Detailed Assessment of Air Quality for Sefton MBC Update 2008

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Summary

This document should be read in conjunction with the Detailed Assessment (DA) of air quality carried out by Sefton MBC in 2007 for fine particles (PM_{10}) and nitrogen dioxide.

As a result of the work carried out in 2007, it was established that for fine particles, the PM_{10} daily average Standard Objective was exceeded at Crosby Road North, Waterloo on the A565 during 2006, but was likely to be met in 2007 and that other PM_{10} monitoring along the same road corridor at Millers Bridge in Bootle was giving cause for concern that the Standard would not be complied with in 2007.

In the case of nitrogen dioxide, it was established that at one location, Millers Bridge in Bootle, diffusion tube monitoring continued to show annual average levels of nitrogen dioxide above the Standard. A chemiluminescent monitor was installed at this site, but only six months data had at the time been collected.

Another diffusion tube sited at Lytton Grove, Seaforth, set up at the beginning of 2006 to further assess nitrogen dioxide levels around the area of the A5036 Princess Way, Seaforth also showed high levels. A chemiluminescent monitor was installed at Lathom Close, Seaforth, next to the roundabout where the A5036 Princess Way meets the A565 Crosby Road South in February 2007, but insufficient data had been collected to base any decisions on.

It was concluded for PM_{10}, taking all things into consideration and given that:

- The standard for PM_{10} was unlikely to be exceeded at the Crosby Road North monitoring site in 2007.
- Air quality issues were already an important part of the A565 Route Management Plan.
- The boundaries of any area would be subject to alteration based on results from the Millers Bridge monitoring station,

a decision on the need to declare an Air Quality Management Area (AQMA) and if declared its extent, be delayed until 2008 to allow further investigation of PM_{10} levels along the A565 corridor from Crosby to Bootle by:

- Collecting and analysing a full 12 month data set from the Millers Bridge PM_{10} monitoring site.
- Collecting and analysing a further 12 months PM_{10} data from the Crosby Road North monitoring site.
- Establishing a Lathom Close / Princess Way PM_{10} monitoring site.
- Undertaking a comprehensive review of meteorological conditions.

and then make a decision on the necessity for and extent of any AQMA in 2008.

For nitrogen dioxide, it was decided to wait until a full years continuous real time monitoring data had been obtained from Millers Bridge, Bootle and analyse additional data collected from the Lytton Grove and Lathom Close / Princess Way sites and report on in 2008.

Another factor in delaying a decision on declaration of any AQMA until further work had been carried out and further data collected, was the potential that the AQMA for nitrogen dioxide could lie inside the AQMA for PM_{10}, making declaration of a joint AQMA a possibility.

The conclusions from the further work carried out in this 2008 Detailed Assessment update report are that it will be necessary, due to the likely exceedence of NAQS Standard Objectives, to declare the following Air Quality Management Area's in Sefton:

1. An AQMA for PM_{10} based around the location of Waterloo Primary School, Crosby Road North in Waterloo along a section of the A565.

2. An AQMA for nitrogen dioxide based around the location of the junction of the A5036 Princess Way with the A565 Crosby Road South in Seaforth.

3. An AQMA for PM_{10} and nitrogen dioxide based around the location of the junction of the A5058 Millers Bridge with the A565 Derby Road in Bootle.

The proposed extent and geographical area of the above Air Quality Management Area boundaries are shown in the maps in **Appendix 3**. The area boundaries may be subject to change depending on the outcome of the results of future air quality dispersion modelling.

Building on the work already carried out, further additional work will now be undertaken to work towards bringing about compliance with the Air Quality Standard Objectives within the designated management areas, by preparation of an Air Quality Action Plan in order to achieve the Objectives by a specific date in the future and details of this will be given in a Further Assessment (Stage 4) and Action Plan report.

It is anticipated that the Further Assessment and Action Plan will take approximately one year to complete and a report on the findings issued in 2009.

Contents

Chapter 1 Introduction

1.1 Local Air Quality Management in Sefton

The concept of Local Air Quality Management was introduced in the 1995 Environment Act and required Local Authorities to undertake periodic Review and Assessments of air quality in their areas. If the Review and Assessment determines that National Air Quality Strategy (NAQS) health based air quality Standard Objectives, set by the Government, are unlikely to be met; the local authority is required to produce an Action Plan to work towards compliance with the Objectives.

The initial Review and Assessment, undertaken by Sefton in 1999 was a three stage process, with each stage requiring progressively more detailed investigation. A review undertaken by the Government of the effectiveness of the first round of Review and Assessments concluded that future rounds should be in two stages, an Updating and Screening Assessment (USA): that would determine if there had been any significant changes since the last Review and Assessment and, if the USA identified significant changes, a Detailed Assessment (DA).

The Review and Assessment is currently a two stage process. Initially an Updating and Screening Assessment is undertaken and then, if a risk of failing to meet the Objectives is identified, a Detailed Assessment is carried out. If the Detailed Assessment indicates that the NAQS Objectives are unlikely to be met, Local Authorities are required to declare the affected locations Air Quality Management Areas (AQMA's) and develop an action plan to improve air quality in these areas.

The Updating and Screening Assessment (USA) of air quality carried out by Sefton MBC in 2006 identified that a Detailed Assessment was required for fine particles (PM_{10}) and nitrogen dioxide.

A Detailed Assessment (DA) was carried out in 2007, but it was decided to delay a decision on the need to declare an AQMA and if declared it's extent, until January 2008 in order to carry out further work and data collection.

This document contains the results of the Detailed Assessment update undertaken by Sefton Council in 2008 to comply with its duties under the 1995 Environment Act and should be read in conjunction with the 2007 Detailed Assessment.

Further details on the LAQM process and the results of previous Review and Assessments undertaken in Sefton can be found on Sefton Councils website at: www.sefton.gov.uk/breathingspace.

Chapter 2 Fine Particles (PM_{10})

2.1 Introduction

The Updating and Screening Assessment (USA) of air quality carried out by Sefton MBC in 2006 identified that a Detailed Assessment (DA) was required for PM_{10}, as daily average levels of PM_{10} recorded in 2005 at Crosby Road North, outside Waterloo Primary School, came very close to exceeding the Governments Objective, with 34 exceedences recorded during 2005. A Detailed Assessment for PM_{10} was therefore undertaken.

The Detailed Assessment, completed in September 2007, established that for fine particles, the PM_{10} daily average Standard Objective was exceeded at Crosby Road North, Waterloo on the A565 during 2006, with 46 exceedences recorded. As early indications at the time were showing that the Standard was likely to be met in 2007 and that other PM_{10} monitoring along the same road corridor at the newly established Millers Bridge monitoring station in Bootle was also giving cause for concern that the Standard would not be complied with in 2007, it was decided to delay a decision on the need to declare an AQMA and if declared it's extent, in order to carry out further work and data collection.

2.2 Crosby Road North, Waterloo Air Quality Monitoring Station

The roadside air quality monitoring station located at Crosby Road North, Waterloo is situated outside a Primary School in a residential and shopping area next to the busy A565. This section of the A565 carries commuter traffic to and from Liverpool and a considerable amount of local traffic to offices and shops in the Waterloo area. There is a pedestrian crossing adjacent to the station and queuing traffic is commonplace.

The monitoring station measures fine particles (PM_{10}) and also oxides of nitrogen. Monitoring has been carried out at this site since August 2001. PM_{10} is measured using an ESM Andersen Instruments, Eberline Beta Attenuation Monitor (BAM) model FH 62 I-R, equipped with a Rupprecht and Patashnick sampling head and has a heated manifold.

In accordance with Technical Guidance LAQM TG (03), as the instrument is operating with a heated manifold, all PM_{10} results quoted have been adjusted by multiplying the data by 1.3, to estimate gravimetric equivalent concentrations.

The FH 62 I-R instrument was not included in the 'UK Equivalence Programme for Monitoring of Particulate Matter' study, carried out by Bureau Veritas (Report

Ref:BV/AQ/AD202209/DH/2396, June 2006) for DEFRA, to determine if equivalence criteria against the reference method EN12341 was met. However, ESM Andersen Instruments commissioned TÜV Süddeutschland, Bau and Betrieb to carry out comparative testing and their Report (No 2404 2605-2 September 2000) concluded that the FH 62 I-R met the requirements of EN 12341.

A location map and aerial photograph for the station are shown in **Figures 2.1** and **2.2** respectively.

Figure 2.1 Map Showing the Location of the Crosby Road North Air Quality Monitoring Station.

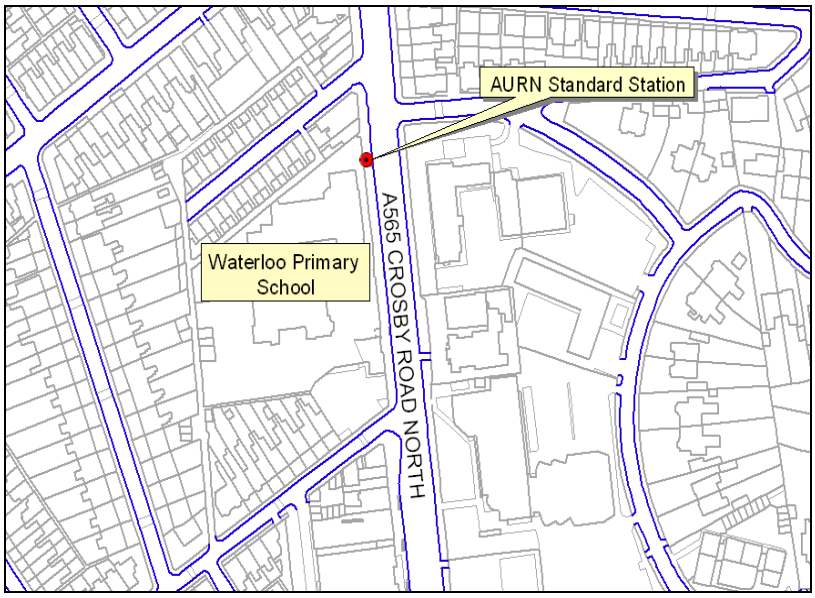


Figure 2.2 Aerial Photograph of the Location of the Crosby Road North Air Quality Monitoring Station.

2.2.1 PM_{10} Results From Crosby Road North, Waterloo

Details of all PM_{10} daily average results during 2007 are shown in **Appendix 1**. All data have been ratified and multiplied by 1.3 in accordance with the Technical Guidance LAQM TG (03) to estimate gravimetric equivalent concentrations.

There are two NAQS Standards and Objectives for PM_{10}:

- A Standard of 40 μgm^{-3} measured as an annual average, with an Objective to meet this Standard by 31 December 2004.

- A Standard of 50 μgm^{-3} measured as a daily 24 hour average, with an Objective for this not to be exceeded more than 35 times per year by 31 December 2004.

Both Standards at this location were met in 2007:

The annual average PM_{10} concentration at this location in 2007 was 29.3 μgm^{-3} and is in line with having been consistently below the 40 μgm^{-3} Standard since monitoring began.

The PM_{10} daily average Standard was exceeded on 21 days in 2007, the lowest number of exceedence days recorded for a whole years data.

The results at this site since 2001 are shown in **Table 2.1** below.

Table 2.1 Results from PM_{10} Monitoring at Crosby Road North, Waterloo (2001 – 2007)

Year	Annual Average PM_{10} adjusted to gravimetric (μgm^{-3})	No. of Exceedence Days of PM_{10} Daily Standard
2001	30.2*	7*
2002	32.6	36
2003	38.6	63
2004	33.4	29
2005	33.7	34
2006	34.8	46
2007	29.3	21

* August to December 2001.

2.2.2 Monthly, Daily Trends and Meteorological Influences

Monthly and daily trend data analysis of the exceedences of the daily Standard during 2007 were compared with previous years, to try to identify the possible circumstances responsible for the lower number of daily exceedences recorded in 2007. A breakdown of the number of exceedences in each month is shown in **Table 2.2**.

Table 2.2 Number of Exceedences of the PM_{10} Daily Standard in Each Month at Crosby Road North, Waterloo (2001 – 2007)

Month	2001	2002	2003	2004	2005	2006	2007
Jan	n/a	6	4	0	3	9	2
Feb	n/a	2	13	6	5	8	1
Mar	n/a	6	16	8	2	2	5
Apr	n/a	6	9	1	4	1	4
May	n/a	3	1	1	0	5	1
Jun	n/a	0	0	0	0	2	0
Jul	n/a	0	1	0	0	6	0
Aug	0*	0	3	1	1	1	0
Sep	0	1	2	3	2	3	0
Oct	1	1	2	0	4	3	1
Nov	2	4	5	2	9	1	3
Dec	4	7	7	7	4	5	4
Total	7	36	63	29	34	46	21

* Commenced 03/08/01.

From analysis of the monthly data, it can be seen that the high number of exceedences in 2006 during the months of January and February were not repeated in 2007 (17 compared to 3) with the 3 exceedences recorded in 2007 during these two months being the lowest total recorded since monitoring began.

Similarly, the high number of exceedences in 2006 recorded during May to July (13), a period which normally yields very few exceedence days, saw 2007 return back to the norm, with only 1 exceedence during this period.

Rainfall: The rainfall patterns over these periods, showed that in 2007 there were both more rainy days and higher total rainfall during the months in question, than in 2006. See **Tables 2.3** and **2.4**

Table 2.3 Number of Rainy days Jan – Feb and May – Jul 2004 – 2007

Year	Jan - Feb	May - Jul
2004	34	42
2005	39	46
2006	26	29
2007	33	52

Table 2.4 Total Rainfall (mm) Jan – Feb and May – Jul 2004 - 2007 Total Rainfall (mm) Jan – Feb and May – Jul 2004 – 2007

Year	Jan - Feb	May - Jul
2004	136.9	151.0
2005	78.8	202.5
2006	100.7	137.9
2007	143.0	291.6

Note - 2003 is generally considered to be a 'high pollution' year when national meteorological conditions resulted in elevated particulate levels throughout the country and as such the monthly levels for that year are out of step with other years and have therefore not been used for comparative purposes.

