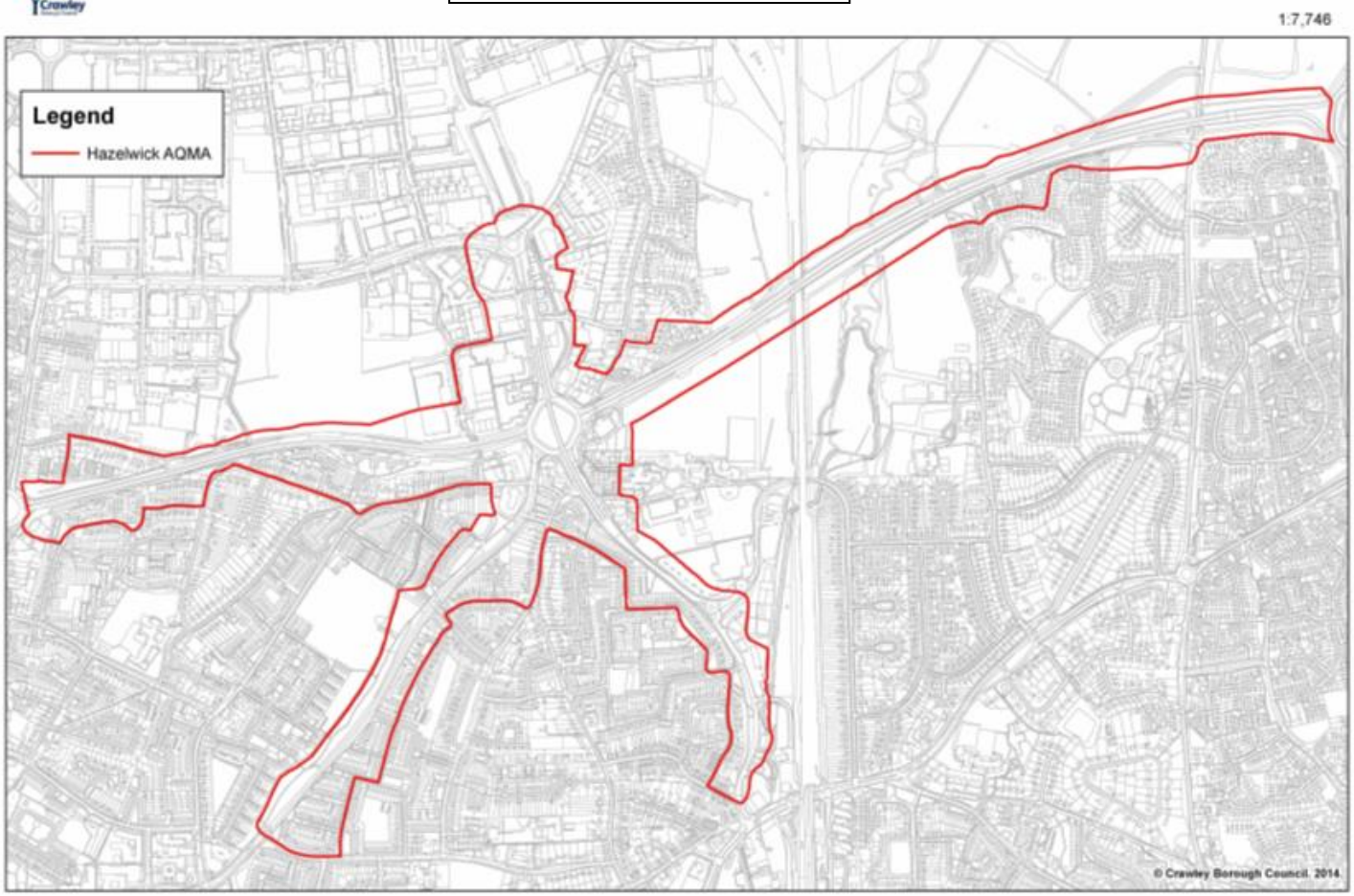


Fig D.2 2017 Diffusion Tube Monitoring Site Crawley Borough Council

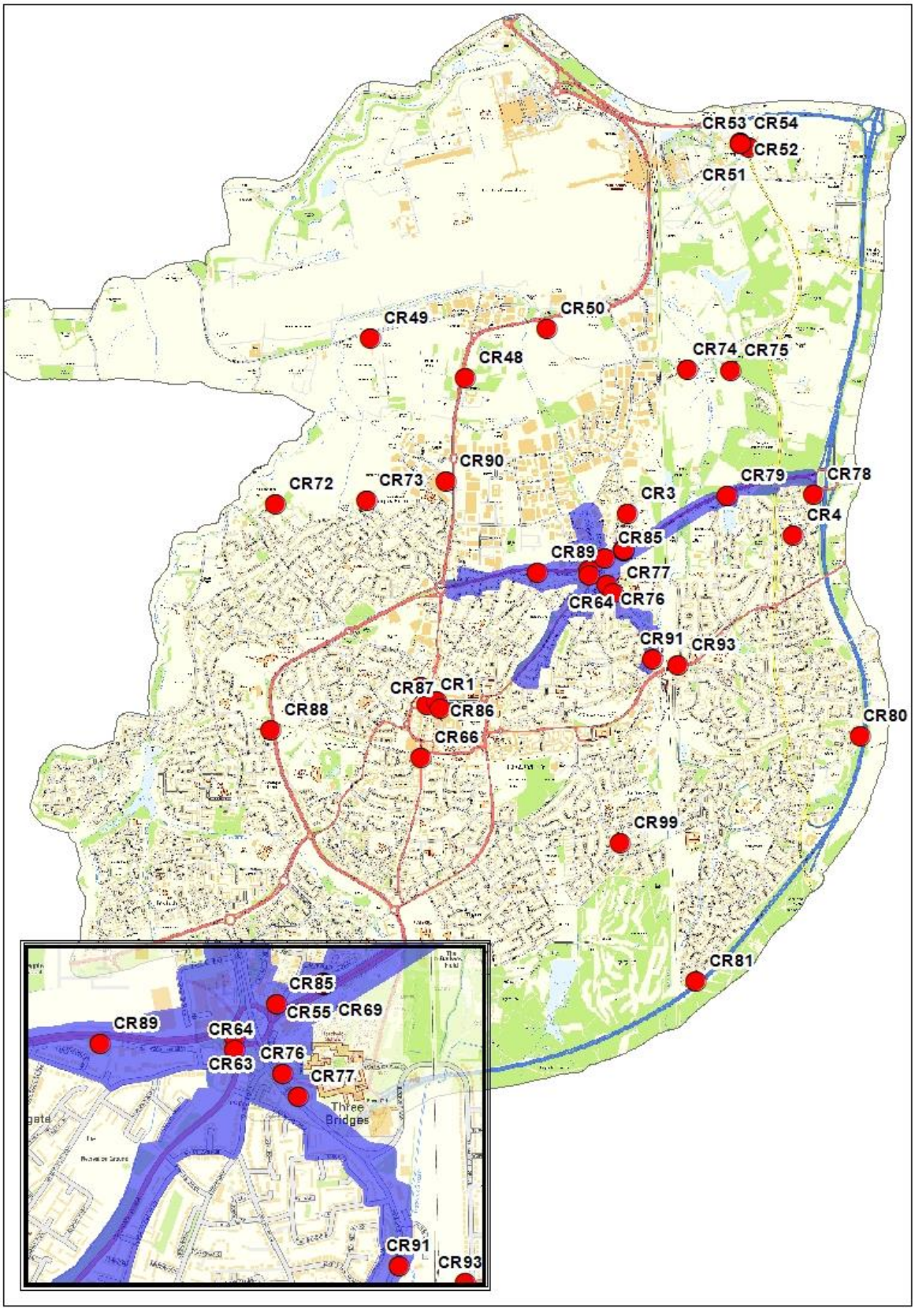


Fig D.3 Monitoring Sites in Hazelwick AQMA

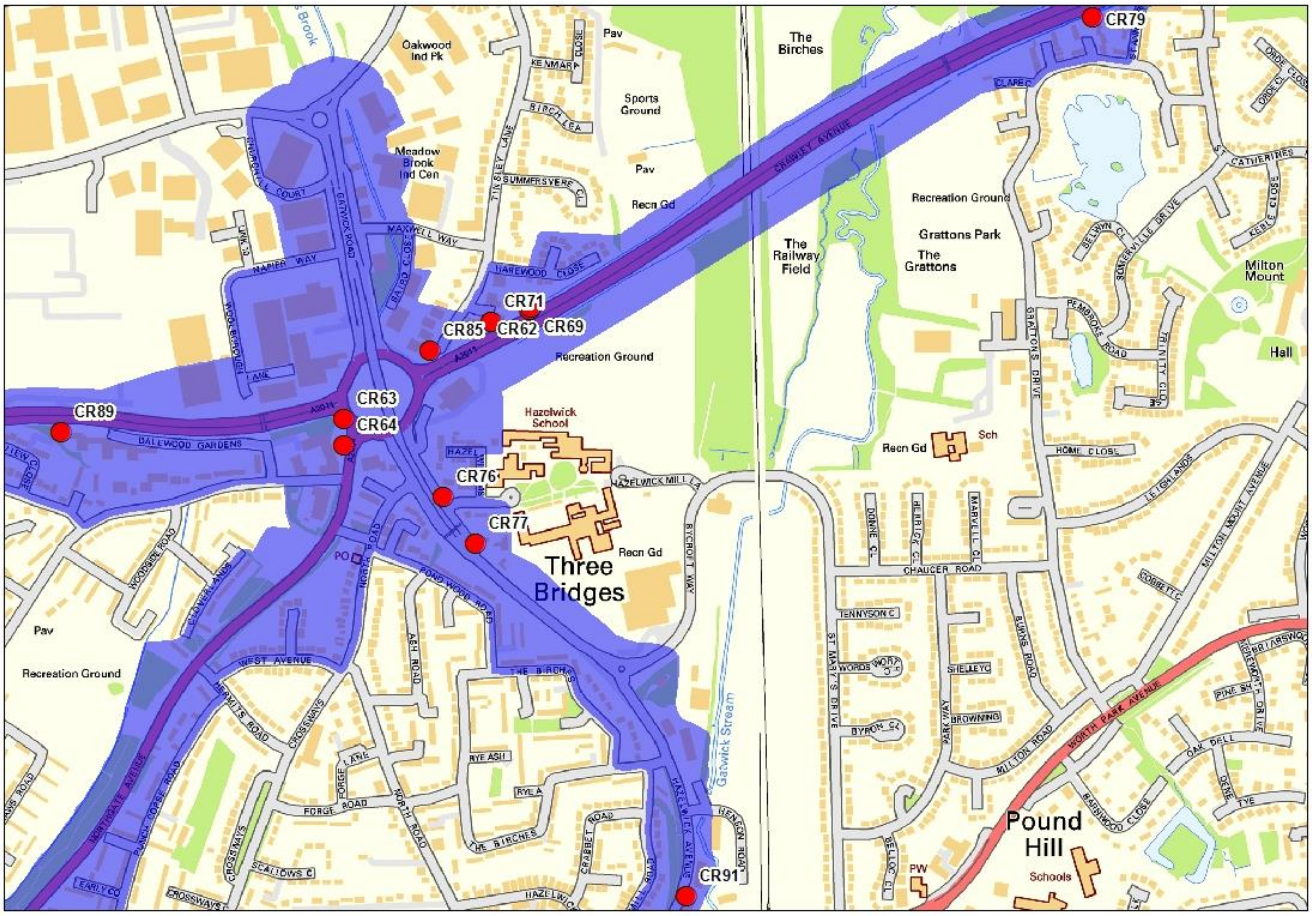
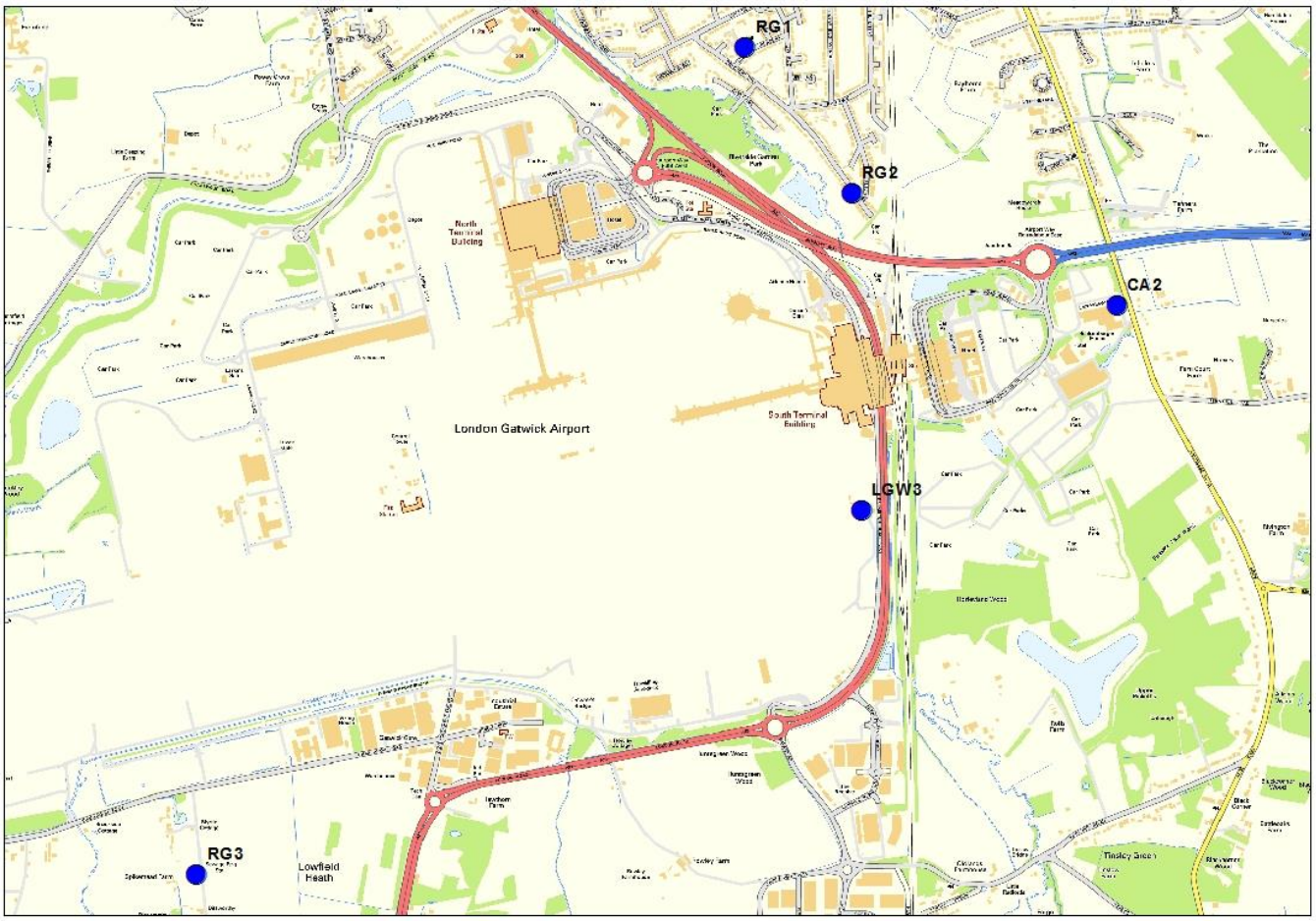


Fig D.4 Automatic Monitoring Sites - Gatwick Airport



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 micrograms 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
CBC	Crawley Borough Council

References

Local Air Quality Management Technical Guidance 2016 - LAQM.TG(16)

Sussex Air Quality Emissions Mitigation Guidance 2013

Crawley Borough Council Local Plan 2015

Crawley Growth Programme 2016

Crawley Town Centre Regeneration Programme 2016

National bias adjustment factor spreadsheet:
http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Tube precision spreadsheet:
www.airquality.co.uk/archive/laqm/tools/AEA_DifTPAB_v03.xls

Volatile Correction Model website:

http://www.volatile-correction-model.info/

Air Quality Consultants: Nitrogen Dioxide Distance from Road Calculator (Issue 4)