DERBY CITY COUNCIL

(Photograph courtesy of Derby Daily Telegraph Ltd)

DETAILED ASSESSMENT FOR PARTICULATE MATTER (PM_{10})

July 2006

SUMMARY

There are two health-based standards for particulate matter (PM_{10}). There is an annual average of 40µg/m^3 and a 24-hour mean of 50µg/m^3, which must not be exceeded more than 35 times in a calendar year.

Exceedences of these standards at dwellings, schools and nurseries are considered to pose a risk to human health. The Review and Assessment of local air quality considers the likelihood of these standards being exceeded.

The initial 2004 Updating and Screening Assessment identified the need for a Detailed Assessment for road-traffic based PM_{10}. This was in relation to the 24-hour PM_{10} standard at a number of busy junctions in Derby. The USA also confirmed that there was no need to proceed to a Detailed Assessment for the annual average PM_{10} standard.

The first section of this report provides background information on PM_{10} and road-traffic pollution. It also details of the Review and Assessment process, so as to put this Detailed Assessment in context.

The second chapter evaluates the 2004 Updating and Screening Assessment (USA), using DMRB screening assessments. As a result, 5 busy junctions are identified as requiring a Detailed Assessment for PM_{10}. These junctions are:

1 Bridge Street/ Agard Street
2 Osmaston Road/Ascot Drive
3 Osmaston Road/ Harvey Road (Mitre pub)
4 London Road/Midland Road
5 London Road/Traffic Street

In terms of the Detailed Assessment itself, ADMS-Urban dispersion modelling is used to determine the likelihood of an exceedence of the 24-hour standard at these junctions. This is in terms of both a base year of 2005 and a future year scenario of 2011.

In the absence of specific PM_{10} monitoring at the 5 junctions, verification of the dispersion model relied upon monitoring data from the Council House and Warwick Avenue air quality monitoring stations. The report describes these analysers and presents the results obtained. It also describes the dispersion model settings and presents the predicted 90th percentile PM_{10} concentrations. The associated contour plots are provided in Appendix 1.

Analysis of the dispersion modelling results concludes that the 24-hour PM_{10} standard was likely to have been met at all roadside locations in 2005. In 2011, anticipated nationwide reductions in background PM_{10} concentrations mean that an exceedence of the 24-hour PM_{10} standard is even less likely.

On this basis, it is concluded that there is no need to designate any road-traffic related PM_{10} AQMAs in Derby. It should also be noted that there is an existing industrial-related PM_{10} AQMA on Victory Road. Following the closure of the QDF foundry in October 2005, monitoring is continuing to determine whether this AQMA can be revoked.

In contrast to the Detailed Assessment for PM_{10}, the Detailed Assessment for road-traffic based Nitrogen Dioxide (NO_2) reported that exceedences of the annual average NO_2 standard are likely. As a result, the Council proposes to:

- Revise the existing Inner and Outer Ring-Road NO_2 AQMAs
- Designate a new NO_2 AQMA along the A52 in Spondon

This situation of predicted exceedences of the annual average NO_2 standard and not of the 24-hour PM_{10} standard is repeated in many UK cities.

Although there are no predicted exceedences of the PM_{10} standard in Derby, PM_{10} is a non-threshold pollutant. There are therefore significant health benefits to be achieved from a PM_{10} Action Plan, to minimise road-traffic related PM_{10} emissions. This plan already exists in effect, in the form of the Council's NO_2 Action Plan. This is because many actions to reduce road-traffic related NO_2 will also reduce road-traffic related PM_{10}.

CONTENTS *Page*

Tables *Page*

Maps *Page*

Photographs *Page*

Graphs

1.0 INTRODUCTION

Derby is a city of almost 250,000 people. It is situated in the heart of the East Midlands and is surrounded by primarily rural districts. The urban conurbation of Derby is the responsibility of the unitary authority of Derby City Council.

Under the Environment Act 1995, Derby City Council is under a duty to continually review and assess the concentrations of 7 pollutants, to determine whether they will exceed the National Air Quality Objectives. The pollutants in question are benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide (NO_2), particulate matter (PM_{10}) and sulphur dioxide.

This report is a Detailed Assessment for road-traffic related PM_{10}. It specifically considers the likelihood of exceedences of the 24-hour mean PM_{10} standard at points of relevant exposure close to busy roads and junctions in Derby.

Particles can vary widely in size and composition. Particulate matter smaller than 10 microns in diameter is known as PM_{10}. Similarly, particulate matter smaller than 2.5 microns in diameter is known as $PM_{2.5}$.

The PM_{10} standard was designed to identify those particles likely to be inhaled by humans. PM_{10} has therefore become the generally accepted measure of particulate material in the atmosphere in the UK and Europe.

There are a wide range of sources that contribute to PM_{10} emission sources in the UK. These natural and man-made sources are divided into 3 main categories, based on their composition:

1. Primary particle emissions are derived directly from combustion sources and in particular road transport. Vehicle exhausts emit elemental carbon, whilst vehicle fuels and lubricants emit Volatile Organic Carbons (VOCs). Both of these types of PM_{10} are emitted more from diesel vehicles than petrol vehicles.

   Power generation and in particular domestic coal combustion, have also traditionally been a major source of particulate emissions in the UK, as have industrial processes such as bulk handling, construction, mining and quarrying.

   All of these sources of primary particle emissions are governed directly by legislation, such as the vehicle emission standards. They are therefore expected to continue to reduce in future years.

2. Secondary particles are formed by chemical reactions in the atmosphere, principally comprising of sulphates and nitrates. Since these particle emissions are largely governed by legislative controls on sulphur dioxide and nitrogen oxide emissions, a reduction in these emissions is again expected to continue in future years.

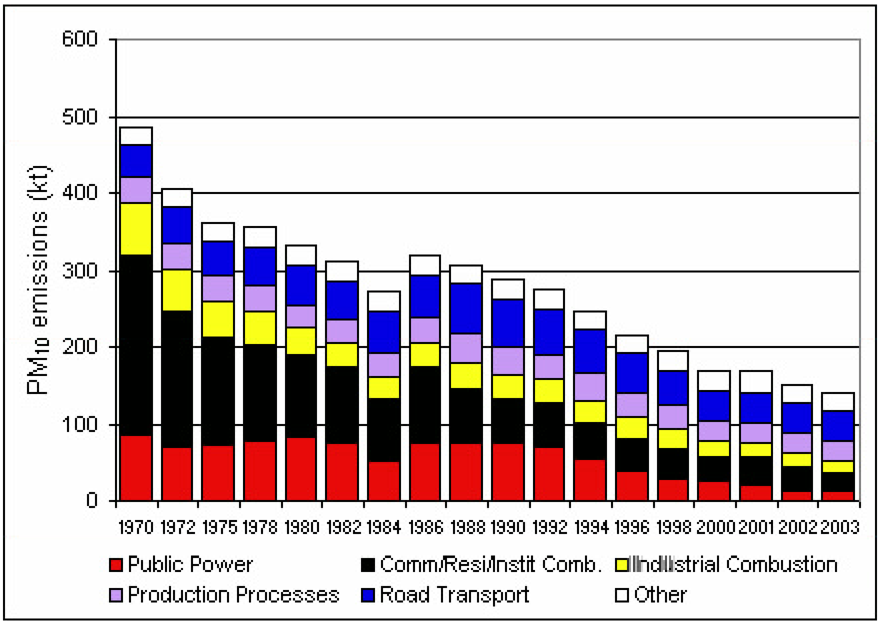
3. Coarse particles comprise of emissions from a wide range of sources, including re-suspended dust from road traffic, construction works, wind-blown dusts and soils, sea salt and biological particles. In contrast to primary and secondary particles, coarse particles are largely uncontrolled and therefore are not expected to decline in future years.

As is shown in Graph 1, total UK emissions of PM_{10} have declined since 1970. This is due mainly to a reduction in UK domestic coal use, falling from 234 kilotonnes (48%) in 1970 to 24 kilotonnes (17%) in 2003 (Reference 1).

Although there has been a year-on-year reduction in total PM_{10} emissions, the relative contribution from road transport has remained relatively constant. This is due to improvements in engine technology being unable to counteract the effect of increased traffic growth. This is in contrast to NO_2, where significant improvements in engine technology have resulted in year-on-year reductions in road-traffic related NO_2 emissions.

Graph 1

UK Total PM_{10} Emissions 1970-2003



http://www.naei.org.uk/pollutantdetail.php

In terms of health effects, PM_{10} is a non-threshold pollutant. Since no amount of exposure to PM_{10} is therefore deemed safe, there are health benefits to be achieved from reducing PM_{10} concentrations below the objective levels. This is in contrast to NO_2, which a threshold pollutant (Reference 4 and 5).

The UK government is therefore considering introducing a PM_{10} Exposure Reduction Strategy, with the aim of reducing background PM_{10} concentrations and therefore general population exposure. This will complement the existing Air Quality Standards for PM_{10}, which consider PM_{10} pollution hotspots.

The Air Quality Expert Group (AQEG) concludes that both short-term and long-term exposure to ambient PM_{10} is consistently associated with respiratory illness, cardiovascular illness and mortality. There is general consensus that these health effects are most frequently observed by the elderly, children and people with pre-existing lung, disease, heart disease or diabetes (Reference 5).

National Air Quality Objectives have been set for PM_{10}, with a target date of 31 December 2004. Since this date has now passed, these Objectives are now referred to as National Air Quality Standards. These standards measure exposure over both long and short-term averaging periods.

As is shown in Table 1, the National Air Quality Standards for PM_{10} are an annual average concentration of 40µg/m^3 and a 24-hour mean concentration of 50µg/m^3, which must not be exceeded more than 35 times per year.

Table 1
Summary of the National Air Quality Standards for PM_{10}

Pollutant	Concentration	Measurement	Target Date
Particulate matter	50µg/m^3	35 exceedences of 24-hour mean	31 Dec 2004
	40µg/m^3	Annual mean	31 Dec 2004

These standards are based upon exposure to PM_{10} concentrations in those locations where members of the public are regularly present for the averaging period of the objective. The health of people in the work place is addressed through health and safety legislation.

For the 24-hour mean, relevant public exposure is for all locations where the annual mean standard applies (building facades of dwellings, nurseries, schools and hospitals), as well as the rear gardens of residential properties. Front gardens are excluded, on the basis that people are unlikely to sit in front gardens located next to busy roads (Reference 2).

Kerbside sites where public exposure is expected to be short-term, and therefore the pavements of busy shopping streets and cafes with outdoor seating, are specifically excluded from this assessment.

In addition to the National Air Quality Standards, the European Union has set more stringent indicative objectives for PM_{10}. These objectives are an annual mean of 20µg/m^3 and a 24-hour mean of 50µg/m^3, which must not be exceeded more than 7 days per year. Although these objectives are to be met by 1 January 2010, they are only indicative and so are not considered in this Detailed Assessment.

The continual process of Review and Assessment of local air quality requires local authorities to determine the likelihood of exceeding National Air Quality Standards.

Where an exceedence is considered likely, the local authority is under a duty to designate an Air Quality Management Area (AQMA). Following designation, there is also a requirement for the local authority to produce an Action Plan in consultation with stakeholders. This is with the aim of enabling the AQMA to be revoked.

Of the 107 road-traffic related AQMAs designated in the UK by May 2004, 48 were due to both nitrogen dioxide (NO_2) and particulate matter (PM_{10}). The remaining 59 AQMAs were stand-alone road-traffic related NO_2 AQMAs (Reference 3). This reflects the fact that road vehicles emit proportionally more NO_x than PM_{10}.

Derby City Council undertook its first Review and Assessment of local air quality in 2000. This was a four-stage review of the National Air Quality Objectives, which used a combination of real-time monitoring and detailed dispersion modelling.

It screened out benzene, 1,3-butadiene, carbon monoxide, lead and sulphur dioxide, determining that none of these pollutants would be likely to cause a breach of the relevant National Air Quality Objectives.

The Stage 3 assessments for PM_{10} and NO_2 identified likely exceedences of the annual mean objectives for both of these pollutants, due to industrial based particulate matter and road-traffic related nitrogen dioxide.

For industrial based PM_{10}, the Stage 3 assessment determined that a breach of the 24-hour objective was likely at 54 dwellings in the vicinity of the QDF foundry on Victory Road. As a result of the PM_{10} from this foundry, the Victory Road PM_{10} Air Quality Management Area (AQMA) was declared in 2001.

Following closure of the QDF foundry in October 2005, particulate monitoring continues to be undertaken by the City Council. This is with a view to determining whether this industrial based PM_{10} AQMA can now be revoked.

For NO_2, the primary source of the predicted exceedences of the 2005 annual mean objective was exhaust emissions on the City's inner and outer ring-road roads. An NO_2 Air Quality Management Area was declared in 2001, to include around 1,500 dwellings close to the inner and outer ring roads.

A Stage 4 Report on the NO_2 AQMA considered the boundary of this new AQMA. Subsequently, the AQMA was amended on 1 September 2002, to remove Raynesway and the city centre end of the A52. This created 2 separate NO_2 AQMAs for the inner and outer ring roads.

In 2002, Derby City Council commenced this second Review and Assessment of local air quality. In contrast to the first Review, this is a 2-stage process. The initial Updating and Screening Assessment (USA) identifies local air quality issues, in light of any changes in local circumstance and/or guidance since the first Review and Assessment. Where necessary, a Detailed Assessment then considers these issues in more detail.

Derby City Council's USA was approved by the Department for Environment, Food and Rural Affairs (Defra) in March 2004. It has subsequently been placed on Defra's website as an example of good practice.

The USA concluded that there was a need for Detailed Assessments to be undertaken in relation to both industrial-based benzene and road-traffic based NO_2 and PM_{10}.

The Detailed Assessment for Benzene was approved by Defra in April 2006. It concluded that although current exceedences of the 2010 objective of $5\mu g/m^3$ are evident at dwellings close to the Acetate Products factory in Spondon, these exceedences are unlikely to continue in 2010. Consequently, there is no need to declare an AQMA for benzene at this stage. This situation will of course be kept under review.

The Detailed Assessment for NO_2 was approved by Defra in May 2006. It specifically considered road-traffic NO_2 associated with busy roads and junctions outside of the 2 existing NO_2 AQMAs.

The Detailed Assessment for NO_2 concluded that for a number of dwellings close to these busy roads and junctions, exceedences of the 2005 NO_2 annual mean standard of $40\mu g/m^3$ are likely. Consequently, it proposed to:

1. Revise the 2 existing Inner and Outer Ring-Road NO_2 AQMAs. This will involve joining them together along Osmaston Road, extending their boundaries in some places and reducing their boundaries in others.

2. Designate a new road-traffic related NO_2 AQMA in Spondon, which is physically separate to the revised Inner and Outer Ring-Road AQMA. This second smaller AQMA will include dwellings close to Brian Clough Way (A52), Nottingham Road and Derby Road.

The Detailed Assessment for road-traffic based PM_{10} is the subject of this report. As with the Detailed Assessments for Benzene and NO_2, the need for this assessment was identified by the 2004 USA.