Day of the week: Examining the days of the week on which exceedences occurred, showed a not too dissimilar pattern in 2007, with 71 % of the exceedences occurring during weekdays (Monday to Friday) compared with 76% in 2006 and 80 % for 2001 – 2006. See **Figures 2.3** and **2.4**

Figure 2.3 Graph of Number of Exceedences of PM_{10} Daily Standard by Day of the Week at Crosby Road North, Waterloo (2007)

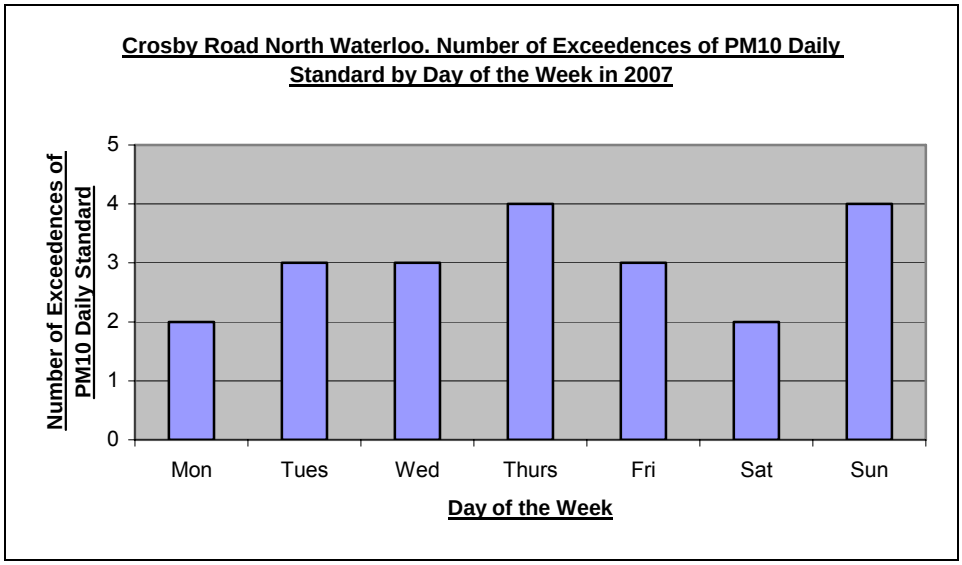
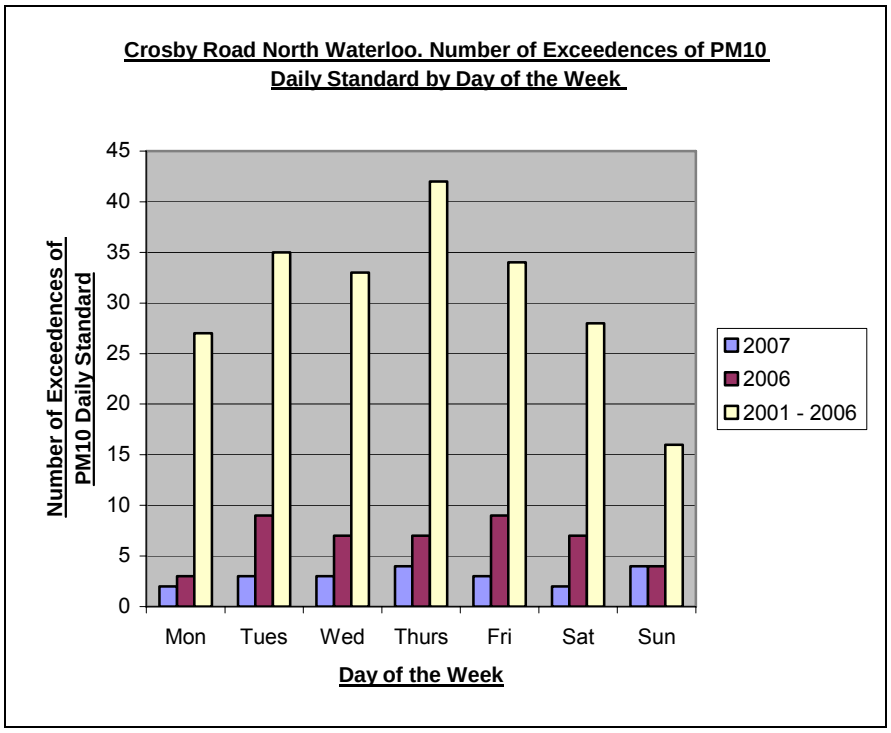


Figure 2.4 Graph of Number of Exceedences of PM_{10} Daily Standard by Day of the Week at Crosby Road North, Waterloo (2001 – 2007



Wind direction: Average wind direction during exceedence days in 2007 showed a broadly similar pattern to previous years, with 61% of exceedences occurring in the 90 – 180^0 wind sector, compared with 67% in 2006 and 58% during 2001 – 2006. See **Figures 2.5** and **2.6**

Figure 2.5 Average Wind Direction During Exceedences of PM_{10} Daily Average (2007)

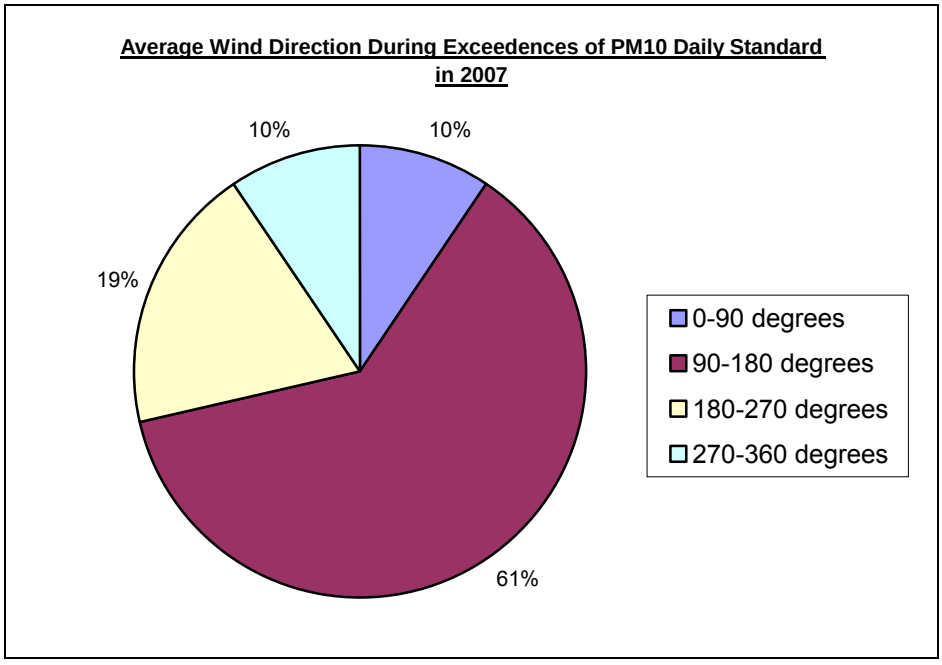
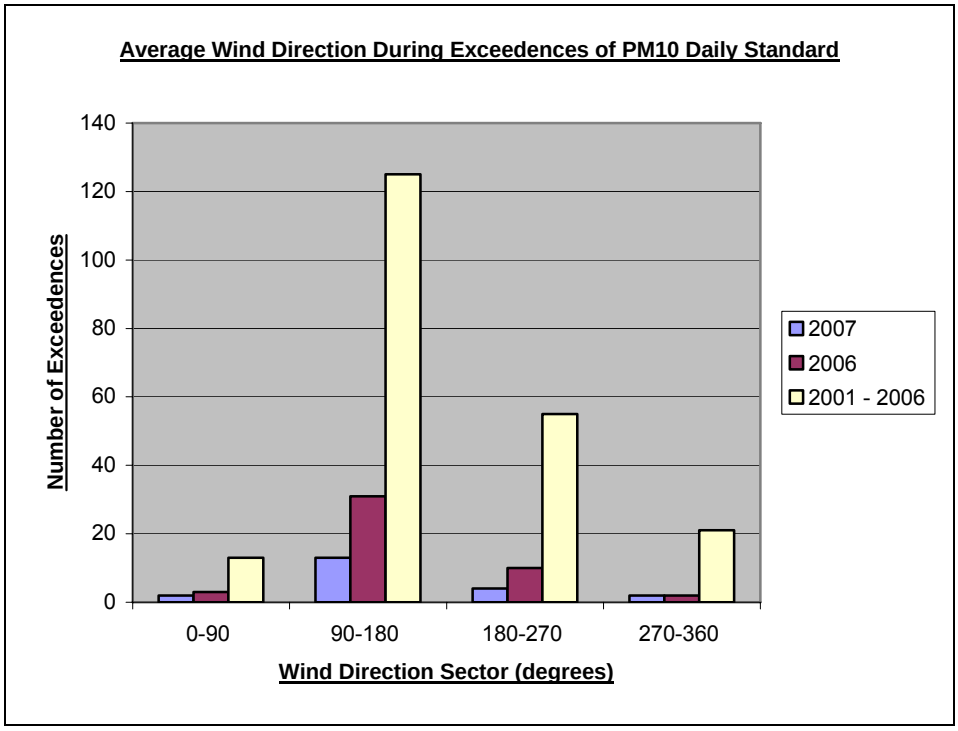


Figure 2.6 Average Wind Direction During Exceedences of PM_{10} Daily Average (2001 – 2007)



Wind speed: 66 % of the exceedences occurred when the wind speed was less than 2 m/s in 2007 compared with 87% in 2006 and 76% in 2001 – 2006. See **Figures 2.7** and **2.8**

Figure 2.7 Average Wind Speed During Exceedences of PM_{10} Daily Average (2007)

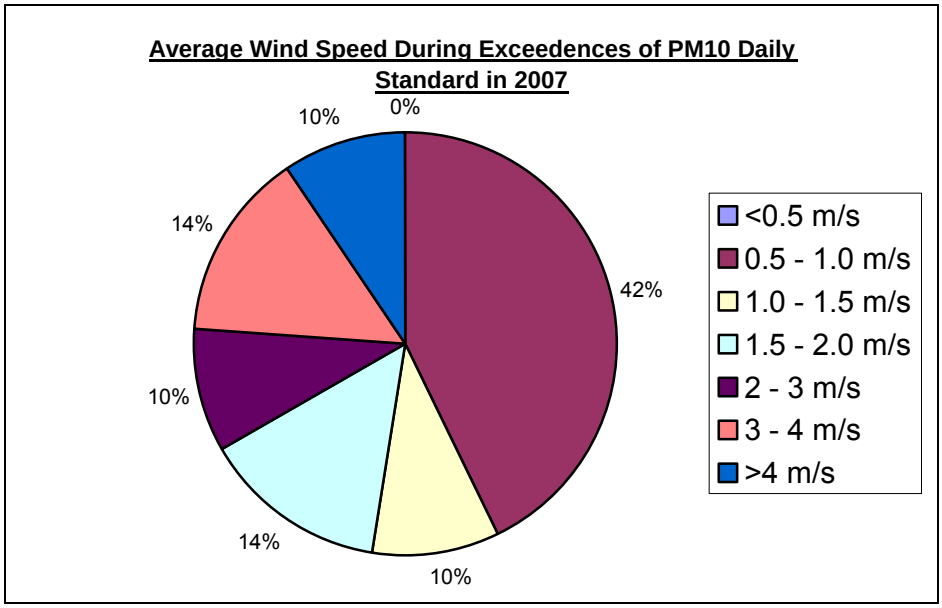
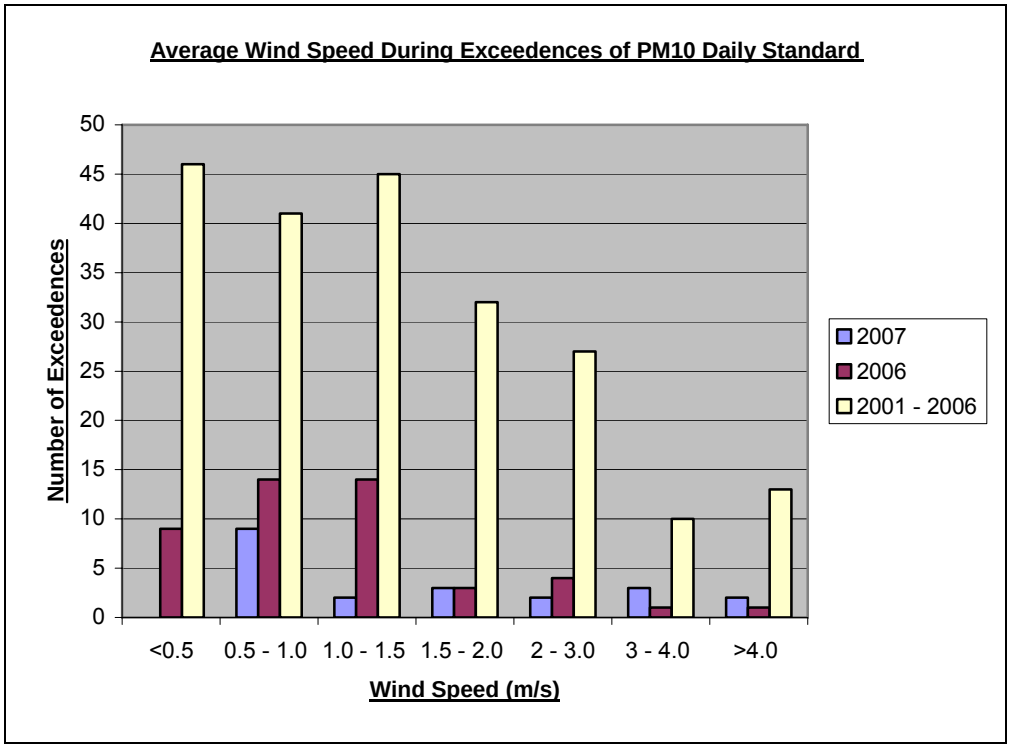


Figure 2.8 Average Wind Speed During Exceedences of PM_{10} Daily Average (2001 – 2007)



Temperature: 62% of the exceedences occurred when the temperature was less than 10 ^{0}C in 2007 compared with 57% in 2006 and 68% during (2001-2006), with 24 % occurring when the temperature was below 5 ^{0}C in 2007 compared with 44% in 2006 and 35% during 2001 – 2006. See **Figures 2.9** and **2.10**

Figure 2.9 Average Temperature During Exceedences of PM_{10} Daily Average (2007)

