UPDATING AND SCREENING ASSESSMENT 2006

AIR QUALITY WITHIN WINCHESTER'S DISTRICT

August 2006

Executive Summary

This report has been compiled in accordance with statutory duties under Part IV of the Environment Act 1995 and the Air Quality (England) Regulations 2000 (as amended). It is a reassessment of the air quality within Winchester's district to gauge compliance with the objectives set within these Regulations. This report updates the work conducted in a similar report issued in 2003 and has been performed in accordance with DEFRA technical guidance document LAQM TG(03) together with an updated checklist issued by DEFRA in January 2006.

The main air quality issue is within Winchester town centre for the pollutants nitrogen dioxide and particles. This is already the subject of an Air Quality Management Area (AQMA) and Air Quality Action Plan (AQAP).

The conclusion of this assessment is that no further detailed assessments are required.

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1.0 INTRODUCTION

Since the implementation of Part IV of the Environment Act 1995 all local authorities have been under a duty to review air quality within their district. The current objectives that have to be met are prescribed under the Air Quality (England) Regulations 2000 (as amended). It is a requirement that each local authority conducts a formal staged review of air quality within its district in accordance with a comprehensive set of guidance documents. These reports are then sent to the Department of Environment, Food and Rural Affairs (DEFRA) for approval.

The Regulations include a set of air quality objectives with different compliance dates between 2003 and 2010. Where it is predicted that air quality is unlikely to meet these objectives then an Air Quality Management Area (AQMA) needs to be declared to implement additional measures to try and achieve such compliance. Current air quality objectives, which are required to be assessed as part of this Local Air Quality Management (LAQM) regime, are shown in Table 1 below.

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25μg/m^3	Running annual mean	31.12.2003
	5.00μg/m^3	Annual mean	31.12.2010
1,3-butadiene	2.25μg/m^3	Running annual mean	31.12.2003
Carbon monoxide	10.0mg/m^3	Maximum daily running 8 hour mean	31.12.2003
Lead	0.5μg/m^3	Annual mean	31.12.2004
	0.25μg/m^3	Annual mean	31.12.2008
Nitrogen dioxide (Provisional)	200μg/m^3 not to be exceeded more than 18 times a year	1 Hour mean	31.12.2005
	40μg/m^3	Annual mean	31.12.2005
Particles (PM10) (Gravimetric)	50μg/m^3 not to be exceeded more than 35 times a year	24 hour mean	31.12.2004
	40μg/m^3	Annual mean	31.12.2004
	50μg/m^3 not to be exceeded more than 7 times a year[1]	24 hour mean	31.12.2010
	20μg/m^3 [1]	Annual mean	31.12.2010
Sulphur dioxide	350μg/m^3 not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125μg/m^3 not to be exceeded more than 3 times a year	24-hour mean	31.12.2004

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
	266μg/m^3 not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1. New objectives not currently within regulations but guidance recommends inclusion in an assessment

Table 1 – Current Air Quality objectives for England set within Regulations for the purpose of Local Air Quality Management

The purpose of this report is to review compliance with these air quality objectives across the whole of Winchester's district. It considers changes since the last assessment in 2003, in both the emission of pollutants and relevant exposure locations. These assessments are called Updating and Screening assessments (USA's). Where this initial assessment identifies a potential exceedance in the air quality objectives then a further detailed assessment has to be conducted within 12 months. Guidance from DEFRA is issued in Local Air Quality Management (LAQM) Technical Guidance TG(03). This was supplemented by a revised checklist issued in January 2006.

Winchester City Council has already issued the following reports:

- ***Winchester City Council Stage 1 Review (Dec 1998)*** – Concluded that only three pollutants needed further assessment, these being Carbon monoxide (CO), Nitrogen dioxide (NO_2) and Particles (PM_{10}'s).

- ***Winchester City Council Stage 2/3 Review*** **(Aug 2000)** – Concluded that CO, NO_2, and PM_{10} levels would comply with relevant objectives. However, DEFRA required further assessment for Nitrogen dioxide levels at houses close to main roads within the town centre. This report included a dispersion modelling study (AAQuIRE model) of South Hampshire performed by consultants CES.

- ***Winchester City Council Air Quality Review and Assessment (Additional Assessment of Nitrogen dioxide levels within Winchester Town Centre)*** **(Oct 2001) -** This report was in response to DEFRA's comments. It concluded that there were a small number of properties close to busy city centre roads that could have levels higher than the background site and that dispersion modelling should be performed to investigate these locations further. DEFRA rejected this conclusion advising that we should declare an AQMA and then perform this dispersion modelling.

- **Casella Stanger & Winchester City Council – Air Quality Review and Assessment – Detailed Dispersion Modelling (July 2003) –** This report was a detailed dispersion model of Winchester town centre using the BREEZE dispersion model. It predicted that failures of the annual nitrogen dioxide objective would occur after the set deadline. The model performed poorly for particles, it suggested that failures could occur but poor data ratification meant exact quantification was not possible. With regard to particles it was recommended that alternative models with better consideration of topographical effects were explored

- ***Winchester City Council Air Quality Review, Updating and Screening Assessment (USA).*** New guidance on the assessment of air quality was

issued by DEFRA early 2003. The most important document being Technical Guidance LAQM TG(03), which provides comprehensive guidance on performing such an assessment. In accordance with this guidance a review of the initial assessments were made. This report concluded that some monitoring was required for sulphur dioxide at the Alresford Station of the Watercress Steam Railway Line but all other conclusions remained valid.

- **Casella Stanger – Winchester City Council – Air Quality Review and Assessment – ADMS roads update August 2004.** This used the same data as Casella's July 03 report but utilised a different model (ADMS Roads) that included better consideration of topographical effects. However modelled results still failed to correlate with monitoring data. It was concluded that the level of exceedances for particles was less than that for nitrogen dioxide and that any action plan aimed at achieving the nitrogen dioxide standard should ensure compliance with the 24 hour particle standard. It was further concluded that additional sites for particle monitoring should be considered to check compliance is achieved.

- **Winchester City Council – Detailed Assessment of sulphur dioxide levels from The Hampshire Watercress Line (Feb 2005).** This detailed assessment monitored the levels of sulphur dioxide at the Alresford railway station platform from the steam engines running on the heritage railway between Alresford and Alton. It concluded that pollution levels were in compliance with all the Sulphur dioxide air quality objectives and therefore an AQMA was not required.

- **Winchester City Council – Air Quality Progress Report 2005.** This report provided an update on air quality issues since the issue of the Updating and Screening report in 2003. The only potential issue raised was that of Nitrogen dioxide levels adjacent the M3 in the Shawford to Otterbourne area. This issue was scheduled for further consideration within the next Updating and Screening Assessment i.e. this report.

- **Winchester City Council – Air Quality Action Plan 2006.** This document provides a detailed assessment of Nitrogen dioxide levels with Winchester Town Centre Air Quality Management Area. It identifies 21 actions to reduce these levels as far as practicable. This report can be downloaded from the Environmental Health air quality page at www.winchester.gov.uk.

This document is the latest Updating and Screening Assessment (USA) for Winchester's district and builds upon the work performed in the reports discussed above. As well as considering changes in the District since the last assessment this report has been performed using revisions to the guidance issued in January 2006.