The aim of this Detailed Assessment is to consider road-traffic related PM_{10} associated with busy roads and junctions across Derby. Specifically, this Detailed Assessment will only consider those busy roads and junctions where there are nearby dwellings and there is a risk of an exceedence of the 24-hour standard.

Many of the busy roads and junctions considered in this assessment have also been considered in the Detailed Assessment for road-traffic related NO_2. In many instances, these roads and junctions are considered likely to exceed the annual average NO_2 standard and have therefore been included in the proposed new NO_2 AQMAs.

2.0 EVALUATION OF UPDATING & SCREENING ASSESSMENT

The 2004 Updating and Screening Assessment (USA) considered all possible sources of PM_{10} and locations of relevant public exposure. As a result and as is shown in Table 2, a Detailed Assessment was necessary for busy road junctions and new roads constructed since the first Review and Assessment.

Table 2
Summary of the Updating and Screening Checklist for PM_{10}

Section	Source, location or data that need to be assessed	Detailed Assessment Required?	Why?
A	Monitoring data outside AQMA	No	This decision was based upon PM_{10} monitoring data for the Council House urban background site. The kerbside TEOM analyser at Warwick Avenue was not commissioned until October 2004, so the monitoring data from this new station was unable to be considered in the original USA.
B	Monitoring data within an AQMA	No	-
C	Busy roads and junctions in Scotland	N/A	-

Section	**Source, location or data that need to be assessed**	**Detailed Assessment Required?**	**Why?**
D	Busy junctions	Yes	More than 10,000 vehicles per day, relevant exposure within 10m of kerb and a DMRB assessment result > the 24-hour standard for the following busy junctions: 1. London Road/ Harvey Road/ Shardlow Road 2. Newdigate Street/ Balaclava Road 3. Uttoxeter New Road/ Manor Road/ Kingsway 4. Burton Road/ Manor Road/ Warwick Avenue 5. Osmaston Park Road/ Moor Lane 6. Osmaston Road/ Ascot Drive 7. Burton Road/ Abbey Street 8. Boulton Lane/ Chellaston Road/ Merrill Way 9. St. Alkmunds Way/ Cathedral Road 10. Stafford Street/ Friary Street 11. Friar Gate/ Ashbourne Road/ Uttoxeter Old Road 12. Derby Road/ Raynesway/ Acorn Way
E	Roads with high flow of buses and/or HGVs	No	-

Section	Source, location or data that need to be assessed	Detailed Assessment Required?	Why?
F	New roads constructed or proposed since first Review and Assessment	Yes	Alvaston Bypass opened on 17 December 2003. Its air quality impact assessment predicted that as a result, the following properties would be likely to exceed the 24-hour standard: • Properties fronting Raynesway South • Properties on A6 Blue Peter South to Field Lane • Properties on A6 Field Lane to Lindon Drive • Properties on A6 Lindon Drive to Keldholme Road • Properties on A6 Keldholme Road to Snelsmoor Lane
G	Roads close to the objective during the first Review & Assessment	No	-
H	Roads with significantly changed traffic flows	No	-
I	New industrial sources	No	-
J	Industrial sources with substantially increased emissions	No	-

Section	Source, location or data that need to be assessed	Detailed Assessment Required?	Why?
K	Areas with domestic solid fuel burning	No	-
L	Quarries, landfill sites, opencast coal and handling of dusty cargoes at ports	No	-
M	Aircraft	No	-

These conclusions from the 2004 USA are unfortunately now outdated since:

1. They are based on 2002 traffic data. Additional 2003, 2004 and 2005 traffic data is now available.

2. Monitoring data is now available for the kerbside TEOM analyser at Warwick Avenue. Its kerbside location increases the accuracy of assessing roadside PM_{10} concentrations. Furthermore, this 2005 monitoring data is beyond the target year of 2004, so avoids the need to apply future year correction factors.

3. The emission factors have recently changed, so previous predictions are likely to slightly underestimate PM_{10} concentrations.

It is for these reasons that this Detailed Assessment will initially review the 2004 USA conclusions for Sections A, D and F, in sections 2.1, 2.2 and 2.3 of this report.

2.1 REVIEW OF UPDATING & SCREENING ASSESSMENT - MONITORING DATA (SECTION A)

A summary of the PM_{10} monitoring results from Chapter 4 is provided in Tables 3 and 4. This is within the context of whether a Detailed Assessment for PM_{10} is required due to local monitoring data.

Table 3 - Council House (review of monitoring data)

Diffusion Tube Location	Within PM_{10} AQMA?	Relevant exposure within 10m?	Exceeds 24-hour PM_{10} Standard?	Detailed Assessment Required?
Council House TEOM analyser	No	No	No	No

Table 4 – Warwick Avenue (review of monitoring data)

Diffusion Tube Location	Within PM_{10} AQMA?	Relevant exposure within 10m?	Exceeds 24-hour PM_{10} Standard?	Detailed Assessment Required?
Warwick Avenue TEOM analyser	No	Yes	No but 78m from busy junction at Warwick Avenue/ Burton Road	No - see DMRB assessment in Table 7, Part 1

2.2 REVIEW OF UPDATING & SCREENING ASSESSMENT – BUSY ROAD JUNCTIONS (SECTION D)

The Guidance requires identification of busy junctions, which have a flow greater than 10,000 vehicles per day (vpd) and relevant exposure within 10m of the kerb. These junctions need to be assessed using the DMRB spreadsheet.

It has not been possible to simply reconsider the busy junctions identified in the Detailed Assessment for NO_2 because:

1. The criterion for relevant exposure for PM_{10} is any outdoor location where the public might be regularly exposed to a 24-hour mean. In addition to the building facades of residential properties, schools, nurseries and hospitals, the rear gardens of residential buildings are therefore also considered. It is unlikely that anyone will spend sufficient time in their front garden, when it is next to a busy road.

2. Automatic and manual traffic count data is available from the Highways Department for 2004. Rather than multiplying the morning peak hour data by 5, as was originally recommended by Highways, this Detailed Assessment was therefore able to use more accurate 24-hour Annual Average Daily Traffic (AADT) counts. These 2003 counts were adjusted to 2005.

3. The Detailed Assessment for NO_2 only considered busy junctions outside of the Inner and Outer Ring-Road NO_2 AQMAs. A large number of busy junctions affected by road-traffic based PM_{10} are located within the NO_2 AQMAs.

The junctions identified as having an AADT greater than 10,000 are shown in Table 6, Parts 1 to 12. This assessment was based upon manual and automatic traffic count data from across Derby's road network.

As is discussed in Section 2.3, a number of receptors close to the Alvaston Bypass have also been included in Table 6. This information is provided together with information on relevant exposure, so as to determine whether a Design Manual for Roads and Bridges (DMRB) screening assessment is required.

The DMRB screening assessment data and outcomes are shown in Table 7, Parts 1 to 11. No adjustment has been required for street canyons. Map 1 shows the locations of these busy junctions.

The 2003 AADT count data was calculated using the traffic flow data contained within the Derby Area Transport Study (DATS). DATS is a comprehensive road-traffic database, commissioned by Derby City Council's Highways Department. It provides detailed traffic flows for every link within Derby's road network.

In order to convert the 2003 AADT into 2005 AADT values, local traffic growth factors were used. These growth factors were calculated by the Highways Department, using automatic traffic monitoring data for the City's 5 Area Panels. These Area Panels are shown in Map 5. The local growth factors are shown in Table 5.

Map 5

Derby City Council's Area Panels

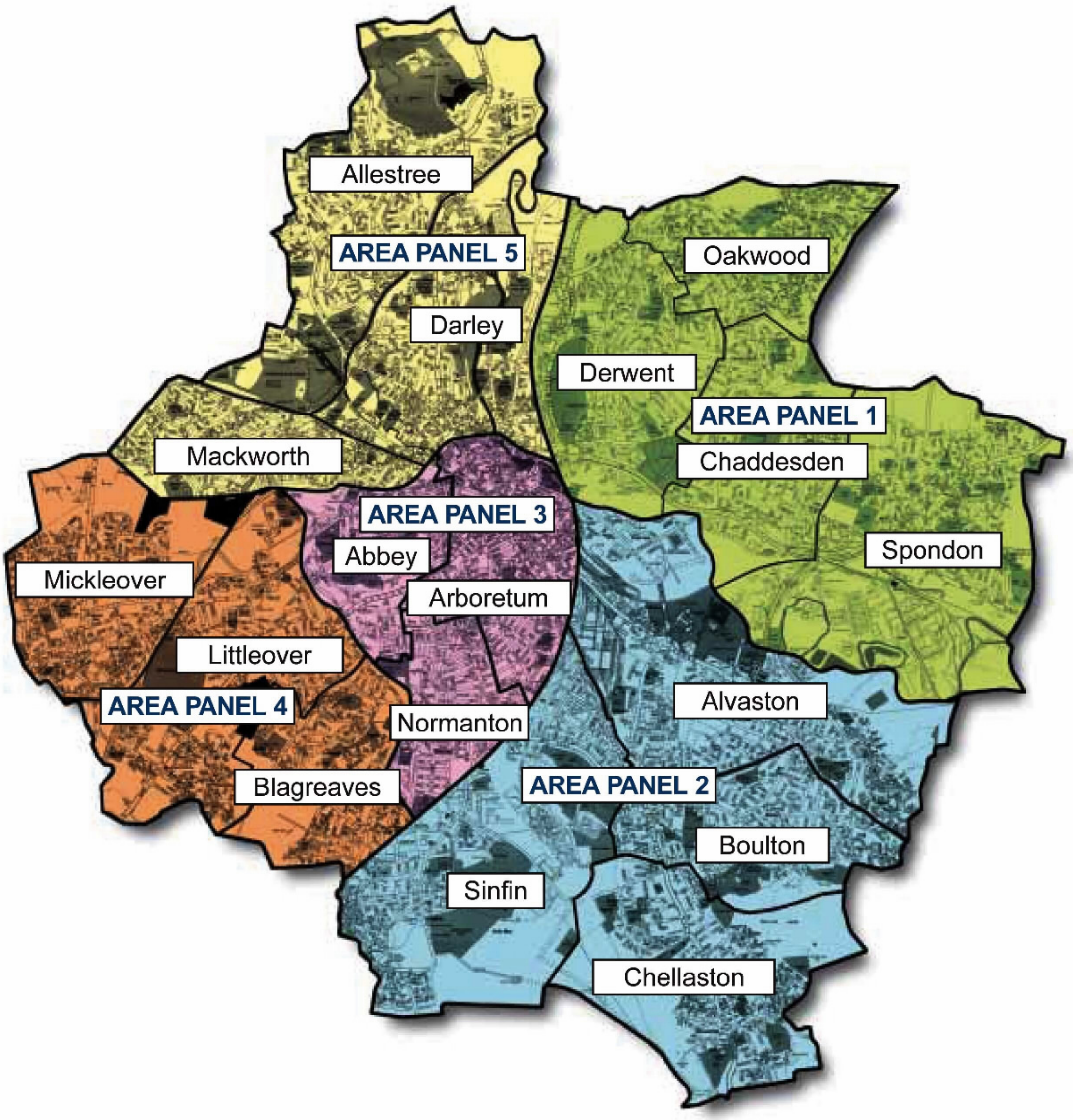


Table 5, Local Growth Factors for 2003 - 2005

Area Panel Number	Wards	Local Traffic Growth Factor 2003 to 2005 (%)
1	Oakwood, Derwent, Chaddesden & Spondon	6.05
2	Alvaston, Boulton, Sinfin & Chellaston	-4.92
3	Abbey, Arboretum & Normanton	0.46
4	Mickleover, Littleover & Blagreaves	1.63
5	Allestree, Darley & Mackworth	-1.17

The significant traffic growth and reductions in Area Panels 1 and 2, arise from the opening of the Alvaston Bypass on 17 December 2003. This bypass was designed to relieve congestion in the Alvaston area.

LAQM Technical Guidance Note (2003) recommends that if there is monitoring data available for a busy junction, it should be used in preference to the DMRB assessment. However, neither the Council House nor Warwick Avenue monitoring stations are close enough to busy junctions. The Council House is an urban background site, whilst the Warwick Avenue station is 78 metres from the busy junction at Warwick Avenue/Burton Road.

Table 6 – Part 1
Busy Junctions with > 10,000 AADT

Busy Road	Busy Junction & Area Panel	Relevant exposure within 10m of junction?	Location of nearest receptor	Require DMRB?
Duffield Road	Duffield Road/ Evans Avenue - Panel 5	No	-	No
Duffield Road	Duffield Road/ Ford Lane - Panel 5	No	-	No
Duffield Road	Duffield Road/ Cornhill Park Lane - Panel 5	Yes	1 Cornhill Pak Lane	Yes
Duffield Road	Duffield Road/ Derwent Avenue - Panel 5	No	-	No
Duffield Road	Duffield Road/ Broadway roundabout - Panel 5	No	-	No
Duffield Road	Duffield Road/ 5 Lamps - Panel 5	Yes	55 Duffield Road	Yes
Duffield Road	Duffield Road/ King Street (Five Lamps) - Panel 5	Yes	109A King Street	Yes
A38	Duffield Road north/ Roundabout - Panel 5	No	-	No
A38	Duffield Road south/ Roundabout - Panel 5	No	-	No
A38	A38 slip lanes, Abbey Hill - Panel 5	Yes	7 Gema Close	Yes

Table 6 – Part 2
Busy Junctions with > 10,000 AADT

Busy Road	Busy Junction & Area Panel	Relevant exposure within 10m of junction?	Location of nearest receptor	Require DMRB?
A38	A38 slip lanes, Queensway - Panel 5	No	-	No
A38	Queensway/ Markeaton roundabout - Panel 5	No	-	No
A38	Kedleston Road slip roads - Panel 5	No	-	No
A38	Kingsway/ Markeaton roundabout - Panel 5	No	-	No
A38	Kingsway/A38 roundabout - Panel 5	No	-	No
A38	Mickleover slip roads next to campus - Panel 4	No	-	No
A38	Mickleover slip roads next to Brierfield Way - Panel 4	No	-	No

Table 6 – Part 3
Busy Junctions with > 10,000 AADT

Busy Road	Busy Junction & Area Panel	Relevant exposure within 10m of junction?	Location of nearest receptor	Require DMRB?
Station Road, Mickleover	Station Road/ Uttoxeter Road - Panel 4	No	-	No
Uttoxeter Road, Mickleover	Uttoxeter Road/ Corden Avenue - Panel 4	No	-	No
Kedleston Road	Kedleston Road/ Broadway - Panel 5	No		No
Kedleston Road	Kedleston Road/ Garden Street (Five Lamps) - Panel 5	Yes	2 Kedleston Road	Yes
Alfreton Road	Alfreton Road/ Sir Frank Whittle Road roundabout - Panel 1	No	-	No
Alfreton Road	Alfreton Road/ Mansfield Road - Panel 5	Yes	2 Old Chester Rd	Yes