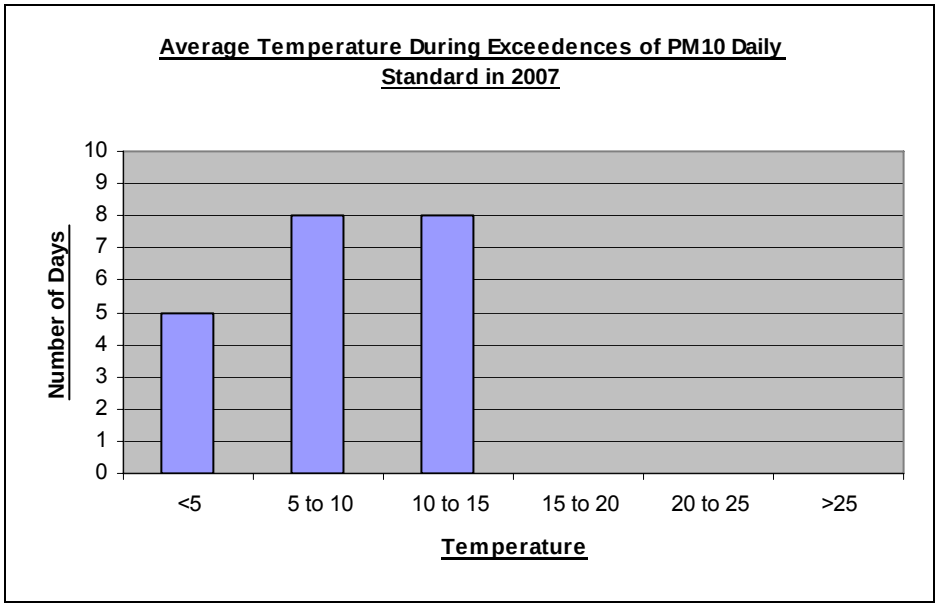
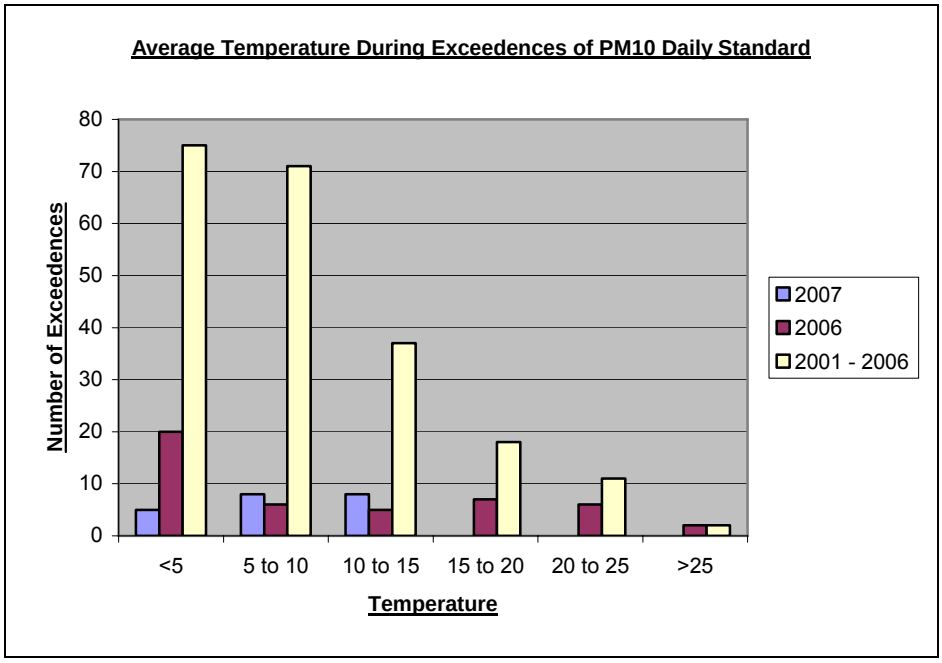


Figure 2.10 Average Temperature During Exceedences of PM_{10} Daily Average (2001 – 2007)



January to February period: As discussed previously, there was a significantly greater number of exceedences during these months in 2006 than in 2007, (17 versus 3). Rainfall patterns over these periods, already discussed, showed that in 2007 there were both more rainy days and higher total rainfall during the months in question, than in 2006. See **Tables 2.3** and **2.4**.

It was concluded in the 2007 Detailed Assessment, that exceedence days were most likely to occur on cold days, having low wind speed and when the wind direction is in the 90 – 180^0 sector and being consistent with the generally accepted view that cold still days and hot still days are related to elevated levels of air pollutants. It was also established in the 2007 Detailed Assessment, by comparison with data from other monitoring sites in the north west, that exceedences are caused by local effects influencing PM_{10} concentrations and also on days during high regional particulate levels.

Daily average temperature, wind speed and wind direction comparisons for January – February 2006 and 2007 were carried out. This showed that 2007 had higher temperatures, higher wind speeds and fewer days when the wind direction was in the 90 – 180^0 sector during these months. This combination of meteorological conditions appear to have been the reason for the much reduced number of exceedences recorded during January – February 2007. See **Figures 2.11 – 2.13**.

Figure 2.11 Average Daily Temperature January – February 2006 and 2007

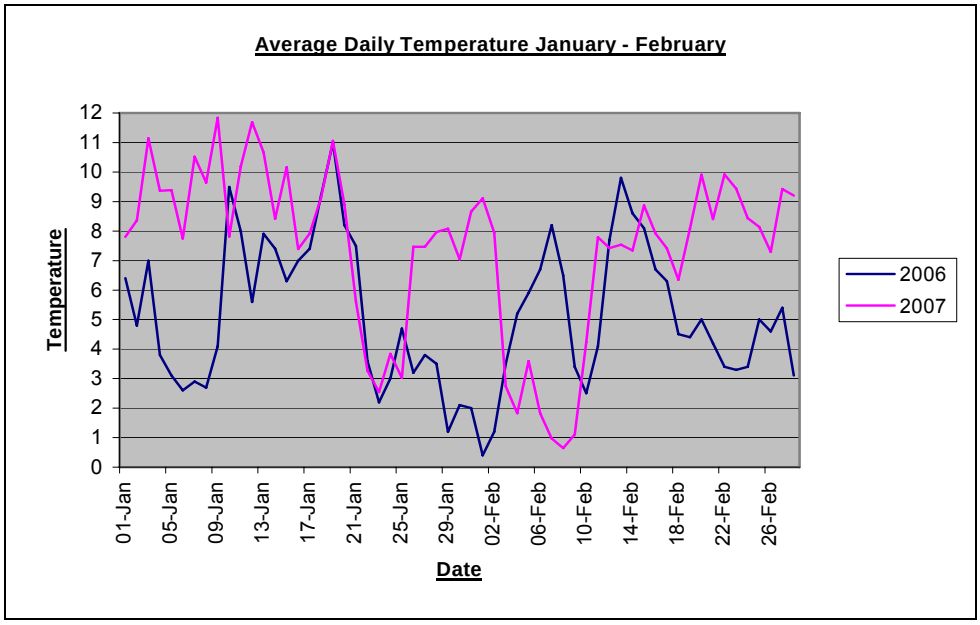


Figure 2.12 Average Daily Wind Speed January – February 2006 and 2007

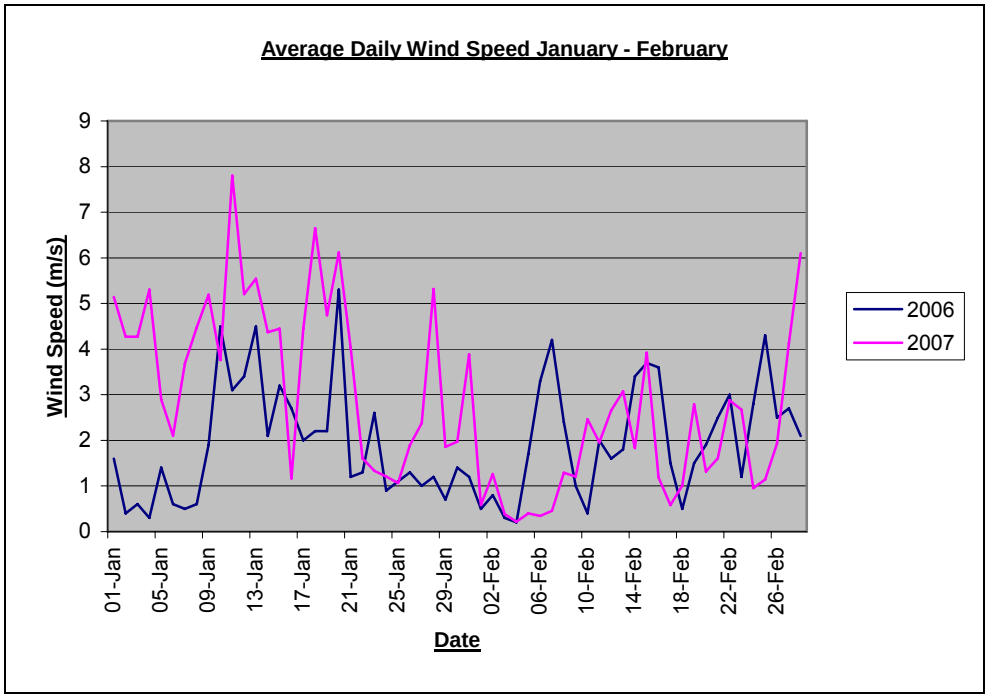
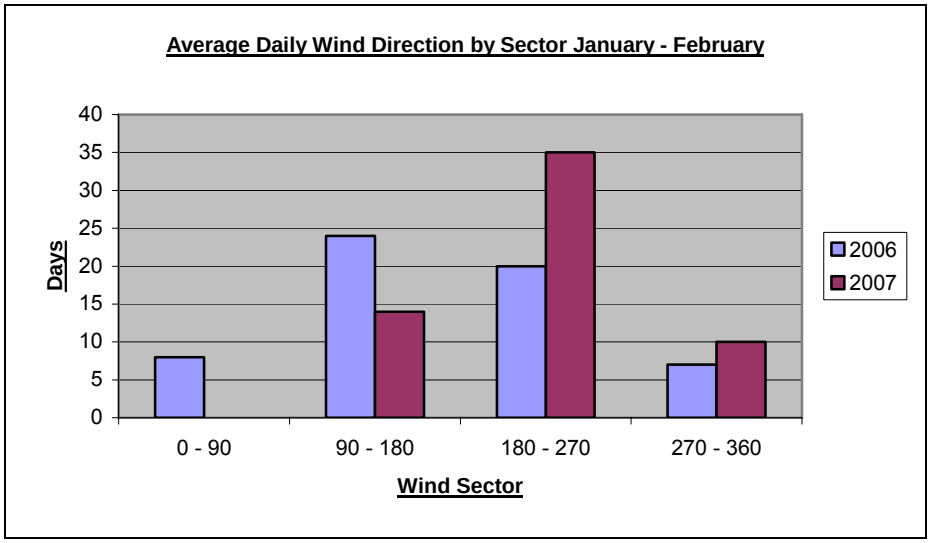


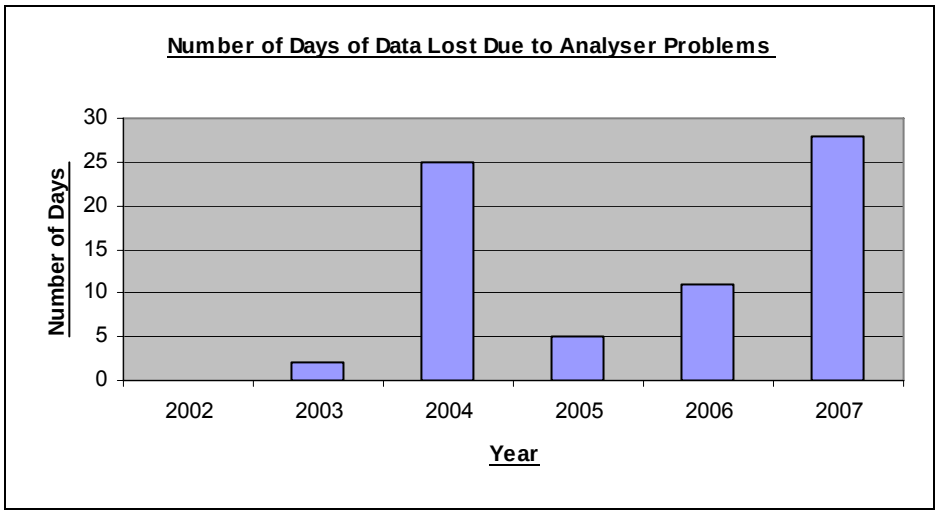
Figure 2.13 Average Daily Wind Direction January – February 2006 and 2007



Data Capture: Another significant factor during 2007, which may have contributed to the low number of exceedence days in 2007, was the number of days data lost due to instrument breakdown. A total of 28 days day were lost in 2007 compared with 11 in 2006, due to pump failure and intermittent tearing of the paper reel to the BAM. See **Figure 2.14**

The months affected when daily data was lost due to instrument malfunction were May (12), June (3), September (3) and October (10).

Figure 2.14 Number of Days Data Lost due to Instrument Breakdown



2.2.3 Conclusions Regarding Crosby Road North, Waterloo

The PM_{10} daily average Standard Objective was not exceeded at Crosby Road North, Waterloo during 2007. However it was exceeded in 2002, 2003 and 2006 and was borderline in 2005.

Road traffic is the main local source of PM_{10} and exceedences appear to be caused either as a result of high regional background levels of particulates combining with locally generated pollution or when the meteorological conditions are such, that they give rise to atmospheric conditions which result in poor dispersal of locally produced PM_{10}.

The effect of meteorological conditions appears to play a major factor in determining whether or not the Standard will be met in any given year. In 2006 there was a combination of meteorological conditions that led to an increased number of exceedences. In 2007 increased rainfall, particularly in the January – February and May – July periods appear to have suppressed particulate levels during these months. January – February 2007 also had higher temperatures, higher wind speeds and fewer days when the wind direction was in the critical 90 – 180^0 sector during these months, when compared with 2006 and it appears that this combination of meteorological conditions and increased rainfall were responsible for the large reduction in exceedences recorded during this period in 2007 compared with 2006. This, combined with lower than normal data capture, has led to the Standard being met in 2007.

Taking everything into account however, although the Standard was not exceeded at Crosby Road North, Waterloo in 2007, it has become apparent from the work carried out that it is highly probable that the Standard could be exceeded in future years, given a different set of meteorological conditions and full data capture.

