LOCAL AIR QUALITY MANAGEMENT

DETAILED ASSESSMENT OF AIR QUALITY

Part IV of the Environment Act 1995

2007

Prepared by:

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with assistance from the

Sussex Air Quality Partnership

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SUMMARY

Part IV of the Environment Act 1995 requires local authorities to periodically review & assess the current and likely future air quality within their area. This is a long-term, ongoing process aimed at identifying where there is a risk that the Air Quality Objectives may be exceeded and if so the extent of that exceedence. Where the prescribed objectives are not likely to be met, an Air Quality Management Areas (AQMA) must be designated. This applies only to those non-occupational locations where members of the public might reasonably be exposed for the relevant period.

The 2006 Updating and Screening Assessment for Crawley identified Gatwick Airport as having the potential to exceed the Air Quality objectives for NO_2 and PM_{10}. A Detailed Assessment was undertaken for areas of relevant public exposure within 500m of the perimeter of Gatwick Airport, representing the most sensitive receptors.

For the previous DA (2004) BAA Gatwick produced dispersion modelling reports for PM_{10} and NO_2 at the airport. However, due to their commitments to the Heathrow Project no modelling was undertaken for 2006 at Gatwick. As a result, no assessment based on predictive modelling was presented in the 2007 Detailed Assessment.

In the absence of any modelled predictions for air quality at Gatwick, the Detailed Assessment was undertaken relying solely on monitoring data to identify the likelihood of the NO_2 and PM_{10} AQ objectives being exceeded at locations of relevant public exposure. The approach was precautionary with monitoring being carried out at locations of the most sensitive receptors within 500m of the airport perimeter. The results of the detailed assessment can therefore be considered as worst case.

Monitoring results were assessed and projected forward to estimate concentrations for 2010. The projected monitoring data represents the best possible estimates, but uncertainties in the results arising from intrinsic margins of error may lead to over or under-predictions. In an attempt to provide an additional level of confidence in the results, the 2010 predictions were compared and assessed against airport air quality trends to see if they followed expected improvements or decline in air quality concentrations.

The detailed assessment of NO_2 and PM_{10} at Gatwick Airport concluded that there was no exceedences of the annual average AQ objectives in 2006 and none were estimated for 2010 at the locations of relevant public exposure for the most sensitive receptors within 500m of the Airport perimeter.

The indicator level at which a 1-hour NO_2 exceedence may occur is estimated to be 60µg/m^3 annual mean (Laxen and Marner, July 2003). No exceedences of this level were measured at locations of relevant public exposure within 1000m of the airport perimeter for 2006.

The review of the monitoring data highlighted two sites where projected 2010 NO_2 concentrations were approaching the AQ objective. These were: Bar Med in Crawley High Street and Tinsley Close, adjacent to the A2001 dual carriage way.

The Bar Med location is a roadside site on the High Street adjacent to commercial premises. The 2006 and projected 2010 annual averages for this site were not at the

60µg/m^3 level (indicator for potential to exceed the 1 hour mean NO_2 objective). It was therefore concluded that there would be no relevant public exposure for annual mean or hourly average mean NO_2.

The Tinsley Close site, representing the most sensitive receptor on the A2011, Crawley Avenue, was identified as requiring a detailed assessment by the 2003 USA. The 2004 Detailed Assessment modelled the NO_2 concentrations for compliance with the AQ objective and found no exceedence of the 40µg/m^3 objective and therefore no relevant public exposure.

As there had been no evidence of significant change in traffic flows or speeds since the 2004 Assessment this location was not identified as requiring a detailed assessment in 2007. However, the 2010 projected NO_2 concentrations were estimated to be approaching the 40µg/m^3 annual average objective and it was therefore recommended that this site should be kept under review and continue to be monitored for compliance with the AQ objectives.

Conclusions and Recommendations

The detailed assessment of NO_2 and PM_{10} monitoring data, at relevant locations for the most sensitive receptors, for Gatwick Airport concluded that:

- The Air Quality Objectives for both NO_2 and PM_{10} were being met at Gatwick Airport in 2006 and are unlikely to be exceeded in 2010.

- There was no evidence of relevant public exposure within 500m of the Airport perimeter and therefore no justification, at this time, for Crawley Borough Council to declare an Air Quality Management Areas for NO_2 or PM_{10} at Gatwick Airport.

- There was evidence for potential exceedences of the AQ objective for annual mean NO_2 at the Tinsley Close site, which represents the most sensitive receptor on the A2011, Crawley Avenue. It was recommended that this site should be kept under review for compliance.

- The report recommended that monitoring for PM_{10} should continue at Gatwick even when the current AQ standards are being met. This was so that trends in particulates can be examined in line with the Government's aim to reduce public exposure to particulate matter in the long term.

- The report Recommended that the Gatwick Airport and Tinsley Close locations, should continue to be monitored and where it appears further detailed modelling and monitoring is necessary these will be undertaken during the next round of review and assessment.

- The Council will produce its Progress Report in 2008 detailing those matters which may have changed during the year and which may require further assessment

GLOSSARY

AADT	Annual Average Daily Traffic (vehicles per day)
AEOLIUSQ	Screening model for street canyons (Met Office)
APEG	Airborne Particles Expert Group
AQMA	Air Quality Management Area
AQO	Air Quality Objective (UK limit levels for pollutants)
AURN	Automatic Urban and Rural (air quality monitoring) Network
COMEAP	Committee on the Medical Effects of Air Pollutants
DA	Detailed Assessment
DEFRA	Department for Environment Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges Screening Model
HDV	Heavy Duty Vehicles
LAQM	Local Air Quality Management
LGW R2	London Gatwick Runway 2
LHR R3	London Heathrow Runway 3
mg/m^3	Milligrams of the pollutant per cubic meter of air
$\mu g/m^3$	Micrograms of the pollutant per cubic meter of air
ppb	Parts per billion
ppm	Parts per million
NAEI	National Atmospheric Emissions Inventory
NAQS	National Air Quality Strategy
NO	Nitrogen monoxide
NO_2	Nitrogen dioxide
PM_{10}	Particles with diameter less than 10µm
QA/QC	Quality Assurance / Quality Control
R&A	Review and Assessment
SAQSG	Sussex Air Quality Steering Group
TEOM	Tapered Element Oscillating Microbalance
USA	Updating and Screening Assessment
UWE	University of West England
Vpd	Vehicles per day
WSCC	West Sussex County Council

1. INTRODUCTION

Under the Environment Act 1995, local authorities are required to review and assess air quality on a regular basis. A review of air quality means a consideration of the levels of pollutants in the air for which objectives are prescribed in Regulations, and estimations of likely future levels. An assessment of air quality is the consideration of whether estimated levels for the relevant future period are likely to exceed the levels set in the objectives.

The first round of review and assessments was completed in July 2000. The conclusion was that the National Air Quality Objectives were not likely to be exceeded in Crawley. This first round constituted a bench mark against which the Council could measure future progress in making improvements to the local air quality.

Guidance issued by the Department for Environment, Food and Rural Affairs (DEFRA) in 2003 required local authorities, who found exceedences of the air quality objectives in their Updating & Screening Assessment (USA) to undertake a Detailed Assessment in the following year. The 2006 USA indicated that London Gatwick Airport, whilst not exceeding the current objective, was found to fulfil the criteria for potential exceedences of PM_{10} and NO_2 in future years, and concluded that this location should be taken forward for a detailed assessment in 2007.

This report represents the detailed assessment for Gatwick Airport for the pollutants NO_2 and PM_{10}. The detailed assessment is intended to identify with reasonable clarity whether or not an exceedence will occur. The assessment is intended to be sufficiently detailed to determine both the magnitude and the geographical extent of an exceedence. Where the prescribed objectives are not likely to be met, an Air Quality Management Areas (AQMA) must be designated. This applies only to those non-occupational locations where members of the public might reasonably be exposed for the relevant period.

2. NATIONAL AIR QUALITY OBJECTIVES

The air quality objectives, below, set out in the Air Quality Regulations, provide the statutory basis for the system of Local Air Quality Management (LAQM). For each objective, local authorities have to consider present and likely future air quality, and assess whether the objectives are likely to be achieved in time.

Table 1 National Air Quality Objectives [LAQM TG(03)]

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	5 µg/m^3	Annual mean	31.12.2010
1,3 Butadiene	2.25 µg/m^3	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Maximum daily running 8-hour mean	31.12.2003
Lead	0.25 µg/m^3	Annual mean	31.12.2008
Nitrogen dioxide	200 µg/m^3 not to be exceeded more than 18 times a year	1 hour mean	31.12.2005
	40 µg/m^3	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 µg/m^3 not to be exceeded more than 35 times a year	24 hour mean	31.12.2004
	40 µg/m^3	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m^3 not to be exceeded more than 24 times a year	1 hour mean	31.12.2004
	125 µg/m^3 not to be exceeded more than 3 times a year	24 hour mean	31.12.2004
	266 µg/m^3 not to be exceeded more than 35 times a year	15 minute mean	31.12.2005

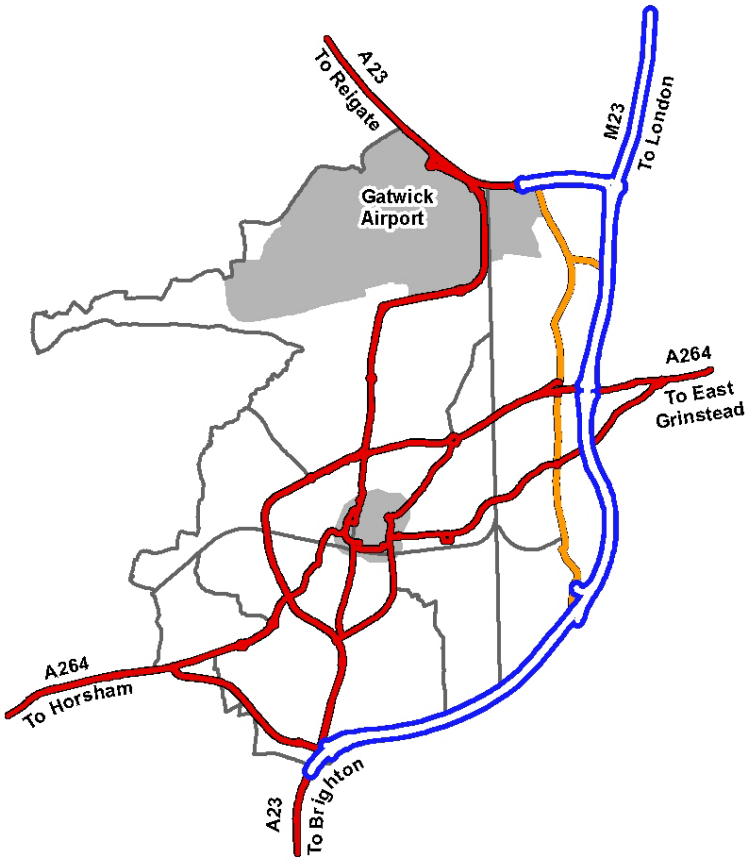
3. INFORMATION ABOUT THE CRAWLEY AREA

Crawley is situated in the north eastern part of the county of West Sussex, mainly urban in character, covering approximately 4500 hectares, it is surrounded by countryside and has excellent transport links, being adjacent to the M23 and close to the M25 motorways, as well as having good railway services to London and the south coast. Gatwick Airport, one of the world's busiest international airports is located at the northern edge of the Borough.