Table 6 – Part 4
Busy Junctions with > 10,000 AADT

Busy Road	Busy Junction & Area Panel	Relevant exposure within 10m of junction?	Location of nearest receptor	Require DMRB?
Ashbourne Road	Ashbourne Road/ Markeaton roundabout - Panel 5	No	-	No
Ashbourne Road	Ashbourne Road/ Merchant Street - Panel 5	Yes	56 Ashbourne Rd	Yes
Ashbourne Road	Friar Gate/ Bridge Street - Panel 5	Yes	1 Bridge Street	Yes
Ashbourne Road	Ashbourne Road/ Vernon Street - Panel 3	Yes	1 Vernon Street	Yes
Uttoxeter New Road	Uttoxeter New Road/ Kingsway - Panel 5	Yes	431 Uttoxeter New Road	Yes
Uttoxeter New Road	Uttoxeter New Road/ Albany Road - Panel 5	Yes	2 Albany Road	Yes
Uttoxeter New Road	Uttoxeter New Road/ Uttoxeter Old Road - Panel 5	Yes	207 Uttoxeter New Road	Yes
Uttoxeter New Road	Uttoxeter New Road/ Stafford Street - Panel 5	Yes	98 Uttoxeter New Road	Yes

Table 6 – Part 5
Busy Junctions with > 10,000 AADT

Busy Road	Busy Junction & Area Panel	Relevant exposure within 10m of junction?	Location of nearest receptor	Require DMRB?
Outer Ring-Road	Manor Road/ Uttoxeter New Road - Panel 3	Yes	437 Uttoxeter New Road	Yes
Outer Ring-Road	Manor Road/ Burton Road - Panel 3	No	-	No
Outer Ring-Road	Burton Road/ Warwick Avenue - Panel 3	Yes	Ridgeway Court	Yes
Burton Road	Burton Road/ Whitaker Road - Panel 3	Yes	1 Farley Road	Yes
Burton Road	Burton Road/ Chain Lane - Panel 4	No	-	No
Burton Road	Burton Road/ Rykneld Road - Panel 4	No	-	No
Rykneld Road	Rykneld Road/ Callow Hill Way roundabout - Panel 4	No	-	No
Blagreaves Lane	Blagreaves Lane/ Moorway Lane - Panel 4	Yes	4 Moorway Lane	Yes
Outer Ring-Road	Warwick Avenue/ Stenson Road roundabout - Panel 3	No	-	No

Table 6 – Part 6
Busy Junctions with > 10,000 AADT

Busy Road	Busy Junction & Area Panel	Relevant exposure within 10m of junction?	Location of nearest receptor	Require DMRB?
Outer Ring-Road	Osmaston Park Road/ Sinfin Lane - Panel 3	Yes	4 Newdigate Street	Yes
Stenson Road	Stenson Road/ Upper Dale Road roundabout – Panel 4	Yes	3 Derby Lane	Yes
Stenson Road	Stenson Road/ Littleover Lane/ Village Street - Panel 4	No	-	No
Stenson Road	Stenson Road/ Sunnyhill Avenue - Panel 4	No	-	No
Stenson Road	Stenson Road/ Blagreaves Lane - Panel 4	No	-	No
Pear Tree Road	Pear Tree Road/ Lower Dale Road/ Normanton Road - Panel 4	Yes	1 Pear Tree Road	Yes
Pear Tree Road	Pear Tree Road/ Dairy House Road - Panel 4	Yes	185 Pear Tree Road	Yes
Outer Ring-Road	Osmaston Park Road/ Victory Road - Panel 4	Yes	112 Osmaston Park Road	Yes

Table 6 – Part 7
Busy Junctions with > 10,000 AADT

Busy Road	Busy Junction & Area Panel	Relevant exposure within 10m of junction?	Location of nearest receptor	Require DMRB?
Outer Ring-Road	Osmaston Park Road/ Osmaston Road (Spider Island) – Panel 2	No	-	No
Outer Ring-Road	Osmaston Road/ Harvey Road (Spider Island) – Panel 2	Yes	Mitre Pub	Yes
Sinfin Lane	Sinfin Lane/ Wilmore Road – Panel 2	No	-	No
Sinfin Lane	Sinfin Lane/ Thackeray Street - Panel 2	Yes	1 Thackeray Street	Yes
Osmaston Road	Osmaston Road/ Charnwood Street - Panel 3	Yes	92 Osmaston Road	Yes
Osmaston Road	Osmaston Road/ Litchurch Lane - Panel 2	No	-	No
Osmaston Road	Osmaston Road/ Ascot Drive - Panel 2	Yes	730 Osmaston Road	Yes
Chellaston Road	Chellaston Road/ Boulton Lane - Panel 2	Yes	429 Boulton Lane	Yes

Table 6 – Part 8
Busy Junctions with > 10,000 AADT

Busy Road	Busy Junction & Area Panel	Relevant exposure within 10m of junction?	Location of nearest receptor	Require DMRB?
Chellaston Road	Chellaston Road/ Sinfin Avenue/ Derby Road - Panel 2	Yes	267 Chellaston Road	Yes
Derby Road	Derby Road/ Sinfin Moor Lane - Panel 2	No	-	No
Outer Ring-Road	Harvey Road/ Shardlow Road - Panel 2	No	-	No
A6 between Blue Peter roundabouts	Blue Peter roundabouts - Panel 2	Yes	Li's Fish Bar - between Blue Peter roundabouts	Yes
Raynesway south	Alvaston Bypass roundabout/ Raynesway - Panel 2	No but see Section 2.3	Metcalfe Close Flats - Block 1	Yes
Alvaston Bypass	Alvaston Bypass - Panel 2	No but see Section 2.3	16 Wolverley Grange - next to Alvaston Bypass	Yes

Table 6 – Part 9
Busy Junctions with > 10,000 AADT

Busy Road	Busy Junction & Area Panel	Relevant exposure within 10m of junction?	Location of nearest receptor	Require DMRB?
Shardlow Road	Harvey Road/ Shardlow Road roundabout - Panel 2	No but see Section 2.3	33 Shardlow Road - Blue Peter South to Field Lane	Yes
Shardlow Road	Shardlow Road/ Keldholme Lane roundabout - Panel 2	Yes	1 Bembridge Drive - Keldholme Lane to Snelsmoor Lane	Yes
Shardlow Road	Shardlow Road/ Alvaston Bypas roundabout - Panel 2	Yes	37 Corinium Close - Keldhlme Lane to Snelsmoor Lane	Yes
London Road	London Road/ Wilmorton Link roundabout - Panel 2	Yes	10 Harrow Street	Yes
London Road	London Road/ Litchurch Lane Panel 2	No	-	No
London Road	London Road/ Midland Road - Panel 3	Yes	153 London Road	Yes

Table 6 - Part 10
Busy Junctions with > 10,000 AADT

Busy Road	Busy Junction & Area Panel	Relevant exposure within 10m of junction?	Location of nearest receptor	Require DMRB?
Willowcroft Road, Spondon	Willowcroft Road/ Nottingham Road - Panel 1	Yes	32 Nottingham Rd	Yes
Nottingham Road, Spondon	Nottingham Road/ Station Road roundabout - Panel 1	Yes	1 Station Road	Yes
Lodge Lane	Lodge Lane/ Sitwell Street - Panel 1	No	-	No
Sitwell Street	Sitwell Street/ Willowcroft Road - Panel 1	Yes	93 Willowcroft Rd	Yes
A52	Slip Roads adjacent to Lodge Lane - Panel 1	Yes	19 Gilbert Close	Yes
A52	A52/ Derby Road roundabout - Panel 1	Yes	76 Derby Road	Yes
Raynesway	Raynesway/ Derby Road roundabout - Panel 1	No	-	No
Nottingham Road	Nottingham Road/ Sunny Grove - Panel 1	No	-	No

Table 6 - Part 11
Busy Junctions with > 10,000 AADT

Busy Road	Busy Junction & Area Panel	Relevant exposure within 10m of junction?	Location of nearest receptor	Require DMRB?
Nottingham Road	Nottingham Road/ St Marks Road - Panel 1	Yes	33 Nottingham Road	Yes
A52	A52/ Highfield Lane - Panel 1	No	-	No
A608	A608/ Old Mansfield Road - Panel 1	No	-	No
St Alkmunds Way	St Alkmunds Way/ Nottingham Road - Panel 3	Yes	53 Nottingham Rd	Yes
Burton Road	Burton Road/ Abbey Street - Panel 3	Yes	202 Burton Road	Yes
Burton Road	Burton Road/ Normanton Road - Panel 3	No	-	No
Mount Street	Mount Street/ Burton Road - Panel 3	Yes	44 Mount Street	Yes
Normanton Road	Normanton Road/ Charnwood Street - Panel 3	Yes	91 Charnwood Street	Yes
Normanton Road	Normanton Road/ Leopold Street - Panel 3	Yes	77 Leopold Street	Yes

Table 6 - Part 12
Busy Junctions with > 10,000 AADT

Busy Road	Busy Junction & Area Panel	Relevant exposure within 10m of junction?	Location of nearest receptor	Require DMRB?
Traffic Street	Traffic Street/ London Road roundabout - Panel 3	Yes	Strutts Pub	Yes
A6	A6/ Siddals Road - Panel 3	Yes	Siddals Road Nursing Home	Yes
The Cock Pitt	The Cock Pitt/ A6 roundabout - Panel 3	No	-	No
Morledge	Morledge/ The Cock Pitt – Panel 3	No	-	No
Mansfield Road	Mansfield Road/ Fox Street - Panel 3	Yes	14 Mansfield Road	Yes
Ford Street	Ford Street/ Agard Street - Panel 3	Yes	35 Ford Street	Yes
Bridge Street	Bridge Street/ Agard Street - Panel 3	Yes	1-37 Kenneth House	Yes
Friary Street	Friary Street/ Stafford Street - Panel 3	Yes	29 Stafford Street	Yes
Abbey Street	Abbey Street/ Curzon Street - Panel 3	Yes	37 Curzon Street	Yes

Table 7 - Part 1
DMRB 2005 PM_{10} Predictions for Junctions with AADT > 10,000 vpd & Relevant Public Exposure within 10m

Junction	Grid ref	Background 2005 PM_{10} (µg/m^3)	Link	2003 AADT	2005 AADT	Speed (km/hr)	Mean % HDV	Distance from link center to receptor point (m)	Road type	Predicted number of days > 50µg/m^3 in 2005
Warwick Avenue TEOM analyser	433678 334533	21.6	1548/1592 & 1624 3162/1592 & 1605	25,877 18,749	25,996 19,055	32.2 22.4	4 2	12.2 79.4	A A	15
Council House TEOM analyser	435475 336252	22.4	1019/7103	9,092	9,134	32.4	5.7	38.4	B	9
Duffield Road/ Cornhill Park Lane	435090 339899	20.3	1939/1943 1965/1943	4,122 20,794	4,074 20,550	22.6 37.2	1.2 5.7	12.0 17.8	B A	10
Duffield Road/ 5 Lamps	434828 337068	25.1	1080 & 1873 1091 & 1080 1091 & 2789	15,731 7,305 7,999	15,547 7,220 7,905	36.3 38 13.3	4.9 6.3 2.3	9.5 11.3 25.0	A A A	33.7
Duffield Road/ King Street (Five Lamps)	434956 336874	22.1	1029 2778	14,098 16,021	13,933 15,834	38 38	2.76 3.18	3.8 9.5	A A	31

Table 7 - Part 2

DMRB 2005 PM_{10} Predictions for Junctions with AADT > 10,000 vpd & Relevant Public Exposure within 10m

Junction	Grid ref	Background 2005 PM_{10} (µg/m^3)	Link	2003 AADT	2005 AADT	Speed (km/hr)	Mean % HDV	Distance from link center to receptor point (m)	Road type	Predicted number of days > 50µg/m^3 in 2005
A38 slip lanes, Abbey Hill	435311 339515	20.3	2663/2650 2650/2660 2664/2651 2651/2652	15,634 3,153 15,112 6,661	15,451 3,116 14,935 6,583	91 72.9 91 67.3	15.6 15.5 4.6 3.98	33.9 79.6 49.7 143.2	A A A A	11
Kedleston Road/ Garden Street (Five Lamps)	434807 337054	22.1	2792/1091 2791/1091	6,532 8,772	6,456 8,669	5.0 5.0	2.5 5.5	10.2 17.3	B A	25
Alfreton Road/ Mansfield Road	435623 337535	23.5	2051/2024 & 2861 1985/2024 & 2859	16,729 6,680	16,533 6,602	31.5 31.7	7.8 9.7	11.3 11.3	B B	22
Ashbourne Road/ Merchant St	434055 336657	22.1	1635/1678 & 1714 1678/1695	23,656 5,308	23,415 5,246	37.9 23.9	8.8 5.0	9.5 5.8	A B	22
Friar Gate/ Bridge Street	434482 336500	22.1	1001/1002 820/1001 & 1770	21,809 32,695	21,554 32,312	38 28	7.4 7.1	10.8 18.2	A A	32.8
Ashbourne Road/ Vernon Street	434531 336513	25.1	1757/1770 & 1001 1738 & 1770	32,695 -	32,312 -	38 -	7.05 -	14.2 -	A B	26

Table 7 - Part 3
DMRB 2005 PM_{10} Predictions for Junctions with AADT > 10,000 vpd & Relevant Public Exposure within 10m

Junction	Grid ref	Background 2005 PM_{10} (µg/m^3)	Link	2003 AADT	2005 AADT	Speed (km/hr)	Mean % HDV	Distance from link center to receptor point (m)	Road type	Predicted number of days > 50µg/m^3 in 2005
Bridge St/ Agard St	434528 336586	25.1	1002/2785 & 1003 1767/2785 & 1003	23,305 22,376	23,032 22,114	38 30.4	7 1.4	8.3 6.0	A A	39.9 days @ Kenneth House. Annual average = 33.0µg/m^3
Uttoxeter New Road/ Kingsway	433106 335296	21.3	3095/1517 & 1570 1528/1517 & 1518	32,425 20,518	32,046 20,278	38 29.3	1.2 1.7	21.1 24.2	A A	17
Uttoxeter New Road/ Albany Road	433498 335563	21.5	1517/1570 & 1591 1528/1570	15,716 -	15,532 -	37.6 -	2.3 -	20.3 -	A B	9
Uttoxeter New Road/ Uttoxeter Old Road	433859 335804	22.4	3149/1626	15,858	15,672	26.7	2.3	10.4	A	13
Uttoxeter New Road/ Stafford Street	434667 336112	25.3	2787/1005 7069/1007	3,632 8,598	3,590 8,497	14 43	0.5 1.4	6.6 6.2	A A	24

Table 7 - Part 4
DMRB 2005 PM_{10} Predictions for Junctions with AADT > 10,000 vpd & Relevant Public Exposure within 10m