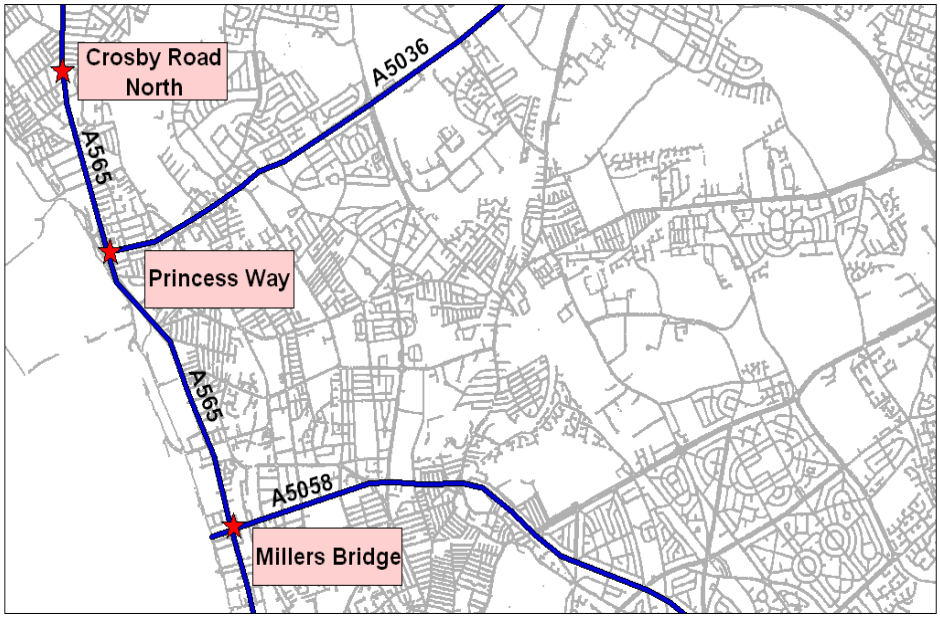
It will therefore be necessary to declare an Air Quality Management Area (AQMA) for PM_{10} based around this location.

2.3 Millers Bridge, Bootle Air Quality Monitoring Station

As previously discussed in the 2007 Detailed Assessment, Sefton redesigned its monitoring programme in 2006 to take account of the results of previous reviews and assessments, air pollution modelling and the monitoring carried out to that date. As a result of this, a new monitoring station was installed towards the end of October 2006, located further south of the Crosby Road North station on the A565, at the junction of Millers Bridge with Derby Road in Bootle. This station measures PM_{10}, and nitrogen dioxide. Funding was also secured for a BAM PM_{10} monitor to be

added to an existing monitoring station at the junction of Princess Way (A5036) with the A565, but there was a delay with the supply of this instrument and it was not installed until late January 2008. The locations of these stations in relation to the Crosby Road North monitoring station are shown in **Figure 2.15**.

Figure 2.15 PM_{10} Monitoring along the A565 Corridor



The roadside air quality monitoring station located at Millers Bridge is situated at the busy junction of Derby Road (A565) and Millers Bridge (A5058) and is in close proximity to the Port of Liverpool.

The monitoring station measures fine particles (PM_{10}) and also oxides of nitrogen. Monitoring has been carried out at this site since 27th October 2006. PM_{10} is measured using a Rupprecht and Patashnick 1400a series Tapered Element Oscillating Microbalance (TEOM), with a PM_{10} sampling head and has a heated manifold. The TEOM used at Millers Bridge is the instrument taken from the discontinued Southport Town Hall monitoring location. TEOM instruments were found not to meet the equivalence criteria in the 'UK Equivalence Programme for Monitoring of Particulate Matter' study, carried out by Bureau Veritas (Report Ref:BV/AQ/AD202209/DH/2396, June 2006) for DEFRA, to determine if equivalence criteria against the European reference method EN12341 was met. However, DEFRA have deemed results using TEOM to be acceptable for the purposes of LAQM in the UK.

In accordance with Technical Guidance LAQM TG (03), as the instrument is operating with a heated manifold, all PM_{10} results quoted have been adjusted by multiplying the data by 1.3, to estimate gravimetric equivalent concentrations.

2.3.1 PM_{10} Results From Millers Bridge Bootle

Details of all PM_{10} daily average results during 2006 and 2007 are shown in **Appendix 2**. All data have been ratified and multiplied by 1.3 in accordance with the Technical Guidance LAQM TG(03) to estimate gravimetric equivalent concentrations.

There are two NAQS Standards and Objectives for PM_{10}:

- A Standard of 40 μgm^{-3} measured as an annual average, with an Objective to meet this Standard by 31 December 2004.

- A Standard of 50 μgm^{-3} measured as a daily 24 hour average, with an Objective for this not to be exceeded more than 35 times per year by 31 December 2004.

The annual average PM_{10} concentration at this location in 2007 was 36.7 μgm^{-3} and meets the Standard.

The PM_{10} daily average Standard Objective was exceeded on 46 days in 2007 and does not meet the Standard.

2.3.2 Monthly, Daily Trends and Meteorological Influences

Monthly and daily trend data analysis of the exceedences of the daily Standard during 2007 was examined. A breakdown of the number of exceedences in each month during 2006 and 2007 is shown in **Table 2.6**

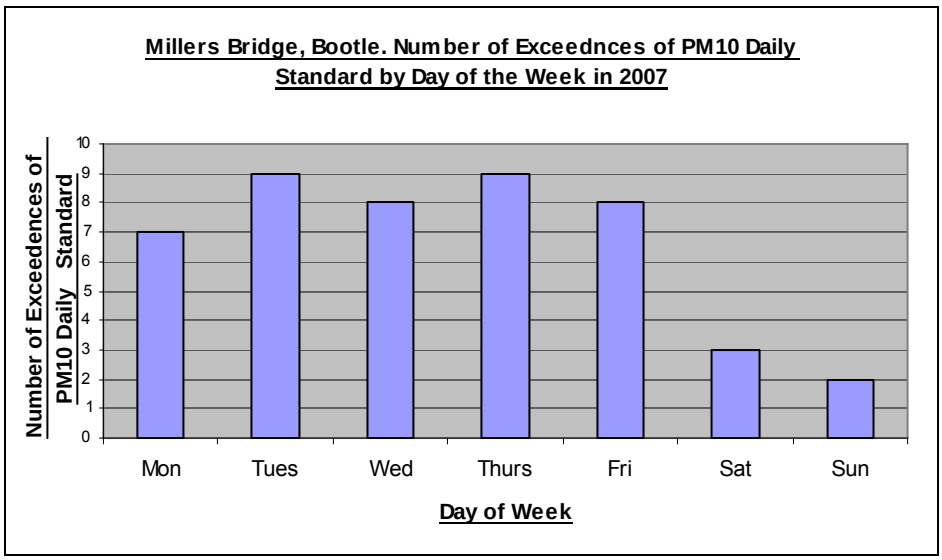
Table 2.6 Number of Exceedences of the PM_{10} Daily Standard in Each Month at Millers Bridge, Bootle (2007)

Month	2006	2007
Jan	n/a	1
Feb	n/a	5
Mar	n/a	8
Apr	n/a	6
May	n/a	0
Jun	n/a	5
Jul	n/a	2
Aug	n/a	5
Sep	n/a	4
Oct	0*	4
Nov	4	5
Dec	4	1
Total	**8**	**46**

* Commenced 27/10/06.

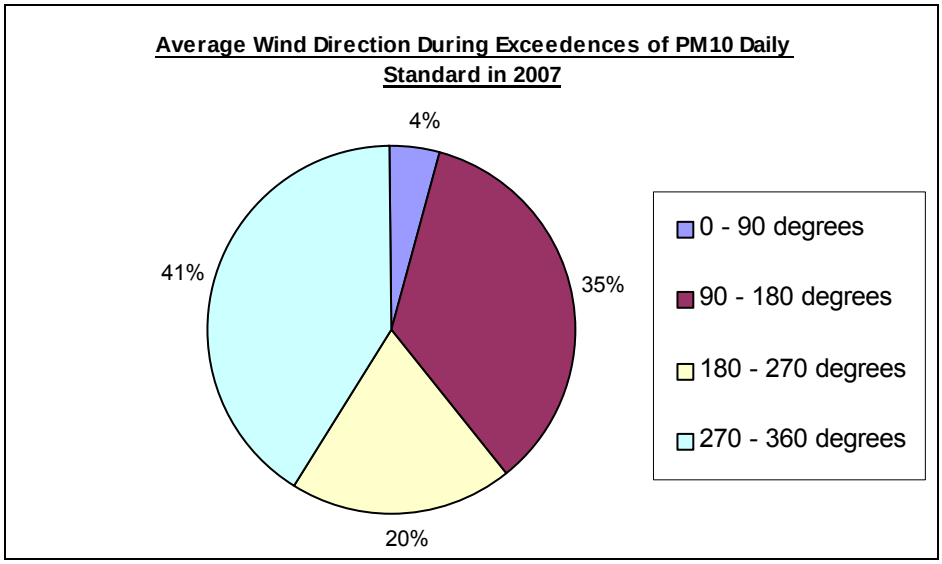
Day of the week: Examination of the day of the week on which exceedences occurred, revealed that 89% of exceedences (41 out of 46) occurred on weekdays, Monday to Friday, see **Figure 2.16**. Of the 5 that occurred on Saturday or Sunday, 1 was as a result of the effects of bonfire night (4/11/07) and the remaining 4 occurred during days identified as being influenced by regional effects on 25/3/07, 14/4/07, 9/6/07 and 10/6/07, see **Table 2.7**.
It can be concluded from this that there is strong evidence of a working day influence on PM_{10} emissions at this location.

Figure 2.16 Graph of Number of Exceedences of PM_{10} Daily Standard by Day of the Week at Millers Bridge, Bootle (2007)



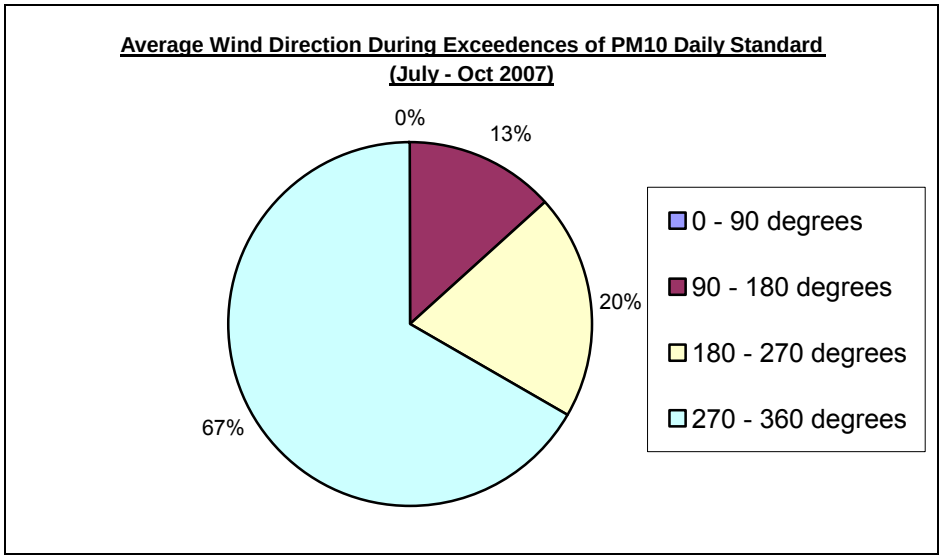
Wind direction: Analysis of the average wind direction during exceedence days in 2007 showed most exceedences occurred when the wind direction was either from the northwest with 41% occurring in the 270 – 360^0 sector or the southeast with 35% occurring in the 90 – 180^0 sector. See **Figure 2.17**

Figure 2.17 Average Wind Direction During Exceedences of PM_{10} Daily Average (2007)



The number of exceedences when the wind direction was in the 270 – 360^0 sector rose significantly from 41% to 67% when the period from July to October 2007 was examined, representing 10 out of the 15 exceedences recorded during this period. See **Figure 2.18**

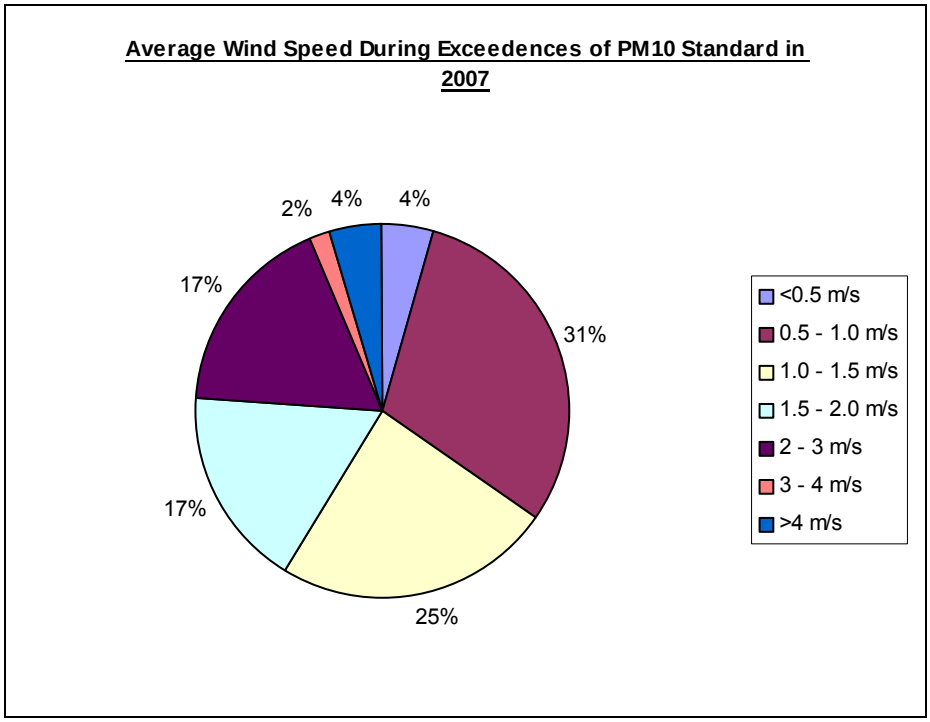
Figure 2.18 Average Wind Direction During Exceedences of PM_{10} Daily Average July to October 2007



Further examination showed all 10 exceedences fell within the 285 – 315^0 sector.

