



2012 Air Quality Updating and Screening Assessment for *Liverpool City Council*

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

August 2012

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Executive Summary

Under the Environment Act 1995, Local Authorities are required to undertake regular review and assessments of air quality. Local Authorities have recently begun the fifth round of the Review and Assessment process. Each round comprises two steps. The first step is an Updating and Screening Assessment (USA). Where a significant risk of exceedence of one or more of the UK objectives is identified it is necessary for the Local Authority to proceed to a Detailed Assessment (DA). Where a Local Authority does not need to undertake a DA, a shorter Progress Report (PR) is required instead.

The USA presented in this report indicates that Nitrogen Dioxide (NO₂) concentrations will exceed the NO₂ air quality objective of 40 µg/m³ at 86% of the locations where passive diffusion tube monitoring was undertaken in 2011. This is a similar situation to 2009 and 2010 where data has been presented in a series of progress reports. However a DA is not required as the whole of the city of Liverpool and its boundaries have been designated as an Air Quality Management Area (AQMA) and a DA would serve no purpose, the objective for proceeding to a DA is based on either further hotspots being identified which may lead to a change in an existing AQMA, or whereby an AQMA can be revoked. Neither of which are the case here in Liverpool.

Additionally this USA concludes that LCC is not required to carry out a DA for Particulate Matter (PM₁₀), Carbon Monoxide, Benzene, 1,3-Butadiene, Lead or Sulphur Dioxide (SO₂).

LCC will continue to monitor air quality, in particular NO₂ and will continue to implement and report upon progress of actions identified and agreed within the updated AQAP of 2008. This in turn will hopefully lead to an improvement in air quality through a reduction in NO₂ concentrations observed across the city.

Table of contents

1	Introduction	6
1.1	Description of Local Authority Area	6
1.2	Purpose of Report.....	7
1.3	Air Quality Objectives	7
1.4	Summary of Previous Review and Assessments	9
1.4.1	Review and Assessment Background	9
1.4.2	Liverpool City Council Review & Assessment.....	10
2	New Monitoring Data	15
2.1	Summary of Monitoring Undertaken.....	15
2.1.1	Automatic Monitoring Sites	15
2.1.2	Non-Automatic Monitoring Sites	18
2.2	Comparison of Monitoring Results with AQ Objectives.....	26
2.2.1	Nitrogen Dioxide (NO ₂)	26
2.2.3	Sulphur Dioxide (SO ₂).....	47
2.2.4	Benzene.....	47
2.2.5	Other pollutants monitored	47
2.2.6	Summary of Compliance with AQS Objectives	48
3	Road Traffic Sources	49
3.1	Narrow Congested Streets with Residential Properties Close to the Kerb	49
3.2	Busy Streets Where People May Spend 1-hour or More Close to Traffic.....	49
3.3	Roads with a High Flow of Buses and/or HGVs	49
3.4	Junctions.....	49
3.5	New Roads Constructed/Proposed Since the Last Round of Review and Assessment .	49
3.6	Roads with Significantly Changed Traffic Flows.....	50
3.7	Bus and Coach Stations	50
4	Other Transport Sources.....	51
4.1	Airports.....	51
4.2	Railways (Diesel and Steam Trains)	51
4.2.1	Stationary Trains.....	51
4.2.2	Moving Trains	51
4.3	Ports (Shipping)	52
5	Industrial Sources.....	53
5.1	Industrial Installations	53
5.1.1	New/Proposed Installations for which an Air Quality Assessment has been Carried Out	53

5.1.2	Existing Installations where Emissions Increased substantially or New Relevant Exposure has been Introduced	53
5.1.3	New or Significantly Changed Installations with No Previous Air Quality Assessment...	53
5.2	Major Fuel (Petrol) Storage Depots	53
5.3	Petrol Stations.....	54
5.4	Poultry Farms.....	54
6	Commercial and Domestic Sources	55
6.1	Biomass Combustion – Individual Installations	55
6.2	Biomass Combustion – Combined Impacts.....	55
6.3	Domestic Solid-Fuel Burning	55
7	Fugitive or Uncontrolled Sources.....	56
8	Conclusions and Proposed Actions.....	57
8.1	Conclusions from New Monitoring Data	57
8.1.1	Nitrogen Dioxide (NO ₂)	57
8.1.2	Particulate Matter <10 micron (PM ₁₀)	57
8.1.3	Other Pollutants	58
8.2	Conclusions from Assessment of Sources	58
8.2.1	Road Traffic Sources	58
8.2.2	Other Transport Sources	58
8.2.3	Industrial Sources	58
8.2.4	Commercial and Domestic Sources	58
8.3	Proposed Actions.....	59
9	References.....	60

List of Tables

Table 1.1: Air Quality Objectives included in Regulations for the purpose of LAQM in England

Table 1.2: Summary of Review and Assessments undertaken by LCC since 2003.

Table 2.1: Details of Automatic Monitoring Sites

Table 2.2: Details of Non-Automatic Monitoring Sites

Table 2.3: Results of Automatic Monitoring for NO₂: Comparison with Annual Mean Objective

Table 2.4: Results of Automatic Monitoring for NO₂: Comparison with 1-hour Mean Objective

Table 2.5a: Results of Nitrogen Dioxide Diffusion Tubes in 2011

Table 2.5b: Estimation of annual mean concentrations from short term monitoring data

Table 2.5c: Adjusted data at locations with <75% data capture

Table 2.6: Relevant exposure for those locations that exceed 60ug/m³ annual mean

Table 2.7: Results of Nitrogen Dioxide Diffusion Tubes (2007 to 2011)

Table 2.8: Results of Automatic Monitoring of PM₁₀: Comparison with Annual Mean Objective

Table 2.9: Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour Mean Objective

Table 2.10: Results of Automatic Monitoring of SO₂: Comparison with Annual Mean Objective

List of Figures

Figure 1.1 Map of Liverpool City Council AQMA Boundary

Figure 2.1 Automatic Monitoring Site locations in Liverpool

Figure 2.2 Map showing Non-Automatic Monitoring Sites in Liverpool

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations at Automatic Monitoring Sites

Appendices

Appendix A: QA/QC data

Appendix B: Diffusion Tube Bias Adjustment Factors

Appendix C: Unadjusted NO₂ diffusion tubes data 2011

1 Introduction

1.1 Description of Local Authority Area

The city of Liverpool is part of the metropolitan county of Merseyside. Liverpool lies on the estuary of the Mersey River near its mouth on the Irish Sea, about 180 miles northwest of London. It is one of Britain's largest cities, main ports, and chief commercial centres.

Liverpool is approximately 18 km long from North to South and 10km wide from West to East, with a total area of 11193 Ha (43.5 sq. miles) with a population distribution of 40 persons per Ha. The total population of the City in 2007 stood at 435,500.

Liverpool Urban Area runs directly into Bootle, Crosby and Maghull in south Sefton to the north, and Kirkby, Huyton, Prescot and Halewood in Knowsley to the east. It faces Wallasey and Birkenhead across the River Mersey to the west.

The city forms a crescent on the flat eastern bank of the Mersey. Long stretches of docks, basins, and warehouses line the waterfront. About midway along the river rise several tall office buildings in the city's main business district. Just south of the city the Mersey estuary is linked by a ship canal with Manchester and other nearby industrial cities.

The Mersey, or Queensway, Tunnel links Liverpool and Birkenhead, a busy port and industrial city on the western bank of the river. An international airport is just south of the city.

Liverpool City Council is adjoined directly to three other Local Authorities; Sefton to the North, Knowsley to the East and Halton to the South. To the West across the River Mersey lies Wirral Metropolitan Borough Council (MBC).

The commercial growth of Liverpool in recent years has been impressive. There have been many changes in the City and its economy. Ford has invested millions in a new Jaguar plant whilst Sony has invested around £40 million in a computer games company. At the same time strong companies such as Littlewoods and Royal & Sun Alliance have maintained their status as large employers in the City whilst Business Parks such as Brunswick Dock and Wavertree Technology Park are thriving. Liverpool is also becoming a city of expertise in call centre businesses e.g. Abbey National and QVC. The port has also seen a major revival and is now handling more tonnage than at any time in its history.

The City of Liverpool has experienced a significant rise in its economy. Since the early 1990's, the Council has worked to rebuild the city and improve its economy, working with both private sector and other public sector agencies. With money coming from both central government and Europe, the city has seen unprecedented growth as follows:

- The city's unemployment rate, always higher than the national average, steadily falling faster than the national level for a number of years.

- Between 1998 and 2002 the city's economy grew by 25.5%.
- In 2004 the number of firms in the city grew by 1.75%; this rate rise was more than the rest of the UK.
- Business confidence is continually improving. New offices have been built in the city centre - mostly in the Commercial District and at Princes Dock. The first two phases of the prestigious St Paul's Square opened in early 2008 at a combined cost of £122million.
- Liverpool One mixed business/residential development was completed and opened in 2009.

The city of Liverpool is currently one of the UK's leading business destinations, transformed by an ambitious and far reaching multi billion pound regeneration programme.

Of the national air quality objectives Liverpool has failed to meet the annual mean for Nitrogen Dioxide. The main sources of oxides of nitrogen are from Heavy-duty vehicle emissions and they are the largest contributor to near congested junctions. The emissions from stationary vehicles in traffic queues are also a significant source throughout the City.

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in **England** are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the

objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in England

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	$16.25 \mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	$5.00 \mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	$2.25 \mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	$10.0 \text{ mg}/\text{m}^3$	Running 8-hour mean	31.12.2003
Lead	$0.5 \mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	$0.25 \mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	$200 \mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	$40 \mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	$50 \mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	$40 \mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	$350 \mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	$125 \mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	$266 \mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

1.4.1 Review and Assessment Background

The first step of each round of the Review and Assessment process is an Update Screening Assessment (USA), which is to be undertaken by all local authorities (LA's). This is based on a checklist to identify those circumstances that have changed since the previous round was completed, and which may now require assessment. Each USA should cover: new monitoring data; new objectives; new sources or significant changes to existing sources, either locally or in neighboring authorities; and other local changes that might affect air quality. If there is a risk that these changes may be significant, then a simple screening assessment should be carried out. Nomograms and similar tools are provided to help with this screening assessment.

Where the USA has identified a risk that an air quality objective will be exceeded at a location with relevant public exposure, the authority will be required to undertake a Detailed Assessment (DA) following the guidance set out in LAQM TG (09). The aim of a DA should be to identify with reasonable certainty whether or not a likely exceedence will occur.

The assumptions within the DA need to be considered in depth, and the data that is collected or used, should be quality-assured to a high standard. This is to ensure that LA's are confident in the decisions they reach. Where a likely exceedence is identified, then the assessment should be sufficiently detailed to determine both its magnitude and geographical extent. Local authorities should not declare an AQMA unless a DA has been completed.

Progress Reports (PR's) are intended to maintain continuity in the LAQM process, and fill in the gaps between the three-yearly cycle of Review and Assessment. PR's are required in all years when a local authority (LA) is not completing an USA.

Once a new AQMA has been declared, Section 84(1) of the Act, and Article 13 of the Order, requires that local authorities complete a Further Assessment (FA) within 12 months of designating the AQMA. This also applies when an AQMA is amended, although in many cases it will be sufficient to inform Defra and the Devolved Administrations that the previous FA covers the assessment for the amended AQMA.

The FA is intended to supplement the information provided in the DA. It should aim to confirm the exceedence of the objectives; define what improvement in air quality is required, and indicate the corresponding reduction in emissions that is required to attain the objectives; and provide information on source contributions. The latter will provide useful information for the development of the Air Quality Action Plan (AQAP), and assist in the targeting of appropriate measures. The level of detail required in the FA is, to some extent, dependant on what information the authority has also accrued and reported in other Review and Assessment reports.

1.4.2 Liverpool City Council Review & Assessment

Liverpool City Council (LCC) declared Air Quality Management Areas for Nitrogen Dioxide (NO₂) as a result of stage 3 of the **first round** of Review and Assessment for Liverpool city centre (AQMA1) and at the end of the M62 - The Rocket junction (AQMA2).

In September 2003, the **second round** of the review and assessment process was undertaken. An initial updating and screening assessment (USA) was completed. This identified the pollutants that merited a more detailed assessment (DA) In June 2004. The purpose of the DA was to provide an accurate assessment of the likelihood of an air quality objective being exceeded at locations with relevant exposure.

The DA considered the effects of the proposed City Centre Management Strategy on air quality. NO₂ passive diffusion tubes (PDT's) indicated annual average objective exceedence at many locations outside the existing AQMAs close to major roads and junctions throughout Liverpool.

The DA considered NO₂ concentrations in twelve areas outside the two existing AQMAs. The DA report identified that six of the twelve areas would fail to meet the annual mean objective. These areas were:

- Prescot Road/ East Prescot Road
- Walton Hall Avenue/Walton Village
- Rice Lane between Whitefield Road and Hornby Road
- Walton Vale near top Warbreck Moor
- Rice Lane/Queens Drive, Walton
- Public House St. Oswald Street/Edge Lane Drive

In November 2005 LCC then produced a Progress Report (PR) to provide an update on progress being made in improving air quality in Liverpool. PDT data prepared for the PR showed that air quality had worsened since the original AQMA declarations. The report concluded that LCC should retain the existing AQMAs and that a detailed assessment of the following six locations was required:

- County Road / Spellow Lane
- Millbank / Queens Drive
- Kensington / Sheil Road traffic lights
- Smithdown Road Lamp outside Costcutter
- Speke Road 1st dual pelican
- Edge Lane / Jubilee Drive

The **third round** of Review and Assessment included a USA, DA and PR undertaken in 2006, 2007 and 2008 respectively. LCC proceeded with the USA in November 2006

and it concluded that a DA was required for NO₂ for a further six areas near roads outside of the existing AQMAs on the basis of roadside diffusion tube monitoring data:

- Junction of Edge Lane Drive and Jubilee Drive
- Junction of Wavertree Road/Durning Road
- High Street Picton Clock Roundabout
- Junction of Smithdown Road and Tunnel Road
- Junction of Utting Avenue and Queens Drive
- Junction of Deysbrook Lane and Croxteth Hall Lane

LCC considered the potential exposure of members of the public at these locations and concluded that it was also likely that it would be necessary to declare AQMAs at these locations.