Junction	Grid ref	Background 2005 PM_{10} ($\mu g/m^3$)	Link	2003 AADT	2005 AADT	Speed (km/hr)	Mean % HDV	Distance from link center to receptor point (m)	Road type	Predicted number of days > $50\mu g/m^3$ in 2005
Manor Road/ Uttoxeter New Road	433106 335296	21.3	3095/1517 & 1570 1528/1517 & 1518	32,425 16,149	32,046 15,960	38 38	1.2 1.2	22.1 24.4	A A	12
Burton Road/ Warwick Avenue	433640 334609	21.6	1548/1592 & 1624 3162/1592 & 1605	25,877 18,749	25,996 18,835	32.2 22.4	3.95 1.98	22.6 12.9	A A	19 days (15 @ Warwick Avenue TEOM)
Burton Road/ Whitaker Road	433891 334784	21.6	1605/1634 & 1775 1597/1634	19,746 4,300	19,837 4,320	37.8 32.9	1.46 0.57	7.5 12.2	A B	12
Blagreaves Lane/ Moorway Lane	433036 333331	20.1	1505/1507	15,296	15,545	37.7	2.9	20.9	B	6
Osmaston Park Road/ Sinfin Lane	435145 333467	22.5	1917/1955 & 1989 2845/1955 & 1957	22,817 6,999	22,922 7,031	29.2 22.4	8.3 2.4	8.9 5.9	A B	27
Stenson Road/ Upper Dale Road roundabout	434565 333971	23.5	1846/1862 & 1876 1861/1862 & 1899	18,755 3,988	19,061 4,053	25.3 29.6	1.2 1.5	17.4 8.5	B B	16

Table 7 - Part 5
DMRB 2005 PM_{10} Predictions for Junctions with AADT > 10,000 vpd & Relevant Public Exposure within 10m

Junction	Grid ref	Background 2005 PM_{10} ($\mu g/m^3$)	Link	2003 AADT	2005 AADT	Speed (km/hr)	Mean % HDV	Distance from link center to receptor point (m)	Road type	Predicted number of days > $50\mu g/m^3$ in 2005
Pear Tree Road/ Lower Dale Road/ Normanton Road	435137 334743	25.2	1961/1953 & 1967 192/1953	9,948 2,677	10,110 2,721	23.4 20.9	1.5 1.2	6.9 19.8	B B	19
Pear Tree Road/ Dairy House Road	435430 334283	23.5	1995/1999 & 2012 1986/1999 & 2010	5,121 8,515	5,205 8,654	27.1 18.3	1.3 2.2	9.4 13.0	B B	15
Osmaston Park Road/ Victory Road	435757 333337	24.4	2026/2035 & 2061 2030/2035 & 2037	21,364 10,857	21,712 11,034	27.3 28.4	6.6 3.2	19.4 19.1	A B	27
Osmaston Road/ Harvey Road (Spider Island)	436896 332834	25.3	2137/2163 /2749 & 2206 2180/2751 /2748 & 2160	26,719 18,509	25,404 17,598	35.8 21.9	5.8 7.5	18.2 33.8	A A	34.6 days @ ground floor. Annual average = $31.8\mu g/m^3$
Sinfin Lane/ Thackeray Street	434994 332501	22.5	1896/1930	18,037	17,150	29.9	3.1	20.4	B	11

Table 7 - Part 6

DMRB 2005 PM_{10} Predictions for Junctions with AADT > 10,000 vpd & Relevant Public Exposure within 10m

Junction	Grid ref	Background 2005 PM_{10} ($\mu g/m^3$)	Link	2003 AADT	2005 AADT	Speed (km/hr)	Mean % HDV	Distance from link center to receptor point (m)	Road type	Predicted number of days > $50\mu g/m^3$ in 2005
Osmaston Road/ Charnwood Street	435492 335582	25.3	818/933 & 7032 932 & 933	13,371 10,017	13,433 10,063	38 38	1.9 1.0	7.9 14.2	A A	24
Osmaston Road/ Ascot Drive	436773 333112	25.3	2160 & 2146 2136/2146 & 2156	23,283 16,328	22,137 15,525	25.6 28.4	7.1 6.5	12.7 17.1	A A	44.6 days @ 730 Osmaston Road. Annual average = $34\mu g/m^3$
Chellaston Road/ Boulton Lane	437257 331945	22.3	2149/2208 & 2211 2218/2208 & 2195	17,708 7,969	16,837 7,577	20.1 21.1	6.95 0.5	11.2 20.2	A B	23
Chellaston Rd/ Sinfin Ave	437463 331320	21	2237/2239 & 2251 2239/2820	29,520 274	28,068 261	33.6 38	5.3 0.16	9.4 19.5	A B	14

Table 7 - Part 7
DMRB 2005 PM_{10} Predictions for Junctions with AADT > 10,000 vpd & Relevant Public Exposure within 10m

Junction	Grid ref	Background 2005 PM_{10} ($\mu g/m^3$)	Link	2003 AADT	2005 AADT	Speed (km/hr)	Mean % HDV	Distance from link center to receptor point (m)	Road type	Predicted number of days > $50\mu g/m^3$ in 2005
Blue Peter roundabouts	438569 333375	22.7	2376/2369	44,864	42,657	24.6	4	18.6	A	18
Alvaston Bypass roundabout/ Raynesway	438689 333722	23.2	2385/2754 & 2638 Alvaston* Bypass	21,940 -	20,861 11,420	29.1 33.2	3.96 11.85	29.5 116.5	A A	14 days @ Metcalfe Close Flats, Block 1
Alvaston Bypass	439781 332814	21.4	Alvaston Bypass*	-	11,420	33.2	11.85	45.0	A	8 days @ 16 Wolverley Grange
Harvey Road/ Shardlow Road roundabout	438602 333295	22.7	2382/2376	29,406	27,959	27.6	4.7	27.9	A	14 days @ 33 Shardlow Road
Shardlow Road/ Keldholme Lne roundabout	439441 332484	21.4	2443/2452 & 2475 2451/2452	20,687 327	19,669 311	42.2 27.7	5.4 0	33.2 10.1	A B	9 days @ 1 Bembrdge Drive

* Information provided by 2005 automatic traffic count

Table 7 - Part 8
DMRB 2005 PM_{10} Predictions for Junctions with AADT > 10,000 vpd & Relevant Public Exposure within 10m

Junction	Grid ref	Background 2005 PM_{10} (µg/m^3)	Link	2003 AADT	2005 AADT	Speed (km/hr)	Mean % HDV	Distance from link center to receptor point (m)	Road type	Predicted number of days > 50µg/m^3 in 2005
Shardlow Road	439835 332263	21.4	2452/2475	20,511	19,502	41.4	5.5	13.3	A	12 days @ 37 Corinium Close
London Road/ Wilmorton Link roundabout	437161 334370	27.3	2885/2204 & 7138 2175/2204 & 2152	18,127 17,847	17,235 16,969	36.6 34	6.5 4.7	12.5 65.6	A B	34
London Road/ Midland Road	435921 335425	27.3	6033/805 & 7006 805/7002	14,513 5,536	14,580 5,561	26.8 22.4	9.6 3.2	11.4 8.8	B A	37.3 days @ 153 London Road. Annual average = 32.4µg/m^3
London Road/ Traffic Street	435624 335715	26.8	814/1014 & 6037 6039/1014 & 6029	39,893 20,798	40,077 20,894	25.1 26.4	7.3 3.7	14.1 8.7	A A	62.6 days @ Strutts Pub. Annual average = 37.4µg/m^3

Table 7 - Part 9
DMRB 2005 PM_{10} Predictions for Junctions with AADT > 10,000 vpd & Relevant Public Exposure within 10m

Junction	Grid ref	Background 2005 PM_{10} (µg/m^3)	Link	2003 AADT	2005 AADT	Speed (km/hr)	Mean % HDV	Distance from link center to receptor point (m)	Road type	Predicted number of days > 50µg/m^3 in 2005
Willowcroft Road/ Nottingham Road	439921 335349	22.3	2476/2472 & 2464 2489/2464	13,875 4,804	14,714 5,095	27.5 20.2	7.6 3.1	14.9 12.9	A A	19
Nottingham Road/ Station Road roundabout	439777 335437	22.3	2472/2464 & 2410 2461/2464 & 2640	7,378 13,875	7,824 14,714	30.7 20.2	5.1 3.1	15.9 12.4	B A	18
Sitwell Street/ Willowcroft Road	440045 335888	21.7	2467/2485 & 2488 2493/2485	8,855 3,764	9,391 3,992	29.6 29.1	1.4 0.9	10.8 10.0	A A	10
A52/ Lodge Lane	439823 335688	23.6	2636/2465 & 2486 2465/2640 2480/2637	33,026 6,368 23,721	35,024 6,753 25,156	100 38 91	3.72 0.63 5.3	17.9 25.3 32.5	A A A	27
A52/ Derby Road roundabout	439468 335618	22.5	2624/2625	12,752	13,523	38	0.7	13.3	A	11

Table 7 - Part 10
DMRB 2005 PM_{10} Predictions for Junctions with AADT > 10,000 vpd & Relevant Public Exposure within 10m

Junction	Grid ref	Background 2005 PM_{10} ($\mu g/m^3$)	Link	2003 AADT	2005 AADT	Speed (km/hr)	Mean % HDV	Distance from link center to receptor point (m)	Road type	Predicted number of days > $50\mu g/m^3$ in 2005
Nottingham Road/ St Marks Road	436531 336617	25.2	2106/2116 & 2140 2115/2116	20,132 322	21,350 342	36.9 23.1	0.9 6.6	5.8 6.3	B B	22
St Alkmunds Way/ Nottingham Road	435561 336633	19.5	1095/1102 928/1028	31,819 32,936	31,965 33,088	48 48	4.3 3.2	11.8 26.8	A A	18
Burton Road/ Abbey Street	434839 335294	21.6	1824/1008 /905 & 1053/1008	24,725 9,025	24,839 9,067	20.1 22.1	1.4 1.8	10.3 17.9	A A	17
Mount Street/ Burton Road	435134 335411	23.5	1074/7050	19,139	19,227	38	1.3	5.7	A	16
Normanton Road/ Charnwood Street	435224 335431	25.2	7032/1012 & 950 1011/1012 & 817	13,371 6,512	13,433 6,542	15.8 5	1.9 0.9	5.6 9.1	A B	30

Table 7 - Part 11
DMRB 2005 PM_{10} Predictions for Junctions with AADT > 10,000 vpd & Relevant Public Exposure within 10m

Junction	Grid ref	Background 2005 PM_{10} ($\mu g/m^3$)	Link	2003 AADT	2005 AADT	Speed (km/hr)	Mean % HDV	Distance from link center to receptor point (m)	Road type	Predicted number of days > $50\mu g/m^3$ in 2005
Normanton Road/ Leopold Street	435198 335487	25.2	1072/1011 & 7027	10,081	10,127	38	0.4	4.7	A	24
			1011/1012	6,512	6,542	5	0.9	9.1	A	
A6/ Siddals Road	436007 335931	26.8	7014/809 & 801	6,255	6,284	38	3.7	5.9	A	26
			2793/801	6,483	6,513	38	5.2	18.3	A	
Mansfield Road/ Fox Street	435656 336803	25.6	1098/2002 & 2003	21,832	21,577	31.3	7.1	18.8	B	24
			2002/2025	4,936	4,878	33.3	0.07	10.8	B	
Ford Street/ Agard Street	434787 336463	25.3	2785/1002 & 1001	23,305	23,412	30.4	1.4	16.1	A	33
			2595/1003 & 6063	26,949	27,073	38	3.5	9.8	A	
Friary Street/ Stafford Street	434738 336255	25.3	2787/1005 & 7071	3,632	3,649	14	0.49	9.1	A	23
			2888/1005 & 7071	17,668	17,749	38	1.7	7.1	A	
Abbey Street/ Curzon Street	434846 336168	25.3	7073/1006 & 5000	5,724	5,750	21.6	0.3	7.8	A	21
			7073/1006 & 1037	7,364	7,398	20.6	3.0	9.9	A	

The 5 busy junctions that have been identified as requiring a Detailed Assessment by the review of Section D of the USA, are shown in Table 8.

Table 8
Busy Road Junctions Requiring Detailed Assessments

Junction	Predicted number of exceedences of 24-hour mean PM_{10} concentration of 50µg/m^3 for 2005 (µg/m^3)	Reason for Detailed Assessment
Bridge Street/ Agard Street	39.9	Possible new PM_{10} AQMA
Osmaston Road/ Ascot Drive	44.6	Possible new PM_{10} AQMA
Osmaston Road/ Harvey Road (Mitre pub)	34.6	Possible new PM_{10} AQMA
London Road/ Midland Road	37.3	Possible new PM_{10} AQMA
London Road/ Traffic Street	62.6	Possible new PM_{10} AQMA

Since there are no existing road-traffic related PM_{10} AQMAs, all 5 of these busy junctions require a Detailed Assessment.

The Osmaston Road/Harvey Road (Mitre pub) busy junction is included in Table 8, as its 34.6 days of exceedences has been rounded up to 35 days. This is a precautionary approach, since:

1. The 24-hour standard is 35 days
2. DMRB is a conservative screening tool
3. The 34.6 days of exceedences relates to the ground floor facade of the Mitre pub, whereas the residential accommodation and therefore relevant public exposure is at first floor. This increase in distance from the road means that this prediction is likely to be slightly conservative.

In comparison to the 5 busy junctions identified in this re-run of the USA, the 2004 USA determined that 12 junctions required a Detailed Assessment. This is likely to be due to the more detailed traffic data used in this review, including actual vehicle speed data and distances between link points and receptors.

All of the busy junctions requiring a PM_{10} Detailed Assessment are located within the proposed road-traffic related NO_2 AQMAs. This is to be expected, as both road-traffic related PM_{10} and NO_2 are dependant upon traffic flows, traffic speeds, vehicle types and the proximity of relevant public exposure.

The DMRB assessments in Table 7 have been verified using DMRB assessments for Warwick Avenue and the Council House. As is shown in Tables 9 and 10, there is good correlation between the predicted and measured 24-hour and annual means.

Table 9
Warwick Avenue 2005 PM_{10} Concentrations

Time-Base	DMRB Prediction	Measured Concentration
24-hour (days)	15	17
Annual average (µg/m^3)	26	30

Table 10
Council House 2005 PM_{10} Concentrations

Time-Base	DMRB Prediction	Measured Concentration
24-hour (days)	9	4
Annual average (µg/m^3)	23.2	24.2

The slight discrepancy in 24-hour average PM_{10} exceedences at the Council House, is likely to be due to the DMRB assessment being unable to account for:

1. The Council House monitoring station being adjacent to a car-park
2. The shielding effect of nearby buildings, including the portacabins which were sited in the car park in 2005
3. Temporary relocation of the bus station along the Morledge in 2005

2.3 REVIEW OF UPDATING & SCREENING ASSESSMENT - NEW ROADS (SECTION F)

Alvaston Bypass opened on 17 December 2003 and is therefore the only road which has been built since the first Review and Assessment. The Air Quality Impact Assessment for this new road, predicted those locations likely to exceed the 24-hour standard with a fully operational bypass.

Table 11, Part 1 - 2 lists all the dwellings which were considered in the Air Quality Impact Assessment. Map 2, Parts 1 to 3 shows the location of these receptors.