Since its designation as a New Town in 1947, Crawley's growth has been rapid. In 1951, the population was approximately 10,000; by 1961 it had increased to amount 54,000. At the last national census (2001), the population was 99,744, with 40,382 households, representing a population density of 22.2 persons per hectare. Around 80% of households have at least one car.

The major employment areas within the borough remain Airport related industries, Hotel, Retail and Leisure, the Business/Professional sectors and Advanced Manufacturing.

Fig 1: Map of Crawley Borough Council



3.1 Industrial Sources of Air Pollution

Industrial sources of air pollution are currently controlled under the Environmental Protection Act 1990, and are classified into either Part A (large industries such as power stations and chemical works) or Part B/A2 processes (such as crematoria, petrol stations, cement works, etc.) for guidance and control. Part A processes fall under the jurisdiction of the Environment Agency, whilst control of Part B/A2 processes is a duty carried out by local authorities. Those small industrial processes that fall outside of Part B/A2 Process control are also of concern and are regulated using other parts of the Act, such as Statutory Nuisance, or other primary legislation, such as the Clean Air Act 1993.

There are currently two new Part A industries in Crawley permitted by the Environment Agency, which were not registered at the time of the previous Detailed Assessment in 2004. These are:

- Gatwick Airport Limited was granted a permit in December 2006 for the operation of a Power Station. This does not necessarily reflect a change in size or the addition of a new installation. It is a result of the new PPC regime, which does not distinguish between boilers, turbines etc as did the old IPC regime, so that adding all the appliances together has brought the total of combustion appliances to >50 MW triggering the requirement to be regulated under Part A(1) (combustion activity).

- EDF Energy Networks Ltd has applied for a Part A permit for the Storage of Electrical Transformer Oil at its Grid Substation Site in the Three Bridges area of Crawley. The application was submitted in April 2007 and has not yet been determined by the Environment Agency.

Lists of Part A/A(1), Part B/A2 and other processes of potential concern from within the Borough or from neighbouring areas are given in Appendix 4. Any significant or new changes to these sources of emissions are referred to in the relevant pollutant section. A survey of neighbouring authorities has confirmed that there are no new or significantly changed sources which could affect air quality in Crawley.

3.2 Transport and Road Traffic

Details of road traffic movements in Borough are collected by West Sussex County Council. Recent traffic data is shown in Appendix 3. Each District in the County has its own growth factor which can be used to convert traffic flows into predicted future flows, assuming that there is no local development nearby likely to increase traffic flows before this date. All councils within the County have been advised to use the high growth factor, which represents the worst case figure.

The technical guidance requires the review and assessment process to consider details of roads with more than 80,000 vehicles per day (a possible significant source of carbon monoxide and benzene) and busy streets or junctions with more than 10,000 vehicles per day or high flow of buses/HGVs (a possible significant source of NO_2 and PM_{10}). Those road sections that fall into the above categories are listed in Appendix 2 and highlighted on the Borough map in Fig.1

3.3 Other Significant Sources of Air Pollution

Gatwick Airport is a source of a range of pollutants from aircraft engines and the many tens of thousands of vehicles (cars, taxis, buses, servicing vehicles, freight lorries etc.) travelling within as well as to and from the airport each day. The main pollutants of concern from the airport are nitrogen dioxide and particulate matter.

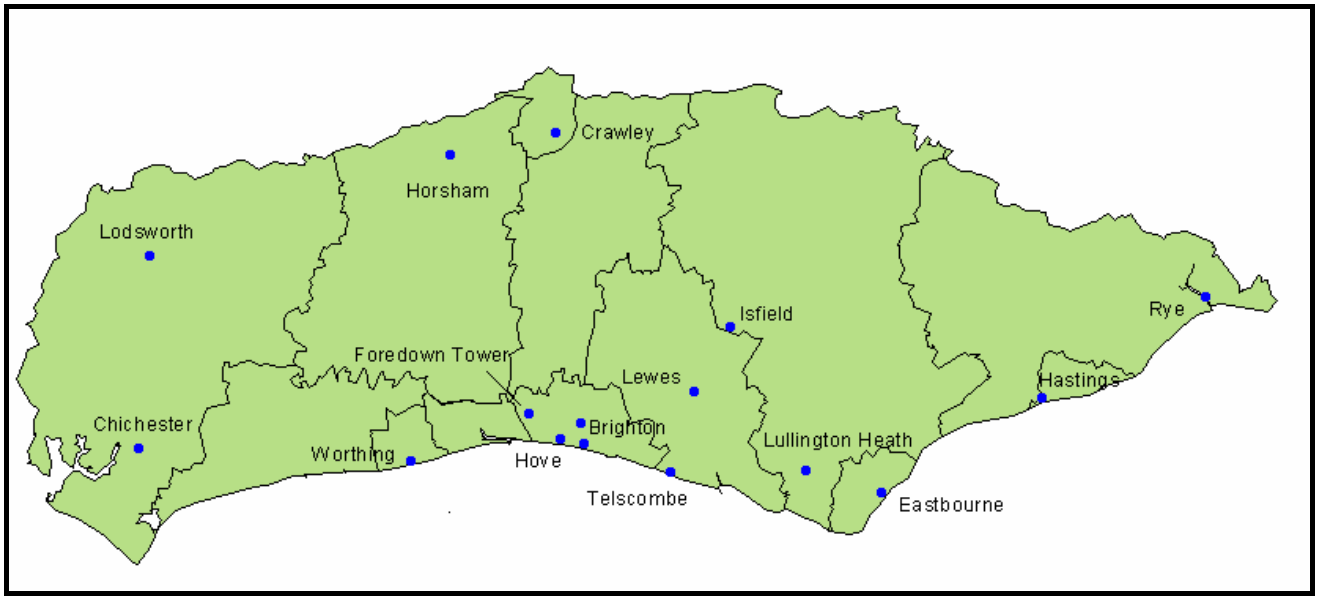
Information from modelling studies indicates that much of the emissions from aircraft taking off or landing at Gatwick are dispersed in the general atmosphere of the region and emissions from ground based sources are diluted by the time they reach the airport boundary. However, exceedences of the air quality objectives have been measured in Horley, which adjoins the airport along its northern boundary. Consequently, Reigate and Banstead Borough Council, has declared an Air Quality Management Area in that area.

Crawley's 2004 review and assessment concluded that the public in Crawley would not be exposed to pollutants above the air quality objectives. This is mainly due to the prevailing wind direction taking pollutants away from the Borough into neighbouring Horely, and the distance from the airport boundary of residential properties in Crawley which ensures adequate dilution has occurred to reduce the risk of air quality exceedences at the façade of the dwelling.

3.4 Air Quality Monitoring in Crawley and Across Sussex

Crawley Borough Council is a member of the Sussex Air Quality Partnership, which benefits from the co-ordinated monitoring of air pollutants across the region. The group has access to monitoring stations and is able to make comparative and comprehensive assessments for the different pollutants required under LAQM. The Sussex Air Quality Network is managed and co-ordinated by Kings College London ERG who provide data calibration and ratification of results. The map of air quality stations is shown below:

Fig 2: Sussex Air Quality Network (Jan. 2007)



The Sussex Air Quality Network is comprised of local authority air quality monitoring stations and has integrated data from national air quality stations (AURN - Lullington Heath, Brighton). The main pollutants monitored with automatic analysers are shown in Table 2 below:

Table 2 Sussex Air Quality Monitoring Network				
LA	POLLUTANTS	LOCATION	CLASSIFICA	TYPE
Brighton CC/AURN	CO, NOX, O3 , PM10	Brighton Pavilion	Roadside	Urban
Brighton CC/AURN	CO, NOX, O3 , PAH	Hove Roadside	Roadside	Urban
Brighton CC	O3	Foredown Tower	Background	Urban
Crawley B.C.	NOx	East Gatwick	Background	Urban
Eastbourne B.C.	PM10, NOx, O3	Devonshire Park	Roadside	Urban
Lewes D.C.	PM10, NOx, O3,	Telscombe Cliffs	Roadside	Sub-urban
Lewes	PM10, NOx	Lewes Town Centre	Roadside	Urban
Rother D.C.	O3	Rye Harbour	Background	Rural
Hastings B.C.	PM10, NOx, O3	Hastings/Bexhill (A259)	Roadside	Urban
Chichester D.C.	PM10, NOx,O3	A27 Ring Road	Roadside	Urban
Chichester D.C.	O3	Lodsworth(ARMO)	Background	Rural
Horsham D.C.	PM10, NOx, WDir, WSp	Horsham centre	Background	Sub-urban
Worthing B.C.	NOx	High St, Worthing	Roadside	Urban
Wealden D.C.	O3	Isfield (ARMO)	Background	Rural
E&W Sussex County C.	PM10, NOx,O3, CO	Mobile unit	Mobile	Mobile
National - AURN	NOx, O3	Preston Park, Brighton	Background	Urban
National - AURN	NOx, O3, SO2	Lullington Heath, Wealden	Background	Rural

Key:

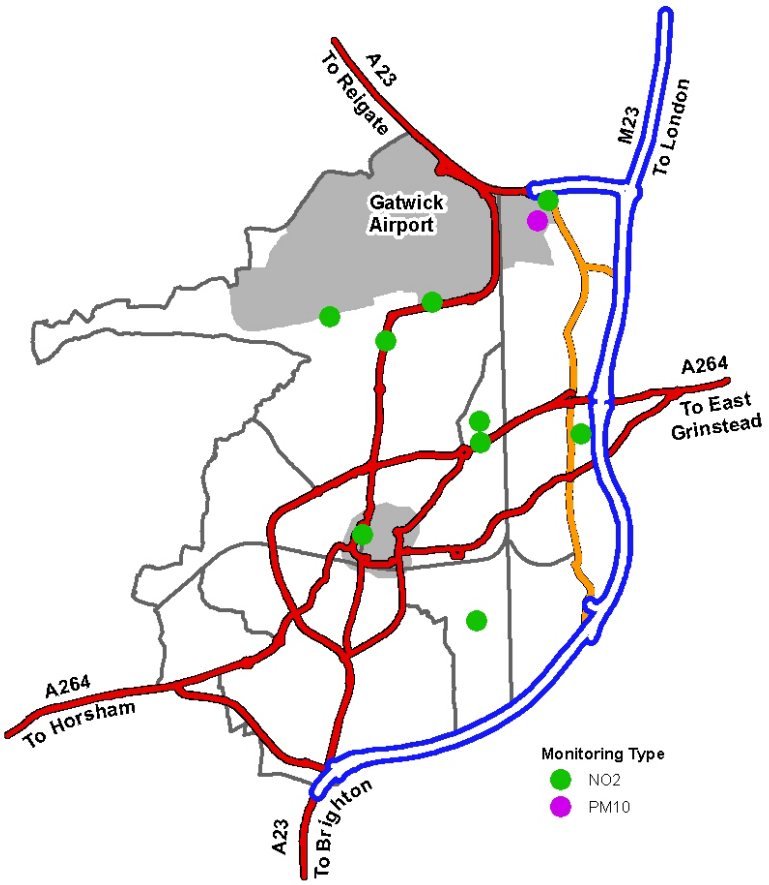
Brighton CC/AURN - affiliated /part-funded by Brighton CC and AURN

AURN - Automatic Urban and Rural Network(DEFRA owned AQ stations)

E&W Sussex County C. - Mobile lab part owned by East and West Sussex County Councils

Crawley also monitors locally, using NO_2 diffusion tubes across the borough and Continuous analysers for NO_2 and PM_{10} at the eastern boundary of Gatwick Airport. The monitoring site network is shown on the Fig 3 below, and the monitoring data for 2006 are presented in the Appendix 1

Fig 3: Crawley Borough Council Monitoring Site Network 2007



4 UPDATING AND SCREENING ASSESSMENT RESULTS

The council completed its Updating & Screening Assessment (USA) in April 2006 using simple screening models and air quality monitoring data. The results of the assessment showed that the majority of the Borough had good air quality and would meet the air quality objectives.