Subsequently, the air quality section of LCC reviewed the overall air quality situation. Taking into consideration the conclusions of both the USA (2006) and the Detailed Assessment (2007), especially the fact that a possible twelve further AQMAs would have to be declared, Air Quality Officers within LCC decided that a city wide AQMA designation would be the best way forward, as this would enable city wide solutions to be found for the air quality problems, and it would make best use of the limited resources that LCC have to manage the whole LAQM process.

Before a decision was taken by LCC to inform Defra of their intentions, LCC consulted with internal and external key stakeholders, and had further discussions with Beacon Councils such as Sefton & Sheffield. From the consultations and discussions it was decided by the LCC Air Quality Steering Group that it would be more appropriate to declare a single AQMA covering the whole of the city of Liverpool, and in May 2008 Defra were notified by LCC to that effect.

Once the decision to declare a single city wide AQMA was made, LCC was then required to carry out a Further Assessment (FA) to confirm the exceedences. The council were also required to review and update the existing Air Quality Action Plan (AQAP) to address the new location exceedences.

The FA that was undertaken in 2008/ 2009 indicated that the air quality objective for NO₂ was likely to be exceeded at congested junctions throughout the whole city and so the decision by the Air Quality Steering Group to designate the whole of the city to its geographical boundaries as an AQMA was deemed appropriate.

The decision to designate the whole of the city as an AQMA also meant that in future LCC would not have to declare or revoke existing AQMAs and therefore would not have the burden of excessive time and cost in having to continually add in new AQMAs and/or revoke existing ones. Since 2003 LCC has completed review and assessments as follows:

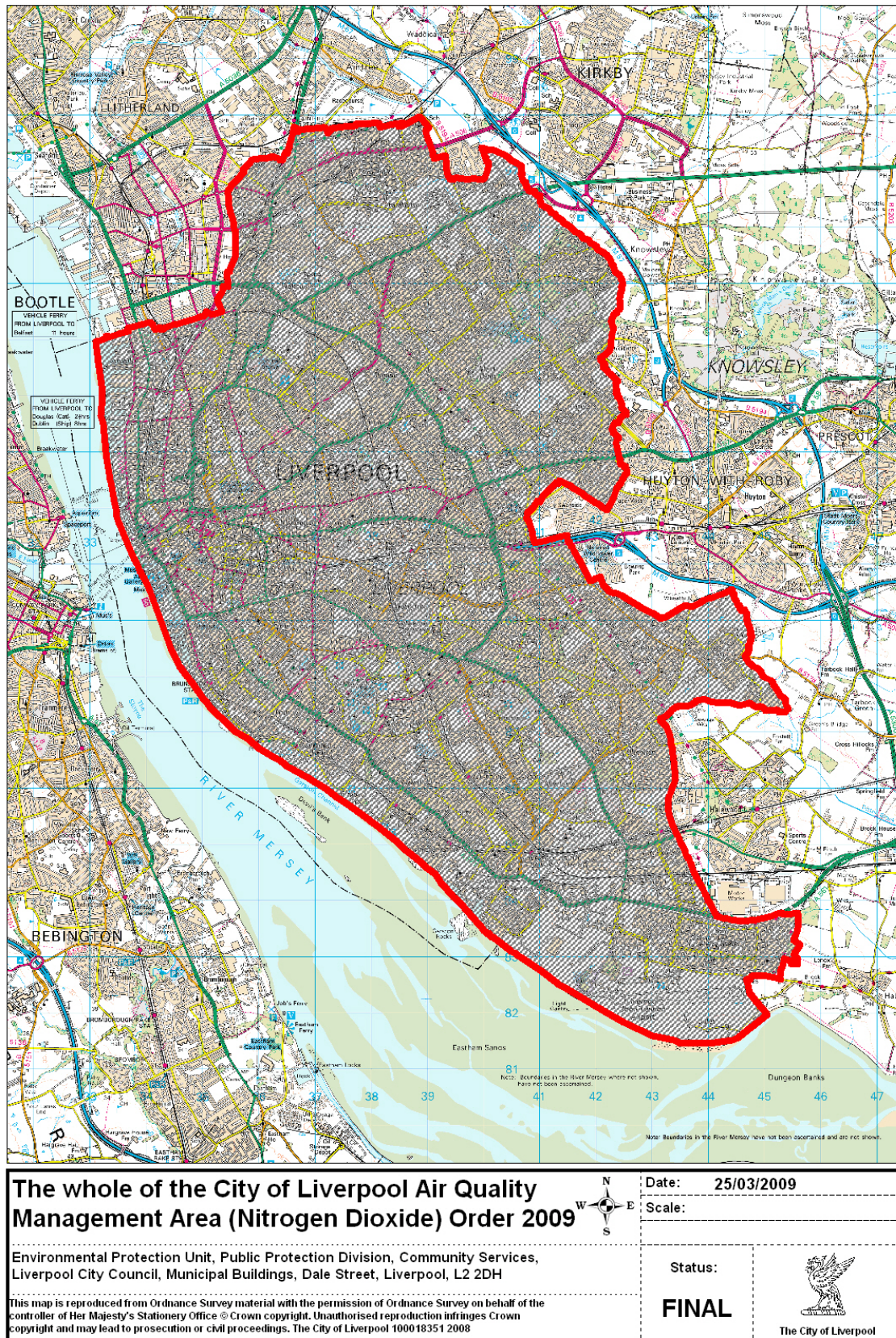
Table 1.2 Summary of Review and Assessments undertaken by LCC since 2003.

Report	Date completed	Outcome(s)
Update and screening assessment (USA)	September 2003	NO ₂ exceedences, DA required for NO ₂ only.
Detailed Assessment (DA)	June 2004	Six small areas exceed NO ₂ annual mean. look at declaring as AQMAs
Progress report (PR)	November 2005	Confirmed AQMA declarations in 2003 were valid. Five extra areas of exceedence require DA.
USA	November 2006	NO ₂ exceedences at six new areas, DA required for NO ₂ only
DA	April 2007	Four of the eleven areas identified in Progress report 2005 and USA 2006 confirmed as requiring AQMA designation. Decision on a city wide AQMA debated.
PR	July 2008	Confirmed citywide AQMA declaration to be the correct action. Most PDT locations exceeded annual NO ₂ mean.
DA/Further assessment(FA)	February 2009	Measurements and dispersion modelling showed NO ₂ objective likely to be exceeded at congested junctions throughout the whole city. Designation of citywide AQMA appropriate.
USA	August 2009	Exceedence of the NO ₂ air quality objective of 40 µg/m ³ at most PDT locations in 2008. A DA is not required. LCC proceeded correctly designating a citywide AQMA.
PR	August 2010	Confirmed citywide AQMA declaration to be the correct action. Most PDT locations exceeded annual NO ₂ mean.
PR	October 2011	Showed that air quality

Liverpool City Council

		had not improved since the previous progress report in 2010.
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Figure 1.1 Map of Liverpool City Council AQMA Boundary



2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

This report has considered monitoring data from four automatic monitoring stations in Liverpool.

Details of all monitoring stations are given below.

- Pollutant concentrations have been monitored at the Automatic Urban and Rural Network (AURN) urban background site at Speke (OS 343884, 383601) since May 2003. The pollutants measured include oxides of nitrogen (NO_x), NO₂, ozone and PM₁₀.
- NO_x, NO₂ and PM₁₀ concentrations have been monitored at the Islington roadside site. The Islington site (335393, 390951) is located on Islington opposite Stafford Street.
- NO_x and NO₂ have been monitored at the Queens Drive roadside site (336164, 394906) since January 2008 as part of the Automatic Urban and Rural Network.
- Monitoring of NO_x and NO₂ commenced at the Old Haymarket kerbside site (334762, 390686) in June 2008.

Because the Speke and Queens Drive (For NO_x and NO₂) sites form part of Defra's AURN, the quality assurance and control procedures for data from these two stations is included within the AURN programme.

Data from the other two automatic stations sited at Islington and Old Haymarket are quality assured to the same AURN standards as part of a calibration club managed by AEA Energy and Environment. These two stations are serviced and maintained by Enviro Technology, covering a five year period between April 2007 and March 2012 and has been funded through the Defra Air Quality grant.

QA/QC procedures are detailed in Appendix A.

Figure 2.1 Automatic Monitoring Site locations in Liverpool

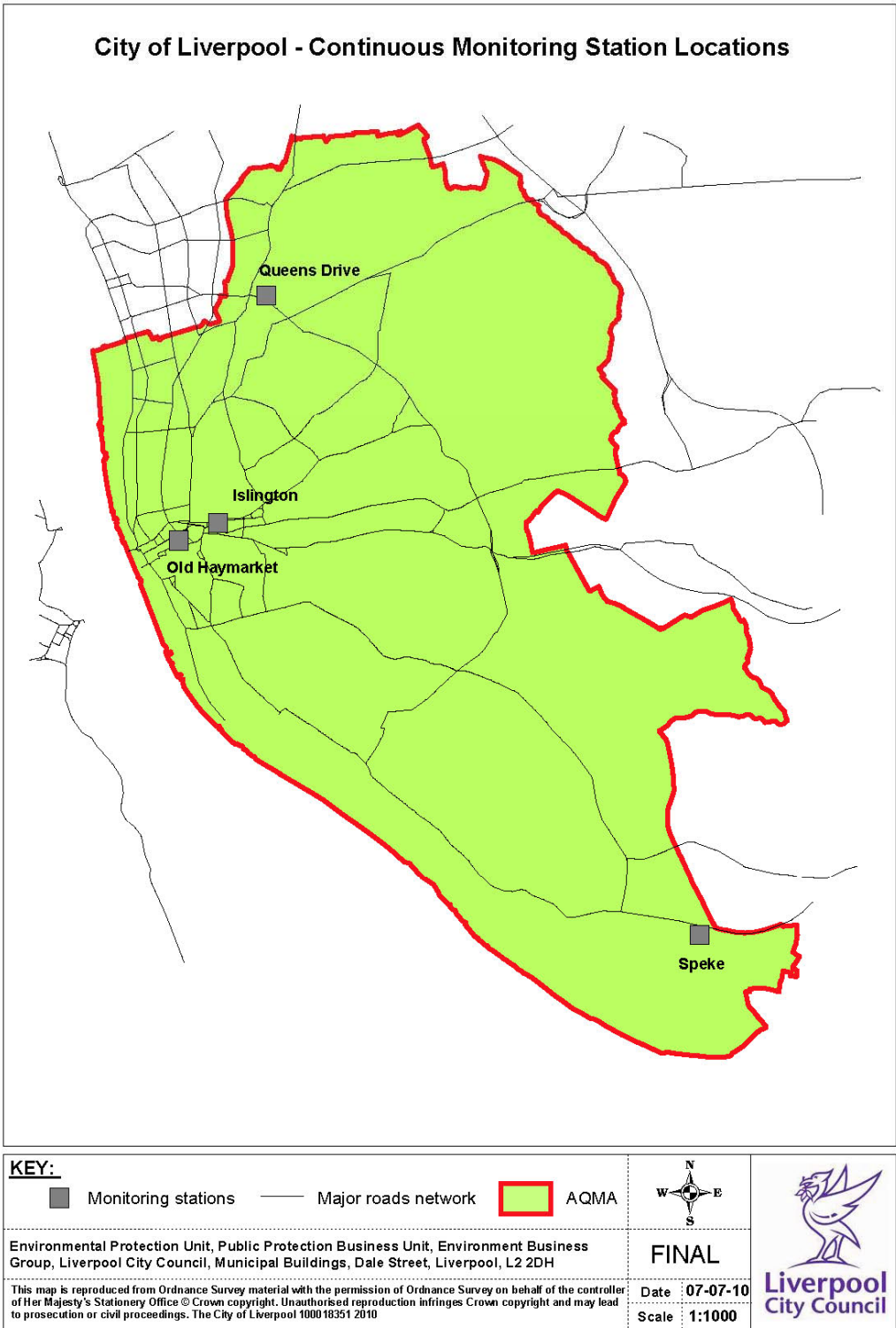


Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Liverpool Islington	Roadside	335394	390956	NO _x , O ₃ , PM ₁₀	Y	Chemiluminescence, Photometric, BAM	N (20 m)	5 m	Y
Liverpool old Haymarket	Kerbside	334762	390686	NO _x	Y	Chemiluminescence, BAM	N (0m)	<1 m	Y
Liverpool Queens Drive	Roadside	336164	394906	NO _x PM ₁₀	Y	Chemiluminescence	Y (10 m)	5 m	Y
Liverpool Speke	Urban Background	343884	383601	NO _x , CO, O ₃ , SO ₂ , PM ₁₀ , PM _{2.5} , PAH, VOC	Y	Multiple	Y (10m)	10 m	N

2.1.2 Non-Automatic Monitoring Sites

Between July 2006 and September 2010, the citywide network consisted of single tubes at 29 sites and triplicate tubes at a further 14 sites, 71 tubes in total. The PDT locations in part were amended from October 2010 to reflect one of the main actions contained within the updated AQAP i.e. bus quality partnerships. Two major bus routes into Liverpool – Routes 10 & 14, have had PDT's located along their respective routes, which in turn has meant that some previously monitored PDT locations have been discarded, whilst others have been kept but renumbered.