The aim of this report is to highlight, for further detailed assessment, any potential failures in meeting the air quality objectives that the above reports have not already identified.

2.0 CARBON MONOXIDE

2.1 Monitoring data available

Results are available for carbon monoxide levels within Winchester Town centre and are detailed in Appendix 2. Monitoring shows that even at the roadside location no failures of the carbon monoxide objective have ever been recorded. In 2005, the maximum 8 hour rolling mean recorded was only 1.8mg/m^3 which is well below the 10 mg/m^3 objective.

During the refurbishment of the air quality stations in 2005 the carbon monoxide analyser at the background site was not replaced. The roadside location within Winchester town Centre is considered to represent a worst case exposure location for the City. Therefore it is considered highly improbable that failures of the objective are occurring at other relevant exposure locations within Winchester town centre.

2.2 Relevant exposure locations

Updated guidance TG (03) requires the identification of the following relevant locations:

- Single carriageway roads with daily average traffic flows which exceed 80,000 vehicles.

- Dual carriageway (2 or 3 Lane) roads with daily average traffic flows which exceed 120,000 vehicles per day.

- Motorways with daily average traffic flows which exceed 140,000 vehicles per day.

Traffic flows of major roads within Winchester's district are shown in Appendix 3. No traffic flow exceeds the criteria detailed above.

2.3 Conclusions

There are no locations that require a detailed assessment for carbon monoxide.

3.0 BENZENE

3.1 Monitoring Data outside an AQMA

No data available.

3.2 Monitoring data inside an AQMA

No data available.

3.3 Very busy roads or junctions in built up areas

Updated guidance TG (03) requires the identification of the following relevant locations:

- Single carriageway roads with daily average traffic flows which exceed 80,000 vehicles.
- Dual carriageway (2 or 3 Lane) roads with daily average traffic flows which exceed 120,000 vehicles per day.
- Motorways with daily average traffic flows which exceed 140,000 vehicles per day.

Traffic flows of major roads within Winchester's district are shown in Appendix 3. No traffic flow exceeds the criteria detailed above.

3.4 New industrial sources (or existing sources with substantially increased emissions or new relevant exposures)

No significant industrial sources of Benzene, such as petrochemical works, have been identified within, or close to, Winchester's district.

3.5 Petrol stations

All petrol stations that are subject to the LAPPC permitting regime under the Pollution Prevention and Control Act 1999 are shown in Appendix 4. The only sites that have a busy road nearby (greater than 30,000 vehicles per day) are those located at motorway/dual carriage way service stations. Neither the A34 service station nor the M3 service station has a relevant exposure location, such as domestic residence, within 10 metres of the pumps.

3.6 Major fuel storage depots

The nearest large fuel storage depot is the BP Hamble fuel terminal within Eastleigh Borough Council's District. This has been assessed as part of Eastleigh's Updating and Screening Assessment for 2006, which concluded no detailed assessment was required.

3.7 Conclusions

There are no locations that require a detailed assessment for Benzene.

4.0 1,3 BUTADIENE

4.1 Monitoring Data

No data available.

4.2 New industrial sources (or existing sources with substantially increased emissions or new relevant exposures)

No significant industrial sources of 1,3 butadiene have been identified within, or close to, Winchester's district.

4.3 Conclusions

There are no locations that require a detailed assessment for 1,3 Butadiene.

5.0 LEAD

5.1 Monitoring Data

No data available.

5.2 New industrial sources (or existing sources with substantially increased emissions or new relevant exposures)

No significant industrial sources of Lead have been identified within, or close to, Winchester's district.

5.3 Conclusions

There are no locations that require a detailed assessment for Lead.

6.0 NITROGEN DIOXIDE

6.1 Monitoring data outside an AQMA

Appendix 1 provides information on the nitrogen dioxide diffusion tube studies that have been conducted outside an AQMA i.e. studies outside of Winchester City Centre. This consists of the District wide study and the M3 study, which are discussed further in Appendix 1.

The District wide diffusion tubes are at roadside locations, adjacent to the main link roads in other significant conurbations across the District. These tubes should represent very much a worst case scenario for nitrogen dioxide exposure in these locations. The results for 2005 are presented in Appendix 1. Of the nine sites, two are above the annual mean objective of 40µg/m$^{3.}$ These being Site 2 on City Road, Winchester and Site 9 at Otterbourne. In addition Site 8 at Bishops Waltham is exactly at the air quality objective of 40µg/m^3. Site 2 is within the AQMA for Winchester City Council and monitoring is continued here only to maintain the data set for this location. Further diffusion monitoring within the AQMA is discussed in section 6.2 below. However it of interest to note that the town study includes a diffusion tube at the same point on City Road, which is located on the building façade rather than the roadside lamppost location of Site 2. The roadside tube gave an average of 55.6µg/m^3 compared to the building façade result of 48.0µg/m^3 i.e. 15.8 percent higher. This demonstrates the scale of differences obtained between roadside and typical building façade results.

Site 8 is located only 1.5 metres from the kerb whilst the nearest relevant exposure location on this section of the road is just over 5 metres. Thus the roadside site 8 result of 40µg/m^3 will mean compliance is being achieved at nearest relevant exposures i.e. nearest domestic building façades. The results for previous years at Site 8 have been 2003 – 40.1µg/m^3, 2004 – 41.9µg/m^3, so there is no sign of any increasing trend.

Site 9 at Otterbourne was of enough concern to commence a more detailed study of the Otterbourne to Compton areas of the District, which lie in close proximity to the M3. Results for the first six months of 2006 are detailed in Appendix 1. This study continued the roadside location of site 9 of the district wide study (which is now site 4 of the Otterbourne study) and this site continues to exceed the annual mean objective. However, all other sites, which are located at the nearest relevant exposure locations, are all well below the annual mean objective. Although the data presented is only for six months, the study will continue for at least 12 months. However, it is considered that the first six months data is sufficient evidence to demonstrate that a detailed assessment is not required at this stage.

6.2 Monitoring data within an AQMA

Appendix 1 provides details of the nitrogen dioxide diffusion tube studies. This includes the major ongoing study within Winchester town centre that commenced in 2002/03

Appendix 2 provides details of the real time monitoring of nitrogen dioxide within Winchester town centre at both a roadside and background location.

This data shows that failures of the annual mean objective are still occurring at most monitoring locations within the AQMA. The spatial distribution of the failures shown on the map in Appendix 2 demonstrates that there is no need to alter the current

geographic extent of the AQMA. The highest failures are still occurring on the busy main roads around the town centre one way system. Failures on the arterial roods feeding into the town centre decrease with distance away for the town centre. Additional sites have been added since 2003 that show that away from the main roads in the City Centre, in locations such as Middle Brook St and Parchment Street, compliance is also being achieved.

6.3 Narrow congested streets with residential properties close to the kerb

Winchester town centre is such a location and considerable monitoring of this area is already performed, as detailed in Appendices 1 and 2.

No other locations with flows greater than 10,000 vehicles per day have been identified.

6.4 Junctions

The majority of road junctions with more than 10,000 vehicles per day are within, or close to, the Winchester Town Centre AQMA. Considerable monitoring of this area is already performed, as detailed in Appendices 1 and 2.