The 2006 USA identified one area, Gatwick Airport, with the potential to exceed the air quality objectives for Nitrogen Dioxide and Particulates, triggering the requirement for a detailed assessment for those two pollutants, based on the following criteria:

Nitrogen Dioxide

Location: London Gatwick Airport (including within 1000m of the airport boundary)

Reason: Government guidance, set out in document LAQM.TG(03), requires the local authority to carryout a detailed assessment for nitrogen dioxide where there is potential public exposure within 1000 metres of an airport boundary and an annual throughput greater than 5 million passengers per year. These criteria are met at Gatwick, where there are residential properties within 1000 metres of the airport boundary and an annual throughput of 30 million passengers per year, consequently a detailed assessment for NO_2 was undertaken.

Particulate Matter (PM_{10})

Location: London Gatwick Airport (including within 500m of the airport boundary)

Reason: The guidance requires a detailed assessment for PM_{10} where there is potential for public exposure within 500 metres of an airport boundary, and an annual throughput of more than 10 million passengers per year. Gatwick meets these criteria and consequently a detailed assessment was carried out for PM_{10}.

5. DETAILED ASSESSMENT METHODOLOGY

The purpose of the Detailed Assessment (DA) was to scrutinise more closely those areas that were identified in the 2006 Updating & Screening Assessment (USA) as requiring further assessment. The USA used simple air quality screening/forecasting modelling techniques (DMRB model). The aim of the Detailed Assessment is to look in greater depth and detail at the data collected.

In the 2004 DA, dispersion modelling for Gatwick Airport was provided by BAA Gatwick. However, due to their commitments to the Heathrow Project, modelling predictions were not available for use in the 2007 DA report. In addition, as a result of equipment failure at the Gatwick East site, insufficient data was available from the Crawley operated continuous NO_2 monitor in 2006. NO_2 data from Reigate and Banstead's monitor located on the southern boundary of Gatwick Airport at Poles Lane was used instead.

Monitoring fulfils a central role in the review and assessment process, providing the scientific basis for compliance measurement against the AQ objectives. (Monitoring data can also be used to verify air quality modelling, where this has been carried out, to ensure that the model is producing accurate and reliable estimates of pollutant concentrations).

In the absence of any modelled predictions for the air quality at Gatwick, the Detailed Assessment was undertaken relying solely on monitoring data to identify the likelihood of NO_2 and PM_{10} exceedences at locations of relevant public exposure. The approach was precautionary with monitoring being carried out at locations of the most sensitive receptors within 500m of the airport perimeter. The findings of the detailed assessment can therefore be considered worst case.

Monitoring results were assessed and projected forward to estimate concentrations for 2010 following the methodology in the updated laqm technical guidance (laqm/tools website 2006). The projected monitoring data represents the best possible estimates, but uncertainties in the results arising from intrinsic margins of error may lead to over or under-predictions. In an attempt to provide an additional level of confidence in the results, the 2010 predictions were compared and assessed against airport air quality trends to see if they followed expected improvements or decline in air quality concentrations. Although results are not conclusive they can provide an indication of compliance with AQ objectives and EU Limits based on measured data.

5.1 Passive Monitoring Methods

Passive monitoring involves the use of NO_2 diffusion tubes at numerous locations around the authority (Fig 2). They are simple and cost effective and give a good general indication of annual mean pollution concentrations over a wide spatial distribution.

The NO_2 diffusion tube analysis for Crawley is carried out by Bristol Scientific Services. The NO_2 tube preparation method uses 20% triethanolamine (TEA) in water. All diffusive monitoring data have been ratified following the methods described in

LAQM.TG(03). 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 Updating & Screening Assessment determined the need of a detailed assessment of NO_2 based on the results from this type of monitoring.

Diffusion tube monitoring has inherent errors. In order to minimise these, a bias-adjustment factor is applied to the results. This factor is obtained by collocating three diffusion tubes for a year at a continuous monitoring site that follows strict quality control/quality assurance. The average values from the monthly exposed tubes are then compared directly to the corresponding continuously monitored values. After a year the comparison value can be used on all the diffusion tube data. If more than one collocation study has been conducted, using diffusion tubes from the same laboratory, the average value of these studies can be used as the bias-adjustment factor.

The NO_2 continuous analyser at the Gatwick East site was non-operational for most of 2006. It was not, therefore possible to calculate a local bias adjustment factor from the Gatwick East Tri-location diffusion tube study. The national value calculated by the University of West of England (UWE) was used in this report.

UWE gathered together the various UK collocation study results, and from these calculated the mean value, to arrive at the bias adjustment factor of 0.92, for those authorities using Bristol Scientific Services. The diffusion tube monitoring results discussed in the results section (6) of this report have been bias corrected using this factor.

5.2 Continuous Monitoring Methods

Continuous monitoring produces high resolution measurements in real time. This type of monitoring is expensive and requires technical expertise to maintain quality control and quality assurance for the data produced. The automatic monitoring data for Crawley and SAQP members, is managed under contract by Kings College London Environmental Research Group (ERG) and validated against local site operators calibration results. In addition ERG ratify the data sets after 6 monthly services and provide SAQP members with fully QA/QC ratified data set. Crawley has two continuous monitors located within the borough:

A TEOM monitor, measuring continuous PM_{10}, which is located on the boundary of Gatwick Airport, close to residential properties to represent relevant exposure within the 500m airport zone. (For the TEOM, an adjustment factor of 1.3 has been applied to the data to estimate the gravimetric equivalent concentration).

A chemiluminescent NO_2 analyser, located at the same site on the boundary of Gatwick Airport, close to residential properties to represent relevant exposure within the 1000m airport zone. This NO_2 monitor was non-operational for most of 2006 due to complications caused by a faulty air conditioning unit. Since insufficient data was collected from this monitor to be of use for the detailed assessment, monitoring data for NO_2 was taken from a continuous analyser site on the southern perimeter of Gatwick located at Poles Lane, Crawley (by permission of RBBC).

5.3 Projecting Annual Mean NO_2 and PM_{10} data to 2010

The methodology used to calculate 2010 NO_2 and PM_{10} levels at Gatwick Airport was provided by the Updated LAQM TG (laqm/tools Website 2006). The 2006 monitored data was projected forward to the relevant year of interest using the correction factors provided in the updated laqm guidance website. The method is outlined below and the calculations are shown in Appendix 3.

Projection of NO_2 Data to 2010: In order to project monitored NO_2 concentrations to the year 2010 the annual average value for the 2006 data is multiplied by the correction factor for that year divided by the correction factor for the year 2010.

- Projection of Monitored NO_2 Diffusion Tube Data for Gatwick Airport(and 1000m perimeter): Annual average Monitored NO_2 Diffusion Tube data was available from the Gatwick East site for the period 2006. This data represented an Urban Background location of relevant public exposure approximately 65m from the façade of the nearest residential properties on the Balcombe Road and approximately 850m from the centre of the airport.

- Projection of Continuous Monitored NO_2 for Gatwick Airport(and 1000m perimeter):Annual average continuous monitored NO_2 data was not available from the Gatwick East Site due to equipment failure. Continuous NO_2 data for the year 2006 was taken from a site on the southern boundary of the airport at Poles Lane, Crawley. This data represented an Urban Background location of relevant public exposure approximately 125m from the façade of the nearest residential properties on Poles Road and approximately 600m from the centre of the airport.

Projection of PM_{10} Data to 2010: The contribution from different PM_{10} sources will not remain constant between the current year and 2010. It is therefore not appropriate to apply a single correction factor to measured data in the current year, to estimate concentrations in the future year. The data must first be divided into the separate source categories (primary, secondary and residual) and treated separately. Only the primary component is important in terms of local emissions – the secondary and residual components can therefore be removed and added back once future predictions from local primary sources have been performed.

- Projection of Monitored PM_{10} Data for Gatwick Airport and the 500m Perimeter: Annual average Monitored PM_{10} data was available from the Gatwick East site for the period 2006. This data represented an Urban Background location of relevant public exposure approximately 65m from the façade of the nearest residential properties on the Balcombe Road and approximately 850m from the centre of the airport.

6. DETAILED ASSESSMENT RESULTS

The results of the monitoring exercises have been assessed to see if there is any evidence that the public will be subjected to exceedences of the AQO over the relevant exposure period. If there is no likelihood of any relevant public exposure then no further action needs to be taken, even in areas of exceedence. If the monitored results suggest that the AQO for the pollutant will not be met, where public exposure is likely, then an Air Quality Management Area has to be designated around the areas of exceedence.

6.1 NO_2 Diffusion Tube Monitoring Results 2006/2010

For the purpose of the Detailed Assessment NO_2 concentrations were monitored at the most sensitive receptor sites within 500m of the airport boundary and the results projected to 2010 to assess future compliance with AQ objectives. All these sites were facade locations representing worst case areas of relevant public exposure.

The full 2006 monitoring data for Crawley is shown in Appendix 1. A summary of the diffusion tube data for 2006 and projected 2010 NO_2 concentrations are presented in Table 3 below and shown graphically in figs 4-6 overleaf.

Table 3: Crawley NO_2 Diff Tube Monitoring Data 2006 and Projected 2010

SITE (Reference No. and name of receptor property)	2006 Measured (Bias Adjustment factor 0.92)	2010 using updated laqm yr adjustment calculator
1 BarMed The High Street	33.15	37.00
99 Furnace Farm Rd	20.53	22.92
3 Birch Lea	21.45	23.94
4 Headley Close	22.79	25.44
43 Gatwick North	25.05	27.96
48 Lynhurst Cottage	25.96	28.98
49 Charlwood Nursery	20.79	23.2
50 Rowley Cottage	29.4	32.82
51 Balcombe Rd	25.58	28.55
55 Fence at Tinsley Close	33.87	37.81
56 Steers Lane	24.75	27.62

None of the sites in Crawley showed exceedences of the AQ objective for 2006 or for projected 2010. However, two sites, Bar Med and Tinsley Close, showed projected 2010 NO_2 concentrations approaching the AQ objective at ≥ 37µg/m^3. These are discussed in more detail in the Conclusion and Recommendations section 7.