From October 2010 the PDT's have been rearranged into North, South, Central and No. 10 & 14 bus routes and the results for the 2011 data sets are presented in the report as such.

In addition, there is a network of single tubes at a further 10 sites near to Liverpool John Lennon Airport. The locations of the PDT's are shown in Fig.2.2.

The PDT's used during 2011 were supplied, collected and analysed by Gradko. They were analysed using 20% TEA in water preparation. Gradko follows the procedures set out in the Practical Guidance document and they participate in the Workplace Analysis Scheme for Efficiency (WASP). Gradko has maintained a good performance throughout their participation in the WASP scheme.

The PDT's were exposed for one-month periods, and the average monthly NO₂ concentration at each location, from the 5th of January 2011 until the 4th January 2012 was determined.

The laboratory bias correction factor was calculated using the "diffusion tube" spreadsheet tool and co-location study at Speke site. This "diffusion tube" spreadsheet tool is published by Air Quality Consultants Ltd on behalf of Defra, the Welsh Assembly Government, the Scottish Executive and the Department of the Environment Northern Ireland and it is available on the UWE web site (2008).

A localised mean bias adjustment factor of 1.04 was calculated from the diffusion tubes co-located in triplicate with the AURN background automatic station based at Speke. This local bias factor was used in preference to the application of a national bias factor. (See Appendix A for the rationale on use of local vs. national bias factor on the 2011 PDT data).

The local bias factor was calculated using the AEA Energy and Environment "Spreadsheet for calculating Precision, Accuracy and Bias Adjustment factors of Diffusion Tubes". The bias factor was subsequently applied to the raw PDT data collated by Liverpool City Council and shown in Table 2.5 of this report.

The corrected PDT results indicate that 65 out of the 73 diffusion tubes in the AQMA measured NO₂ levels at or over the 40µg m⁻³ annual mean objective.

Table 2-2 shows the PDT locations in the City of Liverpool between January and October 2010. Table 2-3 shows the PDT locations in the City of Liverpool between October and December 2010. The measurements have been adjusted for bias by the

application of a bias adjustment factor derived for Speke automatic monitoring station.

Figure 2.2 Map showing Non-Automatic Monitoring Sites in Liverpool

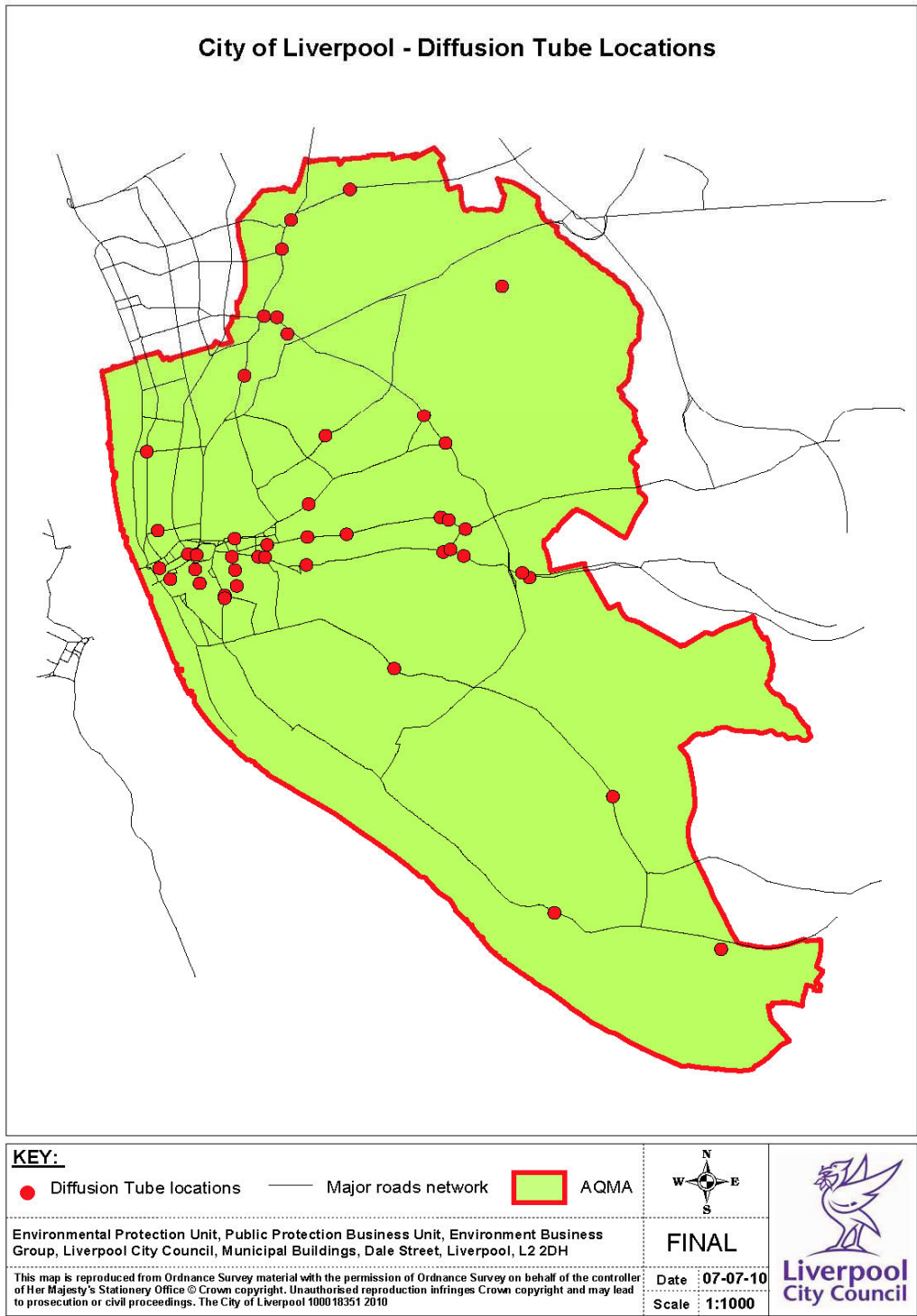


Table 2.2 Details of Non-Automatic Monitoring Sites

No.10 Bus Route

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Prescot St/RLUH Taxi Rank Lamp L7	Urban Roadside	335961	390845	NO ₂	Y	Y>1m	2m	Y
Prescot St/RLUH Taxi Rank Lamp L7	Urban Roadside	335961	390845	NO ₂	Y	Y>1m	2m	Y
Prescot St/RLUH Taxi Rank Lamp L7	Urban Roadside	335961	390845	NO ₂	Y	Y>1m	1.5m	Y
Kensington/Farnworth St Junct	Urban Roadside	336660	390983	NO ₂	Y	Y>1m	1.5m	Y
Outside Riverside Housing Kensington/Sheil Rd	Urban Roadside	337344	391034	NO ₂	Y	Y>1m	1.5m	Y
Opposite old Aldi store Prescot Road	Urban Roadside	337899	390723	NO ₂	Y	Y>1m	8m	N
Prescot Rd/Green Lane Junction Lamp Post	Urban Roadside	338979	391338	NO ₂	Y	Y>1m	8m	N
Lamp post outside Sally Army Prescot Road	Urban Roadside	338720	391316	NO ₂	Y	Y>1m	8m	N
Prescot Rd/St Oswalds St Junction Cent Lamp Post	Urban Roadside	339408	391125	NO ₂	Y	Y>1m	0.5m	Y
Lamp Post by bus stop Blackhorse Lane / Prescot Road	Urban Roadside	339794	391298	NO ₂	Y	Y>1m	0.5m	Y
Central Reservation Prescot Road at jct. of light by Sainsbury's	Urban Roadside	340263	391477	NO ₂	Y	Y>1m	0.5m	Y

Liverpool City Council

No.14 Bus Route

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Midland Chambers (Everton Road / West Derby Rd) No 14 bus stop	Urban Roadside	336101	391272	NO ₂	Y	Y>1m	1m	Y
Lamp post outside No 55 Everton Road	Urban Roadside	335973	391460	NO ₂	Y	Y>1m	1m	Y
Lamp at jct. of Everton Rd / Breck Road	Urban Roadside	335793	391838	NO ₂	Y	Y>1m	1m	Y
Lamp Breck Road (opposite Lance Close)	Urban Roadside	336017	391984	NO ₂	Y	Y>1m	1.5m	Y
Lamp outside Green Cross Pharmacy	Urban Roadside	336429	392268	NO ₂	Y	Y>1m	1m	Y
Lamp outside Quality Fireplaces Breck Road	Urban Roadside	336740	392464	NO ₂	Y	Y>1m	1m	N
Lamp at side of Georgesons car (Priory Road)	Urban Roadside	336969	392766	NO ₂	Y	Y>1m	1m	N
Lamp outside No 93 Townsend Lane	Urban Roadside	337305	392984	NO ₂	Y	Y>1m	1m	N
Telegraph pole outside Clubmoor community centre	Urban Roadside	337761	393399	NO ₂	Y	Y>1m	0.5m	Y
Lamp in central res. opposite 51 Townsend Ave	Urban Roadside	338136	393961	NO ₂	Y	Y>1m	2m	Y
Lamp on central reserve opposite Surestart Utting Ave East	Urban Roadside	338345	394413	NO ₂	Y	Y>1m	2m	Y
Lamp central reserve opp. St Theresa's school Utting Ave East	Urban Roadside	338813	394661	NO ₂	Y	Y>1m	2m	Y
Traffic Lt in central reserve jct. of Lowerhouse / Utting Ave East	Urban Roadside	339443	395098	NO ₂	Y	Y>1m	0.5m	Y

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Central

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Islington AQ Station Traffic Lights	Urban Roadside	335394	390956	NO ₂	Y	Y>1m	1.5m	Y
Islington AQ Station Traffic Lights	Urban Roadside	335394	390956	NO ₂	Y	Y>1m	1.5m	Y
Islington AQ Station Traffic Lights	Urban Roadside	335394	390956	NO ₂	Y	Y>1m	1.5m	Y
Leeds Street/Pall Mall Road Sign	Urban Roadside	334057	391098	NO ₂	Y	Y>1m	1m	Y
Leeds Street/Pall Mall Road Sign	Urban Roadside	334057	391098	NO ₂	Y	Y>1m	1m	Y
Leeds Street/Pall Mall Road Sign	Urban Roadside	334057	391098	NO ₂	Y	Y>1m	1m	Y
Crosshall Street Downpipe 2nd Alng from Dale St.	Urban Roadside	334585	390677	NO ₂	Y	Y>1m	1.5m	Y
Crosshall Street Downpipe 2nd Alng from Dale St.	Urban Roadside	334585	390677	NO ₂	Y	Y>1m	1.5m	Y
Crosshall Street Downpipe 2nd Alng from Dale St.	Urban Roadside	334585	390677	NO ₂	Y	Y>1m	1.5m	Y
Old Haymarket	Urban Roadside	334762	390686	NO ₂	Y	Y>1m	0.5m	Y
Old Haymarket	Urban Roadside	334762	390686	NO ₂	Y	Y>1m	0.5m	Y
Old Haymarket	Urban Roadside	334762	390686	NO ₂	Y	Y>1m	0.5m	Y
Covent Garden/Dale St Lamp Post RH side	Urban Roadside	334086	390425	NO ₂	Y	Y>1m	0.5m	Y
Strand Street/Water Street Jct- Roadsign L2	Urban Roadside	334277	390231	NO ₂	Y	Y>1m	1m	Y
Strand Street/Water Street Jct- Roadsign L2	Urban Roadside	334277	390231	NO ₂	Y	Y>1m	1m	Y
Strand Street/Water Street Jct- Roadsign L2	Urban Roadside	334277	390231	NO ₂	Y	Y>1m	1m	Y

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Berry St o/s St Lukes Ch Pedestrian Lights	Urban Roadside	335221	389886	NO ₂	Y	Y>1m	2m	Y
Renshaw St/Bold St J corner LP Rapid	Urban Roadside	335222	389937	NO ₂	Y	Y>1m	0.5m	Y
Clarence St/Mount Pleasant J LP o/s JMU	Urban Roadside	335432	390107	NO ₂	Y	Y>1m	1m	Y
Pembroke PI LP o/s main ent. Dental Hospital	Urban Roadside	335805	390630	NO ₂	Y	Y>1m	0.5m	Y