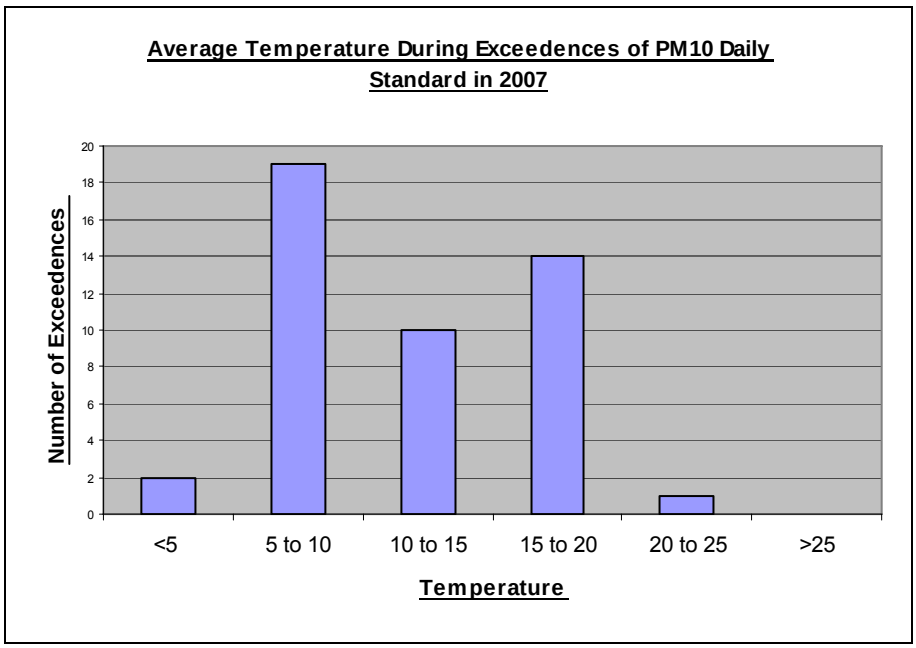
Wind speed: Analysis of the wind speed data showed 76% of the exceedences occurred when the wind speed was < 2 m/s. See **Figure 2.19**

Figure 2.19 Average Wind Speed During Exceedences of PM_{10} Daily Average (2007)



Temperature: The average temperature during exceedence days was also examined, showing the exceedences occurred mostly when the temperature was in the range 5 to 20 ^{o}C, and is shown in **Figure 2.20**

Figure 2.20 Average Temperature During Exceedences of PM_{10} Daily Average (2007)



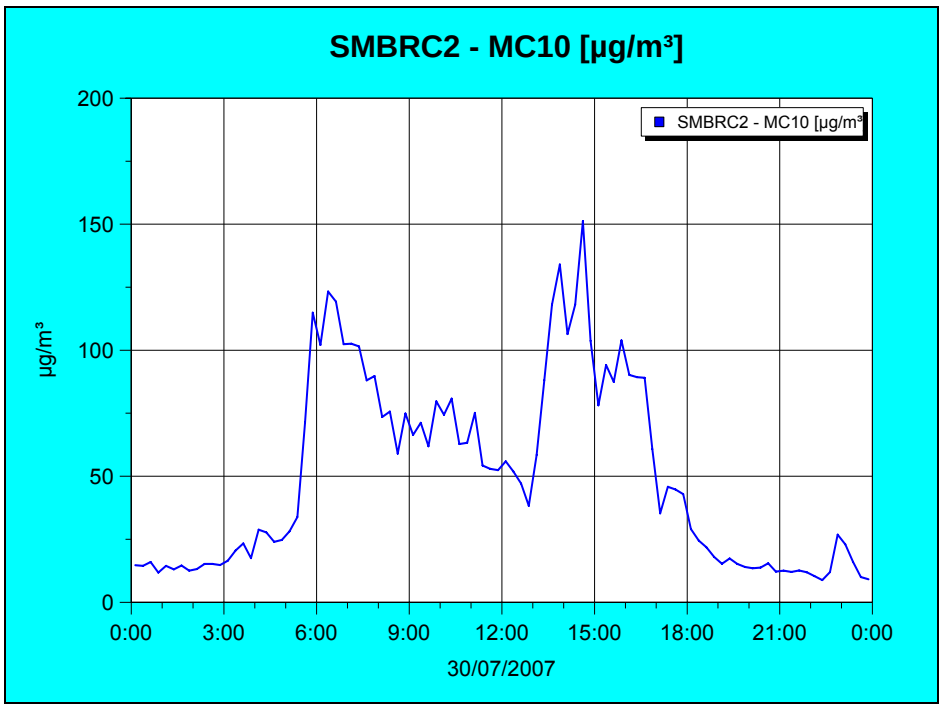
Sources of PM_{10}: The Millers Bridge location is heavily influenced by emissions from road traffic and in particular from

heavy goods vehicles, which make up a high proportion of the total number of vehicles which pass through this location and is exacerbated due to the incline in the road. In addition to road traffic sources, the Millers Bridge location being close to Port of Liverpool, is also subject to sources of fugitive emissions of PM_{10} from the handling of dusty cargoes and from the activities of various businesses operating within the dock estate.

Two businesses, JMD Haulage Limited and European Metal Recycling, have been identified as sites within the dock estate whose activities have had an impact on elevated PM_{10} in the locality.

On the 30th of July 2007 some very high PM_{10} levels were recorded at the Millers Bridge station. See **Figure 2.21**

Figure 2.21 PM_{10} Levels at Millers Bridge on 30th July 2007



A drive around search of the area to investigate the possible cause of the elevated particulate levels, identified the likely source to be JMD Haulage Limited, a five acre container storage yard and haulage business situated on Regent Road, Bootle within the Port of Liverpool dock estate.

The company is Merseyside's largest road haulier, with a fleet of over 50 vehicles and handles all aspects of container storage, repair and sales from the site. The site is currently not fully concreted and large areas of the complex have only a loose hardcore surface as its base. During the heavy rain in the months preceding the incident, there was evidence to suggest that the yard had become very muddy and that vehicles from the yard had

tracked mud onto the roadways near the site entrance, which in turn had dried out and become very dusty (see **Figure 2.22**). Vehicles driving through the dust were observed generating large clouds of dust (see **Figure 2.23**) and the wind direction was such that it was consistent with the dust blowing in the direction of the monitor at Millers Bridge. A further later visit to the yard during a period of heavy rain confirmed the extent of the problem and how muddy the site can become (see **Figure 2.24**).

Figure 2.22 Dust to Site Entrance at JMD Haulage

Figure 2.23 Dust Cloud Generated by Vehicle Driving Through Tracked Out Dust

Figure 2.24 JMD Haulage Yard During Heavy Rain

Daily PM_{10} levels at the Millers Bridge, Bootle site were compared with nearby Crosby Road North, Waterloo and St Joan of Arc School, Bootle monitoring sites and with the results from Automatic Urban Network (AUN) sites in the north west region of England at Bury, Manchester, Wigan and Liverpool Speke to try to, as a rough guide, identify and breakdown which exceedences

could be attributed to site specific incidents, which were due to the influence of high regional background levels and which were as a result of local area produced incidents. This is shown in **Table 2.7**

Table 2.7 Regional Background, Local and Site Specific PM_{10} Incidents 2007

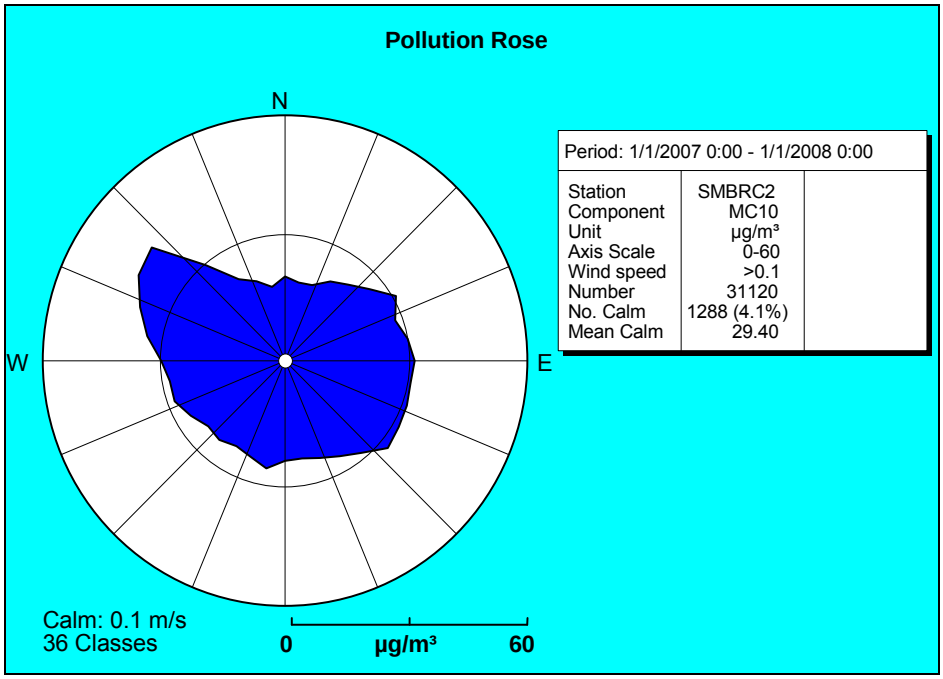
Date	Bury	M'cr	Wigan	Speke	Millers Bridge	Waterloo	St Joan	Category
02/01/2007	29.8	30.7	30.7	30.4	54.1	51.5	47.8	L
02/02/2007	31.8	34.3	24.8	32.3	53.6	35.9	32.8	SS
07/02/2007	73.2	50.6	51.1	45.6	69.4	67.0	46.5	R
14/02/2007	41.7	n/a	31.0	34.0	52.5	41.7	48.6	L
20/02/2007	39.1	28.3	28.0	20.2	50.3	39.4	35.6	SS
26/02/2007	22.9	26.0	24.9	25.3	54.2	30.0	33.0	SS
01/03/2007	29.5	37.1	27.3	n/a	53.3	40.4	41.9	SS
07/03/2007	35.8	35.9	26.3	n/a	51.4	34.7	36.0	SS
14/03/2007	35.8	33.5	29.2	n/a	61.0	32.5	41.1	SS
25/03/2007	84.1	76.2	90.9	70.2	89.3	74.9	80.1	R
26/03/2007	69.5	74.5	65.9	67.7	84.6	71.1	65.9	R
27/03/2007	83.8	102.2	81.9	115.5	115.7	126.0	98.3	R
28/03/2007	71.6	114.8	65.8	90.9	75.7	72.2	53.8	R
30/03/2007	60.6	82.5	52.9	67.7	61.4	68.1	50.6	R
02/04/2007	35.6	48.2	41.2	45.9	51.7	45.0	39.0	R
12/04/2007	37.9	41.0	41.2	53.6	69.0	52.5	48.5	R
13/04/2007	46.3	58.2	44.7	63.6	70.9	63.4	45.9	R
14/04/2007	42.1	59.9	50.1	68.0	70.9	75.0	54.2	R
16/04/2007	28.4	44.6	24.6	31.5	66.7	34.3	39.7	SS
17/04/2007	16.5	22.6	20.8	14.1	58.6	25.2	34.7	SS
08/06/2007	n/a	37.6	44.5	41.5	64.0	36.5	38.7	SS
09/06/2007	n/a	44.9	24.7	30.4	52.3	27.8	29.0	R
10/06/2007	n/a	31.9	36.3	44.0	46.7	n/a	43.0	R
11/06/2007	n/a	46.8	42.3	37.9	54.2	n/a	43.6	R
27/06/2007	n/a	25.1	23.8	9.4	54.7	26.1	26.9	SS
19/07/2007	31.5	17.1	19.7	13.9	55.3	28.7	24.6	SS
30/07/2007	18.5	11.0	16.5	9.3	63.1	22.0	23.4	SS
07/08/2007	20.2	12.6	17.9	7.5	53.3	18.6	23.4	SS
23/08/2007	21.3	14.8	21.5	10.2	64.1	20.0	27.7	SS
24/08/2007	26.6	23.2	12.6	8.8	56.2	15.9	23.3	SS
29/08/2007	21.0	18.0	15.0	11.8	79.3	18.7	22.8	SS
30/08/2007	16.4	12.7	13.9	10.6	85.2	18.2	24.8	SS
10/09/2007	20.3	15.5	23.8	15.9	78.4	30.0	28.0	SS
11/09/2007	30.0	21.7	21.5	14.8	61.6	25.5	25.6	SS
13/09/2007	38.4	31.6	33.6	20.7	50.4	35.4	36.9	SS
14/09/2007	25.1	18.4	19.7	12.6	60.2	33.0	36.3	SS
11/10/2007	47.5	39.8	32.4	27.8	52.9	41.0	33.2	SS
17/10/2007	25.1	19.2	18.0	9.3	52.9	n/a	22.1	SS
18/10/2007	38.9	33.8	35.0	28.0	52.9	n/a	34.2	SS
25/10/2007	24.6	35.2	33.0	36.5	53.6	39.9	37.3	SS
04/11/2007	110.9	204.2	n/a	124.1	135.5	121.9	106.1	R
06/11/2007	29.8	59.9	29.8	18.5	70.5	37.3	35.9	SS
14/11/2007	38.8	29.3	32.4	24.0	55.1	41.7	33.9	SS
15/11/2007	56.2	42.4	45.0	34.5	57.9	54.6	41.0	R
16/11/2007	63.0	37.8	34.2	23.0	54.3	44.2	34.6	R
11/12/2007	65.2	49.6	n/a	37.0	61.9	50.4	47.3	R

Key to category: L = local, R = regional, SS = site-specific incident (highlighted in yellow). n/a = no data available.

Analysis of this data identified periods on which the exceedences were clearly caused by high regional PM_{10} levels, e.g. towards the end of March. However it also showed numerous definite periods where the exceedences were due to a site specific influence, in which much higher levels were recorded at Millers Bridge than at any of the other sites, e.g. most notably during the July to September exceedences. Using this method to categorise the type of exceedence, indicates that 27 days, which equates to 59 % of the exceedences were due to site-specific causes.

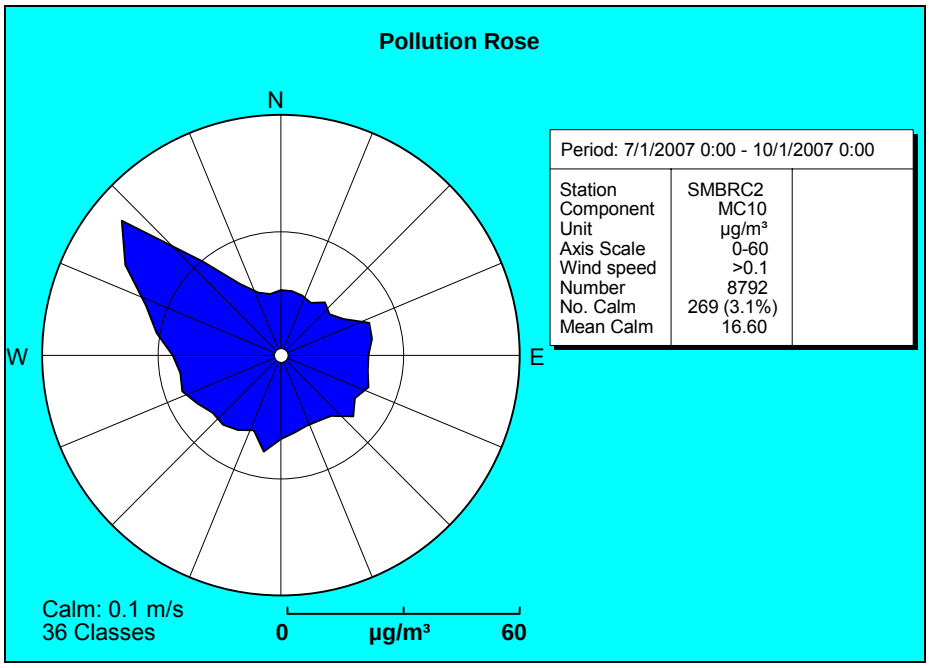
Looking at pollution roses during whole of 2007 confirmed the main source of PM_{10} to be from the 285 – 315^0 direction and is in agreement with previous analysis indicating this sector to be predominant on exceedence days and is consistent with JMD Haulage as a potential source. See **Figure 2.25**

Figure 2.25 Pollution Rose Millers Bridge Jan – Dec 2007



The contribution from this direction is even more noticeable when the pollution rose for July to September, the months identified as being site specific, is displayed. See **Figure 2.26**

Figure 2.26 Pollution Rose Millers Bridge July – Sept 2007



Following a meeting with the director of JMD Haulage Limited, Sefton Council are currently working with the company to better control and minimise dust emissions both within and immediately outside the site.