The other sites meeting these criteria are the entrance and exit roundabouts/junctions for the following motorway and dual carriageways:

- Junction 9 M3/A34
- Junction 10 M3
- Junction 11M3
- Junction 9 M27 - Whitely
- A34, Winchester North (Three Maids Hill)

However, none of these sites have a relevant exposure location within 10 m of the kerb.

6.5 Busy Streets where people may spend 1 hour or more close to traffic

Winchester town centre is such a location and considerable monitoring of this area is already performed as detailed in Appendices 1 and 2. Monitoring data from the real time analysers shows that the roadside and background sites have been in compliance with the 1 hour mean objective in both 2004 and 2005.

No other locations with flows greater than 10,000 vehicles per day have been identified.

6.6 Roads with high flow of buses and/or HGV's

Appendix 4 shows traffic flows and percentage HDV's for the major road networks passing through Winchester's district. No sites have been identified as having a bus and HGV flow of greater than 25 percent of the total AADT that also have a flow of more than 2,500 HDV's per day.

6.7 New roads constructed or proposed since previous review

No new roads with a flow greater than 10,000 vehicles per day have been constructed since the last USA in 2003.

6.8 Roads with significantly changed traffic flows or new relevant exposure

No roads with an AADT of greater than 10,000 vehicles per day have been identified that have had an increase in traffic flows of greater than 25 percent since the last USA in 2003. Traffic flows for the major road network presented in the USA for 2003 have increased by 5 percent or less up to 2004.

6.9 Bus stations

The Bus station in Winchester is already located within the existing AQMA with regards to non compliance with the annual mean objective. Appendix 1 includes data on a diffusion tube located within the bus station at a location representative of public exposures whilst at the bus station. The result shows that the monitored annual mean does not exceed 60 $\mu g/m^3$, indicating it is unlikely to exceed the one hour mean objective.

6.10 New industrial sources

There are no new IPPC or LA-IPPC processes within, or close to, Winchester's boundary that meet the criteria for further assessment listed in Annex 2 to TG(03). A list of all LA-IPPC permitted processes is provided in Appendix 4. There are a number of new IPPC processes currently being processed by the local Environment Agency office but these all relate to the agricultural sector.

6.11 Industrial sources with substantially increased emissions or new relevant exposure

No IPPC or LA-IPPC processes considered in the USA 2003 have had substantially increased emissions or new relevant exposures. A list of all the LA-IPPC permitted processes is provided in Appendix 4.

6.12 Aircraft

There are no civil aviation airports within Winchester's district.

6.13 Conclusions

There are no additional locations that currently require a detailed assessment for nitrogen dioxide. Failures of the annual mean objective are still occurring in many locations within Winchester City Centre but these are accurately represented by the current geographic extent of the existing AQMA.

7.0 SULPHUR DIOXIDE

7.1 Monitoring data outside an AQMA

The only monitoring data available for sulphur dioxide is that associated with the detailed assessment of the Water cress heritage steam railway.

7.2 Monitoring data within an AQMA

There are no AQMA's associated with sulphur dioxide.

7.3 New industrial sources (or existing sources with substantially increased emissions or new relevant exposures)

No significant industrial sources of sulphur dioxide have been identified within, or close to, Winchester's district.

7.4 Areas of domestic coal burning

Very few houses now burn coal as their primary source of heating. A telephone conversation with a local coal merchant suggests there has been a slight decrease in coal provision to domestic properties since the last assessment.

No zones with a density of 100 houses, in a 500 by 500 metre area, burning coal as a primary source of heating could be identified.

7.5 Boilers >5MW (thermal)

A survey for boiler plant greater 5MW (Thermal) that burn coal or fuel oil was conducted as part of the 2003 USA. No new boiler plant has been identified since that assessment.

7.6 Shipping

Winchester is not a coastal authority.

7.7 Railway Locomotives

According to Network Rail (Telephone call to National Helpline on 020 7557 8000) there have been no significant changes in train movement patterns since the last survey conducted as part of the 2003 USA.

The issue of the Watercress heritage steam railway line was subject to a detailed assessment issued in February 2005. Telephone conversations have confirmed that there has been no increase in the frequency of services or engine types, to that monitored in 2004.

7.8 Conclusions

There are no locations that require a detailed assessment for sulphur dioxide.

8.0 PARTICLES (PM_{10})

8.1 Monitoring data outside an AQMA

No data outside of Winchester AQMA has been collected since last USA in 2003.

8.2 Monitoring data within an AQMA

Appendix 2 details the current real time PM_{10} monitoring performed within the Winchester Town Centre AQMA, using BAM analysers. Since the USA in 2003 there has been new guidance on the ratification of PM_{10} data from BAM analysers. The data has now been reworked by dividing the results by the correction factor of 1.2, as advised in the Jan 2006 update to TG(03). This has had a significant influence on the level of failures recorded when reworked using this correction factor. Data for 2005 shows compliance at the roadside and background sites, for both the 24 hour mean objective and the annual average.

Appendix 3 shows the initial results from the Osiris optical systems installed at three locations, one site being co-located with the background site. These sites were installed within Winchester to increase the coverage of PM_{10} data across the AQMA. This was due to the problems previously experienced in modelling concentrations across the town centre from the real time data available. Although the data is only for the first six months of 2006, it shows compliance is likely at the two new locations on City Road and North Walls. Comparisons with the BAM data show that the roadside site location continues to represent a worst case scenario for the monitoring of this pollutant.

The AQMA declared within Winchester was for both the 24 hour mean objective for PM_{10} and the annual mean objective for nitrogen dioxide. Therefore the Air Quality Action Plan for Winchester Town Centre is now based solely on achieving compliance with the annual average nitrogen dioxide objective.

However, it is unclear whether compliance will be achieved with the proposed 2010 24 hour mean objective, which allows only 7 failures per year. Therefore monitoring for PM_{10} will continue in the town centre to assist in assessing compliance with this objective in future assessments.

8.3 Road Traffic (Junctions)

The majority of road junctions with more than 10,000 vehicles per day are within, or close to, the Winchester Town Centre AQMA. Detailed monitoring of this area is already performed and is detailed in Appendices 2 and 3. These results are considered to represent a worst case scenario for Winchester City. As these sites are in compliance with the PM_{10} objectives, no other locations have been identified with Winchester City that are likely to fail.

The other sites meeting these criteria are the entrance and exit roundabouts/junctions for the following motorway and dual carriageways:

- Junction 9 M3/A34
- Junction 10 M3
- Junction 11M3
- Junction 9 M27 - Whitely
- A34, Winchester North (Three Maids Hill)

However, none of these sites have a relevant exposure location within 10 m of the kerb.

8.4 Traffic (Roads with high flow of buses or HDV's)

Appendix 4 shows traffic flows and percentage HDV's for the major road networks passing through Winchester's district. No sites have been identified as having a bus and HGV flow of greater than 20 percent of the total AADT that also have a flow of more than 2,000 HDV's per day.

8.5 New roads

No new roads with a flow greater than 10,000 vehicles per day have been constructed since the last USA in 2003.

8.6 Roads with significantly changed traffic flows or new relevant exposures

No roads with an AADT of greater than 10,000 vehicles per day have been identified that have had an increase in traffic flows of greater than 25 percent since the last USA in 2003. Traffic flows for the major road network presented in the USA for 2003 have increased by 5 percent or less up to 2004.