Fig 4: Monthly Mean NO_2 for 2006 at the Most Sensitive Receptor Sites for Gatwick Airport

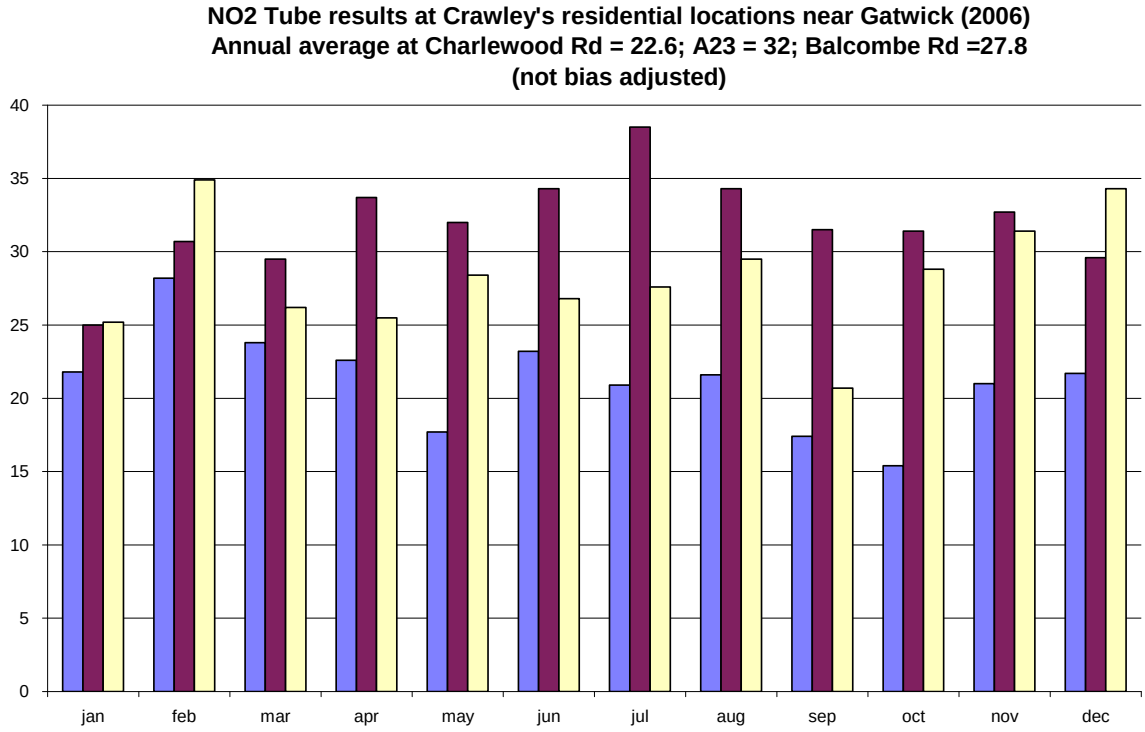


Fig 5: 2006 and Projected 2010 Annual Mean NO_2 at the Most Sensitive Receptor Sites for Gatwick Airport

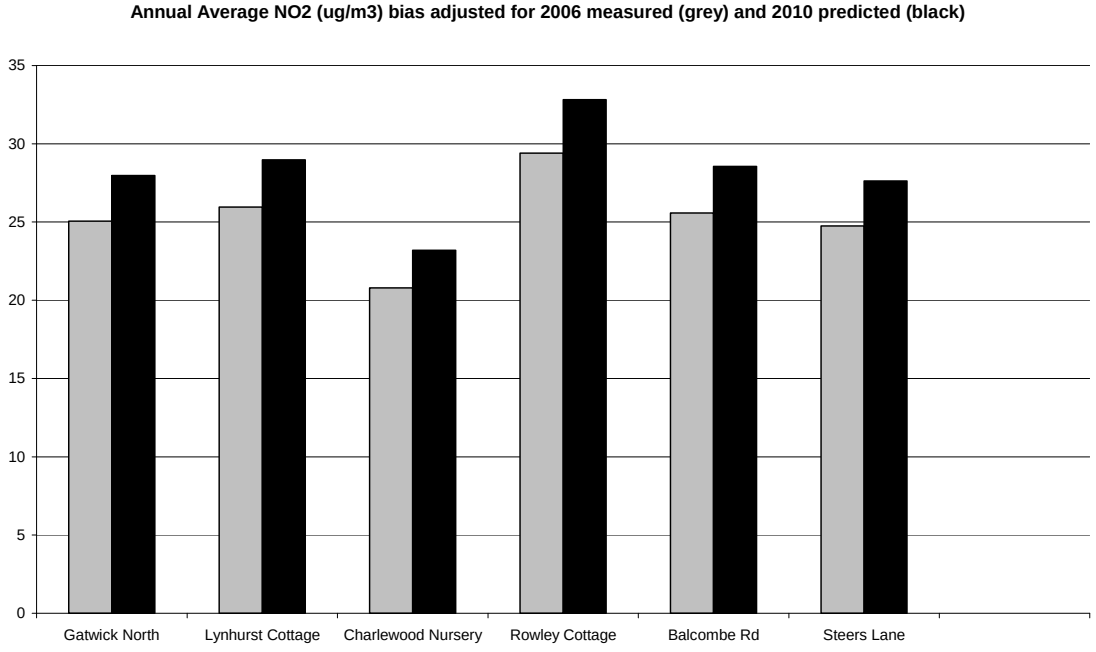
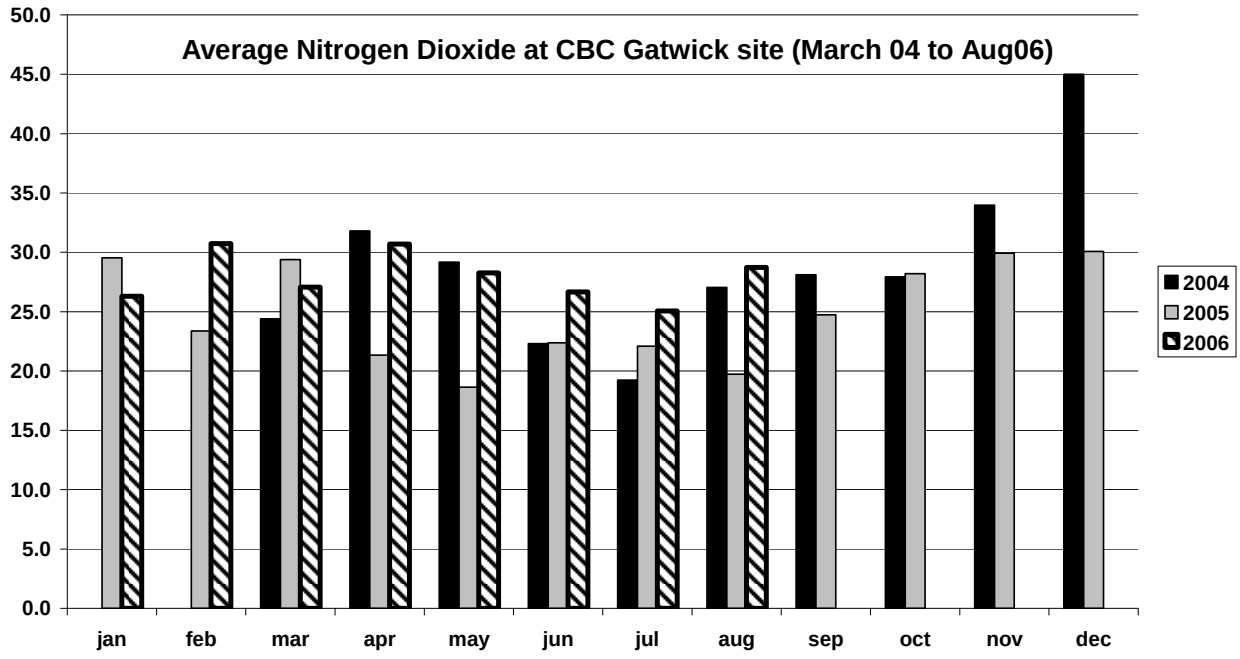


Fig 6: Monthly Mean NO_2 Gatwick East Site 2004-2006



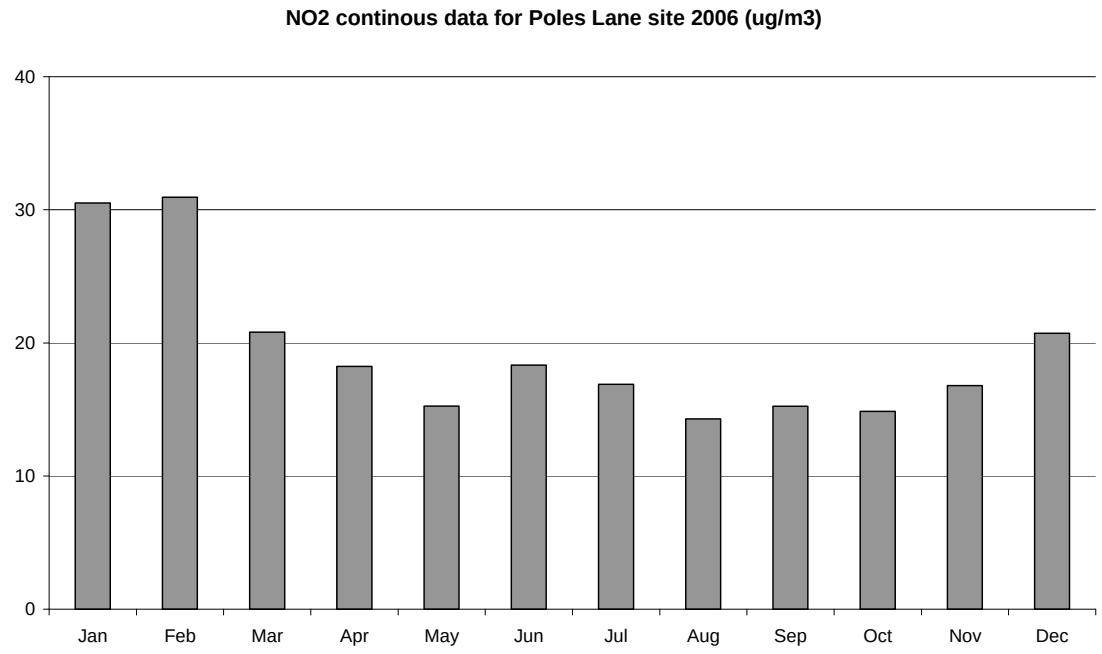
6.2 NO_2 Continuous Monitoring Results 2006/2010

The 2006 monthly mean NO_2 concentrations for the continuous monitoring Site at Gatwick, Poles Lane are shown in Appendix 1 and presented in Table 4 and Fig 7 below. There were no exceedences of the annual mean AQ objective of 40µg/m^3 in 2006 or for the 2010 projected annual mean.