Another potential source from this direction is European Metal Recycling (EMR), which is situated opposite JMD Haulage Limited, at Alexandra Building, Alexandra Dock 1, Bootle.

European Metal Recycling shreds metal consumer products such as motor vehicles and large household appliances. The shredder at Bootle is one of the largest machines of its kind globally. Moving hammers shear the contents of the mill against fixed anvils at rotary speeds of over 420 rpm, allowing a vehicle to be shredded in just 30 seconds. An automated control system monitors the operation, to resolve problems and feeding an appropriate flow of water into the mill to minimise dust emissions. The system also employs air cyclone technology to draw off the lighter fraction of rust, dust and plastics.

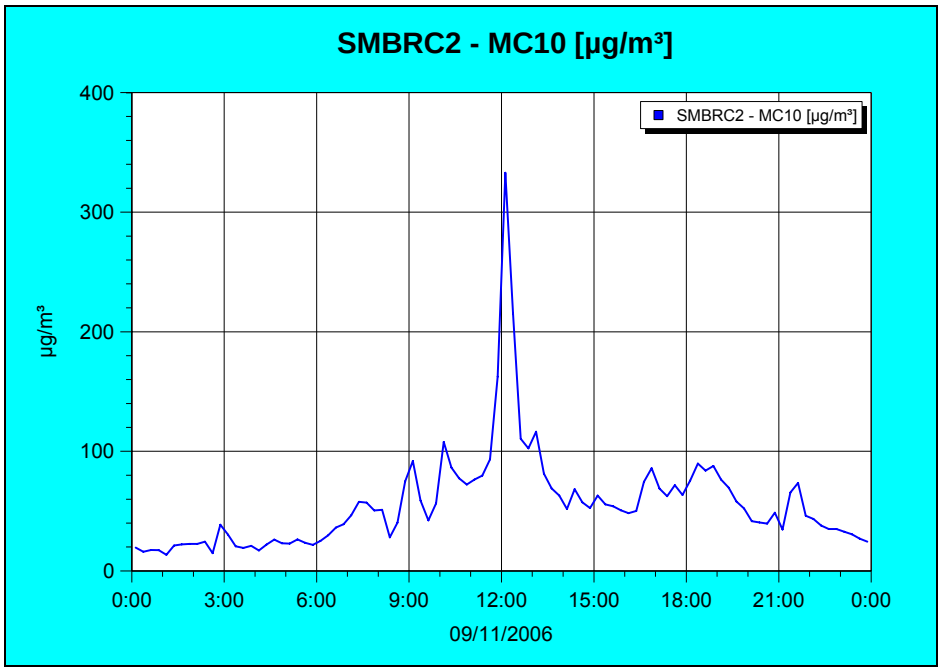
Manual picking is used to remove copper armatures and other items, while rotary magnets extract top-quality shredded steel for distribution to steelworks and foundries worldwide. At the same time, over-band magnets and eddy-current separators recover the metal fines from the light fraction. A conveyor system carries the remaining fraction of mixed heavies, made up of non-ferrous metals, rubbers, aggregates and dense plastics, for onward transfer and treatment. The shredders can typically achieve recycling rates of up to 75% by weight.

The site is regulated by the Environment Agency. Evidence of poor dust control when handling rusty degraded material has been witnessed on several occasions, with dust emissions having been observed both on and off site by Sefton Council officers. See **Figure 2.27,** where a cloud of reddish dust can be seen to the bottom left of the picture, as scrap metal is moved around the site by excavators.

Figure 2.27 Dust From European Metal Recycling Operations

This incident was witnessed on 9th November 2006. Dust was observed blowing off site and corresponded with very high PM_{10} levels at the Millers Bridge site. The average wind direction during at the time of the incident was 310^0. The PM_{10} levels recorded during the incident are shown in **Figure 2.28**

Figure 2.28 PM_{10} Levels at Millers Bridge on 9th Nov 2006



Sefton Council are currently working jointly with the Environment Agency to ensure European Metal Recycling are operating within the conditions of their operating licence.

The location and proximity of both European Metal Recycling and JMD Haulage Limited in relation to the Millers Bridge monitoring station is shown in **Figure 2.29**

Figure 2.29 Aerial Photograph of the Location of the Millers Bridge Air Quality Monitoring Station.

Two laser nephelometer airborne particle screening monitors sited north of the Millers Bridge monitoring location, close to European Metal Recycling and JMD Haulage Limited (as indicated in **Figure 2.29**) have also shown elevated PM_{10} levels. This is further indication of the influence on PM_{10} levels from these commercial operations, with the screening monitors recording high levels when the wind direction is south westerly and demonstrates that the area further north of the Millers Bridge site on the A565 Derby Road is also being affected by high particulate levels. If a DEFRA air quality grant application is successful, it is intended to install a PM_{10} BAM monitor and oxides of nitrogen analyser at this location to further monitor levels in this area.

A TEOM filter from the Millers Bridge monitoring station was sent to Bureau Veritas's St. Albans laboratory for scanning electron microscope and energy dispersive x-ray analysis, to determine the elemental composition of the dust deposit present on the filter and aid identification of the principal source(s) of the dust. From the spectra obtained from the various particles analysed (after removing the elements associated with the filter itself) the deposits were found to consist principally of iron, chlorine (as chloride), calcium and sulphur. Although the results are not totally conclusive, the following conclusions can be made. Given the EMR scrap metal operation is located next to the sea and subject to sea salt spray, the iron and chlorine present on the filter could be associated with this source. Calcium present could be associated with general dust in the environment and is consistent with the dust from JMD Haulage yard. Sulphur is likely to be associated with road traffic vehicle exhaust emissions. Although the preceding conclusions have been drawn, it is recognised that these are based on the analysis of only one sample used for indicative purposes and that further work in this area is planned.

2.3.3 Conclusions Regarding Millers Bridge, Bootle

The PM_{10} daily average Standard was exceeded at Millers Bridge, Bootle during 2007. It will therefore be necessary to declare an Air Quality Management Area (AQMA) for PM_{10} based around this location.

Although emissions from road traffic is a significant source to particulate levels at this location, particularly from HGV's, there is strong evidence to suggest that a major factor in the high number of exceedences recorded at the site during 2007 was due to fugitive emissions from operations being carried out by business activity operations within the Port of Liverpool.

2.4 Lathom Close, Princess Way, Seaforth

Funding was secured to install a Met One Instruments BAM 1020 beta attenuation monitor to an existing monitoring station at Lathom Close, Princess Way, Seaforth next to the roundabout where the A5036 meets the A565. However due to a delay with the supply of the instrument, it was not installed until 29th January 2008. There is therefore insufficient data at present to base a decision with regard to declaration of an AQMA for PM_{10} at this location.

Chapter 3 Nitrogen Dioxide

3.1 Introduction

The Updating and Screening Assessment (USA) of air quality carried out by Sefton MBC in 2006 identified that a Detailed Assessment (DA) was required for nitrogen dioxide, as monitoring of nitrogen dioxide using the passive diffusion tubes screening method, had identified 6 locations where the National Air Quality Strategy (NAQS) annual average Standard Objective may not be met. A Detailed Assessment for nitrogen dioxide was therefore undertaken at these locations.

The Detailed Assessment, completed in September 2007, established that at one location, Millers Bridge Bootle, diffusion tube monitoring continued to show annual average levels of nitrogen dioxide above the Standard. A chemiluminescent monitor was installed at this site, but only six months data had at the time been collected.

Another diffusion tube sited at Lytton Grove, Seaforth, set up at the beginning of 2006 to further assess nitrogen dioxide levels around the area of the A5036 Princess Way, Seaforth also showed high levels. A chemiluminescent monitor was installed at Lathom Close, next to the roundabout where the A5036 Princess Way meets the A565 Crosby Road South in February 2007, but insufficient data had at the time been collected to base any decisions on. It was therefore decided to delay a decision on the need to declare an AQMA and if declared it's extent, until a full years continuous real time monitoring data had been obtained from Millers Bridge and additional data collected from the Lytton Grove and Lathom Close - Princess Way sites could be analysed.

3.2 Nitrogen Dioxide NAQS Standards and Objectives

All continuous electronic monitoring data has been ratified and all diffusion tube results reported have been bias corrected in line with the advice given in Technical Guidance LAQM TG (03) by co-locating with a chemiluminescent monitor and deriving a bias correction factor. Tubes have been co-located with the chemiluminescent monitor at St Joan of Arc School, Bootle.

There are two NAQS Standards and Objectives for NO_2:

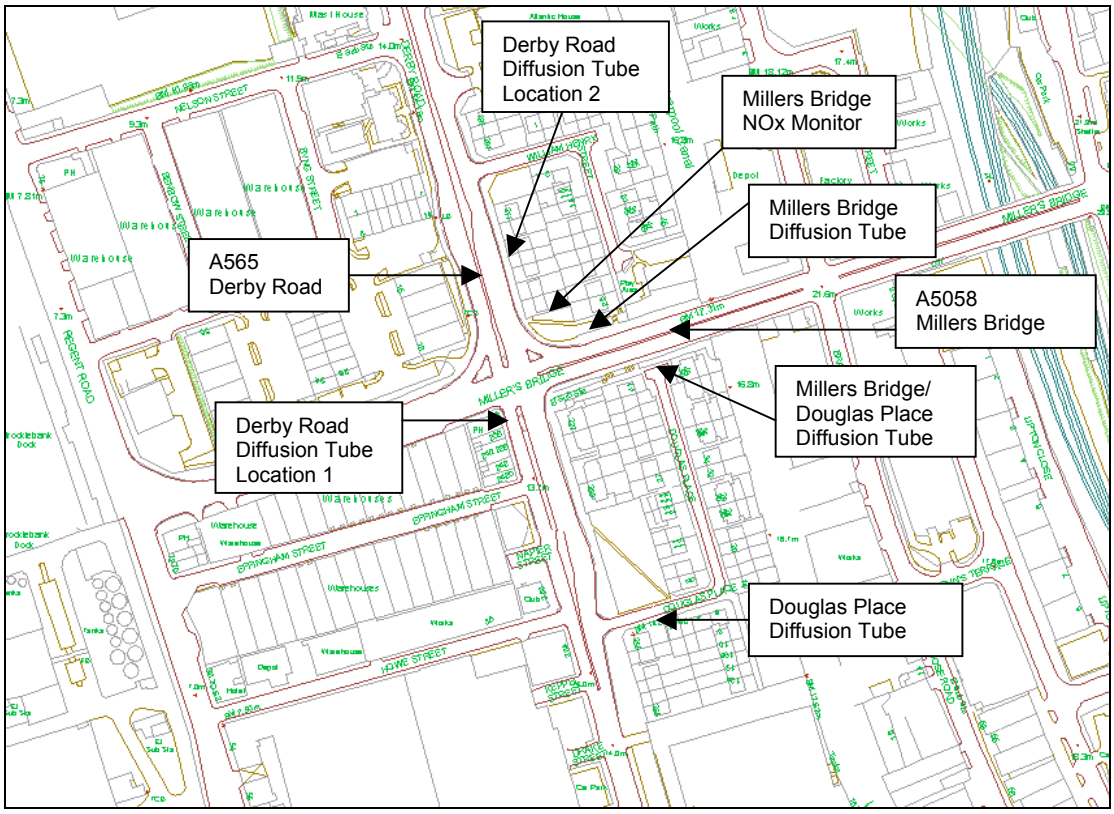
- A Standard of 40 μgm^{-3} measured as an annual average, with an Objective to meet this Standard by 31 December 2005.

- A Standard of 200 μgm^{-3} measured as a one hour average, with an Objective for this not to be exceeded more than 18 times per year by 31 December 2005.

3.3 Nitrogen Dioxide Results From Millers Bridge, Bootle

This monitor is located close to the corner of the junction with Millers Bridge A5058 with Derby Road A565, Bootle. The location was considered in both the 2004 Detailed Assessment and the 2006 Updating and Screening Assessment and dispersion modelling was carried out. It was concluded at the time, that although levels of nitrogen dioxide at residential properties were close to the Standard, it was not necessary to declare an Air Quality Management Area. The area was however designated a Local Air Quality Priority Area (LAQPA) in line with Sefton's Air Quality Strategy and a decision was taken to increase the number of diffusion tubes in the vicinity and install a chemiluminescent oxides of nitrogen monitor. The locations of all monitoring sites are shown in **Figure 3.1**

Figure 3.1 Nitrogen dioxide monitors at Derby Road / Millers Bridge Junction



The results from the chemiluminescent monitor at Millers Bridge in 2007 are shown in **Table 3.1**

Table 3.1 Results from Chemiluminescent Monitor at Millers Bridge in 2007

Annual Average (μgm^{-3})	40.5
Hourly Maximum (μgm^{-3})	177.1
Number of one hour averages > 200 μgm^{-3}	0

The results of diffusion tube monitoring in the vicinity of Millers Bridge with Derby Road Junction are given in **Table 3.2** below.

Table 3.2 Diffusion Tube Annual Average Nitrogen Dioxide Levels in 2007 in the vicinity of Millers Bridge with Derby Road Junction, Bootle (Bias Corrected)

Location	**Result** (μgm^{-3})
Derby Road Location 1	60
Derby Road Location 2	51
Millers Bridge	47
Millers Bridge/ Douglas Place	40
Douglas Place	35

3.3.1 Conclusions Regarding Millers Bridge, Bootle

Chemiluminescent monitoring data at this location has shown that the annual average Standard for nitrogen dioxide was exceeded in 2007.