South Liverpool

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Edge Lane/Jubilee Dr LHS Junct nr C2414	Urban Roadside	336642	390484	NO ₂	Y	Y>1m	1m	Y
Edge Lane/Rathbone Rd Jct. Lamp Post	Urban Roadside	339023	390715	NO ₂	Y	Y>1m	2m	Y
St Oswald St/Paraffin Oil Shop TL L13	Urban Roadside	339149	390762	NO ₂	Y	Y>1m	1m	Y
Edge Lane Drive/Mill Ln L8047 Cent Resvtn	Urban Roadside	339380	390645	NO ₂	Y	Y>1m	2m	Y
Renville Rd/Bowring Park Rd 30MPH sign AQMA2 L14	Urban Roadside	340397	390344	NO ₂	Y	Y>1m	2m	Y
Renville Rd/Bowring Park Rd 30MPH sign AQMA2 L14	Urban Roadside	340397	390344	NO ₂	Y	Y>1m	2m	Y
Renville Rd/Bowring Park Rd 30MPH sign AQMA2 L14	Urban Roadside	340397	390344	NO ₂	Y	Y>1m	2m	Y
Bowring Park Road Slip Rd on Give Way sign	Urban Roadside	340154	390501	NO ₂	Y	Y>1m	0.5m	Y
Hillfoot Rd/Allerton Rd J Lamp LH p J	Urban Roadside	341976	386333	NO ₂	Y	Y>1m	2m	Y

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C2507								
Speke Rd 1st Dual Pelican Cross 2672/2673	Urban Roadside	340959	384247	NO ₂	Y	Y<1m	2m	Y
Speke DEFRA Site Tarbock Rd L24	Urban Background	343884	383601	NO ₂	Y	Y>1m	5m	Y
Speke DEFRA Site Tarbock Rd L24	Urban Background	343884	383601	NO ₂	Y	Y>1m	5m	Y
Speke DEFRA Site Tarbock Rd L24	Urban Background	343884	383601	NO ₂	Y	Y>1m	5m	Y
Smithdown Road Lamp outside Costcutter	Urban Roadside	338170	388629	NO ₂	Y	Y>1m	1m	Y
Smithdown Road info sign outside Sefton Park pharmacy (by Asda)	Urban Roadside	337881	388939	NO ₂	Y	Y>1m	1m	Y
Smithdown Road Lamp in central Res. opp. Budget exhausts	Urban Roadside	338977	388485	NO ₂	Y	Y>1m	1.5m	Y
Smithdown Rd by Howard Jenkins funerals jct. lodge lane	Urban Roadside	337003	389459	NO ₂	Y	Y>1m	0.5m	Y

North Liverpool

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Millbank/Queens Dr - Junction Lamp Post	Urban Roadside	339066	392667	NO ₂	Y	Y>1m	2m	Y
Muirhead Ave/Queens Dr central res. traffic Lights (by dentist)	Urban Roadside	338689	393167	NO ₂	Y	Y>1m	2m	Y
Storrington Ave/Stonebridge Ln (on lamp post by traffic lights)	Urban Roadside	340046	395497	NO ₂	Y	Y>1m	3m	Y
Longmoor Ln/Seeds Ln J L Traffic C2607	Urban Roadside	337400	397234	NO ₂	Y	Y >1m	1.5m	Y
Middle Walton Vale-Pedestrian crossing	Urban Roadside	336375	396687	NO ₂	Y	Y>1m	1m	Y
Lamp post J 3268 outside	Urban Roadside	336216	396165	NO ₂	Y	Y>1m	1m	Y

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324-328 Rice Lane L9								
Queens Drive Monitoring Station	Urban Roadside	336164	394906	NO ₂	Y	Y>1m	2m	Y
Queens Drive Monitoring Station	Urban Roadside	336164	394906	NO ₂	Y	Y>1m	2m	Y
Queens Drive Monitoring Station	Urban Roadside	336164	394906	NO ₂	Y	Y>1m	2m	Y
County Rd/Spellow Ln-Lp nr Traffic C2222	Urban Roadside	335565	393897	NO ₂	Y	Y>1m	1.5m	Y
Blackstone St./Gt. Howard St. L3 LTS 2202	Urban Roadside	333866	392514	NO ₂	Y	Y>1m	2m	Y

2.2 Comparison of Monitoring Results with AQ Objectives

2.2.1 Nitrogen Dioxide (NO₂)

Nationally, the principal source of NO_x emissions is from road transport. Major roads carrying large volumes of high-speed traffic (such as motorways and other primary routes) are a predominant source, as are conurbations and city centres with congested traffic. Within most urban areas, the contribution of road transport to local emissions will be much greater than for the national picture.

The Government and the Devolved Administrations have adopted two Air Quality Objectives for NO₂. An annual mean concentration of 40µg/m³, and a 1-hour mean concentration of 200µg/m³ not to be exceeded more than 18 times per year.

Meeting the annual mean objective is considerably more demanding than achieving the 1-hour objective. The EU limit values may still be exceeded at urban background sites in London, and at roadside locations in other cities.

Automatic Monitoring Data

Table 2.3 summarises the measurements of NO₂ concentrations at continuous monitoring stations in Liverpool between 2007 and 2011.

For 2011 the Islington Site had no exceedences of the 1-hour mean objective and the annual mean concentration recorded was 35µg/m³.

The Speke site had no exceedence of the 1-hour mean objective and had an annual mean concentration of 24µg/m³.

The Queens Drive site recorded no exceedences of the 1-hour mean objective; and the annual mean concentration recorded was 34µg/m³.

The Old Haymarket site had one exceedences of the 1-hour mean objective and the annual mean concentration recorded was 46µg/m³.

As Old Haymarket automatic monitoring station is not representative of public exposure a calculation has been applied to the recorded annual mean to predict NO₂ concentration at a distance of 59 metres from the roadside where public exposure exists. The calculation used to derive NO₂ concentration reductions at distance from the nearest road is shown in Box 2.3 of LAQM TG (09).

Table 2.3 Results of Automatic Monitoring for NO₂: Comparison with Annual Mean Objective

Location	Within AQMA?	Data Capture for full calendar year 2011 %					
			2007	2008	2009	2010	2011
Islington	Y	99.0	35	32	33	40	35
Old Haymarket	Y	98.2	NA	51	45	50	46
Queens Drive (Walton)	Y	98.8	NA	40	33	38	34
Speke	Y	96.8	24	22	21	30	24

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations at Automatic Monitoring Sites

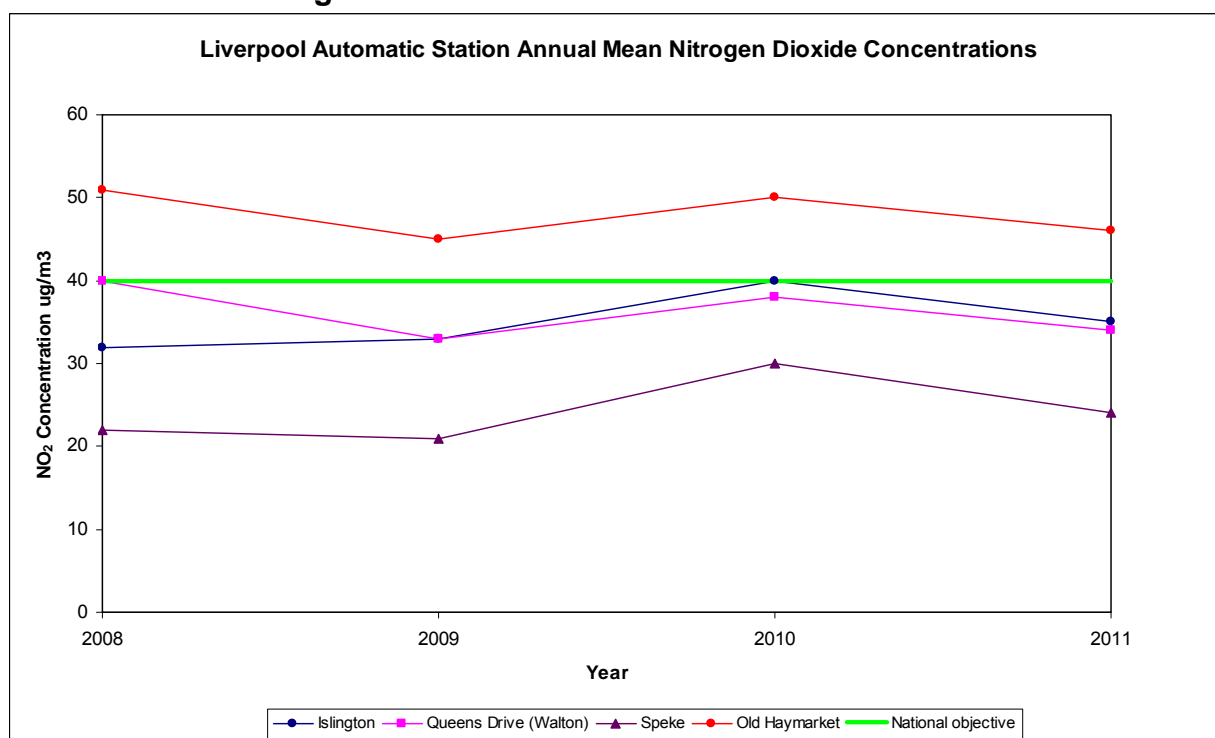


Table 2.4 Results of Automatic Monitoring for NO₂: Comparison with 1-hour Mean Objective

Location	Within AQMA?	Data Capture for full calendar 2011 %	Number of Exceedences of hourly mean (200 µg/m ³) <i>If the period of valid data is less than 90% of a full year, include the 99.8th %ile of hourly means in brackets.</i>		
			2009	2010	2011
Islington	Y	99.0	1	0	0
Old Haymarket	Y	98.2	3	2	1
Queens Drive (Walton)	Y	98.8	0	0	0
Speke	Y	96.8	0	0	0

Diffusion Tube Monitoring Data

At each location, the diffusion tubes were exposed for one-month periods, and the average monthly NO₂ concentration, from the 5th of January 2011 until the 5th January 2012, was determined and from these monthly figures the annual mean for each location was then calculated.

The PDT results are shown in Table 2.5a below. The results have only been bias adjusted against the local bias factor - of 1.04 taken from the urban background site at Speke. (See Appendix A for rationale).

The citywide network of NO₂ tubes consists of single tubes at 29 sites and triplicate tubes at a further 14 sites. Therefore there are results given for 73 exposed tubes with within this section of the report.

Using the local bias correction factor of 1.04 the PDT monitoring data results show that 65 out the 73 diffusion tubes in the Liverpool City AQMA measured NO₂ levels exceed the 40µg/m³ objective (89%).

The highest diffusion tube reading recorded for locally corrected tube data was 74µg/m³ for the Millbank/Queens Dr - Junction Lamp Post (Site ID N63).

Table 2.5a Results of Nitrogen Dioxide Diffusion Tubes in 2011

Site ID	Location	Site Type	Within AQMA?	Triplicate and/or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 1.04)
								2011 ($\mu\text{g}/\text{m}^3$)
B1	Prescot St/RLUH Taxi Rank Lamp L7	Roadside	Y	Triplicate	92	N	N	61
B2	Prescot St/RLUH Taxi Rank Lamp L7	Roadside	Y	Triplicate	92	N	N	59
B3	Prescot St/RLUH Taxi Rank Lamp L7	Roadside	Y	Triplicate	92	N	N	60
B4	Kensington/Farnworth St Junct	Roadside	Y	No	100	N	N	53
B5	Outside Riverside Housing Kensington/Sheil Rd	Roadside	Y	No	100	N	N	59
B6	Opposite old Aldi store Prescot Road	Roadside	Y	No	100	N	N	54
B7	Prescot Rd/Green Lane Junction Lamp Post	Roadside	Y	No	100	N	N	58
B8	Lamp post outside Sally Army Prescot Road	Roadside	Y	No	83	N	N	45
B9	Prescot Rd/St Oswalds St Junction Cent Lamp Post	Roadside	Y	No	100	N	N	66

Site ID	Location	Site Type	Within AQMA?	Triplicate and/or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 1.04)
								2011 ($\mu\text{g}/\text{m}^3$)
B10	Lamp Post by bus stop Blackhorse Lane / Prescott Road	Roadside	Y	No	100	N	N	42
B11	Central Reservation Prescott Road at jct. of light by Sainsbury's	Roadside	Y	No	100	N	N	48
B12	Corner Finch Lane / East Prescott Road	Roadside	Y	No	100	N	N	49
B13	Midland Chambers (Everton Road / West Derby Rd) No 14 bus stop	Roadside	Y	No	100	N	N	49
B14	Lamp post outside No 55 Everton Road	Roadside	Y	No	100	N	N	52
B15	Lamp at Jct of Everton Rd / Breck Road	Roadside	Y	No	100	N	N	47
B16	Lamp Breck Road (opposite Lance Close)	Roadside	Y	No	100	N	N	37
B17	Lamp outside Green Cross Pharmacy	Roadside	Y	No	100	N	N	38
B18	Lamp outside Quality Fireplaces Breck Road	Roadside	Y	No	100	N	N	49

Site ID	Location	Site Type	Within AQMA?	Triplicate and/or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 1.04)
								2011 ($\mu\text{g}/\text{m}^3$)
B19	Lamp at side of Georgesons car (Priory Road)	Roadside	Y	No	100	N	N	45
B20	Lamp outside No 93 Townsend Lane	Roadside	Y	No	100	N	N	42
B21	Telegraph pole outside Clubmoor community centre	Roadside	Y	No	100	N	N	36
B22	Lamp in central res. opposite 51 Townsend Ave	Roadside	Y	No	100	N	N	44
B23	Lamp on central reserve opposite Surestart Utting Ave East	Roadside	Y	No	100	N	N	45
B24	Lamp central reserve opp. St Theresa's schl Utting Ave East	Roadside	Y	No	100	N	N	36
B25	Traffic Lt in cntrl reserve Jct of Lowerhouse / Utting Ave East	Roadside	Y	No	100	N	N	38
T26	Islington AQ Station Traffic Lights	Kerbside	Y	Triplicate and co located	75	N	N	47