Table 11 - Part 1
Predicted 90.41%ile of 24-hour Mean 2005 PM_{10} Concentrations (µg/m^3)

Receptor	Predicted 90.41%ile 24-hour Mean 2005 PM_{10} Concentrations (µg/m^3)
Raynesway Park	56
Properties fronting Raynesway South	58
Metcalfe Close flats - Block 1	56
Metcalfe Close flats - Block 2	52
Properties on A6 between Blue Peter roundabouts	57
Metcalfe Close flats - Block 3	51

Table 11 - Part 2

Predicted 90.41%ile of 24-hour Mean 2005 PM_{10} Concentrations (µg/m^3)

Receptor	Predicted 90.41%ile 24-hour Mean PM_{10} Concentrations (µg/m^3)
Properties on A6 Blue Peter South to Field Lane	51
Properties on A6 Field Lane to Lindon Drive	50
Properties on A6 Lindon Drive to Keldholme Road	50
Properties on A6 Keldholme Road to Snelsmoor Lane	50
Glastonbury Road and Nesfield Close	50
Caroline Close to Stocker Avenue	50
Elvaston Lane to Coronation Plantation	50
Properties fronting A6 East at Thulston (outside City boundary)	49
Properties on Boulton Moor Development (outside City boundary)	49
Alvaston Street to Manifold Drive	49

It is evident from Table 11, that the impact assessment predicts that PM_{10} concentrations will exceed the 2005 24-hour standard at 13 of the 16 chosen receptors (shown in red).

Of these 13 receptors, there is no relevant public exposure at Raynesway Park, the southern end of Raynesway or at the A6 between Raynesway and Field Lane. Consequently, the Air Quality Impact Assessment concluded that there was no need for further consideration of these locations.

No further consideration is also required for those properties adjacent to the new bypass, despite the DMRB exceedences predicted in Table 11. LAQM TG(03) states that exceedences are only likely within 10 metres of kerbside. These dwellings are at least 34 metres from the road, so confirming the conservative nature of the Alvaston Bypass Air Quality Impact Assessment.

Of the 13 dwellings with predicted exceedences, only the following 5 locations have relevant public exposure within 10 metres of the kerb and are therefore considered further:

Properties fronting Raynesway South
Properties on A6 Blue Peter South to Field Lane
Properties on A6 Field Lane to Lindon Drive
Properties on A6 Lindon Drive to Keldholme Road
Properties on A6 Keldholme Road to Snelsmoor Lane

Given the conservative nature of these predictions and that the Alvaston Bypass has now opened, the DMRB assessments for these 5 areas have been re-run using up-to-date traffic data. This revised screening assessment specifically makes use of the following 6 receptors, which are shown in Map 3:

Li's Fish Bar, between Blue Peter roundabouts
Metcalfe Close flats – Block 1
16 Wolverley Grange (closest property to Alvaston Bypass)
33 Shardlow Road
1 Bembridge Drive
37 Corinium Close

The results of the revised DMRB assessments are shown in Table 7 - Parts 7 & 8. It is evident from these results, that exceedences of the 24-hour standard are unlikely at any of these 6 receptors. Consequently, there is no need to proceed to a Detailed Assessment for road-traffic based PM_{10} in respect of the Alvaston Bypass.

This conclusion is supported by the DMRB assessments undertaken in Derby City Council's Stage 3 Report. This report determined that no roads in the vicinity of Alvaston Bypass would be likely to exceed either the 24-hour and annual mean PM_{10} Standards.

3.0 MONITORING LOCATIONS

3.1 COUNCIL HOUSE

The ‘Council House’ monitoring station is an urban background site. It is located in a converted garage, to the east of the Council House and 22 metres to the north of the ‘busy’ Morledge road. This is shown in Map 4.

This monitoring station has been used for a number of years, to continuously measure urban background concentrations of both PM_{10} and NO_2. It uses a TEOM particulate analyser and a chemiluminescent NO_x analyser to undertake these measurements.

Photograph 1
The Council House Monitoring Site

3.2 WARWICK AVENUE

The 'Warwick Avenue' site is a kerbside monitoring station. It was commissioned on 1 October 2004, to provide continuous PM_{10} monitoring data for this road traffic based PM_{10} Detailed Assessment.

The Warwick Avenue monitoring station is located on a grass verge, adjacent to the northern carriageway of Derby's outer ring-road. It is also located within the Outer Ring-Road NO_2 AQMA and is just 4 metres a new 4-storey apartment block.

The Warwick Avenue monitoring station contains both a TEOM particulate analyser and a chemiluminescent NO_x analyser. The monitoring station is shown in Photographs 2 and 3, as well as in Map 5.

Photograph 2
Warwick Avenue Monitoring Station

Photograph 3
Inside Warwick Avenue Monitoring Station

Warwick Avenue was chosen as a suitable monitoring location for the following reasons:

- Nearby relevant public exposure, with apartment blocks being built directly behind
- Sufficient space for this sizeable monitoring station
- An acceptable risk of vandalism
- An available mains electricity supply
- Within the USA, the DMRB assessment predicted 64 exceedences of the 24 hour PM_{10} Objective at the Warwick Avenue/Burton Road junction. As a result, this busy junction was identified as requiring a PM_{10} Detailed Assessment.
- It represents a 'pollution hotspot' on the outer ring-road. This is because:

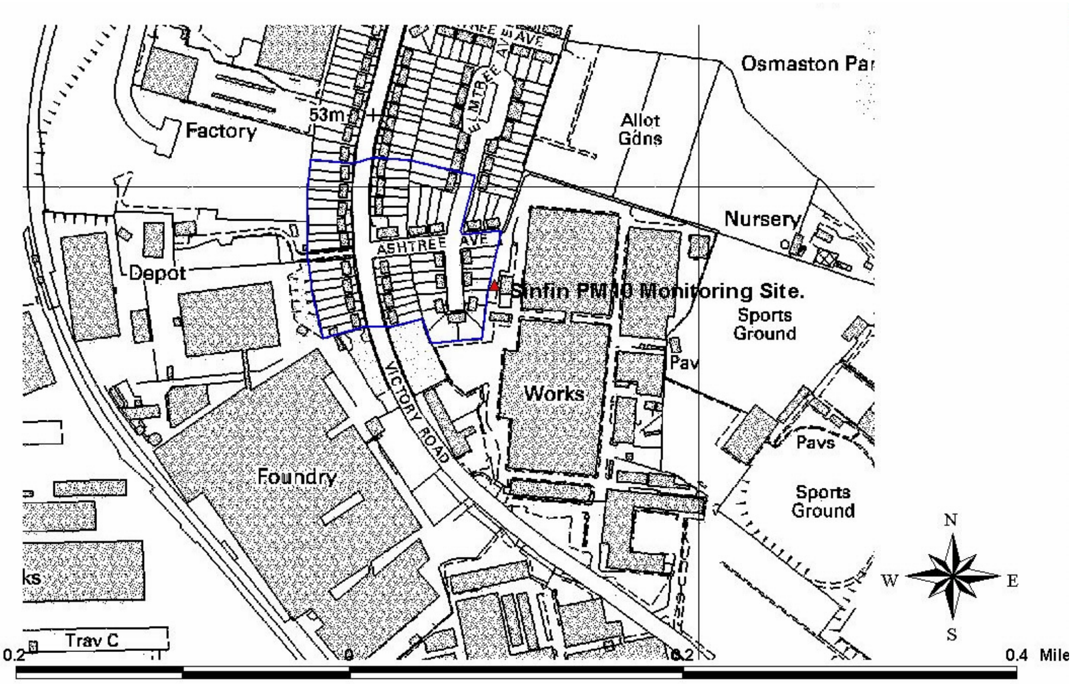
    1. When the traffic lights on Warwick Avenue are on red, there are often 4 lanes of (northbound) stationary road-traffic adjacent to the monitoring station. At the same time, there may also be 2 lanes of free-flowing southbound traffic.

    2. When the same traffic lights change to green, the TEOM analyser records a clearly discernable peak in PM_{10} exhaust emissions, which are associated with acceleration from a standing start. This problem is exacerbated by the uphill gradient on Warwick Avenue.

3.3 SINFIN B

The 'Sinfin B' monitoring station is located immediately to the east of the Victory Road industrial PM_{10} AQMA, approximately 250 metres to the north-east of the former QDF foundry. It is permanently installed on Rolls-Royce's Sinfin B site:

Map 3
Sinfin B Monitoring Site and PM_{10} Air Quality Air Management Area



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The Sinfin B analyser contains both a TEOM particulate analyser and a co-located gravimetric analyser. These analysers are used to measure industrial PM_{10}. Consequently, the associated monitoring results are not considered within this Detailed Assessment for road-traffic based PM_{10}.

Following the closure of the QDF foundry in October 2005, the associated monitoring results will instead be used to consider whether it is possible to revoke the Victory Road PM_{10} AQMA.

4.0 MONITORING RESULTS

In order to be able to draw accurate and robust conclusions on the need to declare, amend or revoke Air Quality Management Areas, it was necessary to obtain at least 12 months of monitoring data from the new kerbside TEOM analyser at Warwick Avenue. This enables a full account to be taken of meteorological and seasonal factors.

Monitoring data is provided for the Warwick Avenue kerbside TEOM for October to December 2004, as well as the calendar year 2005. In addition to the monitoring data for Warwick Avenue, 1999 to 2005 PM_{10} monitoring data is also provided for the Council House urban background site.

For the sake of completeness, consideration is given to both the 24-hour and annual average PM_{10} standards for both of the Warwick Avenue and Council House TEOM analysers.

Validation and ratification of the monitoring data obtained from these analysers made use of the audit trail described below.

The TEOM analysers are subject to maintenance agreements, whereby an engineer responds to any problems experienced with the analysers. These ad hoc visits complement regular 6 monthly servicing of all of the analysers. The associated service reports are referred to during data validation and ratification.

During the service, the engineer checks both the flow data and ensures that the KO factor (stated calibration constant of the TEOM tapered element) is within +/- 2.5% of the pre-weighed reference filter. This is the case for both the Warwick Avenue and Council House TEOM analysers, so none of the monitoring data in this report has been corrected.

In relation to the real-time 15 minute monitoring data obtained from the TEOM analysers, hourly means were only considered to be 'valid' where there were at least three valid 15-minute PM_{10} means. In turn, 15-minute mean PM_{10} concentrations were generally considered to be invalid where there were:

1) Several consecutive 'zero' readings, possibly due to a power cut or filter change
2) Sudden and dramatic changes in 15-minute PM_{10} concentrations
3) 'Invalid cell' due to a problem with the analyser, as confirmed through cross-checking with the analyser logbook
4) PM_{10} concentrations less than $-4\mu g/m^3$, since a loss in filter weight can arise during periods of heavy rainfall. This is due to the water that initially lands on the filter, being recorded as PM_{10} and then subsequently evaporating.

Subsequently, the 24-hour mean PM_{10} TEOM concentrations were only considered to be valid, where there were at least 18 valid hourly means.

Following validation of the PM_{10} data at the Council House and Warwick Avenue, data ratification was undertaken.

Data ratification involved detailed examination of the validated PM_{10} concentrations recorded at each of these analysers, with a view to discrediting any invalid data. This was within the context of adopting a precautionary approach, whereby results were only invalidated where this could be confidently assumed.

Cross-referencing took place between the Council House and Warwick Avenue PM_{10} results, as well as between the PM_{10} and NO_2 concentrations recorded at Warwick Avenue. Regional comparisons were also made with Nottingham City Council's and Leicester City Council's urban background PM_{10} monitoring stations.

The final element of the validation and ratification process is related to the percentage data capture. In accordance with the guidance in LAQM.TG(03), a minimum of 90% data capture is required for an annual mean to be considered valid.

The data capture rates for both the Council House and Warwick Avenue PM_{10} analysers exceed 90%, as is shown in Tables 12 and 13. The associated data differs from that shown in Derby City Council's May 2005 Progress Report. This is as a result of further validation and ratification of the data, following initial problems with new air quality monitoring software.

In order to convert the PM_{10} concentrations from TEOM to gravimetric $\mu g/m^3$, a standard 1.3 conversion factor has been applied.

4.1 COUNCIL HOUSE

The 2005 monitoring results for the Council House urban background TEOM are provided in Table 12. In order to facilitate comparisons with the Council House monitoring data for previous years, the monitoring data for 1999 to 2004 has also been provided.

Table 12
Council House TEOM Results (gravimetric $\mu g/m^3$)

	1999	2000	2001	2002	2003	2004	2005	National Air Quality Standard
Annual mean (gravimetric $\mu g/m^3$)	24.7	23.7	22.1	20.3	25.2	22.5	24.2	40
Maximum Daily Average (gravimetric $\mu g/m^3$)	75.4	141.7	91	54.9	76.7	56.9	71.5	-
90^{th} Percentile of 24-hourly averages (gravimetric $\mu g/m^3$)	40.3	41.6	34.5	30.7	46.7	35.6	36.8	50
Number of exceedences of 24-hour Standard of $50 \mu g/m^3$	8	9	10	2	24	5	4	35
Data Capture (%)	78	89	88	87	96	96	98	90

4.2 WARWICK AVENUE

The 2004 and 2005 monitoring results for the Warwick Avenue TEOM are shown in Table 13. They are considered to be representative of pollution levels on this part of Derby's outer ring-road.

Table 13
Warwick Avenue TEOM Results (gravimetric μg/m^3)

	1 October 2004 - 31 December 2004	1 January 2005 - 31 December 2005	National Air Quality Standard
Annual mean (gravimetric μg/m^3)	30.0	30.0	40
Maximum Daily Average (gravimetric μg/m^3)	74.1	78.9	-
90th Percentile of 24-hourly averages (gravimetric μg/m^3)	47.3	44.1	50
Number of exceedences of 24-hour Standard of 50μg/m^3	6	17	35
Data Capture (%)	97	99	90

5.0 ANALYSIS OF MONITORING RESULTS

5.1 COUNCIL HOUSE

Although the Council House monitoring data is considered representative of PM_{10} concentrations at this particular location, within the context of the Detailed Assessment it should be treated with caution for the following reasons:

1. The Council House is an urban background site, so is less relevant to road-traffic PM_{10} than the kerbside Warwick Avenue analyser. Having said this, the diurnal peaks in PM_{10} concentrations associated with morning and afternoon rush hours are still evident at the Council House.

2. The monitoring station is located immediately adjacent to a 2-storey building and behind the Magistrates Court, both of which have a sheltering effect.

3. The monitoring station is also located immediately adjacent to the Council House car park with its associated vehicle exhaust emissions.

4. In September 2005, 6 temporary buildings were sited within a few metres of the monitoring station. These 2-storey office buildings for the temporary bus station further inhibit dispersion in this area. They have also replaced a number of car parking spaces, so making it more difficult to identify historic trends in PM_{10} concentrations at this site.

5. In September 2005, redevelopment work associated with the ‘Riverlights’ project commenced. The Council House monitoring station is within 100 metres of this development, although no demolition work was undertaken during 2005.

6. The monitoring station is only 22 metres from Morledge road. In September 2005, this road became part of the temporary bus station. The road-traffic exhaust emissions associated with the buses are likely to increase the PM_{10} concentrations recorded at the Council House analyser.