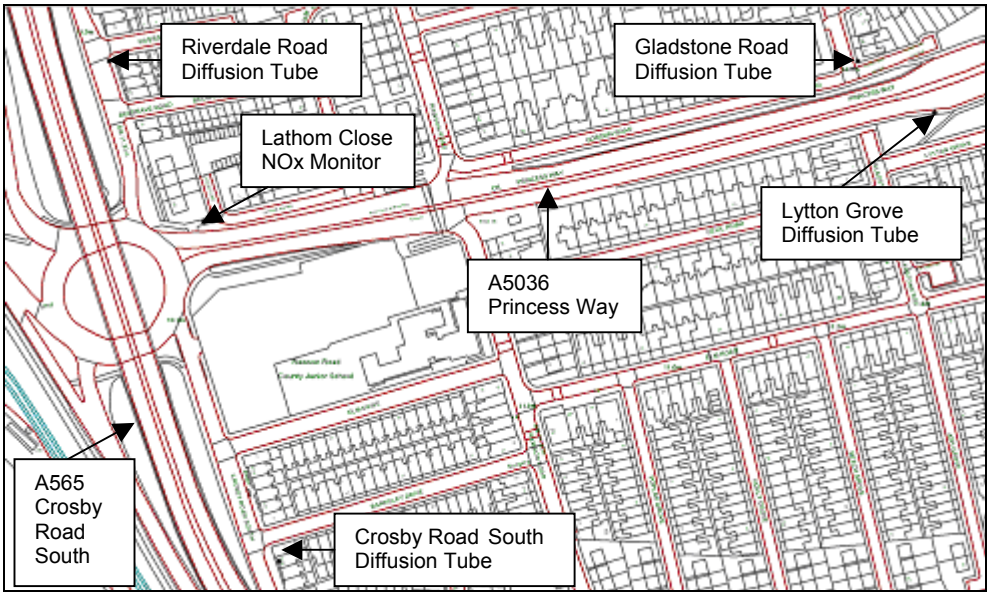
Four of the five diffusion tube results in 2007, sited at locations around the Millers Bridge monitoring station location are also showing levels above the Standard for nitrogen dioxide.

It will therefore be necessary to declare an Air Quality Management Area (AQMA) for nitrogen dioxide based around this location.

3.4 Nitrogen Dioxide Results From Lathom Close, Princess Way, Seaforth

A chemiluminescent monitor was installed at Lathom Close, Seaforth next to the roundabout where Princess Way meets Crosby Road South, on 17th February 2007. There is also a number of diffusion tube monitoring sites in the area around this continuous monitoring station. The locations of the all monitoring sites are shown in **Figure 3.2**

Figure 3.2 Nitrogen dioxide monitors at and around Lathom Close, Princess Way, Seaforth



The results from the chemiluminescent monitor at Lathom Close, Princess Way, Seaforth are shown in **Table 3.3**

Table 3.3 Results from Chemiluminescent Monitor at Lathom Close, Princess Way, Seaforth in 2007

Annual Average (μgm^{-3})	43.7
Hourly Maximum (μgm^{-3})	169.2
Number of one hour averages > 200 μgm^{-3}	0

The results of diffusion tube monitoring in the vicinity of Lathom Close, Princess Way, Seaforth are given in **Table 3.4** below.

Table 3.4 Diffusion Tube Annual Average Nitrogen Dioxide Levels in 2007 in the vicinity of Lathom Close, Princess Way, Seaforth (Bias Corrected)

Location	**Result** (μgm^{-3})
Lytton Grove	57
Crosby Road South	39
Riversdale Road	37
Gladstone Road/Gordon Road	35

The diffusion tube at Lytton Grove was set up at the beginning of 2006 as a result of a review of the monitoring carried out in the Borough and to further assess levels around the area of the

A5036 Princess Way, Seaforth. The monitor was originally located on a lamppost in line with houses in Lytton Grove, adjacent to the A5036 carriageway. The tube was persistently subject to tampering with by unknown individuals and as a result was stolen on four occasions during 2006. A decision was taken to move the tube to a more concealed position to overcome this problem by relocating on the noise barrier to the A5036 in 2007. This location gave an annual average nitrogen dioxide concentration of 44 μgm^{-3} from 8 readings in 2006 which increased to 57 μgm^{-3} from 9 readings in 2007. It is thought however that the noise barrier may be affecting the diffusion process for this tube, causing artificially high readings, thus may not be a true refection of the nitrogen dioxide levels at this location and is therefore interpreted with caution at this stage.

The diffusion tube at Crosby Road South was close to exceeding the annual average Standard in 2007 with a concentration of 39 μgm^{-3} recorded. This tube is located at the property of a Community Airwatch participant and also showed nitrogen dioxide levels equal to the Standard in 2005 (See **Table 3.5**)

Table 3.5 Annual Average Nitrogen Dioxide Levels at Crosby Road South 2004 - 2006 (Bias Corrected)

Year	**Result** (μgm^{-3})
2004	33
2005	40
2006	35

3.4.1 Conclusions Regarding Lathom Close, Princess Way, Seaforth

Chemiluminescent monitoring data at this location has shown that the annual average Standard for nitrogen dioxide was exceeded in 2007.

One of the four diffusion tube results in 2007, sited at Lytton Grove near the Lathom Close monitoring station showed a high annual average concentration above the Standard for nitrogen dioxide. However, it is thought that the siting of this tube may be having an effect on the diffusion process leading to artificially high concentrations. Another diffusion tube at Crosby Road South was borderline and close to exceeding the Standard.

It will therefore be necessary to declare an Air Quality Management Area (AQMA) for nitrogen dioxide based around this location.

Chapter 4 Dispersion Modelling

4.1 Future modelling to support AQMA decision-making

The prediction of local pollution source impacts on air quality at the identified locations will be undertaken using the Airviro Gauss dispersion model. The model will be used to predict concentrations of nitrogen dioxide (NO_2), based on nitrogen oxides (NO_X) concentrations, and particulate matter (PM_{10}), depending on which pollutant(s) are of concern for the area in question.

The Gauss model will allow prediction of 25-metre pollution grids for the study areas as well as pollutant concentrations at specific receptor locations such as residential properties and schools. A limitation to the Airviro Gauss model is that pollution concentrations are modelled at roof height. To consider pollution exposure at ground level, a factor will be derived to determine street level pollutant concentrations. This street adjustment factor will be based on the difference between modelled results using the Airviro Gauss dispersion model and Airviro Street Canyon dispersion model. The street adjustment factor will be applied to road-sourced pollution only, as previous studies have identified that pollution from road emissions are significantly under predicted using the Gauss model (at relevant exposure height) while industrial point and area source emissions are more accurately assessed.

Hourly meteorological data will be used in the modelling to enable consideration of daily and/or hourly exceedences.

Emission sources included within the modelling will be based on the Merseyside Atmospheric Emissions Inventory with possible addition of sources within the emissions database that are identified as pollution sources outside the remit of the emissions inventory.

Chapter 5 Overall Conclusions

5.1 The overall conclusions from the work carried out in this 2008 Detailed Assessment update report are that it will be necessary, due to the likely exceedence of NAQS Standard Objectives, to declare the following Air Quality Management Area's in Sefton:

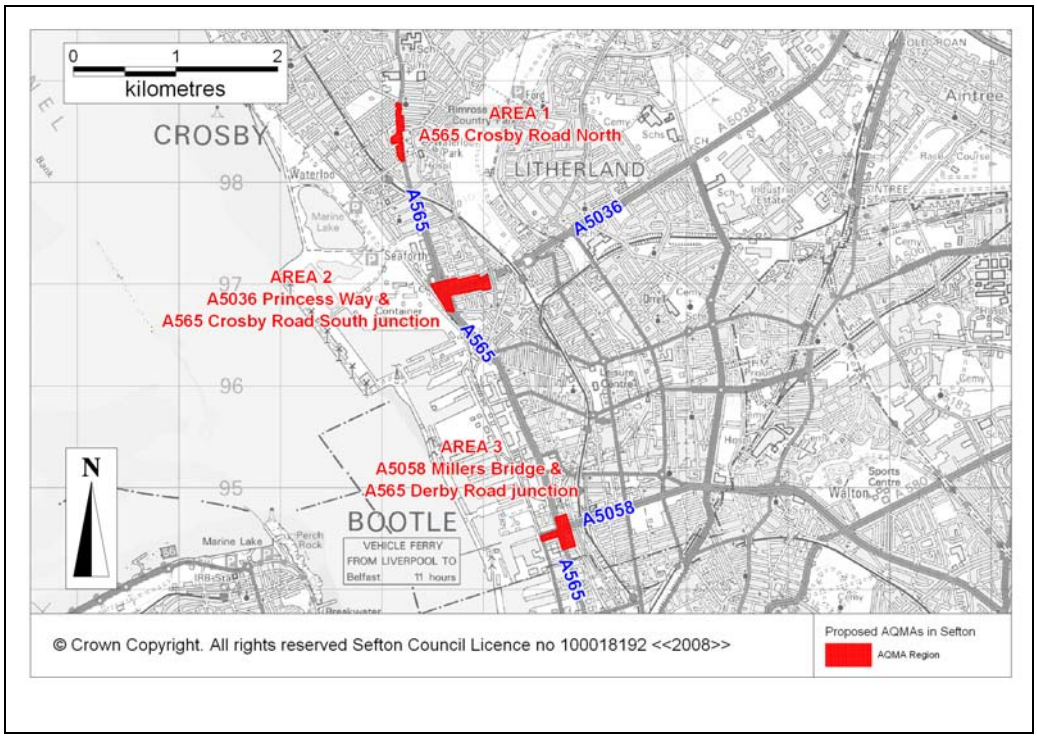
1. An AQMA for PM_{10} based around the location of Waterloo Primary School, Crosby Road North in Waterloo along a section of the A565.

2. An AQMA for nitrogen dioxide based around the location of the junction of the A5036 Princess Way with A565 Crosby Road South in Seaforth.

3. An AQMA for PM_{10} and nitrogen dioxide based around the location of the junction of the A5058 Millers Bridge with A565 Derby Road in Bootle.

The general locations for the AQMA's are shown in **Figure 5.1** and the proposed extent and geographical area of the above Air Quality Management Area boundaries are shown in the maps in **Appendix 3**.

Figure 5.1 General Locations for AQMA's



Building on the work already carried out, further additional work will now be undertaken to work towards bringing about compliance with the Air Quality Objectives at the designated management areas by preparation of an Air Quality Action Plan in order to achieve the Objectives by a specific date in the future and details of this will be given in a Further Assessment and Action Plan report.

The Action Plan will include the following elements:

- Quantification of all source contributions - source apportionment.
- Consideration of all options to help achieve compliance on the grounds of cost – effectiveness and feasibility.
- How Sefton will work with others, including all partners and stakeholders, transport planners, industry and the Environment Agency in pursuit of the Air Quality Objectives.
- Timescales for implementation of the necessary measures.
- Quantification of the proposed measures.
- How Sefton will monitor and evaluate the effectiveness of the action plan.
- Details of all consultation carried out.
- Consideration of other impacts such as noise, climate change, congestion and road safety.

It is anticipated that the Further Assessment and Action Plan will take approximately one year to complete and a report on the findings issued in 2009.

Appendix 1 PM_{10} Daily Average Results at Crosby Road North, Waterloo 2007

NB. Exceedences of the PM_{10} Daily Standard are highlighted in yellow.

Day	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07
1	34.5	28.3	40.4	31.9	31.3	33.5	26.4	25.2	16.9	26.4	28.2	30.7
2	51.5	35.9	33.9	45.0	30.0	23.1	23.1	19.2	16.3	29.9	25.4	33.5
3	29.1	44.9	27.6	16.5	44.6	21.6	23.8	25.5	20.5	29.9	46.2	35.0
4	39.9	46.5	18.2	29.0	38.2	28.2	22.8	13.1	21.5	30.6	121.9	25.0
5	30.2	45.9	26.3	26.3	40.0	29.0	19.2	20.9	16.0	38.6	33.0	35.9
6	29.8	48.1	36.1	23.7	50.4	33.9	26.3	19.4	13.4	36.5	37.3	32.1
7	22.1	67.0	34.7	31.5	23.1	24.6	20.2	18.6	13.1	46.4	40.3	35.1
8	25.7	30.4	23.7	31.7	34.7	36.5	16.1	19.9	13.5	50.3	42.6	29.3
9	30.6	33.2	42.0	22.9	26.8	27.8	16.8	21.5	16.0	30.3	37.2	20.2
10	29.6	13.0	35.0	23.5	34.6	n/a	19.6	24.7	30.0	n/a	52.9	25.2
11	54.7	27.2	32.9	23.0	23.7	n/a	17.0	21.1	25.5	41.0	26.7	50.4
12	43.0	26.0	29.3	52.5	22.4	n/a	14.8	15.2	32.2	27.3	26.9	28.1
13	25.1	42.4	43.0	63.4	20.8	45.9	15.9	17.2	35.4	n/a	26.7	36.5
14	29.6	41.7	32.5	75.0	n/a	17.7	16.9	13.7	33.0	n/a	41.7	37.6
15	23.4	32.8	30.2	53.7	n/a	10.8	17.2	19.6	24.7	n/a	54.6	30.4
16	24.2	24.3	33.0	34.3	n/a	15.6	23.9	21.2	24.4	46.2	44.2	38.0
17	30.0	22.2	32.6	25.2	n/a	11.1	25.7	28.2	17.9	n/a	29.5	42.8
18	42.0	26.1	37.6	20.2	n/a	21.2	22.0	11.8	22.6	n/a	12.4	43.0
19	41.7	25.4	21.2	32.4	n/a	28.0	28.7	11.1	28.0	n/a	18.5	52.5
20	30.3	39.4	16.0	45.6	n/a	26.5	23.1	18.2	31.2	n/a	29.0	59.2
21	28.1	26.9	23.5	47.1	n/a	23.0	14.4	17.4	19.0	n/a	22.8	51.6
22	19.5	22.4	35.6	30.8	n/a	23.1	16.9	19.4	n/a	n/a	17.2	42.5
23	21.3	24.6	36.8	22.2	n/a	17.0	21.2	20.0	n/a	n/a	29.9	23.1
24	19.5	22.4	33.2	28.1	n/a	12.5	18.2	15.9	n/a	37.1	31.3	26.1
25	27.7	18.1	74.9	38.7	n/a	14.0	22.4	15.3	30.8	39.9	36.1	18.9
26	28.2	30.0	71.1	24.7	21.5	17.3	24.8	18.1	13.7	36.9	21.5	26.8
27	22.0	29.1	126.0	26.5	22.8	26.1	25.2	17.4	22.2	15.9	24.1	20.5
28	29.0	40.2	72.2	25.4	17.8	19.0	20.8	19.5	25.5	18.6	21.1	12.7
29	28.5	n/a	15.6	31.2	22.0	23.1	15.6	18.7	22.4	30.9	34.5	34.6
30	20.4	n/a	68.1	37.7	27.0	20.5	22.0	18.2	26.1	26.1	20.7	28.6
31	25.2	n/a	41.7	n/a	26.3	n/a	21.1	20.8	n/a	27.3	n/a	19.9