Table 4: 2006 and Projected 2010 NO_2 Continuous Monitoring Data for Poles Lane, Crawley (Gatwick Airport Southern Border) (**µ**g/m^3)

year	Annual Mean **µ**g/m^3
2006	19.38
2010 PROJECTED ANNUAL MEAN (using updated laqm year adjustment calculator)	21.63

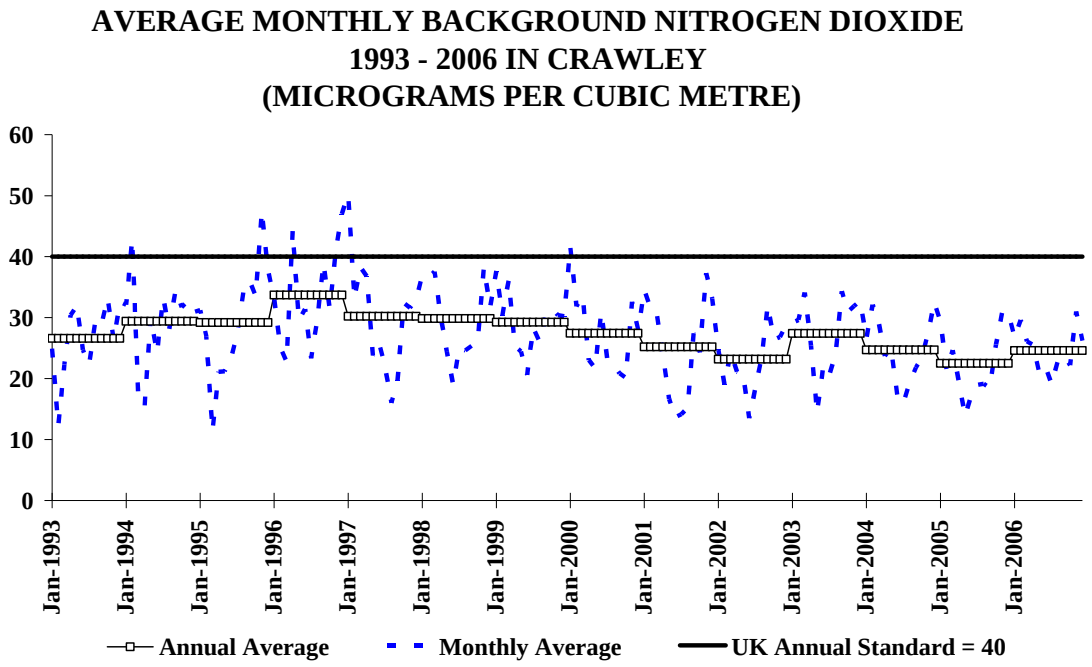
Fig 7: 2006 Monthly Mean NO_2 for Poles Lane Site, Gatwick



6.3 NO_2 Air Quality Trends at Gatwick

The monthly mean and annual mean background concentrations from 1993 – 2006 are shown in Fig 8. There have been no exceedences of the annual mean NO_2 objective throughout the 13 years of diffusion tube monitoring in Crawley. Since 1997 there has been a gradual decline in annual mean NO_2 concentrations (with the exception of 2003).

Fig 8: Crawley Background NO_2 1993-2006



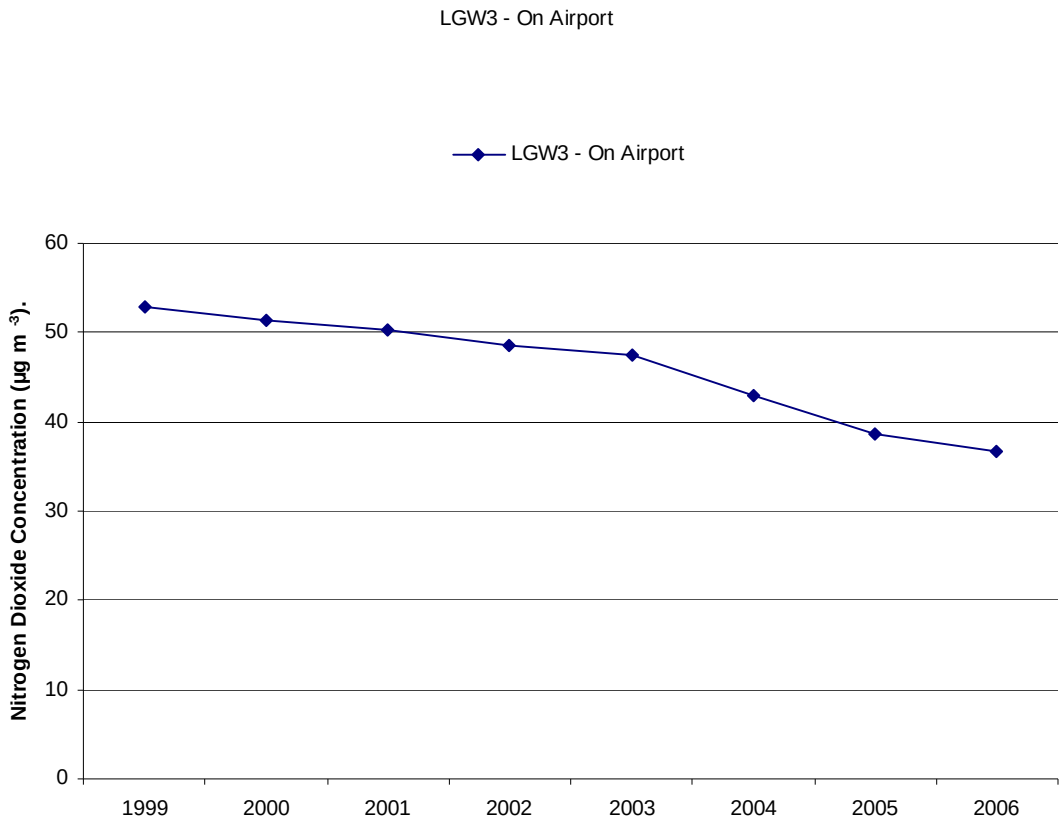
A more detailed statistical analysis of NO_2 (and PM_{10}) data form the airports own monitoring station was undertaken in a joint study by British Airways Authority Gatwick and Reigate and Banstead Borough Council[ref1]. The aim was to determine with a greater degree of accuracy the trends in NO_2 (and PM_{10}) concentrations at the airport for comparison with local pollutant trends and for verifying computer modelling forward predictions about air quality at the airport.
(REF 1. Methodology for estimating NO_x, NO_2 and PM_{10} Concentrations in 2010 in and around London Gatwick Airport – netcen Issue 2 Jan 2006 data)

Fig 9 shows the three-year rolling average NO_2 Concentration from the Gatwick Airport monitor LGW3 (Northern border). In the absence of relevant receptors at the airport monitoring site, it is largely academic whether or not the AQ standards are breached. However, the results are useful to show the on-airport pollutant trends, especially at the northern end of the airport where pollution levels are highest due to the prevailing wind direction.
The graph shows a steady improvement in NO_2 Concentrations at the airport, a rapid drop off from 2003 onwards, followed by a smaller improvement in 2006

Table 5: Annual and Three Year Rolling Annual Average NO_2 Concentrations(µg m^{-3})

Gatwick Monitoring Site (LGW3)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Annual Average	53.8	52.6	52.3	49.2	49.1	47.0	46.0	35.5	34.2	40.3
Data Capture	94.9	89.2	93.3	93.4	93.5	96.1	94.0	95.4	96.7	96.3
Hours Over 200 µg m-3	2	0	1	1	0	0	2	0	0	0
3 Year Rolling Average	LGW3		52.9	51.4	50.2	48.5	47.4	42.9	38.6	36.7

Fig 9: Three-year rolling annual average NO_2 Concs at Gatwick Airport



The downward trend in annual average NO_2 concentrations at the airport is in keeping with a similar pattern seen across the south east where road traffic makes a significant contribution to the pollution problem. Computer modelling supports this prediction by indicating that non-airport sources of NO_2 are predicted to fall until around 2010-2015[1] driven mainly by improvements in road vehicle engine technology.

(REF 1. Methodology for estimating NO_x, NO_2 and PM_{10} Concentrations in 2010 in and around London Gatwick Airport – netcen Issue 2 Jan 2006 data)

6.4 PM_{10} Continuous Monitoring Results 2006/2010

The annual mean 2006 and projected 2010 PM_{10} concentrations for the Gatwick East TEOM monitoring Site are presented in Table 6 below. There were no exceedences of the AQ objectives.

The 2006 24hour mean PM_{10} concentrations for the Gatwick East TEOM monitoring Site are shown graphically in Fig 10 below. The annual mean AQ objective of 40µg/m^3 was not exceeded at this site in 2006 and the 24hr mean AQ objective of 50µg/m^3 was only exceeded 7 times in the year (maximum allowable 35 exceedences/yr).

Fig 10: 2006 PM_{10} Daily Mean for Gatwick East Site

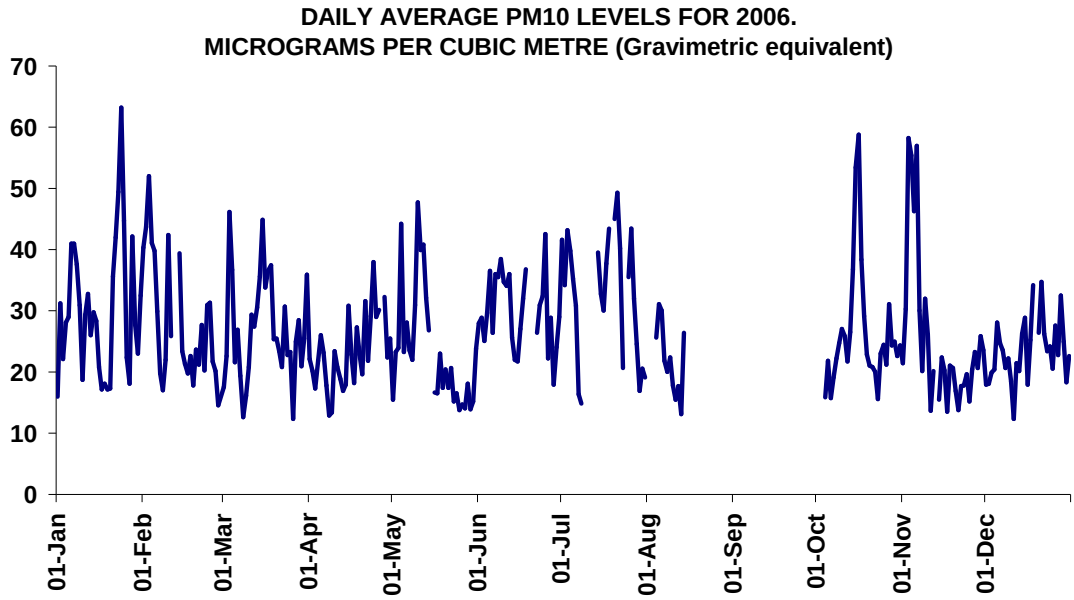


Table 6: 2006 and Projected 2010 PM_{10} Continuous Monitoring Data for Gatwick East Site (**µ**g/m^3)	
Year	Annual Mean **µ**g/m^3
2006	26.60
2010 PROJECTED ANNUAL MEAN (using updated laqm year adjustment calculator)	24.68

In the 2004 Detailed Assessment the Crawley TEOM monitor was located at a background site in a residential area to the west of Crawley. The PM_{10} monitored data from this site was projected forward to 2010 (using the LAQM TG method) and was estimated to be. 19.53**µ**g/m^3.