Site ID	Location	Site Type	Within AQMA?	Triplicate and/or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 1.04)
								2011 ($\mu\text{g}/\text{m}^3$)
T27	Islington AQ Station Traffic Lights	Kerbside	Y	Triplicate and co located	75	N	N	45
T28	Islington AQ Station Traffic Lights	Kerbside	Y	Triplicate and co located	75	N	N	45
T29	Leeds Street/Pall Mall Road Sign	Roadside	Y	Triplicate	75	N	N	53
T30	Leeds Street/Pall Mall Road Sign	Roadside	Y	Triplicate	100	N	N	51
T31	Leeds Street/Pall Mall Road Sign	Roadside	Y	Triplicate	75	N	N	52
T32	Crosshall Street Downpipe 2nd Alng from Dale St.	Roadside	Y	Triplicate	100	N	N	62
T33	Crosshall Street Downpipe 2nd Alng from Dale St.	Roadside	Y	Triplicate	100	N	N	62
T34	Crosshall Street Downpipe 2nd Alng from Dale St.	Roadside	Y	Triplicate	100	N	N	61
T35	Old Haymarket	Roadside	Y	Triplicate and co located	92	N	N	53
T36	Old Haymarket	Roadside	Y	Triplicate and co located	100	N	N	57

Site ID	Location	Site Type	Within AQMA?	Triplicate and/or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 1.04)
								2011 ($\mu\text{g}/\text{m}^3$)
T37	Old Haymarket	Roadside	Y	Triplicate and co located	92	N	N	59
T38	Covent Garden/Dale St Lamp Post RH side	Roadside	Y	No	100	N	N	44
T39	Strand Street/Water Street Jct-Roadsign L2	Roadside	Y	Triplicate	83	N	N	68
T40	Strand Street/Water Street Jct-Roadsign L2	Roadside	Y	Triplicate	75	N	N	66
T41	Strand Street/Water Street Jct-Roadsign L2	Roadside	Y	Triplicate	83	N	N	67
T42	Berry St o/s St Lukes Ch Pedestrian Lights	Roadside	Y	No	92	N	N	57
T43	Renshaw St/Bold St J corner LP Rapid	Roadside	Y	No	100	N	N	66
T44	Clarence St/Mount Pleasant J LP o/s JMU	Roadside	Y	No	92	N	N	58
T45	Pembroke PI LP o/s main ent. Dental Hospital	Roadside	Y	No	92	N	N	59
S46	Edge Lane/Jubilee Dr LHS Junct nr C2414	Roadside	Y	No	67	Y	N	64

Site ID	Location	Site Type	Within AQMA?	Triplicate and/or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 1.04)
								2011 ($\mu\text{g}/\text{m}^3$)
S47	Edge Lane/Rathbone Rd Junc Lamp Post	Roadside	Y	No	100	N	N	50
S48	St Oswald St/Paraffin Oil Shop Traffic light L13	Roadside	Y	No	100	N	N	67
S49	Edge Lane Drive/Mill Ln L8047 Cent Resvtn	Roadside	Y	No	100	N	N	65
S50	Renville Rd/Bowring Park Rd 30MPH sign AQMA2 L14	Roadside	Y	Triplicate	92	N	N	59
S51	Renville Rd/Bowring Park Rd 30MPH sign AQMA2 L14	Roadside	Y	Triplicate	100	N	N	59
S52	Renville Rd/Bowring Park Rd 30MPH sign AQMA2 L14	Roadside	Y	Triplicate	100	N	N	59
S53	Bowring Park Road Slip Rd on Give Way sign	Roadside	Y	No	100	N	N	42
S54	Hillfoot Rd/Allerton Rd J Lamp LH p J C2507	Roadside	Y	No	83	N	N	44
S55	Speke Rd 1st Dual Pelican Cross 2672/2673	Roadside	Y	No	92	N	N	60

Site ID	Location	Site Type	Within AQMA?	Triplicate and/or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 1.04)
								2011 ($\mu\text{g}/\text{m}^3$)
S56	Speke DEFRA Site Tarbock Rd L24	Background	Y	Triplicate and co located	50	Y	N	25
S57	Speke DEFRA Site Tarbock Rd L24	Background	Y	Triplicate and co located	50	Y	N	24
S58	Speke DEFRA Site Tarbock Rd L24	Background	Y	Triplicate and co located	50	Y	N	25
S59	Smithdown Road Lamp outside Costcutter	Roadside	Y	No	92	N	N	63
S60	Smithdown Road info sign outside Sefton Park pharmacy (by Asda)	Roadside	Y	No	100	N	N	59
S61	Smithdown Road Lamp in central Res. opp. Budget exhausts	Roadside	Y	No	100	N	N	49
S62	Smithdown Road Info sign by Howard Jenkins funerals nr Jct with Lodge Lane	Roadside	Y	No	92	N	N	58
N63	Millbank/Queens Dr - Junction Lamp Post	Roadside	Y	No	83	N	N	74

Site ID	Location	Site Type	Within AQMA?	Triplicate and/or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 1.04)
								2011 ($\mu\text{g}/\text{m}^3$)
N64	Muirhead Ave/Queens Dr central res traffic Lights (by dentist)	Roadside	Y	No	100	N	N	62
N65	Storrington Ave/Stonebridge Ln (on lamp post by traffic lights)	Roadside	Y	No	100	N	N	55
N66	Longmoor Ln/Seeds Ln J L Traffic C2607	Roadside	Y	No	100	N	N	43
N67	Middle Walton Vale-Pedestrian crossing	Roadside	Y	No	100	N	N	65
N68	Lamp post J 3268 outside 324-328 Rice Lane L9	Roadside	Y	No	100	N	N	54
N69	Queens Drive Monitoring Station	Roadside	Y	Triplicate and co located	92	N	N	42
N70	Queens Drive Monitoring Station	Roadside	Y	Triplicate and co located	100	N	N	44
N71	Queens Drive Monitoring Station	Roadside	Y	Triplicate and co located	100	N	N	43
N72	County Rd/Spellow Ln-Lp nr Traffic C2222	Roadside	Y	No	100	N	N	55

Site ID	Location	Site Type	Within AQMA?	Triplicate and/or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 1.04)
								2011 ($\mu\text{g}/\text{m}^3$)
N73	Blackstone St./Gt. Howard St. L3 LTS 2202	Roadside	Y	No	92	N	N	52

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)

^c Means should be “annualised” as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.

*Annual mean concentrations for previous years are optional.

Four of the diffusion tubes within Table 2.5a had less than 75% data capture. Therefore in accordance with technical guidance LAQM.TG (09), an annual mean concentration for these locations was estimated using the approach in Box 3.2.

Table 2.5b contains the data for the two continuous monitoring stations used for this recalculation, which were both background sites and part of the AURN network – Tranmere Wirral and Liverpool Speke.

Table 2.5b: Estimation of annual mean concentrations from short term monitoring data

Long Term site	Annual Mean (Am)	Period Mean (Pm)	Ratio Am/Pm
Tranmere, Wirral	26	25	1.04
Speke, Liverpool	25	24	1.04

Therefore the average of the 2 ratios – 1.04 was applied to the data from the 4 locations as shown in Table 2.5c.

Table 2.5c: Adjusted data at locations with <75% data capture

Site ID	Location	Annual Mean (Am)	Readjusted Annual Mean ug/m ³
S46	Edge Lane/Jubilee Dr LHS Junct nr C2414	64	67
S56	Speke DEFRA Site Tarbock Rd L24	25	26
S57	Speke DEFRA Site Tarbock Rd L24	24	25
S58	Speke DEFRA Site Tarbock Rd L24	25	26

At thirteen of the locations in Table 2.5a (18 tubes in total), the annual mean was greater than 60ug/m³. As such it is likely that the hourly mean of 200ug/m³ at these locations will also be exceeded. Therefore each of these locations needed to be assessed for relevant exposure. Many of the diffusion tube sites are designated as roadside or kerbside; neither location normally would be frequented by the general public for 24 hours. These sites may be measured from the diffusion tube location to the nearest facade or doorway of a residential property. Using the distances from the kerb to the diffusion tube location and the distance of the diffusion tube to the nearest facade for relevant exposure and the LAQM tool (it should be possible to determine a concentration at the facades of properties) and thus provide determine whether or not the exceedence of 60 µg/m³ occurs at the location people would likely to receive prolonged exposure.

<http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>

The results of the facade projections are contained within the following table with a comment for each location stating whether or not there is relevant exposure, the distance between diffusion tube and the relevant facade and whether the re-calculations suggest an exceedence is still possible.

Table 2.6: Relevant exposure for those locations that exceed 60ug/m³ as an annual mean

Site ID	Location	Relevant exposure	Distance to kerb (m)	Distance to façade/receptor (m)	Readjusted annual mean ug/m ³
B1	Prescot St/RLUH Taxi Rank Lamp L7	Y	2	30	38
B3	Prescot St/RLUH Taxi Rank Lamp L7	Y	2	30	37
B9	Prescot Rd/St Oswalds St Junction Cent Lamp Post	Y	1.5	33	38
T32	Crosshall Street Downpipe 2nd Alng from Dale St.	Y	1.5	20	40
T33	Crosshall Street Downpipe 2nd Alng from Dale St.	Y	1.5	20	40
T34	Crosshall Street Downpipe 2nd Alng from Dale St.	Y	1.5	20	40
T39	Strand Street/Water Street Jct-Roadsign L2	Y	0.85	18	40
T40	Strand Street/Water Street Jct-Roadsign L2	Y	0.85	18	39
T41	Strand Street/Water Street Jct-Roadsign L2	Y	0.85	18	40
T43	Renshaw St/Bold St J corner LP Rapid	Y	0.5	2	56
S46	Edge Lane/Jubilee Dr LHS Junct nr C2414	Y	1	2	58
S48	St Oswald St/Paraffin Oil Shop Traffic light L13	Y	1.5	40	34
S49	Edge Lane Drive/Mill Ln L8047 Cent Resvtn	Y	1.5	23	41
S55	Speke Rd 1st Dual Pelican Cross 2672/2673	Y	0.8	12	44
S59	Smithdown Road Lamp outside Costcutter	Y	1	2	55
N63	Millbank/Queens Dr - Junction Lamp Post	Y	2	10	48
N64	Muirhead Ave/Queens Dr central res traffic Lights (by dentist)	Y	0.7	30	39
N67	Middle Walton Vale-Pedestrian crossing	Y	1	2	57

Table 2.7 Results of Nitrogen Dioxide Diffusion Tubes (2007 to 2011)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007* (Bias Adjustment Factor = 0.89)	2008* (Bias Adjustment Factor = 0.83)	2009* (Bias Adjustment Factor = 0.76)	2010* (Bias Adjustment Factor = 0.98)	2011 (Bias Adjustment Factor = 1.04)
Longmoor Lane/Seeds Lane J L Traffic C2607	Urban Roadside	Y	51	45	43	52	43
Middle Walton Vale-Traffic Lights 2246	Urban Roadside	Y	67	64	61	71	65
Rice Lane/Queens Dr Flyover-LP nr Baths	Urban Roadside	Y	47	46	52	64	ND
County Rd/Spellow Lane-Lamp nr Traffic C2222	Urban Roadside	Y	48	49	48	58	55
Storrington Ave/Stonebridge Lane Junction Traffic Lights	Urban Roadside	Y	42	42	41	47	55
Priory Rd/Townsend Lane J L nr Traffic C2314	Urban Roadside	Y	42	41	42	46	ND
Muirhead Ave/Queens Dr LHS Traffic Lights	Urban Roadside	Y	52	57	55	61	62
Millbank/Queens Dr - Junction Lamp Post	Urban Roadside	Y	63	63	62	76	74
Kensington/Sheil Rd Traffic Lights Cr pr Junction	Urban Roadside	Y	59	55	48	62	53
Prescot Rd/Green Lane Junction Lamp Post	Urban Roadside	Y	55	53	48	67	58
Prescot Rd/St Oswald's St Junction Cent L Post	Urban Roadside	Y	64	61	59	67	66
Edge Lane/Rathbone Rd Junction Lamp Post	Urban Roadside	Y	46	52	46	63	50
Edge Lane Drive/Mill Lane L8047 Cent Reservation	Urban Roadside	Y	66	61	58	73	65
Bowring Park Road Slip Rd Main Lamp Std	Urban Roadside	Y	44	42	41	55	42