7. There is no relevant public exposure in the vicinity.

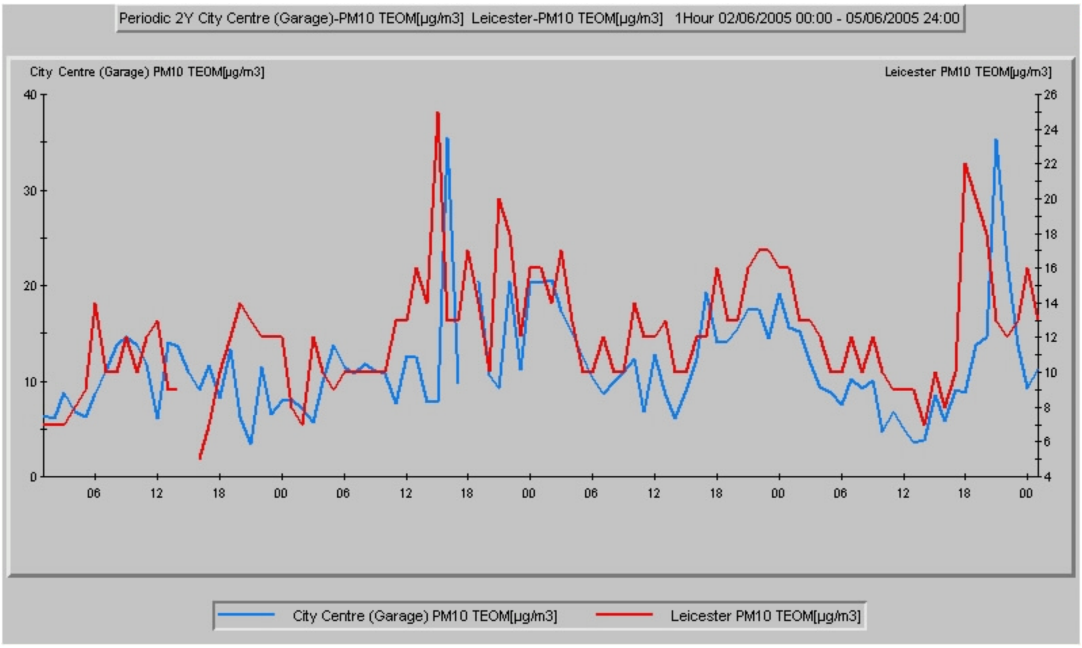
Nevertheless, the Council House monitoring site is still considered to represent urban background PM_{10} concentrations. This is evident with the 2005 annual average concentration of 24.2µg/m^3 at the Council House. This is as compared to the NAEI estimated annual average PM_{10} background concentration for the same location of 22.4µg/m^3.

There were no exceedences of either the 24-hour or annual average PM_{10} standards at the Council House between 1999 and 2005. The highest results were recorded in 2003, which nationally was a poor year for pollution due to the meteorological conditions experienced at this time.

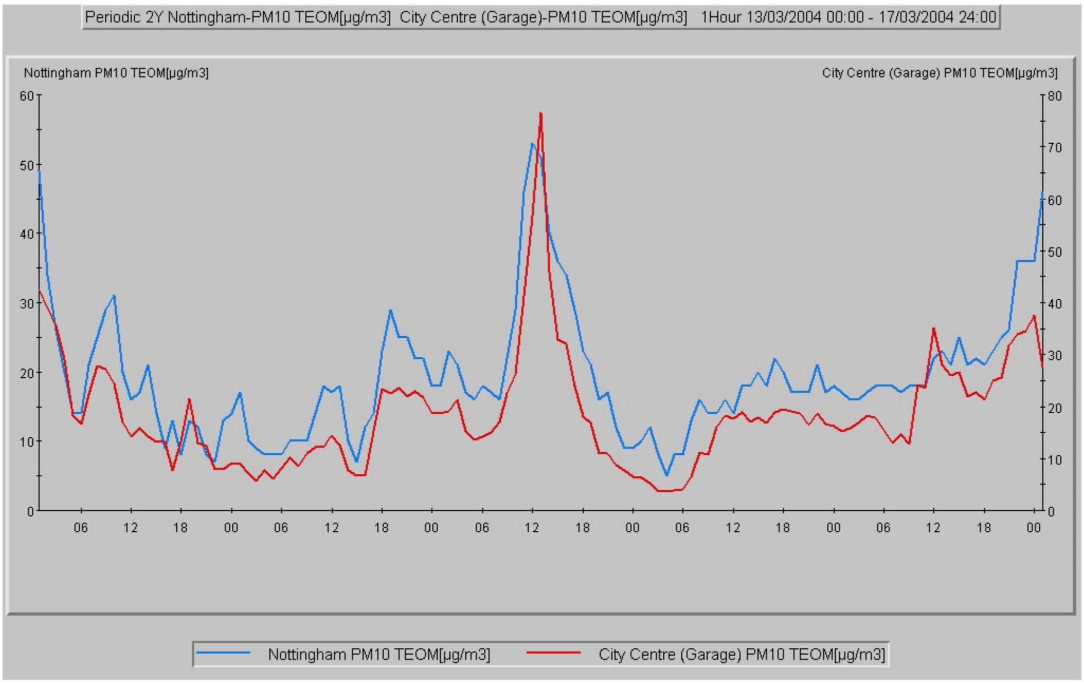
UK road transport related PM_{10} emissions have remained relatively constant over the last few years. Similarly, at the Council House for the 6 year period between 1999 and 2005, there is no clear upward or downward trend in either annual average or 24-hour mean PM_{10} concentrations.

Graphs 2 and 3 show significant regional correlation between the hourly PM_{10} concentrations recorded at the Council House, with those recorded at Leicester’s and Nottingham’s AURN sites. This is primarily due to regional weather patterns and diurnal PM_{10} concentrations associated with the morning and afternoon ‘rush hours.’

Graph 2
Council House versus Leicester PM_{10} (TEOM µg/m^3) Results, 2 - 5 June 2006



Graph 3
Council House versus Nottingham PM_{10} (TEOM µg/m^3) Results, 13 - 17 March 2004



5.2 WARWICK AVENUE

The Warwick Avenue TEOM analyser was commissioned on 1 October 2004. The 2004 and 2005 results from this kerbside site analyser are considered to be slight over-estimates of road-traffic PM_{10} concentrations, due to these periods corresponding with construction work to build apartments on a site immediately to the rear of the analyser.

Dust associated with this construction work is likely to account for at least some of the high 15-minute peak PM_{10} concentrations recorded at the Warwick Avenue analyser during 2004 and 2005. These peaks were not associated with 'typical' diurnal rush hours. They were also not evident at either the Council House or Sinfin B TEOM analysers.

There were no exceedences of either the 24-hour or annual average PM_{10} standards at Warwick Avenue during 2004 or 2005. At first sight this is surprising, given that:

1) Warwick Avenue is a kerbside site. Kerbside monitoring stations represent worst-case scenarios as compared to roadside and urban background monitoring stations. This is because road-traffic PM_{10} decreases significantly with distance from kerbside (Reference 9).

2) When the traffic lights on Warwick Avenue are on red, there are often 4 lanes of (northbound) stationary road-traffic adjacent to the monitoring station. At the same time, there may also be 2 lanes of free-flowing southbound traffic.

3) When the traffic lights change to green, the TEOM analyser records a clearly discernable peak in PM_{10} exhaust emissions, which are associated with acceleration from a standing start. This problem is exacerbated by the uphill northbound gradient on Warwick Avenue.

Significant confidence is however attached to the 2004 and 2005 results, since the associated data capture rates were 97% and 99%. The likely reason for no exceedences of the 24-hour standard at the analyser, is its location 73 metres from the Warwick Avenue/Burton Road 'busy' junction.

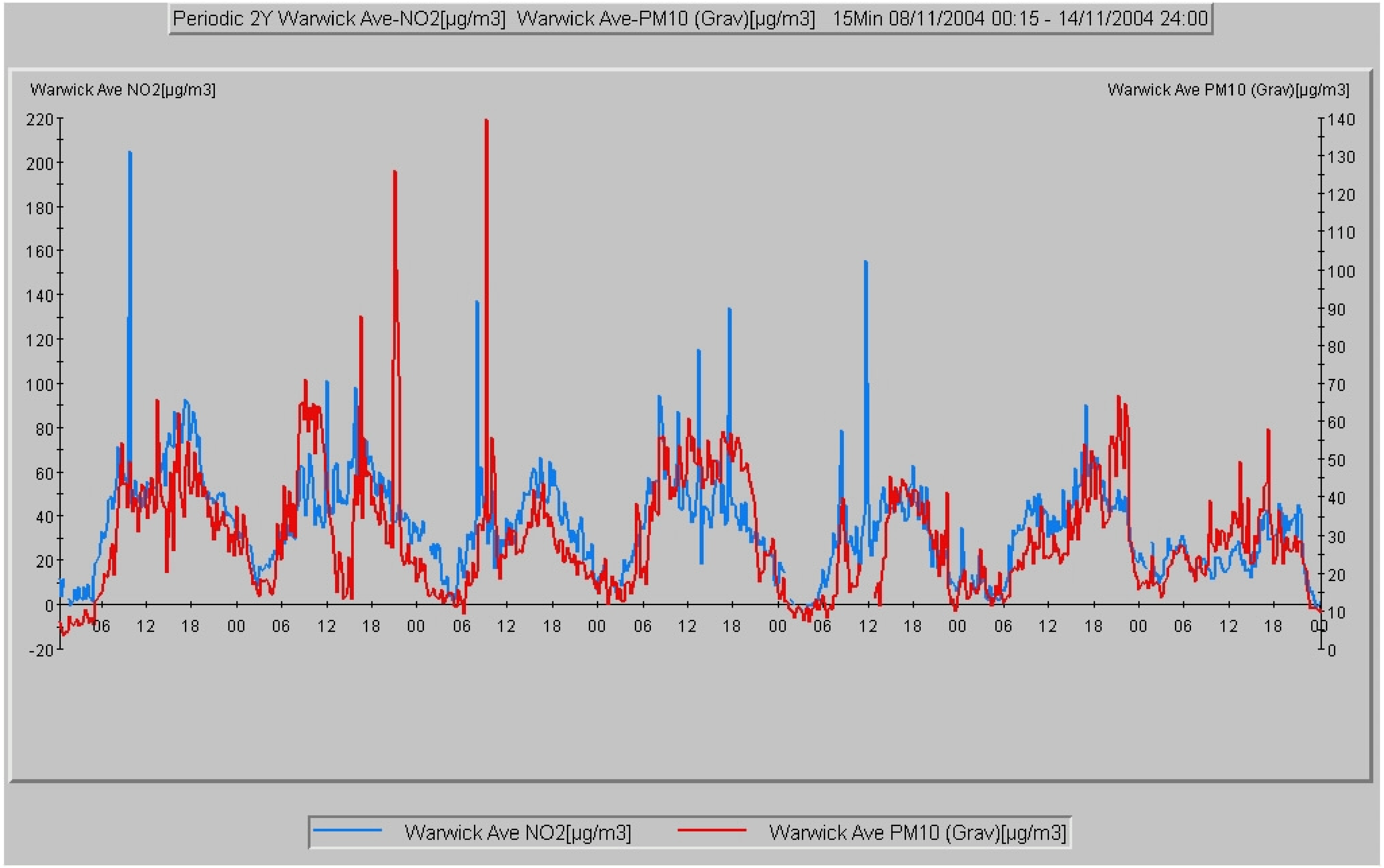
This is within the context of pollutant concentrations significantly decreasing with distance from busy junctions (Reference 10). Unfortunately, the Warwick Avenue monitoring station could not be located any closer to the junction, due to its sizeable nature and limited space immediately adjacent to the junction.

The significant decrease of pollutant concentrations with distance from the Warwick Avenue/Burton Road junction is supported by local NO_2 monitoring. The 2005 annual average concentration for the Warwick Avenue/Burton Road diffusion tube was 55.6ug/m^3, which is located just 6 metres from the junction. This is in comparison to the 38µg/m^3 annual average NO_2 concentration recorded at the Warwick Avenue monitoring station, which is 78 metres away from the junction.

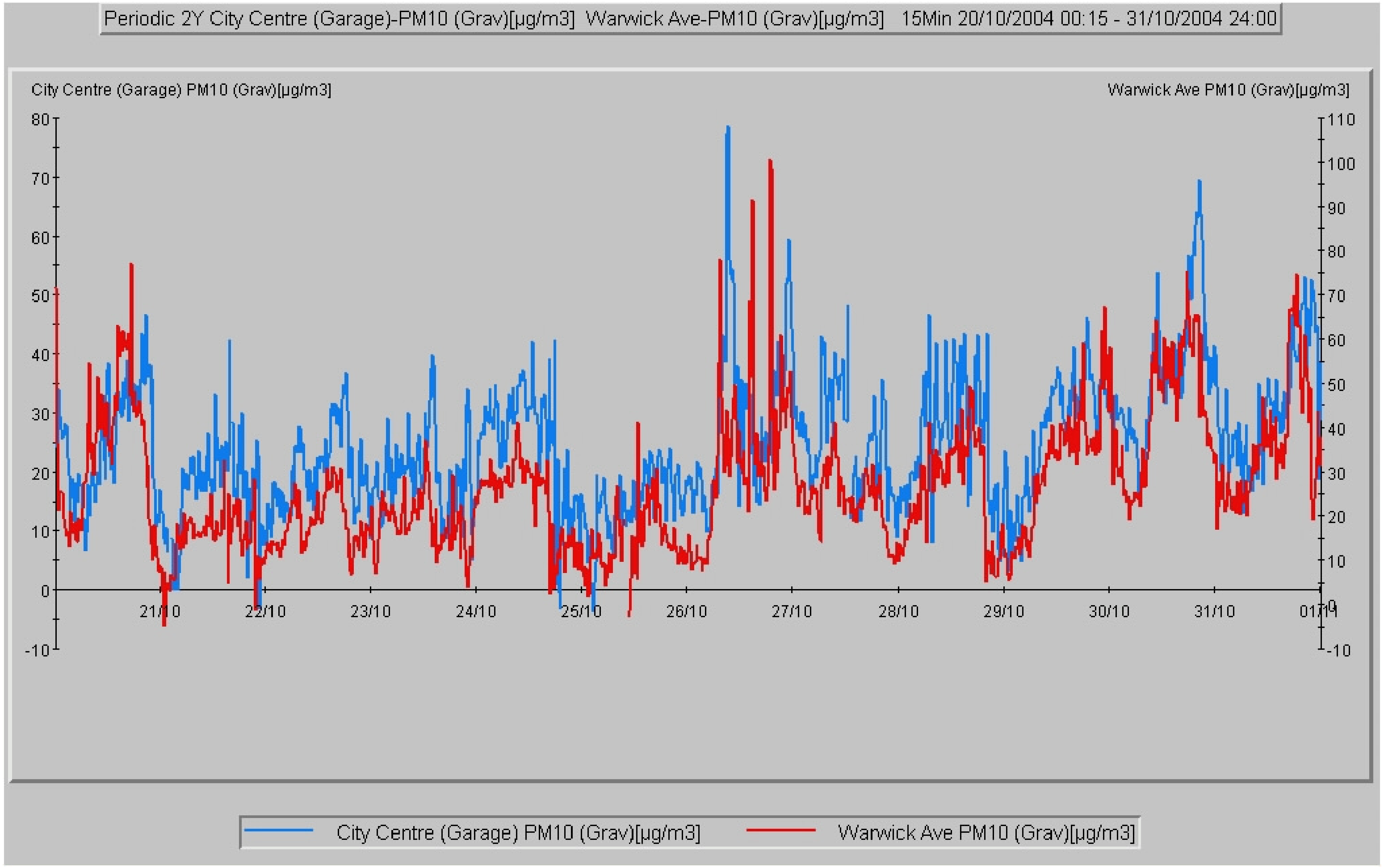
A comparison of the NO_2 and PM_{10} results from the Warwick Avenue TEOM and NO_x analysers is shown in Graph 4. As expected, there is a strong correlation between road-traffic generated PM_{10} and NO_2.