8.7 Roads close to the Objective during the Second Round of Review and Assessment

No such locations were identified.

8.8 New industrial sources

Since the USA in 2003, no new industrial sources have been identified that are considered significant fugitive sources of PM_{10}.

8.9 Industrial Sources with substantially increased emissions or new relevant exposures

Since the USA in 2003 no industrial sources with substantially increased emissions or new relevant exposures have been identified.

8.10 Areas of domestic solid fuel burning

None - See comments for sulphur dioxide

8.11 Quarries, Landfill sites, open cast coal and handling of dusty cargoes

There are no such sites within Winchester's district.

8.12 Aircraft

There are no civil aviation airports within Winchester's district.

8.13 Conclusions

There are no locations that require a detailed assessment for particles (PM_{10}). However, monitoring needs to continue within Winchester town centre to assess future compliance with the proposed 2010 24 hour mean objective.

9.0 FINAL CONCLUSIONS

No further detailed assessments are currently required for Winchester City Council's area.

The current extent of failures for the annual mean nitrogen dioxide objective within Winchester town centre is accurately reflected by the current AQMA.

APPENDIX 1 – Nitrogen Dioxide Diffusion Tube Monitoring

These diffusion tubes adsorb nitrogen dioxide where upon it is converted to nitrite by reacting with the triethanolamine present in the tube. The nitrogen dioxide is then determined by analysing the amount of nitrite present colorimetrically after it has been reacted with the colour-forming reagent sulphonamide. Gradko International of Winchester provided all diffusion tubes used, which were all 50 percent TEA in water specification. Tubes are exposed for a nominal four week period.

All tubes are biased corrected by co-locating a triplicate set of tubes against the roadside nitrogen dioxide monitor. This is in line with recent guidance on deriving bias correction values, as a roadside co-location study has been used to adjust diffusion tubes exposures close to roadside locations. The correction factor is calculated on an annual basis and the following correction factors have been applied to the raw data:

2002/03	1.27
2004	1.23
2005	1.22

Diffusion tubes at located at about 2.5 metres. Although in an ideal world diffusion tubes would be located at head height, this is not possible in these locations as this would result in an unacceptable level of theft.

Three different studies have been performed over recent years, these are:

District Wide Survey. This study provides data across the district using a limited number of tubes at roadside locations. The objective is to establish long term trends in air quality at settlements exposed to significant traffic flows outside Winchester Town Centre. The study is used to identify any locations where a more detailed study would be warranted. The sites chosen are not considered relevant exposure locations from a public health perspective as they are at roadside locations. This study has been temporarily suspended to allow these resources to be redirected into the M3 Motorway study discussed below.

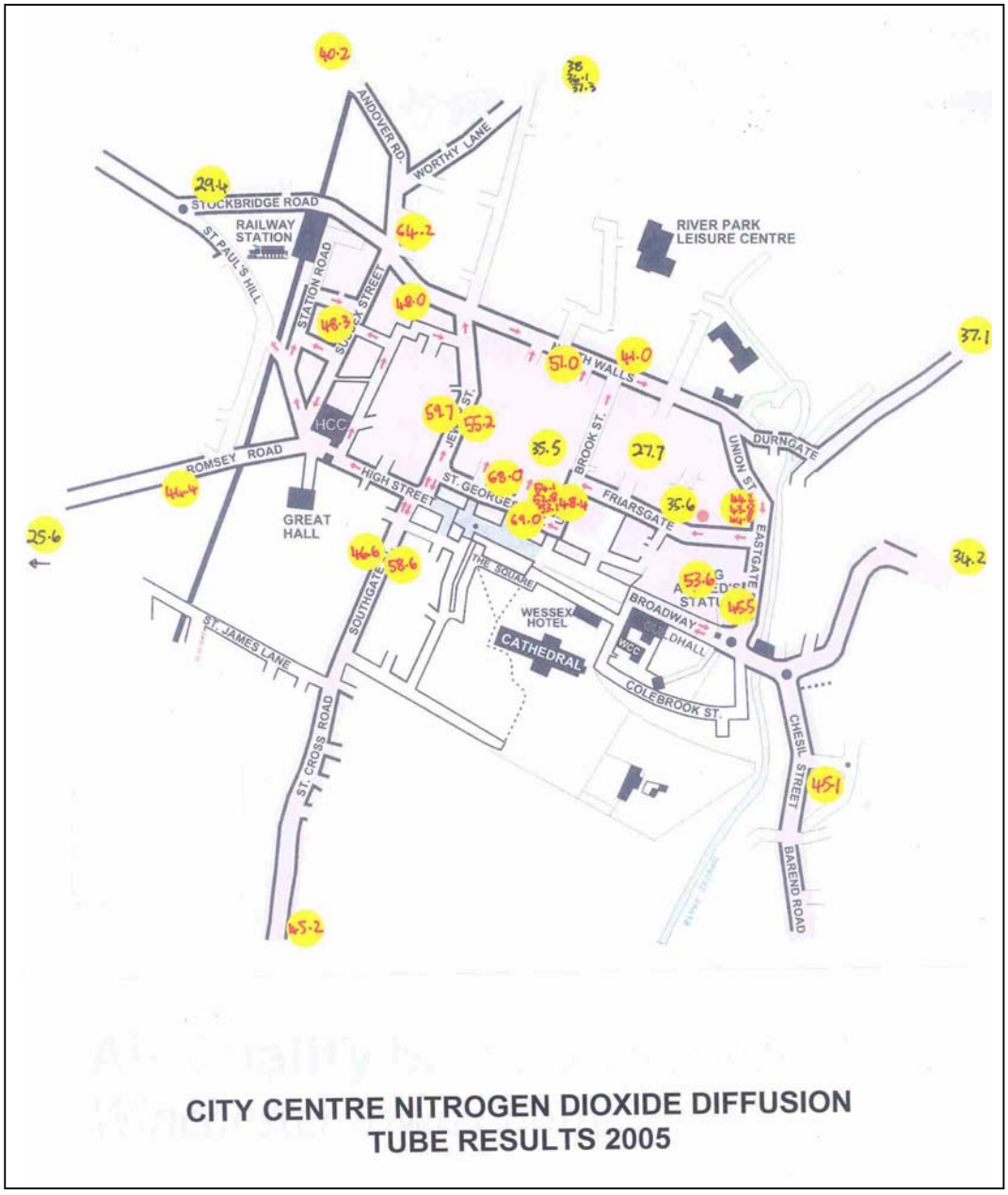
Detailed Winchester Town Centre study. This was commenced in 2002 and focuses on air quality failures with the AQMA. The tubes are located as near as possible to building façades which are considered to constitute relevant public health exposure locations. The study includes the co-location of triplicate samples next to the roadside real time analysers and two other triplicate sites to assess inter-tube variability.

M3 Motorway study. This follows on from the conclusions of the 2005 updating report. This identified that the roadside tube based in Otterbourne was exceeding the annual mean objective for nitrogen dioxide. The purpose of this ongoing study is to establish in more spatial detail the nitrogen dioxide levels in the Otterbourne area at relevant public exposure locations. The study is therefore focused on monitoring levels at the building façades of domestic properties close to the M3. The study commenced in Jan 2006 and will be continued for at least one year. Data from the ongoing Motorway study is presented in this report; ultimately this data will have a 2006 correction factor applied to the results for the whole year. However, in this report the results have been corrected using the 2005 bias correction value and the six monthly to year correction adjustment applied as recommended in TG(03).