Liverpool City Council

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007* (Bias Adjustment Factor = 0.89)	2008* (Bias Adjustment Factor = 0.83)	2009* (Bias Adjustment Factor = 0.76)	2010* (Bias Adjustment Factor = 0.98)	2011 (Bias Adjustment Factor = 1.04)
Smithdown Road Lamp outside Costcutter	Urban Roadside	Y	58	63	59	67	63
Hillfoot Rd/Allerton Rd J Lamp LH p J C2507	Urban Roadside	Y	45	42	39	50	44
Speke Rd 1st Dual Pelican Cross 2672/2673	Urban Roadside	Y	54	55	52	71	60
Covent Garden/Dale St Lamp Post RH side	Urban Roadside	Y	53	42	42	54	44
Hanover St/op Hanover Hotel Lamp Post RHS	Urban Roadside	Y	50	58	ND	ND	ND
Williamson Square/Tarleton St Lamp Post	Urban Roadside	Y	56	ND	ND	ND	ND
Renshaw St/Bold St J corner Lamp Post Rapid	Urban Roadside	Y	68	61	56	69	66
Pembroke PI LP o/s main entrance Dental Hospital	Urban Roadside	Y	57	57	56	66	59
West Derby St opposite Crown St main LP LHS	Urban Roadside	Y	40	38	45	47	ND
Seymour Street outside 25/27 Lamp Post	Urban Roadside	Y	64	68	61	72	ND
Russell Street outside No. 42 Lamp Post	Urban Roadside	Y	57	49	50	52	ND
Clarence St/Mount Pleasant J LP o/s JMU	Urban Roadside	Y	56	55	46	64	58
Berry St o/s St Lukes Ch Pedestrian Lights	Urban Roadside	Y	52	50	42	56	57
West Derby Rd/Horne St Lamp LHS Junction	Urban Roadside	Y	39	41	36	39	ND
Kensington/Farnworth St Junction LHS C2403	Urban Roadside	Y	54	52	50	62	53
Edge Lane/Jubilee Dr LHS Junction nr C2414	Urban Roadside	Y	59	73	70	88	64

Liverpool City Council

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007* (Bias Adjustment Factor = 0.89)	2008* (Bias Adjustment Factor = 0.83)	2009* (Bias Adjustment Factor = 0.76)	2010* (Bias Adjustment Factor = 0.98)	2011 (Bias Adjustment Factor = 1.04)
Blackstone St./Gt. Howard St. L3 LTS 2202	Urban Roadside	Y	50	50	52	61	52
Lamp post D3569 4M outside façade of 64-90 Moor Lane L9	Urban Roadside	Y	54	50	43	36	ND
Lamp post D3569 4M outside façade of 64-90 Moor Lane	Urban Roadside	Y	54	50	34	32	ND
Lamp post D3569 4M outside façade of 64-90 Moor Lane L9	Urban Roadside	Y	54	46	43	34	ND
Lamp post N2490 3.5M outside façade of 461 Prescott Rd L13	Urban Roadside	Y	57	55	53	60	ND
Lamp post N2490 3.5M outside façade of 461 Prescott Rd L13	Urban Roadside	Y	55	56	55	64	ND
Lamp post N2490 3.5M outside façade of 461 Prescott Rd L13	Urban Roadside	Y	53	55	54	59	ND
Lamp post 19 Outside 187 Walton Village L4	Urban Roadside	Y	34	33	31	38	ND
Lamp post 19 Outside 187 Walton Village L4	Urban Roadside	Y	38	35	31	38	ND
Lamp post 19 Outside 187 Walton Village L4	Urban Roadside	Y	36	35	32	39	ND
Renville Rd/Bowring Park Rd 30MPH sign AQMA2 L14	Urban Roadside	Y	50	61	53	64	59
Renville Rd/Bowring Park Rd 30MPH sign AQMA2 L14	Urban Roadside	Y	50	56	53	60	59
Renville Rd/Bowring Park Rd 30MPH sign AQMA2 L14	Urban Roadside	Y	53	53	55	61	59
Crosshall Street Downpipe 2nd along from Dale Street	Urban Roadside	Y	52	55	53	62	62
Crosshall Street Downpipe 2nd along from Dale Street	Urban Roadside	Y	53	56	52	60	62
Crosshall Street Downpipe 2nd along from Dale Street	Urban Roadside	Y	50	56	53	65	61

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007* (Bias Adjustment Factor = 0.89)	2008* (Bias Adjustment Factor = 0.83)	2009* (Bias Adjustment Factor = 0.76)	2010* (Bias Adjustment Factor = 0.98)	2011 (Bias Adjustment Factor = 1.04)
Victoria St. Large sign outside Mandarin Restaurant L2	Urban Roadside	Y	75	72	61	53	ND
Victoria St. Large sign outside Mandarin Restaurant L2	Urban Roadside	Y	79	68	59	55	ND
Victoria St. Large sign outside Mandarin Restaurant L2	Urban Roadside	Y	87	69	60	54	ND
Strand Street/Water Street Junction-Roadsign L2	Urban Roadside	Y	68	66	60	76	68
Strand Street/Water Street Junction-Roadsign L2	Urban Roadside	Y	71	67	61	71	66
Strand Street/Water Street Junction-Roadsign L2	Urban Roadside	Y	66	61	58	72	67
Leeds Street/Pall Mall Road Sign 1	Urban Roadside	Y	44	45	47	60	51
Leeds Street/Pall Mall Road Sign 2	Urban Roadside	Y	49	52	48	62	53
Leeds Street/Pall Mall Road Sign 3	Urban Roadside	Y	49	47	48	57	52
Lamp post J 3268 outside324-328 Rice Lane L9	Urban Roadside	Y	50	50	49	47	ND
Lamp post J 3268 outside324-328 Rice Lane L9	Urban Roadside	Y	50	46	49	47	ND
Lamp post J 3268 outside324-328 Rice Lane L9	Urban Roadside	Y	48	49	47	45	ND
St Oswald St/Paraffin Oil Shop Traffic lights L13	Urban Roadside	Y	54	61	59	68	67
St Oswald St/Paraffin Oil Shop Traffic lights L13	Urban Roadside	Y	57	60	59	68	ND
St Oswald St/Paraffin Oil Shop Traffic lightsL13	Urban Roadside	Y	58	62	60	66	ND

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007* (Bias Adjustment Factor = 0.89)	2008* (Bias Adjustment Factor = 0.83)	2009* (Bias Adjustment Factor = 0.76)	2010* (Bias Adjustment Factor = 0.98)	2011 (Bias Adjustment Factor = 1.04)
Prescot St/RLUH Taxi Rank Lamp L7	Urban Roadside	Y	58	59	54	68	61
Prescot St/RLUH Taxi Rank Lamp L7	Urban Roadside	Y	62	57	56	64	59
Prescot St/RLUH Taxi Rank Lamp L7	Urban Roadside	Y	56	61	55	68	60
Islington AQ Station Traffic Lights	Urban Roadside	Y	41	43	40	47	47
Islington AQ Station Traffic Lights	Urban Roadside	Y	41	44	40	45	45
Islington AQ Station Traffic Lights	Urban Roadside	Y	33	42	40	48	45
Speke Monitoring Station	Urban Roadside	Y	20	22	21	31	25
Speke Monitoring Station	Urban Roadside	Y	21	24	21	28	24
Speke Monitoring Station	Urban Roadside	Y	25	23	21	25	25
Old Haymarket	Urban Roadside	Y	ND	70	50	59	53
Old Haymarket	Urban Roadside	Y	ND	67	50	63	57
Old Haymarket	Urban Roadside	Y	ND	68	51	60	59

ND = Not done

2.2.2 PM₁₀

PM₁₀'s at Speke are measured by a FDMS. The annual mean concentration at the Speke automatic monitoring site was recorded as 16 µg/m³ for 2011, which is below the annual mean objective. There were 3 exceedences of the 1-hour mean during 2011 at this site, the maximum daily mean recorded as 82µg/m³.

PM₁₀'s at Islington as measured by a Beta Attenuation Monitor (BAM) with a factor of 0.83333 applied to give gravimetric equivalent concentrations. The annual mean concentration at the Islington automatic monitoring site was recorded as 21 µg/m³ for 2011, which is below the annual mean objective. There were 3 exceedences of the 1-hour mean during 2011 at this site, the maximum daily mean recorded as 73µg/m³.

PM₁₀'s at Queens Drive as measured by a BAM with a factor of 0.83333 applied to give gravimetric equivalent concentrations. The annual mean concentration at the Liverpool Queens Drive automatic monitoring site was recorded as 24 µg/m³ for 2011, which is below the annual mean objective. There were 3 exceedences of the 1-hour mean during 2011 at this site, the maximum daily mean recorded as 90µg/m³.

Table 2.8 Results of Automatic Monitoring of PM₁₀: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period % ^a	Valid Data Capture 2011 % ^b	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration µg/m ³				
						2007* ^c	2008* ^c	2009* ^c	2010* ^c	2011 ^c
Speke	Background	Y	96.7	96.7	Y	N/A	16	16	17	16
Islington	Roadside	Y	88.3	88.3	Y	N/A	N/A	27	25	21
Queens Drive	Roadside	Y	94.7	94.7	Y	N/A	N/A	25	30	24

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)

Table 2.9 Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period % ^a	Valid Data Capture 2011 % ^b	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 µg/m ³)				
						2007*	2008*	2009*	2010*	2011
Speke	Background	Y	96.7	96.7	Y	N/A	N/A	5	2	8
Islington	Roadside	Y	88.3	88.3	Y	N/A	N/A	3	7	3
Queens Drive	Roadside	Y	94.7	94.7	Y	N/A	N/A	1	14	8

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)

2.2.3 Sulphur Dioxide (SO₂)

SO₂ is monitored at the Speke site. The annual average concentration for 2011 was 3µg/m³. The exceedences for 2011 against the annual mean are given in Table 2.9 below.

Table 2.9 Results of Automatic Monitoring of SO₂: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period % ^a	Valid Data Capture 2011 % ^b	Number of Exceedences (percentile in bracket µg/m ³) ^c		
					15-minute Objective (266 µg/m ³)	1-hour Objective (350 µg/m ³)	24-hour Objective (125 µg/m ³)
Speke	Background	Y	98.7	98.7	8	0	0

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

^c if data capture is less than 90%, include the relevant percentile in brackets

2.2.4 Benzene

Not applicable

2.2.5 Other pollutants monitored

Ozone is monitored at both the Speke and Islington sites. The annual average concentration during 2011 was 51µg/m³ at the Speke site, and 42µg/m³ at the Islington site.

PM_{2.5} is monitored at the Speke site. The annual average concentration during 2011 was 12µg/m³.

2.2.6 Summary of Compliance with AQS Objectives

Liverpool City Council has measured concentrations of NO₂ above the annual mean at 86% of PDT locations, and at one location the 1-hour mean, however due to the whole of the city of Liverpool being designated as an AQMA, there is no need to proceed to a Detailed Assessment for NO₂.

Other pollutants measured during 2011 met with the air quality objectives and therefore a detailed assessment is not required for any of the other pollutants.

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Liverpool City Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

Liverpool City Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

3.3 Roads with a High Flow of Buses and/or HGVs.

Liverpool City Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

3.4 Junctions

Liverpool City Council confirms that there are no new/newly identified busy junctions/busy roads.

3.5 New Roads Constructed/Proposed Since the Last Round of Review and Assessment

Liverpool City Council confirms that there are no new/proposed roads.

3.6 Roads with Significantly Changed Traffic Flows

Liverpool City Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

Liverpool City Council confirms that there are no relevant bus and coach stations in the Local Authority area.

4 Other Transport Sources

4.1 Airports

John Lennon International Airport has been considered as part of previous review and assessment processes and also falls within the Liverpool City AQMA therefore does not require further assessment at this time.

Liverpool City Council confirms that there are no other new airports in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

The Merseyside rail network and the West Coast Mainline are electrified and consequently there are relatively few diesel trains. It is unlikely that there will be any locations where there is public exposure less than 15 m from the track and where diesel trains regularly stand with their engines running for periods of 15 minutes or more. No further assessment is required.

Liverpool City Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

4.2.2 Moving Trains

The Merseyside rail network and the West Coast Mainline are electrified and consequently there are relatively few diesel trains. The Liverpool Lime Street to Allerton line is highlighted in LAQM TG (09) however as the local background concentration of NO₂ is less than 25 µg/m³ no further assessments is required.

Liverpool City Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

4.3 Ports (Shipping)

All ports that may have an impact on air quality have been considered as part of previous review and assessment processes and also falls within the Liverpool City AQMA. There is no requirement for further assessment at this time.

Liverpool City Council confirms that there are no ports or shipping that meets the specified criteria within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

5.1.1 New/Proposed Installations for which an Air Quality Assessment has been Carried Out

Liverpool City Council confirms that there are two new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority. Air Quality assessments will be undertaken for these two installations, however at the present time, only scoping reports have been produced indicating what will be considered within their respective air quality assessments, therefore LCC are unable to comment at this moment on the potential impact of either installation.

5.1.2 Existing Installations where Emissions Increased substantially or New Relevant Exposure has been Introduced

Liverpool City Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

Liverpool City Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.2 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots within the Local Authority area.

5.3 Petrol Stations

Liverpool City Council confirms that there are no petrol stations meeting the specified criteria.

5.4 Poultry Farms

Liverpool City Council confirms that there are no poultry farms meeting the specified criteria.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

Liverpool City Council confirms that there are no biomass combustion plants in the Local Authority area.

6.2 Biomass Combustion – Combined Impacts

Liverpool City Council confirms that there are no biomass combustion plants in the Local Authority area.

6.3 Domestic Solid-Fuel Burning

Liverpool City Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

7 Fugitive or Uncontrolled Sources

Liverpool City Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

This USA has followed the guidance set in Part IV of the Environment Act 1995 Local Air Quality Management Technical Guidance LAQM TG (09) to ensure continuity in the LAQM process. The following conclusions arise from the findings in this report:

8.1.1 Nitrogen Dioxide (NO₂)

Monitoring of NO₂ at the four automatic sites in Liverpool showed that concentrations at Islington, Queens Drive and Speke were below the annual mean objective. However, the annual mean objective was exceeded at Old Haymarket.

Old Haymarket also had one exceedence of the hourly mean objective; none of the other three automatic-monitoring sites recorded any exceedences of the hourly mean objective.