Graph 5 shows that there is also a strong correlation between the Warwick Avenue and Council House PM_{10} concentrations. These kerbside and urban background sites both show a diurnal variation in PM_{10} concentrations, which coincide with the weekday 'rush hour' peaks.

Graph 4
Warwick Avenue PM_{10} (gravimetric) and NO_2 Concentrations, 8 - 14 November 2004



Graph 5
Warwick Avenue and Council House PM_{10} (TEOM $\mu g/m^3$), 20 - 31 October 2004



6.0 DISPERSION MODELLING

The re-run of the USA has identified the need for Detailed Assessments for road-traffic based PM_{10} for the following busy junctions:

1. Bridge Street/Agard Street

2. Osmaston Road/Ascot Drive

3. Osmaston Road/Harvey Road

4. London Road/Midland Road

5. London Road/Traffic Street

In the absence of roadside/kerbside PM_{10} monitoring at any of these 5 junctions, it is necessary to undertake detailed dispersion modelling as an integral part of these Detailed Assessments.

This dispersion modelling will be for the 24-hour standard of 50µg/m^3, which should not be exceeded more than 35 times in a calendar year.

The USA has confirmed that the annual average PM_{10} standard of 40µg/m^3 is likely to be met at all points of relevant public exposure close to the city's road network. Consequently, a Detailed Assessment for road-traffic related PM_{10} is not required in relation to the annual average objective.

The dispersion modelling for the 24-hour PM_{10} standard considers both a base year of 2005 and a future year scenario of 2011.

The advantages of a base year of 2005 are:

1. 2005 is considered to be a typical year in terms of meteorological conditions. It can therefore be reasonably assumed that these conditions will be repeated in future years. Model runs using 2005 meteorological data are therefore considered realistic.

2. Continuous PM_{10} monitoring data is available for the whole of 2005, for the TEOM analysers at both Warwick Avenue and the Council House. The Warwick Avenue analyser was commissioned in October 2004.

3. The 24-hour mean National Air Quality Standard for PM_{10} has a target date of 31 December 2004. A 2005 base year therefore avoids the need to apply any future year correction factors to the road traffic data used in the dispersion modelling.

4. Although construction work commenced on both Riverlights and the Eagle Centre extension in the middle of 2005, their large scale construction phases do not significantly impact upon local air quality at the Warwick Avenue analyser. Consequently, it is possible to use the 2005 monitoring data collected from this kerbside analyser.

5. Although Connecting Derby has been granted planning permission, it may be subject to a public inquiry. Consequently, construction work on this scheme has not commenced, so there has been no impact on the 2005 air quality results for Warwick Avenue.

6. The Inner Ring-Road Maintenance Scheme (IRRIMS) has no long-term air quality impacts. In the short-term, the associated road works significantly affect traffic flows on just the northern section of the inner ring-road. Warwick Avenue is on the western section of the outer ring-road.

The advantages of a future year scenario of 2011 are:

1. The European Union has set indicative limits for PM_{10}, which are to be achieved by 1 January 2010. These limits are considerably more stringent, with an annual mean of 20µg/m^3 and a 24-hour mean of 50µg/m^3 to be exceeded on no more than 7 days per year.

   Although it is not proposed to model the 2011 scenario on these indicative limits, it is possible to make a comparison if required.

2. The Local Transport Plan operates on a 5-year cycle. In the case of LTP 2, this is from 2006 to 2011. Consequently, the large amount of traffic data collected for LTP 2 has already been projected to the future year scenario of 2011.

3. By 2011 both Riverlights, the Eagle Centre extension, Connecting Derby and IRRIMS are scheduled to have been completed. This means that the long-term local air quality impacts associated with these committed developments has been able to be accounted for within the 2011 traffic data provided by the Derby Area Transport Study (DATS).

6.1 VALIDATION OF ADMS-URBAN

Validation studies are detailed comparisons of modelled results against monitoring data, in order to demonstrate that dispersion models perform well against monitoring data.

ADMS-Urban is a development of the Atmospheric Dispersion Modelling System (ADMS). It is used throughout the UK by the Environment Agency and many local authorities, to model the urban environment.

ADMS-Urban has been extensively validated, both in terms of its original components (e.g. point source, building effects and meteorological pre-processor) and its overall performance. Validation studies have demonstrated that it performs well in comparison to monitoring data for urban areas, including Central London and Birmingham.

6.2 MODEL SETTINGS

The model conditions used in the dispersion modelling in this Detailed Assessment are summarised in Table 14, Parts 1 - 2.

Table 14, Part 1
ADMS-Urban Model Settings

Variable	Input
Surface roughness at source *(land-use characteristic affecting wind shear)*	1.0
Monin-Obukhov length *(measure of atmospheric stability)*	30m
Terrain type	None, as terrain data is only used with industrial plume modelling.
Receptor location	Warwick Avenue and Council House analysers & intelligent gridding of the roads being modelled.
Emission	PM_{10}

Table 14, Part 2
ADMS-Urban Model Conditions

Variable	Input
Meteorological data	Hourly 2005 sequential data from East Midlands Airport, with cloud cover from Coleshill, Birmingham. Surface roughness = 0.2 for airport
Road width	Roads plotted so they correspond to carriageways and therefore 2-way flows
Model outputs	90.41^{st} percentile & annual mean. Hourly averages for verification.
Receptors	10m grid spacing to 75m each side of the relevant road.
Source location	The 2003 Derby Area Transport Study (DATS) major road network data was updated to 2005, using the growth factors calculated within Table 15. These growth factors were applied to all nodes within the vicinity of each of the 12 automatic traffic counters.

Table 14, Part 3
ADMS-Urban Model Conditions

Variable	Input
Source location *continued*	It was assumed that the 2003 speed data remained the same in 2005. Each of the 2-way speeds was flow weighted to the nearest 5km/hr. A default of 5km/hr was used for cells with no data. In order to account for queuing and stationary traffic, ingoing junction link speeds were reduced to 5km/hr. The outbound junction flows are generally free-flowing and were therefore kept the same as in DATS. It was assumed that the 2003 forward and reverse % HGV values remained the same in 2005. This data was available for all principal road links within Derby, so is more accurate than the detailed vehicle classification data for Derby's 12 automatic traffic counters. The remainder of Derby's 2005 Emissions Inventory was also assumed to remain the same as in 2003. Time varying emission factors for Warwick Avenue were applied to the major road network. Localised time varying emission factors were applied to modelled junctions. These factors were calculated by dividing the 5-day, Saturday and Sunday 24-hour flows, by the 7-day total flows. This allows for total weekday flows being higher than total weekend flows.

Table 14, Part 4
ADMS-Urban Model Conditions

Variable	Input
Source location *continued*	The 2011 major road network was obtained directly from DATS. The remainder of the 2011 Emissions Inventory was assumed to remain the same as in 2003.
Rural background concentration	Hourly measured 2005 background data from Harwell. This is a reasonable estimate of rural background concentrations around Derby, since the 2005 Annual average for Harwell was 19.39µg/m^3. This is as compared to 19.98µg/m^3 in Amber Valley Borough Council, which is directly to the north of Derby. 2011 background concentrations were calculated from the 2005 Harwell data, using the factors contained in LAQM TG(03) (revised). All cells with values less than 5.8µg/m^3 were replaced with 5.8µg/m^3.

Table 15
2003 to 2005 Traffic Growth Factors

Automatic counter	Traffic Counter Number	2003 AADT	2005 AADT	Growth Factor %
Station Approach	458	28,955	28,113	-2.9
Stores Road	456	7,128	7,327	2.8
Sir Frank Whittle Way	457	29,036	27,506	-5.3
A514 Osmaston Rd	442	21,878	17,387	-20.5
Nottingham Rd, Chaddesden	455	15,064	16,164	7.3
Normanton Road	449	9,432	12,762	35.3
Mansfield Road	454	18,558	12,924	-30.4
Kedleston Road	452	13,983	13,930	-0.4
A6 Duffield Rd	448	19,883	14,569	-26.7
A5250 Burton Rd	450	17,913	17,392	-2.91
A516 Uttoxeter New Road	451	15,666	18,822	20.2
A6 South of Alvaston (Shardlow Road)	49	20,687	13,315	35.6

6.3 MODEL VERIFICATION

Model verification was undertaken through comparison of the 2005 hourly monitored and modelled values for both the Warwick Avenue and Council House air quality monitoring stations. For this comparison, all rows of data with invalid monitored and/or modelled data were omitted, including all monitored PM_{10} concentrations between zero and -4µg/m^3.

Tables 16 and 17 provide the results of these comparisons. A plot of modelled concentrations versus monitored concentrations is not provided, as there will be perfect correlation between just 2 monitoring locations.

Table 16
Verification of 2005 Dispersion Modelling - Annual Averages

	Council House	**Warwick Avenue**
Modelled Concentration (gravimetric µg/m^3)	22.3	23.0
Monitored Concentration (gravimetric µg/m^3)	24.2	30.0
Difference between Modelled and Monitored Concentrations	-7.9%	-23.3%

Table 17
Verification of 2005 Dispersion Modelling - 90th %ile of 24-hour Averages

	Council House	Warwick Avenue
Modelled Concentration (gravimetric µg/m^3)	35.3	36.7
Monitored Concentration (gravimetric µg/m^3)	36.8	44.1
Difference between Modelled and Monitored Concentrations	-4.1%	-16.8%

Tables 16 and 17 show that the dispersion model is under-reading compared to the TEOM. It is generally accepted that for the dispersion model to effectively model local roads, this difference should ideally be no more than +/-10%. Having said this, much larger differences are frequently evident, even with intensive verification.

In the case of the urban background Council House site, the under-read for both the annual mean and 90th percentiles is less than 10%. For the 90th percentile, the under-read is less than 5%. There is therefore excellent correlation between the modelled and monitored results at the Council House.

The reason for the excellent correlation is likely to be the detailed nature of the modelling data. This data considers 2-way traffic flows for each link in the principal road network, including the Council House car park. The dispersion modelling also includes detailed information on traffic speeds, adjusted to account for queuing on links into junctions. Finally, accurate data is provided on the percentage split between HGVs and LGVs.

In relation to Warwick Avenue, the modelled results for both the annual and 24-hour comparisons under-read by more than 10%. The annual average comparison under-reads by 23.3%, whilst the 90th percentile comparison under-reads by 16.8%.

It is the 16.8% under-read which is of interest for this Detailed Assessment, since it is exceedences of the 24-hour objective which are being investigated. This under-read is acceptable given that:

1. Intensive verification of the dispersion modelling has been undertaken

2. Detailed traffic data has been used in the dispersion modelling

3. In 2004 and 2005, apartments were built immediately to the rear of the Warwick Avenue air quality monitoring station. Construction site dust associated with this development is likely to be responsible for some of the high 15-minute peak PM_{10} concentrations observed.

   Without local meteorological data, this cannot be confirmed with a pollution rose. The filter did however need to be changed every fortnight during construction, compared to the normal 4 to 5 weeks. The dispersion model was unable to account for this construction site dust.

4. The Warwick Avenue air quality monitoring station is on a gradient close to traffic lights at the Warwick Avenue/Burton Road junction. ADMS-Urban is unable to take account of the exhaust emissions associated with traffic queuing uphill, so generally under-predicts pollution concentrations in this scenario. Dispersion modelling is most accurate when modelling free-flowing traffic on straight roads.

Although the 16.8% under-read means that the Warwick Avenue air quality monitoring station is not ideal in terms of model verification, the model is still considered to have performed well. This view is supported by the -4.1% under-read at the Council House urban background site.

Although the issues of construction site dust and gradient do not exist at any of the 5 junctions being modelled, the Warwick Avenue site has still been used instead of the Council House to calculate an adjustment factor. This ensures that the modelling assumes a realistic worst-case scenario, thereby providing confidence in the likelihood of exceedences of the 24-hour PM_{10} standard.

In order to calculate the adjustment factor for the modelled 90^{th} percentile PM_{10} concentrations, the Warwick Avenue modelled and monitored results are compared. The background concentrations have been removed from this comparison. This is because dispersion modelling errors are assumed to arise from the road traffic source data, rather than the background data.

$$\textit{Adjustment Factor} = \frac{\textit{Monitored concentration - Background concentration}}{\textit{Modelled concentration - Background concentration}}$$

= 44.1 - 19.39/ 36.7 - 19.39

= 24.71/17.31

= 1.43

This adjustment factor has been applied to the roadside element of the 2005 and 2011 plots of 90^{th} percentile PM_{10} concentrations. These plots are shown in Maps 6 to 21 at the end of this report.

6.4 2005 BASE YEAR SCENARIO

In order to simplify the modelling, nearby junctions were combined within the same model run. Consequently, the Osmaston Road/Ascot Drive and Spider Island junctions were combined, as were the London Road/Traffic Street and London Road/Midland Road junctions.

Photographs of the modelled junctions are shown in Photographs 4 to 15.

Photograph 4
Corner of Bridge Street/Agard Street (east)

Photograph 5
Bridge Street (north) and Approach to Agard Street

The reasons why Agard Street/Bridge Street junction has been identified as a potential pollution hotspot are:

1. Bridge Street provides access onto the inner ring-road, so has high traffic flows on a narrow street

2. The junction is on a tight corner, so traffic approaching this junction has to slow down to very low speeds and then accelerate away

3. There is relevant exposure close to the kerbside

4. A high percentage of HDVs use this junction

Photograph 6
London Road (west)/Midland Road

Photograph 7
London Road (east)/Midland Road

The reasons why the London Road/Midland Road junction has been identified as a potential pollution hotspot are:

1. High traffic flows due to London Road being a main arterial route into the city + it having 3 entrances to the Derby Royal Infirmary

2. High percentage of HDVs using this junction

3. High background PM_{10} concentrations, due to its proximity to both the east of the city centre and railway sidings

4. Although not specifically considered by DMRB, the traffic lights cause queuing traffic

Photograph 8
London Road (west)/Traffic Street roundabout

The reasons why the London Road/Traffic Street junction has been identified as a potential pollution hotspot are:

1. Very high traffic flows along this part of the inner ring-road

2. High percentage of HDVs using this junction

3. Urban dual carriageway on Traffic Street and Bradshaw Way, with 2 lanes of traffic

4. High background PM_{10} concentrations, due to its proximity to both the east of the city centre and railway sidings

5. Strutts pub is directly adjacent to this extremely busy junction, with residential accommodation on the first floor

6. Although not specifically considered by DMRB, the proximity of mini-roandabouts along this part of the inner ring-road means that congestion is often a problem along this part of the road network

7. Again although not specifically considered by DMRB, the construction work associated with the extension to the Eagle Centre shopping centre has increased congestion in this area. This effect is however of a temporary nature, so has been excluded from further consideration in this Detailed Assessment.