The standard deviation for the Residential site in Crawley was calculated based on 6 years data (appendix 2). If two standard deviations are added to the projected 2010

PM_{10} value, the maximum annual average concentration expected in 2010 at this site would have been $23.46 \mu g/m^3$.

In 2005 the PM_{10} TEOM monitor was moved to a site on the eastern boundary of Gatwick Airport, close to residential properties to represent relevant exposure within the 500m airport zone. The estimated 2010 level for the new site at Gatwick East was $24.68 \mu g/m^3$. This 2010 estimation is significantly higher than the 2010 PM_{10} projection for the Crawley Residential site – even allowing for a 2 standard deviation increase

This increase is attributed to the close proximity of the new monitoring site to Gatwick airport, with its associated higher traffic levels as well as a contribution from the airport itself. Despite trend analysis indicating a downward trend for 2005- 2006 PM_{10} at Gatwick, the contribution from airport and non airport emissions appears to be demonstrated by a significant increase in the projected level of 2010 PM_{10}

6.5 PM_{10} Air Quality Trends at Gatwick

The detailed statistical analysis of airport pollution data carried out by British Airways Authority Gatwick and RBBC to determine the trends in PM_{10} (and NO_2) concentrations at the airport is shown below.

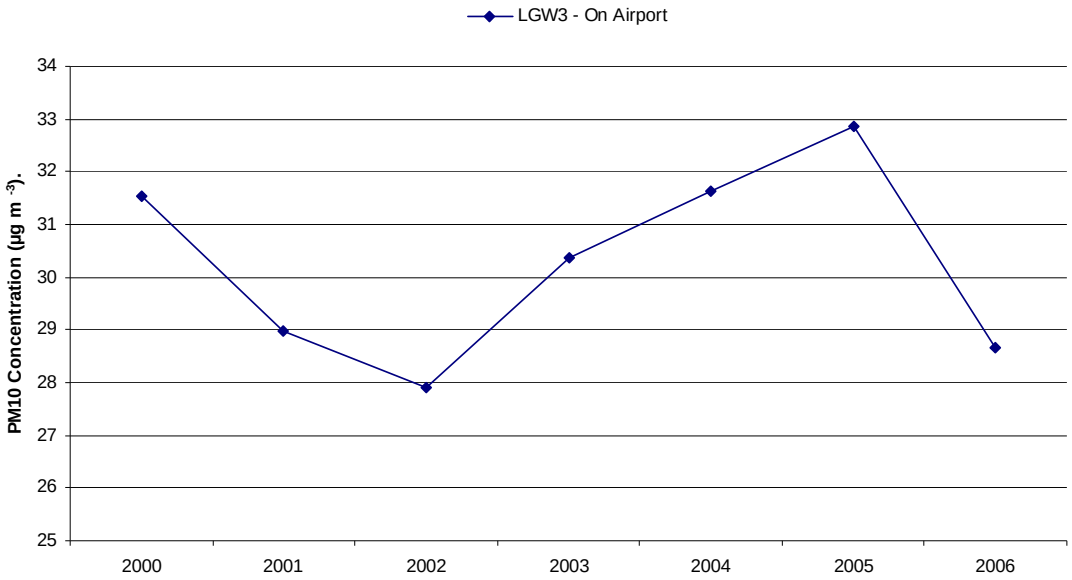
Figure 11 shows the three-year rolling average PM_{10} Concentration from the Gatwick Airport monitor LGW3 (Northern border) to show the on-airport pollutant trends for PM_{10}. The graph shows a steady improvement in PM_{10} concentrations at the airport until 2002, at which point the PM_{10} levels steadily increase and then fall off again in 2006. If the annual averages for each year are examined (Table 7) it can be seen that PM_{10} Concentrations have fallen sharply in 2006 compared to previous years.

However, the concentration of PM_{10} at the Gatwick East monitoring site in Crawley has not shown such a dramatic decrease in 2006, instead a small increase in annual average PM_{10} Concentration was measured. This suggests that the large decrease in 2006 airport PM_{10} is due to local site specific factors rather than any major change in overall airport emissions or background PM_{10} Concentration across the south east.

Table 7: Annual and Three Year Rolling Annual Average PM_{10} Concentrations($\mu g\ m^{-3}$)

Gatwick Monitoring Site (LGW3)	2000	2001	2002	2003	2004	2005	2006
Annual Average	28.7	27.2	27.8	36.1	31.0	31.5	23.4
Data Capture	92.9	97.2	99.2	97.3	97.3	97.3	96.2
3 Year Rolling Average	31.5	28.9	27.9	30.4	31.6	32.9	28.6

Fig 11: Three year rolling annual average PM_{10} Concentrations at London Gatwick Airport



Computer modelling[1] indicates that the airport is not a significant source of PM_{10} at the worst affected properties surrounding the airport, being responsible for no more than 1-2 µg/m^3 of the total PM_{10}.

The main purpose of monitoring PM_{10} at Gatwick is to fulfil the requirements of the review and assessment process and to examine trends in the PM_{10} Concentration, as the UK Government is aiming to reduce public exposure to particulate matter in the longer term even where the air quality standards are met.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Detailed Assessment of NO_2

The Air Quality Objectives only apply where members of the public are likely to be regularly present for the averaging time of the objective. For annual mean objectives, the relevant exposure is limited to residential properties, schools and hospitals. The 1-hour NO_2 objective applies at these locations as well as at any outdoor location where a member of the public might reasonably be expected to stay for 1 hour or more (shopping streets, parks and sports grounds as well as bus and railway stations that are not fully enclosed).

Measurements across the UK have shown that the 1-hour NO_2 objective is unlikely to be exceeded unless the annual average NO_2 concentration is greater than 60µg/m^3 (Laxen and Marner 2003). Thus Exceedences of 60µg/m^3 as an annual mean may be used as an indicator of potential exceedences of the 1 hour mean NO_2 objective.

- The detailed assessment of NO_2 for 2006 and 2010 for Gatwick Airport has indicated that there will be no exceedence of the 40µg/m^3 annual mean objective at the locations of relevant public exposure for the most sensitive receptors within 1000m of the Airport perimeter.

- All diffusion tube results are below 60µg/m^3 annual mean, the level at which a 1-hour NO_2 exceedence may occur (Laxen and Marner, July 2003). There are therefore, no areas of relevant public exposure within 1000m of the airport perimeter predicted to exceed the 1-hour NO_2 objective for 2006.

- The review of the monitoring data highlighted two sites where projected 2010 NO_2 concentrations were approaching the AQ objective. These were: Bar Med, Crawley High Street and Tinsley Close (fence), adjacent to the A2001 dual carriage way.

- The Bar Med site on the High Street showed levels of annual mean NO_2 approaching the AQO limit for the 2010 projection. This location is a roadside site adjacent to commercial premises, therefore there would be no relevant public exposure. The 2006 and projected 2010 annual average for this site were not at the 60µg/m^3 level which indicates potential to exceed the 1 hour mean NO_2 objective.

- The Tinsley Close site (fence) represents the most sensitive receptor on the A2011, Crawley Avenue. The 2004 Detailed Assessment modelled the NO_2 concentrations for compliance and found no exceedence of the 40µg/m^3 AQ objective and therefore no relevant public exposure.

  As there had been no evidence of significant change in traffic flows or speeds since the 2004 Assessment this location was not identified in the 2006 USA as requiring a detailed assessment. However, the 2010 projected NO_2 concentrations are approaching the 40µg/m^3 annual average objective and it is therefore recommended that this site should be kept under review for compliance with AQ objectives.

7.2 Detailed Assessment of PM_{10}

- The detailed assessment of PM_{10} for 2006 and 2010 for Gatwick Airport has indicated that there will be no exceedence of the 40µg/m^3 annual mean objective at the locations of relevant public exposure for the most sensitive receptors within 500m of the Airport perimeter and no exceedence of the 50µg/m^3 24 hour mean

- The assessment concluded that the main purpose for monitoring PM_{10} at Gatwick is to fulfil the requirements of the review and assessment process for compliance with AQ objectives and to examine trends in the PM_{10} Concentrations in line with the Government's aim to reduce public exposure to particulate matter in the longer term even where the air quality standards are met.

7.3 Declaration of AQMA

- The results of this Detailed Assessment have indicated that there is no requirement for Crawley Borough Council to declare an Air Quality Management Area for NO_2 or PM_{10} at Gatwick Airport.

STATUTORY CONSULTEES

Under Part IV of the Environment Act 1995, all Local Authorities are required to consult on their air quality review and assessment with the Environment Agency and the local Highway Authority. Through the Sussex Air Quality Steering Group both of these bodies have been involved since the early stages of the air quality management process, and will be made fully aware of Council's air quality review and assessment. Crawley Borough Council will send out full or summarised copies of this Detailed Assessment to:

Department of the Environment, Food and Rural Affairs

Government Office for the South East

Sussex Air Quality Steering Group

Neighbouring Local Authorities

The Local Health Authority

Environment Agency

Highways Authority

West Sussex County Council

Comments on this report are welcome and can be sent to the report author at the address listed below.

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ACKNOWLEDGEMENTS

The work in this Detailed Assessment has been carried out following the advice in the Technical Guidance [LAQM TG(03)], Updated guidance from laqm tools website and Policy Guidance [LAQM PG(03)] as well as assistance from the project development officer for Sussex Air Quality Partnership and the air quality helpdesk.