Site	Mean Concentration in ug/m3	Tubes Missing
Site 1, 10 Eastgate St	45.5	2
Site 2, Greyfriars 1	44.2	0
Site 3, Greyfriars 2	43.8	2
Site 4, Greyfriars 3	44.8	1
Site 5, Friarsgate	35.6	0
Site 6, Upper Brook St	48.4	0
Site 7, Roadside Monitor	54.1	1
Site 8, Roadside Monitor	52.8	1
Site 9, Roadside Monitor	53.1	1
Site 10, St Georges St TC	68.0	0
Site 11, St Georges St Lad	69.0	0
Site 12, Jewry St CH	55.2	1
Site 13, Jewry St FK	59.7	1
Site 14, Southgate St DV	46.6	0
Site 15, Southgate St CH	58.6	1
Site 16, Sussex St	48.3	1
Site 17, City Road	48.0	1
Site 18, 74 Northwalls	51.0	0
Site 19, 15 Northwalls	41.0	0
Site 20, Wales St	37.1	1
Site 21, Alresford Rd	34.2	7
Site 22, Chesil St	45.1	1
Site 23, Romsey Rd HL	25.6	1
Site 24, Stockbridge Rd	29.4	1
Site 25, Andover Rd	40.2	0
Site 26, Worthy Rd 1	38.0	0
Site 27, Worthy Rd 2	36.1	0
Site 28, Worthy Rd 3	37.3	1
Site29, St Cross Rd	45.2	2
Site 30, Romsey Road	64.2	3
Site 31, Andover Rd	44.4	0
Site 32, Bus Station	53.6	3
Site 33, Parchment St	35.5	5
Site 34, Middle Brook St	27.7	5

RED = Exceeds air quality objective

Nitrogen dioxide diffusion tubes - Town Centre Study 2005



Spatial distribution of nitrogen dioxide diffusion tubes
Town Centre Study 2005

SAMPLING PERIOD	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9
	ALL RESULTS IN PPB (BLANK SUBTRACTED)								
06/01/05 - 04/02/05	Missing	22.5	12.0	15.4	11.3	15.1	15.7	16.1	20.1
04/02/05 - 04/03/05	14.7	22.9	11.6	16.0	9.8	13.3	13.7	15.7	23.7
04/03/05 - 06/04/05	17.9	29.8	14.9	16.7	13.4	19.0	17.8	16.7	18.3
06/04/05 - 27/04/05	16.4	27.9	14.8	17.0	11.5	16.9	18.0	18.7	21.8
27/04/05 - 03/06/05	11.6	22.7	11.5	12.6	8.4	12.8	12.0	15.7	15.1
03/06/05 - 29/06/05	14.6	22.3	13.0	17.3	9.2	18.2	13.8	18.3	19.1
29/06/05 - 28/07/05	10.7	22.0	10.7	13.0	8.5	12.9	10.9	15.6	17.4
28/07/05 - 26/08/05	9.3	18.2	8.9	9.5	7.5	12.4	12.6	15.0	18.3
26/08/05 - 22/09/05	15.8	27.7	13.4	16.5	9.7	14.6	15.0	18.0	18.3
22/09/05 - 27/10/05	14.5	Missing	14.7	15.7	11.7	17.0	15.3	18.8	15.4
27/10/05 - 02/12/05	15.2	Missing	15.2	17.8	12.5	16.2	17.3	18.7	19.0
02/12/05 - 10/01/06	16.9	22.6	14.5	17.1	14.9	17.9	17.9	19.0	20.5
YEARLY AVERAGE (PPB)	**14.3**	**23.9**	**12.9**	**15.4**	**10.7**	**15.5**	**15.0**	**17.2**	**18.9**
BIAS CORRECTED ($\mu g/m^3$)	**33.4**	**55.6**	**30.1**	**35.8**	**24.9**	**36.2**	**34.9**	**40.0**	**44.1**

SITE 1 - Gordon Road, Winchester

SITE 2 - City Road, Winchester

SITE 3 - Kingsworthy (A34)

SITE 4 - Broad St, New Alresford

SITE 5 - Denmead

SITE 6 - Wickham

SITE 7 - Whiteley

SITE 8 - Bishops Waltham

SITE 9 - Otterbourne

Nitrogen dioxide diffusion tubes - District Wide Survey 2005

SAMPLING PERIOD	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9
	ALL RESULTS IN PPB (BLANK SUBTRACTED)								
10/01/06 - 08/02/06	18.6	16.5	18.1	22.8	19.6	17.5	15.7	17.7	12.4
08/02/06 - 14/03/06	13.6	10.7	15.5	20.1	17.1	13.1	12.5	14.6	8.8
14/03/06 - 20/04/06	9.8	11.8	12.5	16.8	13.2	10.8	9.4	10.9	7.9
20/04/06 - 25/05/06	12.9	16.0	13.7	16.9	Missing	10.8	9.9	12.9	9.3
25/05/06 - 06/07/06	Missing	16.4	14.9	17.0	6.0	10.7	8.6	Missing	2.3
AVERAGE	**13.7**	**14.3**	**14.9**	**18.7**	**14.0**	**12.6**	**11.2**	**14.0**	**8.2**
BIAS CORRECTED in PPB	**16.8**	**17.4**	**18.2**	**22.8**	**17.0**	**15.4**	**13.7**	**17.1**	**9.9**
Adjusted Annual Mean in ug/m3	**31.6**	**32.9**	**34.4**	**43.0**	**32.1**	**29.0**	**25.8**	**32.3**	**18.7**

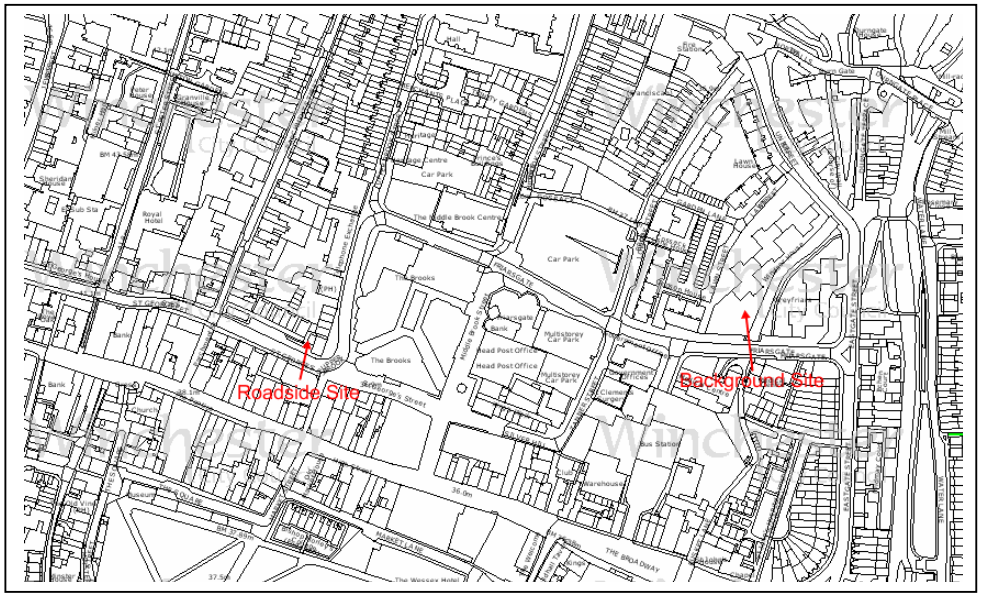
Site 1 = Gordon Road, Winchester
Site 2 = Shephards Down School, Compton
Site 3 = Pearson Lane, Shawford
Site 4 = Southdown Road, Otterbourne
Site 5 = Highways Road, Otterbourne
Site 6 = Bourne Close, Otterbourne
Site 7 = Cranbourne Drive, Otterbourne
Site 8 = Chapel Lane, Otterbourne
Site 9 = Southdown Road, Compton