All the automatic stations showed improvement between 2010 & 2011, however between 2007 & 2011 concentrations have been variable, with Old Haymarket always exceeding the annual mean objective.

From 2012 the automatic stations QA/QC and service & maintenance contracts for Islington and Old Haymarket will be concluded and as a result with a lack of any further funding, these two stations will be taken out of service. Queens Drive and Speke as part of the national AURN network will remain in use.

Data collected from diffusion tubes throughout the city have continued to show exceedences during 2011 supporting conclusions made during previous rounds of review and assessment and the justification in designating the whole of the city as an AQMA.

The PDT results on the No. 10 & 14 bus routes are background readings. The quality bus partnerships that were agreed for these routes only came into force in January 2012. Therefore the data presented in the 2013 progress report will compare the background 2011 PDT data with the 2012 data to see if any reduction in NO₂ concentrations has been observed.

Other actions within the updated AQAP will also be presented in the 2013 progress report.

8.1.2 Particulate Matter <10 micron (PM₁₀)

Monitoring at Speke, Islington and Queens Drive showed that all stations met the required targets for annual and 24 hour means.

8.1.3 Other Pollutants

There is monitoring of 1,3-butadiene, SO₂, PM₁₀ and ozone currently undertaken in at Speke and ozone at Islington. Compliance for these pollutants was observed during 2011.

8.2 Conclusions from Assessment of Sources

8.2.1 Road Traffic Sources

There is no requirement to proceed to a DA for the following sources:

- Busy Streets where people May spend 1-hour or more close to traffic;
- Roads with a high flow of buses and/or HGVs;
- Junctions;
- New Roads constructed or proposed since the last round of review and assessment;
- Roads with significantly changed traffic flows; and
- Bus and coach stations.

8.2.2 Other Transport Sources

There is no requirement to proceed to a DA for the following sources

- Airports;
- Railways (diesel and steam trains); and
- Ports (shipping).

8.2.3 Industrial Sources

There is no requirement to proceed to a DA for the following sources:

- Industrial installations;
- New or significantly changed installations with no previous air quality assessment;
- Major fuel (petrol) storage depots;
- Poultry farms; and
- Petrol stations.

8.2.4 Commercial and Domestic Sources

There are no commercial or domestic sources of air pollution operating within the LCC boundary at this time that meet the criteria required in order to proceed to a DA at this time.

8.3 Proposed Actions

This USA has not identified any requirement to proceed to a DA for NO₂, PM₁₀, carbon monoxide, benzene, 1,3-butadiene, lead or SO₂.

However, as already explained there has been a need for certain NO₂ diffusion tubes to be relocated, to represent one of the main actions contained within the updated AQAP and to ascertain its potential impact in coming review and assessment periods.

This report, therefore, concludes that LCC have proceeded correctly and that LCC should submit a Progress Report in 2013.

9 References

LAQM. PRG(03).Part IV of the Environment Act 1995. *Local Air Quality Management Progress Report Guidance*. December 2003.

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Liverpool City Council (2009).*The Review and Assessment of Air Quality within Liverpool City Council*, Updating and Screening Assessment, 2009.

Liverpool City Council (2010). *Progress Report*, 2010.

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AEA "Spreadsheet for calculating Precision, Accuracy and Bias Adjustment factors of Diffusion Tubes"

http://www.airquality.co.uk/archive/laqm/tools/AEA_DifTPAB_v03.xls

UK Air Quality Archive (2008), <http://www.airquality.co.uk>, accessed July 2012

Appendices

Appendix A: QA/QC Data

Appendix B: Unadjusted NO₂ diffusion tubes data

Appendix A: QA:QC Data

Factors from Local Co-location Studies

Location	Site Type	Bias Factor	PDT Annual mean concentration ($\mu\text{g}/\text{m}^3$)	Automatic Analyser mean concentration ($\mu\text{g}/\text{m}^3$)
Islington	Urban Roadside	0.80	46	35
Old Haymarket	Urban Roadside	0.85	56	46
Queens Drive (Walton)	Urban Roadside	0.82	43	34
Speke	Urban background	1.04	25	24

QA/QC of automatic monitoring

The QA/QC procedures follow the requirements of the LAQM TG (09) and are equivalent to those used at UK National Network (AURN) monitoring sites. This gives a high degree of confidence in the data obtained, both for reliable concentrations at the automatic sites and for bias correction data for the diffusion tubes.

The Speke and Queens Drive sites form part of Defra's Automatic Urban and Rural Network (AURN), and the network quality assurance and control procedures are implemented. Data from the Islington and Old Haymarket sites is quality assured to the same standards as the AURN as part of the Calibration Club managed by AEA.

In order to satisfy the requirement outlined in the LAQM TG (09), the following QA/QC procedures were implemented:

- 3-weekly calibrations of the NO_x analyser,
- 6-monthly audits and servicing of the monitoring site,
- Data ratification.

Calibrations of the NO_x analyser were carried out using certified compressed gas standards (ISO17025). This ensured that the calibration gas was traceable to national and international standards. In addition to the calibration sample filters were changed for both NO_x and TEOM analysers and any faults were identified thus minimising data loss.

Audits of the monitoring site consisted of a number of performance checks to identify any faults with the equipment. The calibration cylinder was also checked against another gas standard in order to confirm the gas concentration. Any identified faults were forwarded on to the service unit for repair.

The final stage of the QA/QC process was to ratify the data. During ratification, all calibration, audit and service data are collated and the data is appropriately scaled. Any suspect data identified are deleted therefore ensuring that the data are of a high quality.

QA/QC of diffusion tube monitoring

The Workplace Analysis Scheme for Proficiency (WASP) is an independent analytical performance-testing scheme, operated by the Health and Safety Laboratory (HSL). WASP formed a key part of the former UK NO₂ Network's QA/QC, and remains an important QA/QC exercise for laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM).

The laboratory participants analyses four spiked tubes, and report the results to HSL. HSL assign a performance score to each laboratory's result, based on their deviation from the known mass of nitrite in the analyte.

Since April 2009, the criteria have been based upon the Rolling Performance Index (RPI) statistic as follows:

- **GOOD:** Results obtained by the participating laboratory are on average within 7.5% of the assigned value. This equates to an RPI of 56.25 or less.
- **ACCEPTABLE:** Results obtained by the participating laboratory are on average within 15% of the assigned value. This equates to an RPI of 225 or less.
- **UNACCEPTABLE:** Results obtained by the participating laboratory differ by more than 15% of the assigned value. This equates to an RPI of greater than 225.

Gradko who analyze Liverpool City Council diffusion tubes have always scored good results within use of the WASP scheme.

Appendix B: Diffusion Tube Bias Adjustment Factors

The national bias adjustment factor for 2011 using the same preparation method i.e. 20% TEA in water showed 12 laboratories using the bias adjustment factor spreadsheet. These suggested applying a correction factor of 0.82 to diffusion tubes for the year 2011.

Three of the diffusion tubes are co-located with the Speke monitoring station, which have been precision checked and have had a bias adjustment factor calculated from this using tool available at www.airquality.co.uk/archive/laqm/tools.php, as specified in the Technical Guidance LAQM TG (09). The calculated bias adjustment factor using the Speke co-location study is 0.104, and there was good precision obtained for the 12 months where two tubes or more were analyzed.

Additionally there are co-located diffusion tubes at the three other automatic station locations.

Islington diffusion tubes were also precision checked and a bias adjustment factor was calculated. Good data capture and precision was obtained for 9 months against which the diffusion tubes were collected. The calculated bias adjustment factor from the co-location study was 0.80.

Old Haymarket had 12 months of PDT's collected and analyzed and the bias adjustment factor calculated was 0.85.

The Queens Drive diffusion tubes were also precision checked and a bias adjustment factor was calculated. Good data capture and precision was obtained for 12 months against which the diffusion tubes were collected. The calculated bias adjustment factor from the co-location study was 0.82.

In summary the bias factor used for adjusting the diffusion tube data in Liverpool for 2011 was that obtained for Speke as this has been obtained from a background site, unlike the other three local sites, which have been discounted because they are at roadside locations and the data is not deemed to be as reliable due to various outside interference as a direct result of their location.

The outputs from the use of the spreadsheet tool for each of the four automatic monitoring stations with co located tubes are shown below.

Checking Precision and Accuracy of Triplicate Tubes

[illegible]

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
41	99.7	Good	Good
31	99.8	Good	Good
32	99.4	Good	Good
12	99.6	Good	Good
18	99	Good	Good
20	95.5	Good	Good
16	95.2	Good	Good
16	92.4	Good	Good
28	99.5	Good	Good
Overall survey →		Good precision	Good Overall DC

Overall survey -->

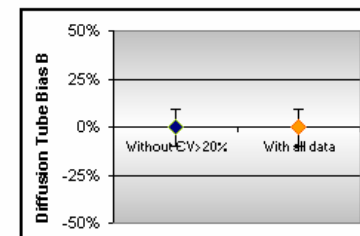
Site Name/ ID:	Speke
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Accuracy	(with 95% confidence interval)	
	without periods	with CV larger than 20%
Bias calculated using 9 periods of data		
Bias factor A	1.04	(0.94 - 1.15)
Bias B	-4%	(-13% - 6%)
Diffusion Tubes Mean:	23	µgm ⁻³
Mean CV (Precision):	5	
Automatic Mean:	24	µgm ⁻³
Data Capture for periods used:	98%	
Adjusted Tubes Mean:	24 (22 - 26)	µgm ⁻³

Precision	9 out of 9 periods have a CV smaller than 20%
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Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 9 periods of data	
Bias factor A	1.04 (0.94 - 1.15)
Bias B	-4% (-13% - 6%)
Diffusion Tubes Mean:	23 μgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	24 μgm^{-3}
Data Capture for periods used:	98%
Adjusted Tubes Mean:	24 (22 - 26) μgm^{-3}

(Check average CV & DC from Accuracy calculations)



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Version 04 - February 2011

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Checking Precision and Accuracy of Triplicate Tubes



Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation	95% CI of mean
1	4/1/2011	2/2/2011	65.0	59.0	74.0	66	7.5	11	18.8
2	2/2/2011	2/3/2011	48.0	63.0	64.0	58	9.0	15	22.3
3	2/3/2011	5/4/2011	69.0	65.0	69.0	68	2.3	3	5.7
4	5/4/2011	3/5/2011	61.0	60.0	67.0	63	3.8	6	9.4
5	3/5/2011	2/6/2011	46.0	48.0	50.0	48	2.0	4	5.0
6	2/6/2011	8/7/2011	54.0	55.0	52.0	54	1.5	3	3.8
7	8/7/2011	3/8/2011	49.0	49.0	49.0	49	0.0	0	0.0
8	3/8/2011	6/9/2011	48.0	52.0	50.0	50	2.0	4	5.0
9	6/9/2011	5/10/2011	52.0	48.0		50	2.8	6	25.4
10	5/10/2011	4/11/2011	38.0	52.0	49.0	46	7.4	16	18.3
11	4/11/2011	7/12/2011	51.0	65.0	56.0	57	7.1	12	17.6
12	7/12/2011	4/1/2012	35.0	43.0	41.0	40	4.2	10	10.3
13									

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
62	96.6	Good	Good
57	99.4	Good	Good
58	99.1	Good	Good
52	98.5	Good	Good
37	95.1	Good	Good
34	97.9	Good	Good
32	99	Good	Good
36	99.5	Good	Good
45	98.6	Good	Good
45	97.2	Good	Good
53	96.7	Good	Good
41	99.6	Good	Good
Overall survey -->		Good precision	Good Overall DC

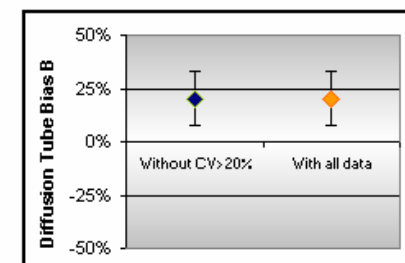
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Old Haymarket
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Accuracy (with 95% confidence interval)	
without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.85 (0.77 - 0.96)
Bias B	18% (5% - 30%)
Diffusion Tubes Mean:	54 μgm^{-3}
Mean CV (Precision):	8
Automatic Mean:	46 μgm^{-3}
Data Capture for periods used:	98%
Adjusted Tubes Mean:	46 (42 - 52) μgm^{-3}

Precision	12 out of 12 periods have a CV smaller than 20%
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Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.85 (0.77 - 0.96)
Bias B	18% (5% - 30%)
Diffusion Tubes Mean:	54 μgm^{-3}
Mean CV (Precision):	8
Automatic Mean:	46 μgm^{-3}
Data Capture for periods used:	98%
Adjusted Tubes Mean:	46 (42 - 52) μgm^{-3}



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Version 04 - February 2011

Checking Precision and Accuracy of Triplicate Tubes

[illegible]

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
51	99.1	Good	Good
47	99.3	Good	Good
40	95.4	Good	Good
23	99	Good	Good
26	99.8	Good	Good
28	99.8	Good	Good
27	99.4	Good	Good
32	96.7	Good	Good
41	99.5	Good	Good
Overall survey -->		Good precision	Good Overall DC