Photograph 9
Osmaston Road (north)/Ascot Drive

Photograph 10
Ascot Drive from Osmaston Road (north)

The reasons why the Osmaston Road/Ascot Drive junction has been identified as a potential pollution hotspot are:

1. High traffic flows

2. High percentage of HDVs using this junction

3. Dwellings on the western side of Osmaston Road are in close proximity to this busy junction

4. High background PM_{10} concentrations, due to the large number of industrial units in this area

5. Although not specifically considered by DMRB, the traffic lights cause queuing traffic

Photograph 11
Osmaston Road (south)/Spider Island

Photograph 12
Spider Island from Osmaston Road (south)

Photograph 13
Harvey Road from Spider Island

Photograph 14
Chellaston Road (south) from Spider Island

Photograph 15
Osmaston Park Road (west) from Spider Island

The reasons why the Osmaston Road/Harvey Road junction has been identified as a potential pollution hotspot are:

1. High traffic flows along this part of the outer ring-road, which is in part due to Allenton being a popular shopping area

2. High percentage of HDVs using this junction

3. Relative close proximity of the Mitre pub to the junction, with residential accommodation on the first floor

4. High background PM_{10} concentrations, due to the large number of industrial units in this area

5. Although not specifically considered by DMRB, the traffic lights cause queuing traffic

In contrast to the verification of the dispersion model, intelligent gridding was used for the model runs themselves. An average respiratory height (z) of 1.5m was also used.

In order to account for the effect of congestion and rush hour peak flows, localised time varying emission factors were used for each of the 5 junctions being modelled. These 24 hour profiles were calculated from weekday, Saturday and Sunday hourly flow data obtained from Derby City Council's Highways Department for the nearby automatic traffic counters shown in Table 18.

Table 18
Automatic Traffic Counters

Junction	Traffic Counter
Bridge Street/Agard Street	Automatic counter on Ashbourne Road (eastbound section)
London Road/Midland Road & London Road/Traffic Street	Automatic counter on London Road (between Midland Road & Traffic Street)
Osmaston Road/Ascot Drive & Spider Island	Manual count undertaken on Osmaston Road, to the north of Ascot Drive

The 2005 Contour Plots for the 5 junctions in this Detailed Assessment are shown in Maps 6 to 13 at the end of this report.

6.5 2011 FUTURE YEAR SCENARIO

In order to model the 2011 future year scenario, traffic data from the 2011 DATS scenario was used. This detailed traffic data on 2-way traffic flows, traffic speeds and percentage HGVs was plotted in ArcView GIS. Information was also entered on carriageway widths.

Once completed, the dataset was imported into the EMIT software package, from which it was possible to calculate both the gridded emissions and the emissions for the principal roads in the vicinity of the junctions being modelled. These emission inventories were then converted into access databases, ready to be imported into ADMS-Urban.

The meteorological data for 2005 was presumed to be the same as in 2011.

In order to account for changes to the background PM_{10} dataset between 2005 and 2011, it was necessary to account for the contribution from the different sources of PM_{10} over this period.

The measured data was first divided into its primary, secondary and coarse categories. Since only the primary component is important in terms of local emissions, the secondary and coarse components are removed and added back in, once future predictions from local sources have been undertaken.

In order to correct the 2005 background concentrations measured at the Harwell air quality monitoring station, the local secondary PM_{10} concentration for 2005 was obtained from the internet map for the Vale of White Horse (Reference 7).

$Csec_{2004}$ = 9.99µg/m^3

$Csec_{2005}$ = 9.99 x 0.9754 = 9.74 (Reference 8)

$Cprim_{2005}$ = Total estimated $PM_{10\ 2005}$ – $Csec_{2005}$ - Residual
= 19.39 - 9.74 - 5.8
= 3.85

$Cprim_{2011}$ = $Cprim_{2005}$ x 0.9127/1.0174
= 3.85 x 0.9127/1.0174
= 3.45

$Csec_{2011}$ = $Csec_{2005}$ x 0.8389
= 9.74 x 0.8389
= 8.17

Total estimated $PM_{10\ 2011}$ background concentration
= $Cprim_{2011}$ + $Csec_{2011}$ + 5.8
= 3.45 + 8.17 + 5.8
= 17.42µg/m^3

Given that the 2005 annual average PM_{10} concentration at Harwell was 19.39µg/m^3, all of the hourly 2005 PM_{10} concentrations were therefore multiplied by a factor of 0.898 (17.42/19.39).

The 2011 Contour Plots for the 5 junctions in this Detailed Assessment are shown in Maps 14 to 21 at the end of this report.

7.0 ANALYSIS OF DISPERSION MODELLING RESULTS

7.1 2005 BASE YEAR

The 2005 Contour Plots in Maps 6 to 13, show 90th percentile PM_{10} concentrations for the 5 junctions in this Detailed Assessment.

These modelled concentrations represent realistic worst-case scenarios. This is because verification relied upon the kerbside analyser at Warwick Avenue, which is adjacent to both a road on an uphill gradient and a construction site.

These factors increased measured PM_{10} concentrations at this monitoring station and yet were unable to be accounted for in the associated dispersion modelling. Consequently, the 1.43 adjustment factor provides realistic worst-case contour plots for the 5 junctions being modelled. This is on the basis that uphill gradient and construction site dust are not present at these junctions.

The 2005 contour plots demonstrate that exceedences of the 24-hour objective are unlikely at any receptors adjacent to the 5 modelled junctions. This is in contrast to the DMRB screening assessments, which were used to identify these junctions for Detailed Assessments.

Table 19 provides a summary of the difference between the DMRB screening assessment and dispersion modelling results.

It is evident from the results shown in Table 19 that as expected, the DMRB screening tool provides conservative assessments of PM_{10} concentrations. It is also evident that in the case of Strutts Public House and 730 Osmaston Road, DMRB has significantly over-estimated 24-hour average PM_{10} concentrations.

Table 19
Comparison of DMRB & Dispersion Modelling Results

Junction	DMRB 90th percentile PM_{10} concentration ($\mu g/m^3$)	Dispersion model 90th percentile PM_{10} concentration ($\mu g/m^3$)
Kenneth House - Bridge Street/ Agard Street	57 (~39.9 days)	43.6 at north western facade
Strutts public house - London Road/ Traffic Street	89.4 (~62.6 days)	46.5 at north western facade
153 London Road - London Road/ Midland Road	53.3 (~37.3 days)	41.9 at facades of all properties close to this junction
Mitre public house - Osmaston Road/ Harvey Road	49.4 (~34.6 days)	44.6 at southern facade
730 Osmaston Road - Osmaston Road/ Ascot Drive	63.7 (~44.6 days)	46.4 at western facade

In order to account for the additional degree of uncertainty associated with random errors within this conclusion, the following calculation has been undertaken:

Standard deviation for the model (SDM) = U Value x Air Quality Objective
= 0.3 x 50µg/m^3
= 15µg/m^3

Since dispersion modeling results are generally considered to be within 1 standard deviation of the model, they will be within +/-15µg/m^3 of the actual PM_{10} concentration. This large degree of uncertainty is inherently associated with dispersion modeling of 24-hour PM_{10} concentrations.

An uncertainty of +/-15% means that the actual worst-case concentration of 46.5µg/m^3, could be anywhere between 38.5µg/m^3 and 61.5µg/m^3. It is as likely to be below 46.5µg/m^3, as it is to be higher and at risk of exceeding the 50µg/m^3 standard.

This is why LAQM TG(03) only states that it is 'possible' that a 90th percentile modelled concentration in the range of 44 - 50µg/m^3 will result in an exceedence of the 24-hour PM_{10} standard. This situation is however considered unlikely in the modeled predictions because:

1. The 90th percentile contour plots show the PM_{10} concentrations as a range of numerical values. Table 19 provides the highest value in the overlying contour plot and therefore a worst-case predicted PM_{10} concentration.

2. The highest predicted PM_{10} concentration is 46.5µg/m^3 at Strutts public house. This is at the bottom end of the 44 - 50µg/m^3 range provided by LAQM TG(03).

3. A significant adjustment factor of 1.43 has been applied to all of the modelled concentrations. Consequently, further allowance for Model Uncertainty would be likely to overestimate PM_{10} concentrations.

Taking these factors and the results in Table 19 into account, no exceedences of the 24-hour PM_{10} standard are considered likely at any roadside dwellings, nurseries or schools in Derby in 2005.

In terms of the contour plots themselves it is worth noting that:

1. In Table 19, a 90th percentile PM_{10} concentration of 46.4µg/m^3 is predicted at the ground floor of the Thirsty Scholar, Ashbourne Road. This is higher than both the 43.6 µg/m^3 modelled concentration for Agard Street/Bridge Street and the 37µg/m^3 (~26 days) DMRB assessment for 1 Vernon Street, due to this pub and its first floor accommodation being just 3 metres from this busy part of Ashbourne Road.

2. In Map 11, there is an anomalous straight PM_{10} concentration contour that goes across Osmaston Road from east to west. This is due to the dispersion models aggregating gridded emissions on 1km^2 grid squares. Small differences in PM_{10} concentrations are therefore evident at grid boundaries, which do not exist in reality.

3. The contour plots show that the impact of road-traffic based PM_{10} is localised, with PM_{10} concentrations significantly decreasing within a few metres of kerbside.

4. The road-traffic element of modelled PM_{10} concentrations is relatively small, with background concentrations accounting for the vast majority of PM_{10} concentrations.

7.2 2011 FUTURE YEAR SCENARIO

The 2011 Contour Plots in Maps 14 to 21, show 90th percentile PM_{10} concentrations for the 5 junctions in this Detailed Assessment.

These modelled concentrations represent realistic worst-case scenarios. As with the 2005 scenarios, this is because verification relied upon the kerbside analyser at Warwick Avenue. This air quality monitoring station is adjacent to both a road on an uphill gradient and a construction site. The dispersion modelling was unable to account for either of these factors.

Table 20 provides a summary of the 2011 dispersion modelling results for those receptors closest to the 5 junctions in this Detailed Assessment.

Table 20
2011 Dispersion Modelling Results

Junction	Dispersion Model 90^{th} percentile PM_{10} concentration ($\mu g/m^3$)
Kenneth House - Bridge Street/ Agard Street	32.7 at north western facade
Strutts public house - London Road/ Traffic Street	41.4 at north western facade
153 London Road - London Road/ Midland Road	37.8 at facades of all properties close to this junction
Mitre public house - Osmaston Road/ Harvey Road	40 at southern facade
730 Osmaston Road – Osmaston Road/ Ascot Drive	39.2 at western facade

On the basis of these results, no exceedences of the 24-hour PM_{10} standard are likely at any roadside dwellings, nurseries or schools in Derby in 2011.

In common with the National Atmospheric Emissions Factors for Derby and the UK, the model results for all 5 junctions also show a downward trend in PM_{10} concentrations between 2005 and 2011 (Reference 8). This is likely to be due to a continued reduction in background PM_{10} concentrations.

As is shown in Graph 1, the contribution of road-traffic related PM_{10} to total PM_{10} emissions has remained relatively constant over the last few years. This is likely to continue in future years, with improvements in engine technology being counteracted by:

1. High local traffic growth forecasts. The Derby Area Transport Study predicts an 11.9% local traffic growth between 2005 and 2011 (Ref 11)

2. National increase in car ownership

3. Increased congestion, which has a disproportionate effect upon the road-traffic pollution at busy junctions and roads

4. Increase in the physical size of cars, although to some extent this is likely to be counteracted by the use of lighter materials

5. Increase in power of road vehicles, with turbo-engine technology now fitted as standard in many cases

6. Air conditioning fitted as standard to many new vehicles, with the associated increase in fuel consumption and exhaust emissions

7. Change in the composition of the national vehicle fleet, with many more 4 x 4s now on the roads and a higher proportion of diesel vehicles.

8.0 OUTCOME OF DETAILED ASSESSMENT

The initial element of this Detailed Assessment reconsiders the conclusions of this USA, using 2003 to 2005 PM_{10} monitoring data. As a result of this revised USA, the 5 busy junctions in Table 21 were identified as requiring Detailed Assessments.

Detailed dispersion modelling was undertaken for the 5 junctions identified by the USA. This was for a base year of 2005 and a future year scenario of 2011. These model runs formed the basis for this Detailed Assessment.

Analysis of the modelled predictions shows that for all 5 junctions, it is unlikely that there will be an exceedence of the 24-hour PM_{10} standard. This is in terms of all roadside dwellings, schools or nurseries in Derby in both the 2005 base year and the 2011 future year scenario.

Table 21 provides a summary of this outcome, specifically in relation to each of the 5 junctions in this Detailed Assessment.

Table 21 - Summary of Outcomes

Junction	Detailed Assessment required?
Bridge Street/ Agard Street	No
London Road/ Traffic Street	No
London Road/ Midland Road	No
Osmaston Road/ Harvey Road	No
Osmaston Road/ Ascot Drive	No

On this basis, this Detailed Assessment concludes that there is no need to designate any road-traffic related PM_{10} Air Quality Management Areas (AQMAs).

This is in contrast to the March 2006 Detailed Assessment for Nitrogen Dioxide (NO_2), which concluded that exceedences of the annual average NO_2 standard of 40µg/m^3 are likely at a number of roadside locations in Derby. Consequently, it is proposed to:

- Revise the existing Inner and Outer Ring-Road NO_2 AQMAs
- Designate a new NO_2 AQMA along the A52 in Spondon

This situation of predicted exceedences of the annual average NO_2 standard and not of the 24-hour PM_{10} standard, is repeated in many UK cities.

Following Defra approval of the Detailed Assessment, consultation will take place with stakeholders. These stakeholders will include the general public, Councillors and statutory consultees.

Since it is not proposed to designate any road-traffic related PM_{10} AQMAs, a formal PM_{10} Action Plan is not be required.

Although there are no predicted exceedences of the PM_{10} standard in Derby, PM_{10} is a non-threshold pollutant. No amount of exposure to PM_{10} is therefore deemed safe. This is in contrast to NO_2, which is a threshold pollutant (Reference 4 and 5). Consequently, there are significant health benefits to be achieved in minimising road-traffic related PM_{10} emissions.

In effect, a PM_{10} Action plan already exists as an integral part of the NO_2 Action Plan. This in turn forms part of the Local Transport Plan (LTP 2), since many of the actions to reduce road-traffic related NO_2 will also reduce road-traffic related PM_{10}.

Derby City Council's Highways Department has responsibility for co-ordinating the implementation of the NO_2 Action Plan. It also has a duty to provide Annual Progress Reports to the Department of Transport.

Environmental Health has a duty to continue to assist in this process, through the provision of PM_{10} monitoring data from its local air quality monitoring network. It will also continue to assess the likelihood of exceeding National Air Quality Standards, through the Review and Assessment process.

9.0 REFERENCES

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(8) http://www.airquality.co.uk/archive/laqm/tools.php?tool=year04

(9) Compilation of New Roadside Monitoring Data Obtained by Local Authorities as Part of the Review and Assessment Process, Air Quality Consultants Ltd, April 2002

(10) Technical Guidance LAQM TG (03)

(11) Locally Adjusted NRTF Traffic Growth Data, Derby City Council Highways Department, 9 March 2006