Nitrogen dioxide diffusion tubes – Otterbourne Study 2006 (to date)

Site 4 has been part of the district wide survey, so data exist for the last 12 month period. The average for July 05 to July 06 is 22.5 which compares to the six month average of 22.8 which gives a correction factor of 0.987 to convert the six monthly results into yearly equivalents. The diffusion tubes have also had the 2005 bias correction factor of 1.22 applied.

APPENDIX 2 – Winchester Town Centre Real Time Monitoring

During March 2005 the town centre sites were totally refurbished and new equipment installed at both locations using the existing cabinets. The roadside site is located 2.75 metres from the kerb on St Georges Street whilst the urban background site is located 18 metres from the kerb on Firiarsgate. The background site samples at a height of 2.80 metres and the roadside site at 2.65 metres. The roadside cabinet was replaced in April 2003 and before this date it sampled at a height of 2.0 metres. The locations are shown below:



The existing equipment was getting old and a combination of increased breakdowns and the time awaiting spare parts was causing a decrease in data collection efficiency. The new equipment is very similar to that previously installed and is provided by the same equipment supplier. The old equipment has been retained to act as a standby should the new analysers malfunction. The analysers are now:

- API M200E Chemiluminescent NO/NO_2/NO_x analyser with IZS,
- New Met One BAM 1020 PM10 analyser with RH triggered heater units (heater units are not currently being used),
- API M300E CO analyser Gas Filter Correlation analyser - roadside site only,
- 2 Code operated switches for direct communication.

In addition the following changes were made:

- A new Wind speed/direction and temp sensors plus data logger (OPSIS DL256) within an IP65 enclosure and 6 metre pneumatic mast and tripod. This was installed on Winchester City Council City Offices roof on Colebrook St and is polled via a GSM modem.
- Air conditioning plant now serviced annually.
- A new polling PC was installed operating OPSIS EnviMan ComVisioner and Reporter.
- Use of same calibration gases but now supplied via Envirotechnology Services.
- Independent data ratification/verification with six monthly and yearly reports.

The data collected from these sites is subject to a verification and ratification process that follows that recommended in the AEA Handbook and DEFRA technical guidance document TG(03):

- Nightly automatic internal zero and span checks (IZS) to the gas analysers.
- Fortnightly calibration of gas analysers to traceable primary gas standards. NOx analysers being checked to both NO and NO_2 gas standards. Six monthly servicing by original equipment provider.
- Data correction for zero and span drifts using Enview/Enviman software.
- Up to June 2005 manual and automatic ratification of data using a series of Excel spreadsheets to spot any data errors. After June 2005 ratification and verification has been provided by an independent third party (Air Quality Consultants Ltd).

Guidance from the DEFRA supported monitoring helpline now recommends that when comparing results from unheated BAMs with the gravimetric based air quality objectives then the results are divided by 1.2 before calculating the number of exceedances of the 24 hour mean and annual mean objectives.

We have therefore applied this correction factor to all our historic one hour BAM data and recalculated all 24 hour and annual mean results.

The below two tables presents a summary of this revised air quality data. All results have a greater than 80 percent collection efficiency except for the results noted below:

2000 PM_{10} Background - 70 percent
2000 No_2 Roadside - 66.4 percent
1999 No_2 Background - 74 percent
2004 PM_{10} Background - 44 percent

Historically it has proven difficult to maintain a 90 percent data collection efficiency, as breakdowns have resulted in equipment being removed for repair for significant periods of time. Replacing our equipment in 2005 and using our old equipment available for hot swapping following any breakdowns, has seen an improvement in this position. Since replacement of the equipment the data collection efficiency has been greater than 90 percent for all parameters. Although it is appreciated LAQM PRG(03) recommends expressing results with a data capture of less than 90 percent as percentiles it is felt expressing some results as percentiles and some as results above objective value would be unhelpful.

Real Time Monitoring, Winchester Town Centre - Short Term Air Quality Objectives

Year	Exceedances of Air Quality Objective					
	PM_{10} 50ug/m^3 (24 Hr Mean)		NO_2 200ug/m^3 (1 Hr Mean)		CO 10mg/m^3 (8hr running mean)	
	Background	**Roadside**	**Background**	**Roadside**	**Background**	**Roadside**
1997	8	22	0	**299**	0	0
1998	5	14	0	6	0	0
1999	1	3	0	8	0	0
2000	2	18	0	15	0	0
2001	3	16	0	12	0	0
2002	2	21	0	**161**	0	0
2003	21	20*	0	**70**	0	0
2004	Not enough data	17	0	0	0	0
2005	8	13	1	6	NA	0
	Pass = less than 35 failures/year		Pass = less than 18 failures/year		Pass = No failures of objective	
	Numbers in red FAILED the short term mean air quality objectives					

Notes

PM10 data uses unheated BAM analysers, raw data corrected to gravimetric equivalent by dividing by a correction factor of 1.2

*Data missing from roadside site during March/April 03 when background site recorded significant pollution episodes.

Real Time Monitoring, Winchester Town Centre - Long Term Air Quality Objectives

Year	Compliance with Annual Mean Air Quality Objectives					
	Mean PM_{10} in ug/m^3 40ug/m^3 (Annual Mean)		Mean NO_2 in ug/m^3 40ug/m^3 (Annual Mean)		Mean CO in mg/m^3 No annual objective	
	Background	Roadside	Background	Roadside	Background	Roadside
1997	18.4	26.5	35.30	**82.7**	0.7	1.3
1998	17.2	21.9	39.7	**58.1**	0.5	1.3
1999	17.6	21.1	31.1	**60.2**	0.5	1.2
2000	16.4	21.2	33.0	**68.6**	0.5	1.2
2001	14.8	27.3	33.4	**50.8**	0.3	1.2
2002	19.8	28.9	27.3	**65.5**	0.3	1.0
2003	25.7	31.6	**41.1**	**55.8**	0.3	1.0
2004	Not enough data	29.8	29.4	**52.1**	0.3	0.8
2005	21.3	28.1	26.2	**53.5**	NA	0.5