Overall survey -->

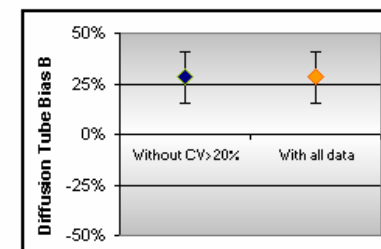
Site Name/ ID:	Islington
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Accuracy	(with 95% confidence interval)	
without periods with CV larger than 20%		
Bias calculated using 9 periods of data		
Bias factor A	0.8 (0.72 - 0.89)	
Bias B	25% (13% - 38%)	
Diffusion Tubes Mean:	44	µgm⁻³
Mean CV (Precision):	6	
Automatic Mean:	35	µgm⁻³
Data Capture for periods used:	99%	
Adjusted Tubes Mean:	35 (32 - 39)	µgm⁻³

Precision	9 out of 9 periods have a CV smaller than 20%
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Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 9 periods of data	
Bias factor A	0.8 (0.72 - 0.89)
Bias B	25% (13% - 38%)
Diffusion Tubes Mean:	44 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	35 μgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	35 (32 - 39) μgm^{-3}

(Check average CV & DC from Accuracy calculations)



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Version 04 - February 2011

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Checking Precision and Accuracy of Triplicate Tubes



Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation	95% CI of mean
1	5/1/2011	2/2/2011	60.0	57.0	58.0	58	1.5	3	3.8
2	2/2/2011	2/3/2011	53.0	49.0		51	2.8	6	25.4
3	3/3/2011	5/4/2011	49.0	53.0	49.0	50	2.3	5	5.7
4	6/4/2011	3/5/2011	43.0	42.0	40.0	42	1.5	4	3.8
5	4/5/2011	2/6/2011	37.0	36.0	39.0	37	1.5	4	3.8
6	2/6/2011	8/7/2011	37.0	38.0	38.0	38	0.6	2	1.4
7	8/7/2011	3/8/2011	34.0	34.0	31.0	33	1.7	5	4.3
8	3/8/2011	6/9/2011	39.0	35.0	40.0	38	2.6	7	6.6
9	6/9/2011	5/10/2011	42.0	44.0	48.0	45	3.1	7	7.6
10	5/10/2011	4/11/2011	40.0	44.0	39.0	41	2.6	6	6.6
11	4/11/2011	8/12/2011	39.0	45.0	44.0	43	3.2	8	8.0
12	8/12/2011	4/1/2012	29.0	20.0	25.0	25	4.5	18	11.2
13									

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
50	99.6	Good	Good
44	94.4	Good	Good
51	99.9	Good	Good
37	99.2	Good	Good
27	99.7	Good	Good
28	99.3	Good	Good
28	98.1	Good	Good
27	99.6	Good	Good
28	94.7	Good	Good
28	99	Good	Good
35	99.9	Good	Good
25	99.8	Good	Good
Overall survey -->		Good precision	Good Overall DC

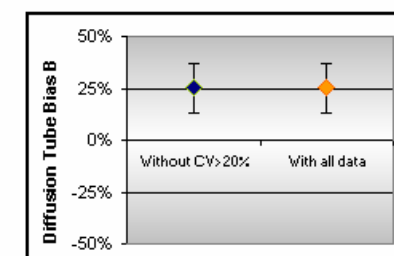
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Queens Drive
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Accuracy (with 95% confidence interval)	
without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.82 (0.74 - 0.9)
Bias B	23% (11% - 35%)
Diffusion Tubes Mean:	42 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	34 μgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	34 (31 - 38) μgm^{-3}

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

Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.82 (0.74 - 0.9)
Bias B	23% (11% - 35%)
Diffusion Tubes Mean:	42 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	34 μgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	34 (31 - 38) μgm^{-3}



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Appendix C: Unadjusted NO₂ diffusion tubes data 2011

Site No.	Location	X	Y	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
B1	Prescot St/ RLUH Taxi Rank Lamp L7	335961	390845	73	M	65	72	51	52	37	53	64	61	74	46
B2	Prescot St/ RLUH Taxi Rank Lamp L7	335961	390845	80	M	70	73	45	56	50	51	56	63	57	27
B3	Prescot St/ RLUH Taxi Rank Lamp L7	335961	390845	68	M	69	73	47	54	47	51	56	63	63	41
B4	Kensington/Farnworth St Junct	336660	390983	65	60	56	61	40	48	50	47	50	47	54	34
B5	Outside Riverside Hsg Kensington/Sheil Rd	337344	391034	72	64	66	68	44	48	54	53	59	47	61	49
B6	Opposite old Aldi store Prescot Road	337899	390723	65	51	59	54	52	46	40	49	55	53	54	44
B7	Prescot Rd/Green Ln Junction Lamp Post	338979	391338	68	69	62	73	44	50	51	48	52	52	59	40
B8	Lamp post outside Sally Army Prescot Road	338720	391316	60	M	49	60	33	37	33	34	45	M	49	29
B9	Prescot Rd/St Oswalds St Junc Cent L Post	339408	391125	90	78	78	74	40	59	60	55	63	61	65	43
B10	Lamp Post by bus stop Blackhorse Lane / Prescot Road	339794	391298	54	45	51	58	28	31	31	32	40	42	46	30
B11	Central Reservation Prescot Road at Jct of light by Sainsburys	340263	391477	73	54	57	53	34	39	36	42	50	37	44	37
B12	Corner Finch Lane / East Prescot Road			58	52	39	56	33	38	34	38	44	41	50	30
B13	Midland Chambers (Everton Road / West Derby Rd) No 14 bus stop	336101	391272	62	54	55	50	36	46	45	45	46	37	52	38
B14	Lamp post outside No 55 Everton Road	335973	391460	64	60	64	54	35	42	39	41	53	51	54	39
B15	Lamp at Jct of Everton Rd / Breck Road	335793	391838	62	57	57	52	33	36	31	37	49	43	55	32
B16	Lamp Breck Road (opposite Lance Close)	336017	391984	54	45	46	41	22	25	27	29	38	34	45	25
B17	Lamp outside Green Cross Pharmacy	336429	392268	55	46	50	44	21	28	27	30	35	35	41	26
B18	Lamp outside Quality Fireplaces Breck Road	336740	392464	66	61	57	50	35	41	35	44	50	40	44	39
B19	Lamp at side of Georgesons car (Priory Road)	336969	392766	62	50	54	49	29	37	38	38	44	39	50	30
B20	Lamp outside No 93 Townsend Lane	337305	392984	50	47	56	44	34	36	36	38	44	35	38	30
B21	Telegraph pole outside Clubmoor community centre	337761	393399	55	39	48	41	20	25	23	25	37	34	47	25
B22	Lamp in central res. opposite 51 Townsend Ave	338136	393961	63	51	52	45	31	35	34	38	42	39	49	31

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B23	Lamp on central reserve opposite Surestart Utting Ave East	338345	394413	70	39	67	49	24	35	33	37	44	37	49	40
B2 4	Lamp central reserve opp. St Theresa's schl Utting Ave East	338813	394661	50	46	44	40	22	25	26	28	33	34	45	26
B2 5	Traffic Lt in cntrl reserve Jct of Lowerhouse / Utting Ave East	339443	395098	59	43	47	43	22	28	29	29	35	33	42	27
T26	Islington AQ Station Traffic Lights	335394	390956	63	M	51	48	34	44	34	37	M	46	51	M
T27	Islington AQ Station Traffic Lights	335394	390956	51	M	55	49	31	42	32	39	M	43	43	M
T28	Islington AQ Station Traffic Lights	335394	390956	60	M	55	47	26	42	35	38	M	41	48	M
T29	Leeds Street/Pall Mall Road Sign	334057	391098	70	M	69	62	35	47	40	48	M	M	55	31
T30	Leeds Street/Pall Mall Road Sign	334057	391098	66	56	63	54	41	52	42	40	32	46	60	34
T31	Leeds Street/Pall Mall Road Sign	334057	391098	55	M	61	60	38	53	43	45	49	46	M	M
T32	Crosshall Street Downpipe 2nd Alng from Dale St.	334585	390677	64	65	66	75	49	68	56	56	56	50	58	47
T33	Crosshall Street Downpipe 2nd Alng from Dale St.	334585	390677	65	66	65	77	49	64	58	53	59	55	57	44
T34	Crosshall Street Downpipe 2nd Alng from Dale St.	334585	390677	69	59	75	70	48	68	55	54	52	54	60	34
T35	Liverpool Centre Old Haymarket	334762	390686	65	48	69	61	46	54	49	48	M	38	51	35
T36	Liverpool Centre Old Haymarket	334762	390686	59	63	65	60	48	52	49	52	48	52	65	43
T37	Liverpool Centre Old Haymarket	334762	390686	74	64	69	67	50	55	49	50	M	49	56	41
T38	Covent Garden/Dale St Lamp Post RH side	334086	390425	61	55	58	17	36	42	47	42	40	41	39	24
T39	Strand Street/Water Street Jct-Roadsign L2	334277	390231	71	M	82	84	55	65	58	56	62	60	59	M
T40	Strand Street/Water Street Jct-Roadsign L2	334277	390231	67	M	76	84	52	60	61	59	53	58	M	M
T41	Strand Street/Water Street Jct-Roadsign L2	334277	390231	65	M	86	84	54	61	60	52	66	64	51	M
T42	Berry St o/s St Lukes Ch Pedestrian Lights	335221	389886	68	63	67	53	42	49	46	48	52	57	56	M
T43	Renshaw St/Bold St J cor Lamp Post Rapid	335222	389937	56	67	81	82	64	64	61	67	64	58	62	35
T44	Clarence St/Mount Pleasant J LP o/s JMU	335432	390107	69	77	73	76	43	56	51	45	52	53	M	20
T45	Pembroke PI LP o/s main ent Dental Hospital	335805	390630	70	49	73	69	43	52	55	53	51	47	59	M
S46	Edge Lane/Jubilee Dr LHS Junct nr C2414	336642	390484	84	70	79	69	44	47	44	54	M	M	M	M
S47	Edge Lane/Rathbone Rd Junc Lamp Post	339023	390715	69	46	64	70	32	44	53	44	37	35	54	35
S48	St Oswald St/Paraffin Oil Shop T.light L13	339149	390762	70	71	80	77	49	58	51	58	74	59	73	53
S49	Edge Lane Drive/Mill Ln L8047 Cent Resvtn	339380	390645	84	66	80	71	34	64	60	50	61	60	66	50
S50	Renville Rd/Bowring Park Rd 30MPH sign AQMA2 L14	340397	390344	67	59	72	58	M	54	45	54	70	55	61	35
S51	Renville Rd/Bowring Park Rd 30MPH sign AQMA2 L14	340397	390344	72	54	73	60	53	60	47	51	62	64	57	30

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S52	Renville Rd/Bowring Park Rd 30MPH sign AQMA2 L14	340397	390344	69	61	76	49	59	54	43	59	59	56	61	29
S53	Bowring Park Road Slip Rd on Give Way sign	340154	390501	56	44	49	59	27	38	47	36	31	34	42	23
S54	Hillfoot Rd/Allerton Rd J Lamp LH p J C2507	341976	386333	56	M	57	58	30	46	46	40	32	41	M	21
S55	Speke Rd 1st Dual Pelican Cross 2672/2673	340959	384247	M	64	72	66	51	58	68	63	33	67	60	36
S56	Speke DEFRA Site Tarbock Rd L24	343884	383601	36	M	29	26	M	19	22	20	18	M	M	M
S57	Speke DEFRA Site Tarbock Rd L24	343884	383601	M	M	31	31	12	19	24	M	M	M	22	M
S58	Speke DEFRA Site Tarbock Rd L24	343884	383601	39	M	29	26	13	20	19	M	M	M	M	M
S59	Smithdown Road Lamp outside Costcutter	338170	388629	70	70	81	M	51	58	53	48	63	58	61	48
S60	Smithdown Road info sign outside Sefton Pk pharmacy (by Asda)	337881	388939	72	68	67	58	48	53	49	50	60	63	62	28
S61	Smithdown Road Lamp in central Res opp. Budget exhausts	338977	388485	65	52	58	57	32	42	42	41	41	45	51	45
S62	Smithdown Road Info sign by Howard Jenkins funerals nr Jct with lodge lane	337003	389459	72	61	74	59	52	53	52	56	54	50	M	29
N63	Millbank/Queens Dr - Junction Lamp Post	339066	392667	75	77	84	83	61	65	61	M	80	66	62	M
N64	Muirhead Ave/Queens Dr central res traffic Lights (by dentist)	338689	393167	68	69	72	54	57	58	49	57	65	55	62	47
N65	Storrington Ave/Stonebridge Ln (on lamp post by traf.lights)	340046	395497	108	56	92	44	37	42	34	43	49	46	46	38
N66	Longmoor Ln/Seeds Ln J L Traffic C2607	337400	397234	50	42	53	44	32	38	34	40	44	37	44	34
N67	Middle Walton Vale-Pedestrian crossing	336375	396687	86	73	81	70	57	64	69	66	41	50	61	35
N68	Lamp post J 3268 outside 324-328 Rice Lane L9	336216	396165	68	61	62	66	36	46	46	48	55	50	50	36
N69	Queens Drive Monitoring Station	336164	394906	60	M	49	43	37	37	34	39	42	40	39	29
N70	Queens Drive Monitoring Station	336164	394906	57	53	53	42	36	38	34	35	44	44	45	25
N71	Queens Drive Monitoring Station	336164	394906	58	49	49	40	39	38	31	40	48	39	44	20
N72	County Rd/Spellow Ln-Lp nr Traffic C2222	335565	393897	68	59	70	60	39	45	47	48	58	51	56	31
N73	Blackstone St./Gt. Howard St. L3 LTS 2202	333866	392514	68	M	63	62	40	54	39	40	51	46	50	42