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- Underwood *et al,*(2003a) Air Quality Modelling for Gatwick 2002/3 Netcen/AEAT/ENV/R/1625
- Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside & kerbside monitoring sites, *Prof. D Laxen & Dr B Marner, July 2003*
- Methodology for estimating NO_x, NO_2 and PM_{10} Concentrations in 2010 in and around London Gatwick Airport – netcen Issue 2 Jan 2006 data

APPENDICES

APPENDIX 1: NO_2 AND PM_{10} MONITORING DATA

CRAWLEY MONITORED NO_2 DIFFUSION TUBE DATA 2003-2010 ANNUAL AVERAGE NO_2 ($\mu g/m^3$) Bias Adjusted						
SITE (Reference No. and name of receptor property)	2003	2004	2005	2006 using laqm yr adjustment calculator for comparison	2006 Measured (Bias Adjustment factor 0.92)	2010 using updated laqm yr adjustment calculator
1 BarMed The High Street	38.12	34.29	30.76	29.95	33.15	37.00
99 Furnace Farm Rd	21.01	19.64	17.87	17.40	20.53	22.92
3 Birch Lea	24.65	22.08	21.26	20.70	21.45	23.94
4 Headley Close	25.98	23.40	20.08	19.55	22.79	25.44
43 Gatwick North	19.53	No site	No site	18.21	25.05	27.96
44 Tinsley Lane	24.47	No site	No site	22.82	No site	-
45 Three Bridges rd	26.13	No site	No site	24.37	No site	-
46 Filbert Crescent	34.78	No site	No Site	32.43	No site	-
47 Tinsley Close	42.60	37.99	34.68	33.76	No site	-
48 Lynhurst Cottage	No site	26.04	23.82	23.19	25.96	28.98
49 Charlwood Nursery	No site	18.44	17.34	16.88	20.79	23.2
50 Rowley Cottage	No site	27.16	24.62	23.97	29.4	32.82
51 Balcombe Rd	No site	25.67	23.16	22.55	25.58	28.55
55 Fence at Tinsley Close	No site	No site	30.48	29.67	33.87	37.81
56 Steers Lane	No site	No site	No site	No site	24.75	27.62

2006 NO_2 Co-location Diffusion Tube Data for Crawley Gatwick North Site ($\mu g/m^3$) (Bias Adjusted 0.92)			
MONTH	TUBE 1	TUBE 2	TUBE 3
January	23.94	21.87	25.20
February	23.94	30.33	28.71
March	25.83	22.41	24.84
April	27.63	27.09	28.17
May	28.17	24.66	23.49
June	22.86	24.93	24.21
July	20.34	22.86	24.48
August	22.86	24.30	30.42
September	27.90	26.01	27.18
October	27.18	26.46	26.64
November	31.68	31.59	31.41
December	28.17	27.09	30.51
Annual Mean	24.67	24.88	25.59
Annual Mean of the three Tubes(T1+T2+T3) = 25.05			
2010 Projected Annual Mean (using updated laqm yr adjustment calculator)		27.96	

2006 NO_2 Continuous Monitoring Data for Poles Lane, Crawley (Gatwick Airport Southern Border) ($\mu g/m^3$)	
DATE	MONTHLY AVERAGE $\mu g/m^3$
January	30.52
February	30.94
March	20.81
April	18.24
May	15.26
June	18.33
July	16.88
August	14.29
September	15.24
October	14.86
November	16.79
December	20.73
Annual Mean	19.38
2010 PROJECTED ANNUAL MEAN (using updated laqm year adjustment calculator)	21.63

2006 PM_{10} TEOM Monitoring Data Gatwick North Site ($\mu g/m^3$)(gravimetric equivilent)	
DATE	MONTHLY AVERAGE $\mu g/m^3$
January	30.1
February	28.1
March	27.0
April	23.2
May	23.3
June	29.9
July	32.0
August	21.9
September	-
October	26.2
November	25.5
December	23.5
Annual Mean	26.6
No. Exceedences >50$\mu g/m^3$ (24hr mean)per yr	7
2010 PROJECTED ANNUAL MEAN (using updated laqm year adjustment calculator)	24.68

APPENDIX 2: UPDATED LAQM TG (2006) METHOD FOR PROJECTING NO_2 and PM_{10} RESULTS FOR FUTURE YEARS

PROJECTION OF NO_2 DATA TO 2010

In order to project monitored NO_2 concentrations to the year 2010 the annual average value for the 2006 data is multiplied by the correction factor for that year divided by the correction factor for the year 2010

Updated LAQM (Tools website 2006) Correction Factors to Estimate Annual Average NO_2 Concentrations in Future Years from Measured data at Background Sites

Year	Correction Factor
2000	1.14
2001	1.10
2002	1.05
2003	1.02
2004	1.00
2005	0.98
2006	0.96
2007	0.93
2008	0.91
2009	0.88
2010	0.86

Using this methodology, the projected 2010 Annual Average NO_2 for location of interest in the Detailed Assessment, namely Gatwick Airport were estimated. The results are shown in the tables below.

Gatwick Airport NO_2 Data Projected to 2010 (LAQM TG Method updated 2006)

Site	Annual Average NO_2 2006(Bias Corrected) **µ**g/m^3.	Correction Factor for 2010	Projected Annual average NO_2 for 2010 (**µ**g/m^3)
Gatwick North Diffusion Tube Data			
Tube 1	24.67	0.96/0.86	27.54
Tube 2	24.88	0.96/0.86	27.77
Tube 3	25.59	0.96/0.86	28.57
Gatwick , Poles Lane Continuous Monitor Data	19.38	0.96/0.86	21.63

NO_2 Data Projected to 2010 (LAQM TG Method updated 2006) for Sites within 1000m of Gatwick Airport representing areas of relevant Public Exposure (all these sites were facade locations of residential properties)

Site	Annual Average NO_2 2006(Bias Corrected) **µ**g/m^3.	Correction Factor for 2010	Projected Annual average NO_2 for 2010 (**µ**g/m^3)
Lynhurst Cottage	25.96	0.96/0.86	28.98
Charlwood Nursery	20.79	0.96/0.86	23.20
Rowley Cottage	29.40	0.96/0.86	32.82
Balcombe Road	25.58	0.96/0.86	28.55
Steers Lane	24.75	0.96/0.86	27.62

NO_2 Data Projected to 2010 (LAQM TG Method updated 2006) for Background sites in Crawley

Site	Annual Average NO_2 2006(Bias Corrected) **µ**g/m^3.	Correction Factor for 2010	Projected Annual average NO_2 for 2010 (**µ**g/m^3)
Birch Lea	21.45	0.96/0.86	23.94
Headley Close	22.79	0.96/0.86	25.44
Bar Med High Street	33.15	0.96/0.86	37.00
Tinsley Close(fence)	33.87	0.96/0.86	37.81
Furnace Farm Road	20.53	0.96/0.86	22.92

PROJECTION OF PM_{10} DATA TO 2010

An approach to adjusting measured annual mean PM_{10} data forwards to 2010 is set out in LAQM TG(03) Boxes 8.6. This method has been updated to use the new fixed residual component value of 5.8 µg/m^3 (previously described as the coarse component)and box 8.7 is no longer valid having been replaced by a new Year Adjustment spreadsheet tool available on the laqm/tools web site:

Box 8.6 The contribution from different PM_{10} sources will not remain constant between the current year and 2010. It is therefore not appropriate to apply a single correction factor to measured data in the current year, to estimate concentrations in the future year.

The data must first be divided into the separate source categories (“primary”, “secondary” and “residual”) and treated separately. Only the primary component is important in terms of local emissions – the secondary and residual components can therefore be removed and added back once future predictions from local primary sources have been performed.

Correction factors to estimate secondary PM_{10} and primary combustion PM_{10} concentrations in future years (Updated 2006 laqm/tools website)

Year	Correction factor to be applied	
	Secondary PM_{10} [(a)]	Primary combustion PM_{10}
2000	0.88	1.11
2001	1.06	1.14
2002	1.05	1.05
2003	1.43	0.98
2004	1.00	1.00
2005	0.98	1.02
2006	0.95	1.00
2007	0.93	0.98
2008	0.90	0.96
2009	0.88	0.94
2010	0.85	0.92

The method for calculating the PM_{10} concentration in future years is given in Box 8.6 (updated by laqm/tools webite FAQ 2006). And each step of this methodology for calculating 2010 PM_{10} concentrations at the Gatwick North site, Crawley is shown below:

1. Calculation of Total Estimated PM_{10} concentration in 2010 using Data from the Crawley PM_{10} TEOM_Monitor at Gatwick:

Background PM_{10} monitoring data was available from the Gatwick North site for calendar year 2006. This was used to project forward to calculate the background levels of PM_{10} in 2010.

Step1: Adjust the TEOM data to estimate gravimetric values by multiplying by 1.3

$$[CG_{2006}] = [CT_{2006}] \times 1.3 = 26.6 \mu g/m^3$$

Step 2: Derive the local secondary PM_{10} concentration from the updated internet maps for 2004[$Csec_{2004}$]

$$[Csec_{2004}] = 10.8 \mu g/m^3$$

Step 3: Estimate the local secondary PM_{10} concentration in 2006 [$Csec_{2006}$] using the updated correction factors from laqm tools

$$[Csec_{2006}] = [Csec_{2004}] \times 0.95 = 10.26 \mu g/m^3$$

Step 4: Estimate the local primary PM_{10} concentration in 2006 [$Cprim_{2006}$] by subtracting the 2006 secondary concentration and the PM_{10} residual component(assumed to be 5.80µg/m^3 gravimetric) from the measured PM_{10} concentration

$$[Cprim_{2006}] = [CG_{2006}] - [Csec_{2006}] - 5.8 = 10.54 \mu g/m^3$$

Step 5:Adjust the local primary PM_{10} concentration in 2006 to the future year of interest using the updated correction factors from laqm tools

$[Cprim_{2010}] = [Cprim_{2006}] \times (0.92/1.00) = 9.70 \mu g/m^3$

Step 6: Calculate the secondary PM_{10} in the same future year using the updated correction factors from laqm tools

$[Csec_{2010}] = [Csec_{2004}] \times 0.85 = 9.18 \mu g/m^3$

Step 7: Calculate the total estimated PM_{10} concentration 2010 by adding the components together

$\underline{[CT_{2010}] = [Cprim_{2010}] + [Csec_{2010}] + 5.8 \mu g/m^3 = 24.68 \mu g/m^3}$

In the 2004 Detailed Assessment the 2003 PM_{10} monitored data was projected forward to 2010 using the same method. At this time the Crawley TEOM monitor was located at a background site in a residential area to the west of Crawley and the projected PM_{10} concentration for 2010 was estimated to be $19.53 \mu g/m^3$.

The standard deviation for the Residential site in Crawley was calculated based on 6 years data and the maximum value that would be expected in 2010, if two standard deviations are added to the projected 2010 PM_{10} would be $23.46 \mu g/m^3$.

The PM_{10} TEOM monitor was moved to a site on the boundary of Gatwick Airport in 2005, close to residential properties to represent relevant exposure within the 500m airport zone. The methodology above shows the projection for 2010 using the 2006 TEOM data from this new Gatwick site. The estimated 2010 level for the Gatwick North Site was $24.68 \mu g/m^3$.