Numbers in red FAILED the annual mean objective

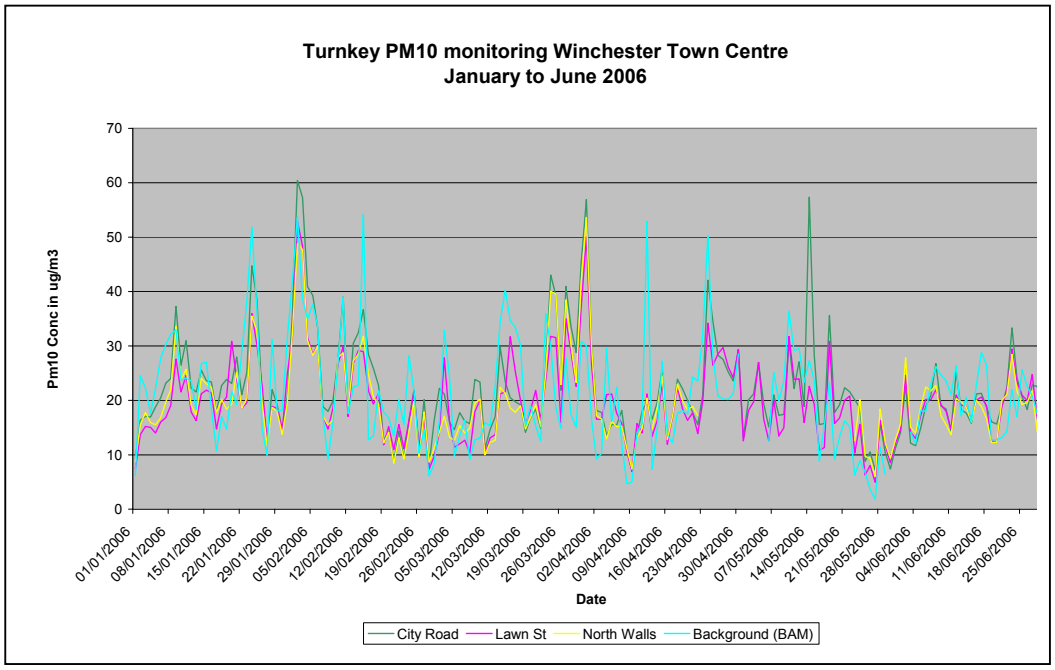
Notes

PM10 data uses unheated BAM analysers, raw data corrected to gravimetric equivalent by dividing by a correction factor of 1.2

APPENDIX 3 - Turnkey PM_{10} analysers (light scattering)

In December 2005 three Osiris Environmental Dust Monitors (from Turnkey Instruments Ltd) were installed within Winchester Town Centre to increase the geographic spread of PM_{10} data available. This project resulted from the difficulties previously experienced in using the data from the real time sites (see appendix 2) to model levels at other town centre locations. The analysers were serviced and calibrated before installation and are on a yearly service and calibration contract with the instrument provider.

These sites were installed on lampposts on City Road and North Walls at a nominal 3 metre height. The third analyser was co-located off Lawn Street at the Background site, sampling at the same height as the BAM PM_{10} analyser. Results for January to June 2006 are shown below.



Although not identical, there is a reasonable correlation in response between these instruments and the BAM PM_{10} analyser. Therefore in the below table the results were corrected by a bias correction factor derived from the comparable responses in the co-located Osiris analyser with that of the PM_{10} BAM. The six monthly average from the PM_{10} BAM was 21.0µg/m^3 compared to the Osiris average of 19.7µg/m^3. Therefore the Osiris data in the below table has been corrected using a calculated bias correction factor of 1.066.

Parameter	City Road	North Walls	B'ground (Opsis)	B'ground (BAM)	Roadside (BAM)
Bias corrected average in µg/m^3	23.5	20.9	21.0	21.0	28
Failures of 24 Hour Mean standard of 50 µg/m^3	4	3	3	5	7
Collection Efficiency	100	83.4	99.9	95.0	94.0

PM10 Data from Osiris and BAM analysers Jan to June 2006

APPENDIX 4 – Traffic Monitoring Data

2004 AADT COUNTS (HGV%) for Highways Agency Area 3

M3 8/9 59000 (7%)
M3 9/10 99700 (12%)
M3 10/11 118000 (11%)
M3 11/12 115600 (10%)
M3 12/13 116000 (9%)

A34 N Bullington 41800 (12%)
A34 S Bullington 48600 (13%)

A303 E Bullington 36000 (8%)
A303 W Bullington 49200 (7%)

M27 E Junction 9 91100 (8%)
M27 W Junction 9 103000 (8%)

Data provided by Hampshire County Council (John Martin, Transport Policy)

APPENDIX 5 – LAPPC Permits for Winchester City Council Area

APPLICATIONS RECEIVED WITH AUTHORISATIONS/PERMITS ISSUED

COMPANY	REFERENCE	PROCESS DESCRIPTION	SITE ADDRESS	AREA	GRID REFERENCE	RISK RATING
Bramdean Garage	PERM/22/06	Petrol vapour recovery		Bramdean	SU613280	
E D Whieldon, Williams Garage	PERM/08/06	Petrol vapour recovery		Otterbourne	SU462234	
TotalFinaElf UK Ltd	PERM/17/06	Petrol vapour recovery	Priory Service Station	Bishops Waltham	SU549175	
Emery Rees Feeds Ltd	PERM06/24	Animal feed compounding	Underdown Farm	Owslebury	SU517233	LOW
ESSO Petroleum, Market Service Station	PERM/14/06	Petrol vapour recovery	Andover Road	Winchester	SU480301	
Foster Yeoman Ltd	PERM04/01	Roadstone coating plant	Station Yard	Botley	SU522133	LOW
GC Easter, Yew Tree Service Station (Texaco)	PERM/11/06	Petrol vapour recovery	Romsey Road	Pitt (Winchester)	SU445276	
GF & DJ Yates Ltd, Harestock Garage	PERM/16/06	Petrol vapour recovery	Priors Dean Road	Winchester	SU468315	
Goldstar MSA Forecourts, M3 Motorway - North	PERM/20/06	Petrol vapour recovery	Marytr Worthy	Winchester	SU522359	
Goldstar MSA Forecourts, M3 Motorway - South	PERM/19/06	Petrol vapour recovery	Marytr Worthy	Winchester	SU523354	
Johnson Cleaners UK Ltd	PERM/02/05	Dry Cleaners	Unit N, Nickel Close	Winchester	SU449130	
Shell UK, A34 Sutton Scotney - North	PERM/13/06	Petrol vapour recovery	Sutton Scotney	Winchester	SU459400	
Shell UK, A34 Sutton Scotney - South	PERM/12/06	Petrol vapour recovery	Sutton Scotney	Winchester	SU459400	
Humphrey Feeds	PERM06/01	Animal feed compounding	Hazeley Road	Twyford	SU487253	MEDIUM
Hursley Estate Ltd	PERM04/07	Waste oil burner <0.4MW	South Lynch Workshop	Hursley	SU418277	
J T Sydenham & Co	PERM04/02	Timber process	Mislingford	Wickham	SU593141	LOW
Murco Petroleum Ltd, Bar End	PERM/10/06	Petrol vapour recovery	Bar End Road	Winchester	SU488285	
New Farm Services	PERM04/06	Waste oil burner <0.4MW	New Farm Road	Alresford	SU580316	
Pitt Vale Serivce Station (MURCO)	PERM/06/06	Petrol vapour recovery	Pitt	Winchester	SU454282	
Cemex (UK) materials Ltd	PERM04/04	Bulk cement process	Easton Lane	Winnall	SU495300	LOW
Rushdene Services Ltd, Botley	PERM/23/06	Petrol vapour recovery	Botley Service Station	Botley	SU521131	
Rushdene Services Ltd, West Meon	PERM/07/06	Petrol vapour recovery	West Meon Service Station	West Meon	SU649260	
Sainsbury Supermarket, Winchester	PERM/02/06	Petrol vapour recovery	Badger Farm	Winchester	SU463276	
Shell UK Ltd - Wickham	PERM/05/06	Petrol vapour recovery		Wickham	SU575110	
Scothall Hampshire	PERM05/01	Vehicle Respraying	Unit1 Bar End Ind Est	Winchester	SU449128	LOW
St Cross Service Station	PERM/21/06	Petrol vapour recovery	St Cross Road	Winchester	SU477284	
Stagecoach South Ltd	PERM04/10	Respraying of road vehicles	Bar End Road	Winchester	SU487284	LOW
Elite Garage, Sutton Scotney	PERM/15/06	Petrol vapour recovery	Sutton Scotney	Winchester	SU465399	
Tesco Stores Ltd, Whiteley	PERM/18/06	Petrol vapour recovery	Whiteley Road	Fareham	SU534096	
Tesco Stores Ltd, Winchester	PERM/03/06	Petrol vapour recovery	Easton Lane	Winchester	SU496302	
Shell, Winchester	PERM/04/06	Petrol vapour recovery	Easton Lane	Winchester	SU495303	
Pace Enterprises, Bishops Waltham	PERM/09/06	Petrol vapour recovery	Winchester Road	Bishops Waltham	SU552175	
Veterinary Investigation Centre	PERM04/05	Animal carcass incinerator	Northington Road	Itchen Abbas	SU532335	MEDIUM
Wessex Demolition & Salvage Ltd	PERM04/11	Concrete Crusher (Mobile)	Bury farm	Curbridge, S'ton	SU524112	LOW