This value is greater than the maximum PM_{10} mean projected for 2010 in the 2004 DA report and could therefore be considered a significant increase (based on a greater than 2 standard deviation increase).

year	Annual Mean PM_{10} (Gravimetric) Background Residential Site ($\mu g/m^3$)	Deviation from Mean(d)
1999	20.54	1.22
2000	20.18	1.58
2001	21.91	0.15
2002	22.11	0.35
2003	24.03	2.27
2004	21.80	0.04
6 year Mean	21.76	$\Sigma d = 4.39$ $\Sigma d^2 = 19.27$

Standard deviation = $\sqrt{\Sigma d^2/n-1}$

$= \sqrt{19.27/5}$

$= 1.96$

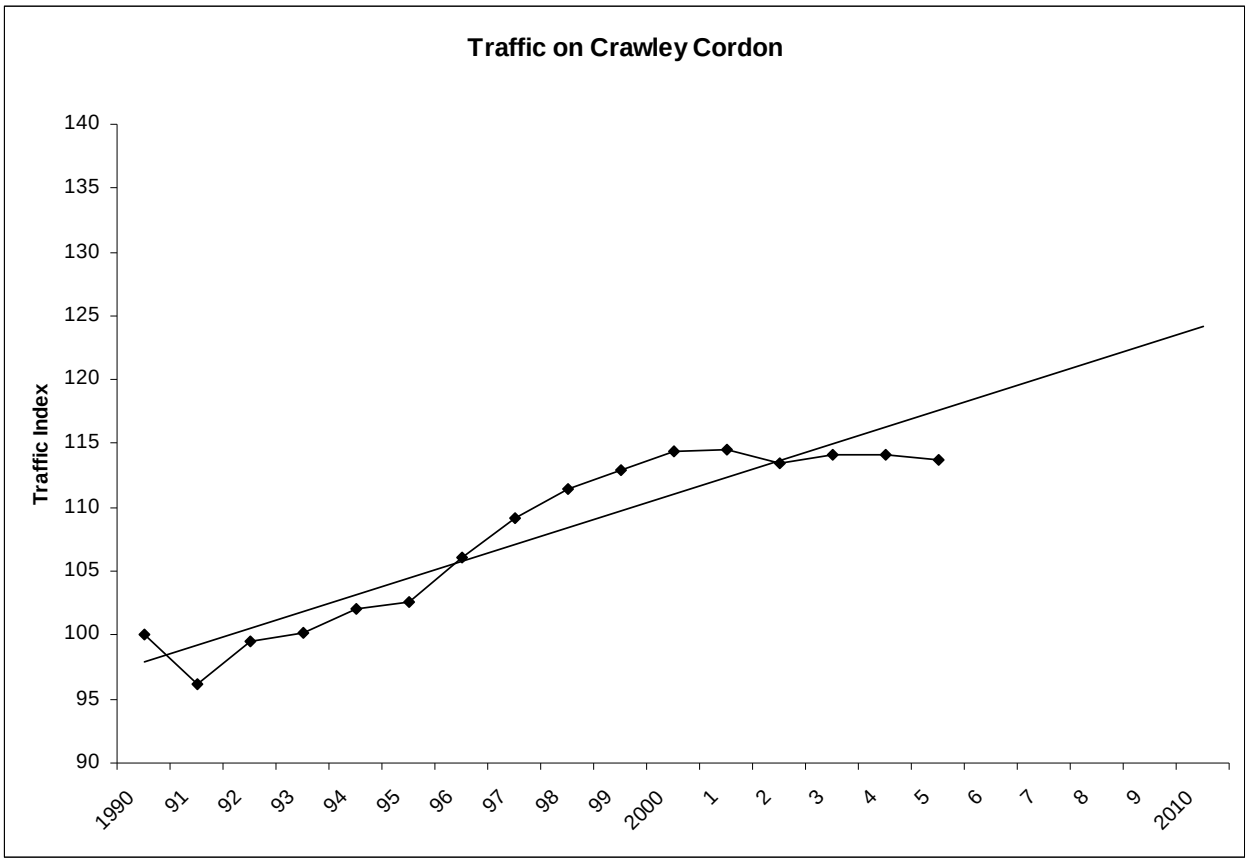
Two sd from the 2010 PM_{10} mean (Residential Site) = $19.53 + 3.93$

$= 23.46 \mu g/m^3$

APPENDIX 3: TRAFFIC DATA FOR CRAWLEY

ANNUAL AVERAGE DAILY TRAFFIC FLOWS FOR MAJOR ROADS IN CRAWLEY			
CBC Ref	CBC Description	Traffic Count -Two way flow 2005 (unless otherwise stated)	2006 Traffic Count (adjusted where necessary using WSCC growth factors)
R1	M23 Spur Link to Gatwick Airport	56,360	56,360
R2	M23 between Junctions 9/10	101,421	101,421
R3	M23 between J10 and J10A	86,498	86,498
R4	M23 between J10A and J11	77,680	77,680
R5	A2011 Crawley Ave, East of Hazelwick Roundabout	32,373	32,373
R6	A264 South West Bypass	38,340(1999)	38,723(+1% grwth)
R7	A264 Horsham Road, west of roundabout with SW Bypass	40,380 (2004)	40,380(0% growth)
R8	A23 Crawley Ave, Gossips Green Stretch, north of A2220	28,792(2003)	28,792 (0% growth)
R9	A2011 Crawley Ave, west of junction 10 of M23	31,772	31,772
R10	A23 Crawley Ave, west of Tushmore Roundabout	29,597(2003)	29,597(0% growth)
R11	A23 Crawley Ave, north of Tushmore Roundabout	31,300(1998)	32,239(+3% grwth)
R12	A23 Brighton Road, Pease Pottage to Broadfield Stadium	21,214	21,214
R13	A2220 Horsham Road, east of Bewbush Roundabout	21,556(2003)	21,556(0% growth)
R14	A23 London Road, north of County Oak Roundabout	24,488	24,488
R15	A2004 Southgate Avenue	18,854(2001)	18,666(-1% growth)
R16	A2011 Crawley Ave, Between Tushmore/Hazelwick R'bouts	19,065(1998)	19,637(+3% grwth)
R17	A23 Crawley Ave Broadfield Playing Field Stretch	17,486(1998)	18,010(+3% grwth)
R18	B2036 Balcombe Road – North of Worth Park Avenue	16,700(1998)	17,201(+3% grwth)
R19	A2220 Haslett Avenue East	24,165(2002)	24,407(+1% grwth)
R20	A2219 London road, south of Tushmore Roundabout	19,554(2003)	19,554 (0% growth)
R21	A2204 Northgate Avenue	13,344(2003)	13,344 (0% growth)
R22	A2219 Pegler Way	8,986(2001)	8,896(-1% growth)
R23	A2219 The High Street	8197(2002)	8,279(+1% growth)
R24	Gatwick Road, Beehive, north of roundabout	16,052	16,052

TRAFFIC GROWTH IN CRAWLEY 1990 -2006
(from WSCC Transport Strategy: Traffic Growth in West Sussex 1990-2010)



Growth Factors for Crawley
(All Flows are 24hr, two-way, AADT)

YEAR	INDEX	AADT
1990	100	158956
1991	96	152830
1992	99	158150
1993	100	159208
1994	102	162260
1995	103	163173
1996	106	168667
1997	109	173437
1998	111	177173
1999	113	179444
2000	114	181926
2001	115	182117
2002	113	180339
2003	114	181354
2004	114	181511
2005	114	180719
2006	114 (estimate)	181160

APPENDIX 4: PART A and PART B INDUSTRIAL PROCESSES IN CRAWLEY

Part B Industrial Processes in Crawley		
Process Type	Operator	Address
Timber Treatment	Komfort Systems Ltd	Units 1-10 Whittle Way, Crawley
Bulk Handling Cement	RMC Readymix Ltd	Tinsley Lane Goods Yard, Gatwick Road, Crawley
Roadstone Coating	Foster Yeoman	Gatwick Road Industrial Estate,
Crematoria	The Crematoria Company	Surrey and Sussex Crematorium, Forge Wood, Balcombe Road,
Bulk Handling cement	Hanson Premix	Stephenson Place, Three Bridges,
Coating (Respraying of Road Vehicles)	Crawley Down Ltd	37-45 East Park, Crawley
Coating (Respraying of Road Vehicles)	Churchill Accident Repair Centre Ltd	Site B, Maidenbower Business Park, Balcombe Road, Crawley
Service Station	Sainsbury's Supermarket Ltd	Crawley Avenue, Crawley
Service Station	Somerfield Service Station	London Road, Crawley
Service Station	BP Oil UK Ltd	County Oak, London Rd, Crawley
Service Station	TCS Total Oil Great Britain Ltd	Ifield Drive, Crawley
Service Station	Tesco Stores Ltd	Hazlewick Ave, Three Bridges,
Service Station	TCS Total Oil Great Britain Ltd	Pelham Place Broadfeld, Crawley
Service Station	Esso Petroleum Co Ltd	Lowfield Heath, Crawley
Service Station	BP Express Shopping	Ring Rd North, Gatwick, Crawley
Service Station	BP Express Shopping Ltd	Longbridge Way Gatwick, Crawley
Service Station	Somerfield	Balcombe Road, Crawley
Service Station	Southern Counties Garages	27/43 Ifield Rd, Crawley
Service Station	Tate Brothers	Fleming Way, Manor Royal, Crawley
Service Station	ROC UK Ltd	Povey Cross roundabout, Brighton Rd,
Service Station	BP, Boxtone Crawley Ltd	Crawley Ave, Gossops Green, Crawley
Service Station	BP Tigate express	Ashdown Drive, Tilgate, Crawley
Service Station	ANC Rental Ltd	Car Rental Bldg, South Terminal, Lower Forecourt Road, Gatwick
Waste Oil Burner	Kirkham Motors	13 Priestley Way, Manor Royal,
Waste Oil Burner	Kirkham Motors	10 Priestley Way, Manor Royal
Dry Cleaners	Apex Dry Cleaners	2 Parkside, Crawley RH10 1EH
Dry Cleaners	Bendix Launderette and Dry Cleaning Services	18 Tilgate Parade Crawley RH10 5EQ
Dry Cleaners	Johnson Cleaners UK Limited	53 High Street Crawley RH10 1BQ

Dry Cleaners	Spencer Dry Cleaners	69 Gales Drive, Three Bridges, Crawley RH10 1QA
Dry Cleaners	Gatwick Laundries	5 Gossops Parade, Gossops Green, RH11
Dry Cleaners	Quality Dry Cleaners	10 Pound Hill Parade, Crawley, RH10 7EA
Dry Cleaners	Sparkle	3 Royce Road, Crawley, RH10 9NX
Dry Cleaners	Kleenest Dry Cleaning	9 Furnace Parade, Furnace Green, Crawley, RH10 6NX
Dry Cleaners	Fly Dry Cleaners	3 Maidenbower Square, Crawley, RH10
Dry Cleaners	Airline Services Ltd	Building 583 D, Perimeter Road South, Gatwick Airport RH6 0PQ
Dry Cleaners	Airbase Interiors	Gatwick Gate, Charlwood Road, Lowfield Heath RH11 0TG

(Last updatedApril 2007)

Part A Industrial Processes in Crawley		
Process Type	Operator	Address
Combustion Plant	Gatwick Airports Ltd	London Gatwick Airport Ashdown House, Crawley RH6ONP
Grid Substation Oil Storage(application)	EDF Energy Networks Ltd	EDF Energy, Stephenson Way, Crawley, RH10 1GD

(Last updated April 2007)