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GLOSSARY

AAQuIRE – An air quality dispersion model. Was used throughout Southern Hampshire in 2000 to predict future mean air quality concentrations associated with major roads and industrial sources.

ADMS ROAD – Another air quality dispersion model. Was used unsuccessfully in 2004 to try to predict more accurately future mean particle concentrations within Winchester Town Centre.

AQAP - Air Quality Action Plan. This document is an AQAP.

AQMA – Air Quality Management Area. This is an identified area where it is predicted that air quality objectives will not be met without the implementation of additional measures.

BAM - Beta attenuation mass monitor. Used to measure particle concentrations within Winchester Town centre, uses the principle that thickness (weight) of dust deposited is proportional to the amount of beta radiation absorbed.

BREEZE – An air quality dispersion model. Was used in 2003 to predict in detail future mean air quality concentrations within the Town Centre.

Co – Carbon monoxide.

DA's (Detailed Assessments) – A formal detailed assessment of any particular air quality issue which has been identified as necessary in a USA review. Detailed reviews have to be submitted to DEFRA within 12 months after the submittal of the relevant USA.

DEFRA – Department for Environment Food and Rural Affairs). The Central Government Department responsible, amongst other issues, for environmental legislation including air quality transport issues (www.defra.gov.uk)

DETR - Previous Central Government Environment Department – now DEFRA.

DfT – Department for Transport. The National Government Department responsible for transport issues (www.dft.gov.uk)

DoE - Previous Central Government Environment Department – now DEFRA.

ENVIEW – Software used at Winchester City Council to collect and process air quality data from the town centre monitoring stations.

Environment Agency – A national agency whose responsibilities include the enforcement of legislation in relation to flood prevention, fisheries, waste management, water quality and emissions from large potentially polluting industries (www.environment-agency.gov.uk)

IZS – Internal Zero and Span. An automatic nightly calibration check performed by the gas analysers in the air quality monitoring stations.

LAQM - Local Air Quality Management. The term used to refer to the whole process of assessment and management of local air quality as specified in national regulations.

LTP – Local Transport Plan. Hampshire County Council are the local transport authority and have the responsibility to produce plans covering all aspects of transport. The current plan covers 2006 to 2011.

mg/m^3 or mgm-3 A way of measuring any gaseous or solid pollutant in air. 1mg/m^3 means a weight of 1 mg (one thousandth of a gram) of the pollutant in 1 metre cube of air.

MIRACLES – A European transport based initiative standing for **M**ulti Initiatives for **R**ationalised **A**ccessibility and **C**lean, **L**iveable **E**nvironment**S.** The Consortium undertaking the MIRACLES project within Winchester City consists of: Hampshire County Council; Winchester City Council; The Transportation Research Group, University of Southampton; Atkins Transport Systems and the Met Office.

NSCA – National Society for Clean Air and Environmental Protection. A registered charity with a long history in the promotion of environmental protection issues including air quality. They run workshops and have issued guidance on most aspects relating to air quality. (www.nsca.org.uk)

No_2 - Nitrogen dioxide.

No – Nitrogen Monoxide (or nitric oxide).

No_X – Oxides of nitrogen. The sum of both Nitrogen dioxide and Nitrogen monoxide which exist in equilibrium within the atmosphere.

PPB - Stands for Parts Per Billion. A way of measuring the concentration of a gaseous pollutant in air. 1 part per billion means one volume of the pollutant in a billion volumes of air. This is at a given temperature and pressure, which unless specified otherwise is, for air pollution work, taken to be 20^{o}C and 101.3kPa.

PPM – Stands for Parts Per Million. A way of measuring the concentration of a gaseous pollutant in air. 1 part per million means one volume of the pollutant in a million volumes of air. This is at a specified temperature and pressure, which unless specified otherwise is, for air pollution work, taken to be 20^{o}C and 101.3kPa.

PG(03) - The reference number to current DEFRA policy guidance on local air quality management.

PM_{10} – A measurement of particle concentrations. Stands for particle matter with an average aerodynamic diameter of less than 10 microns

Stage 1, 2, 3 and 4 Reviews – Air quality reviews that were required to be submitted to DEFRA under older air quality guidance. Now replaced by USA's and DA's.

TEOM - Tapered Element Oscillating Microbalance. The most common methodology for measuring particle concentrations within the UK. This uses the principle that as dust is deposited on the balance it vibrates at a different rate which is proportional to the deposited mass.

TG(03) - The reference number to current DEFRA technical guidance on local air quality management.

µg/m^3 or µgm-3 A way of measuring any gaseous or solid pollutant in air. 1µg/m^3 means a weight of 1 µg (one millionth of a gram) of the pollutant in 1 metre cube of air.

USA – Updating and Screening Assessment. A formal re-review of previous air quality assessment conclusions. These assessments are required on a rolling programme for submittal to DEFRA. Last report issued by Winchester City Council in August 2003. Next review due by April 2006.

WMAP – Winchester Movement and Access Plan (Panel). This is one of a number of strategies dealing with specific parts of Hampshire. The aims of the Strategy are to develop a better, more integrated transport system to tackle the problems of traffic congestion and pollution. The plan was developed jointly between Winchester City and Hampshire County Councils.