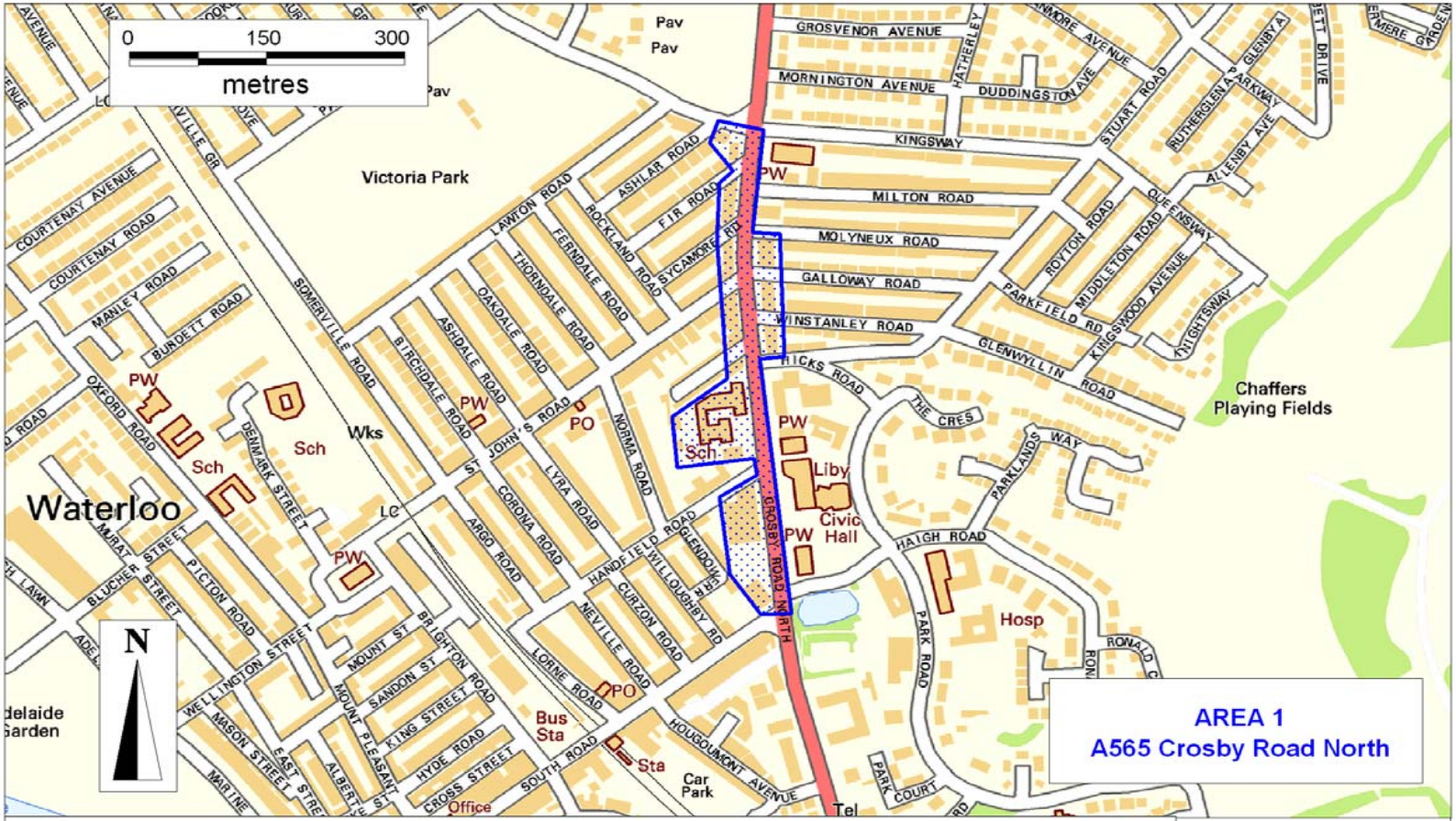
Appendix 2 PM_{10} Daily Average Results at Millers Bridge, Bootle 2006 - 2007

NB. Exceedences of the PM_{10} Daily Standard are highlighted in yellow.

Day	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06
1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	31.2	44.6
2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	34.6	25.9
3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	60.7	25.0
4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	28.2	35.3
5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	30.9	21.3
6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	67.6	27.8
7	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	58.3	26.6
8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	32.1	40.9
9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	72.9	31.2
10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	32.0	12.3
11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	35.4	30.9
12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	35.0	35.0
13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	32.1	23.9
14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	28.3	14.3
15	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	24.0	16.1
16	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	31.1	22.3
17	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	25.4	24.8
18	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	28.2	45.5
19	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	15.0	76.3
20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	41.4	80.6
21	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	35.4	66.2
22	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	36.2	69.6
23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	27.8	44.6
24	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	27.6	30.6
25	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	18.8	32.9
26	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	20.0	23.2
27	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	35.7	31.0	27.7
28	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	21.1	32.2	33.1
29	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	31.1	40.0	18.4
30	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	33.2	30.5	24.0
31	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	33.0	n/a	30.8

Day	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07
1	27.3	46.7	53.3	32.9	n/a	42.9	17.6	42.4	20.7	33.2	44.3	29.4
2	54.1	53.6	39.3	51.7	n/a	30.8	33.5	37.7	22.0	36.5	40.2	26.4
3	26.3	48.4	30.7	19.9	n/a	22.6	23.3	41.5	47.3	35.0	44.5	38.1
4	34.7	49.4	14.3	49.3	n/a	37.4	28.5	14.6	47.5	40.3	135.5	27.7
5	34.2	41.7	30.6	49.3	n/a	38.5	26.1	23.4	40.0	42.0	41.7	36.9
6	29.0	48.2	37.8	33.3	n/a	45.8	26.1	28.7	39.7	n/a	70.5	30.3
7	17.7	69.4	51.4	35.5	n/a	39.0	22.9	53.3	38.5	n/a	n/a	37.6
8	27.6	31.5	37.7	39.4	n/a	64.0	20.5	47.6	33.0	n/a	n/a	23.8
9	24.7	34.6	46.8	23.7	n/a	52.3	28.7	45.9	27.7	45.0	n/a	22.9
10	31.7	14.3	35.2	37.4	n/a	50.4	35.5	41.2	78.4	45.6	n/a	36.5
11	42.5	22.0	34.8	40.7	n/a	54.2	32.9	29.5	61.6	52.9	n/a	61.9
12	34.3	33.0	40.7	69.0	n/a	44.2	29.9	15.6	42.8	48.5	35.6	41.2
13	20.5	45.0	49.8	70.9	n/a	37.3	21.2	24.7	50.4	30.8	34.3	37.4
14	35.1	52.5	61.0	70.9	n/a	12.7	19.8	22.2	60.2	28.6	55.1	33.3
15	37.8	40.6	44.1	44.2	39.7	12.9	20.4	39.8	24.2	48.0	57.9	27.6
16	28.1	30.9	44.3	66.7	23.1	19.4	34.7	32.5	27.2	34.1	54.3	35.5
17	28.7	43.9	28.2	58.6	27.8	16.8	34.1	36.1	29.4	52.9	29.1	42.3
18	40.6	33.3	29.4	35.2	38.5	30.3	41.0	16.8	31.5	52.9	13.3	49.8
19	38.0	35.0	38.7	n/a	30.7	36.4	55.3	14.6	27.0	47.8	27.3	n/a
20	28.2	50.3	21.2	n/a	25.1	34.2	25.1	28.1	34.8	41.6	31.9	n/a
21	20.4	41.1	38.1	n/a	43.7	34.5	13.3	37.8	25.4	28.6	32.9	n/a
22	30.7	25.7	38.9	n/a	34.3	35.9	17.8	24.7	29.4	48.1	25.1	34.6
23	22.5	33.2	29.6	n/a	41.7	21.8	28.2	64.1	19.4	49.0	36.8	19.5
24	20.0	21.3	37.2	n/a	36.7	14.3	39.1	56.2	28.1	44.2	26.4	22.9
25	31.7	25.5	89.3	n/a	42.5	14.2	32.1	30.3	31.5	53.6	37.2	17.3
26	32.1	54.2	84.6	n/a	20.3	48.2	30.8	23.4	18.6	41.2	33.0	22.2
27	29.0	33.4	115.7	n/a	12.4	54.7	30.8	27.6	23.0	24.6	33.8	19.2
28	27.2	44.2	75.7	n/a	13.0	27.4	26.4	43.6	24.7	23.9	28.7	13.5
29	49.7	n/a	37.1	n/a	35.4	27.6	32.8	79.3	21.7	36.3	43.3	28.5
30	45.1	n/a	61.4	n/a	30.9	17.7	63.1	85.2	28.5	41.2	21.6	24.8
31	29.0	n/a	44.2	n/a	35.5	n/a	47.7	35.1	n/a	38.9	n/a	19.2

Appendix 3 Air Quality Management Area Boundaries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GROSVENOR AVENUE
MORNINGTON AVENUE
KINGSWAY
MILTON ROAD
MOLYNEUX ROAD
GALLOWAY ROAD
WINSTANLEY ROAD
HICKS ROAD
GLENWYLLIN ROAD
HAIGH ROAD
THE CRES
PARKLANDS WAY
PARK ROAD
PARK COURT
HOUGOUMONT AVENUE
SOUTH ROAD
CROSBY ROAD NORTH
LAWTON ROAD
ASHLAR ROAD
FIR ROAD
SYCAMORE RD
ROCKLAND ROAD
FERNDALE ROAD
THORNDALE ROAD
OAKDALE ROAD
ASHDALE ROAD
BIRCHDALE ROAD
NORMA ROAD
LYRA ROAD
CORONA ROAD
ARGO ROAD
CURZON ROAD
NEVILLE ROAD
LORNE ROAD
BRIGHTON ROAD
MOUNT ST
SANDON ST
KING STREET
HYDE ROAD
CROSS STREET
MOUNT PLEASANT
WELLINGTON STREET
MASON STREET
EAST STREET
ALBERT ST
MARTINE
PICTON ROAD
BLUCHER STREET
MURAT STREET
DENMARK STREET
SOMERVILLE ROAD
OXFORD ROAD
COURTENAY AVENUE
COURTENAY ROAD
MANLEY ROAD
BUNDETT ROAD
ROYTON ROAD
MIDDLETON ROAD
KINGSWOOD AVENUE
PARKFIELD RD
TWIGHTSWAY
ALLENBY AVE
STUART ROAD
DUDDINGSTON AVE
HATHERLEY
AREA 1
A565 Crosby Road North
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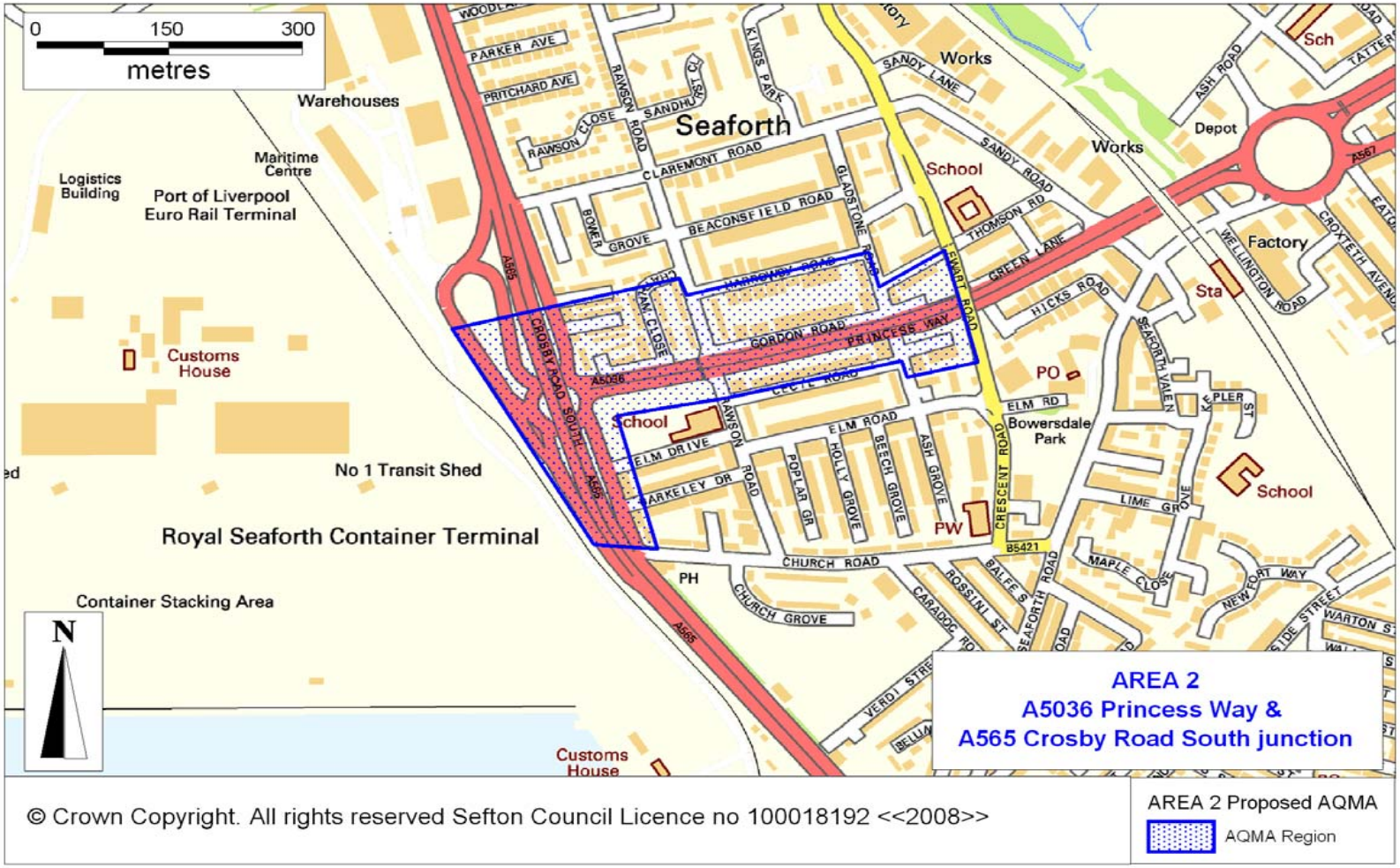
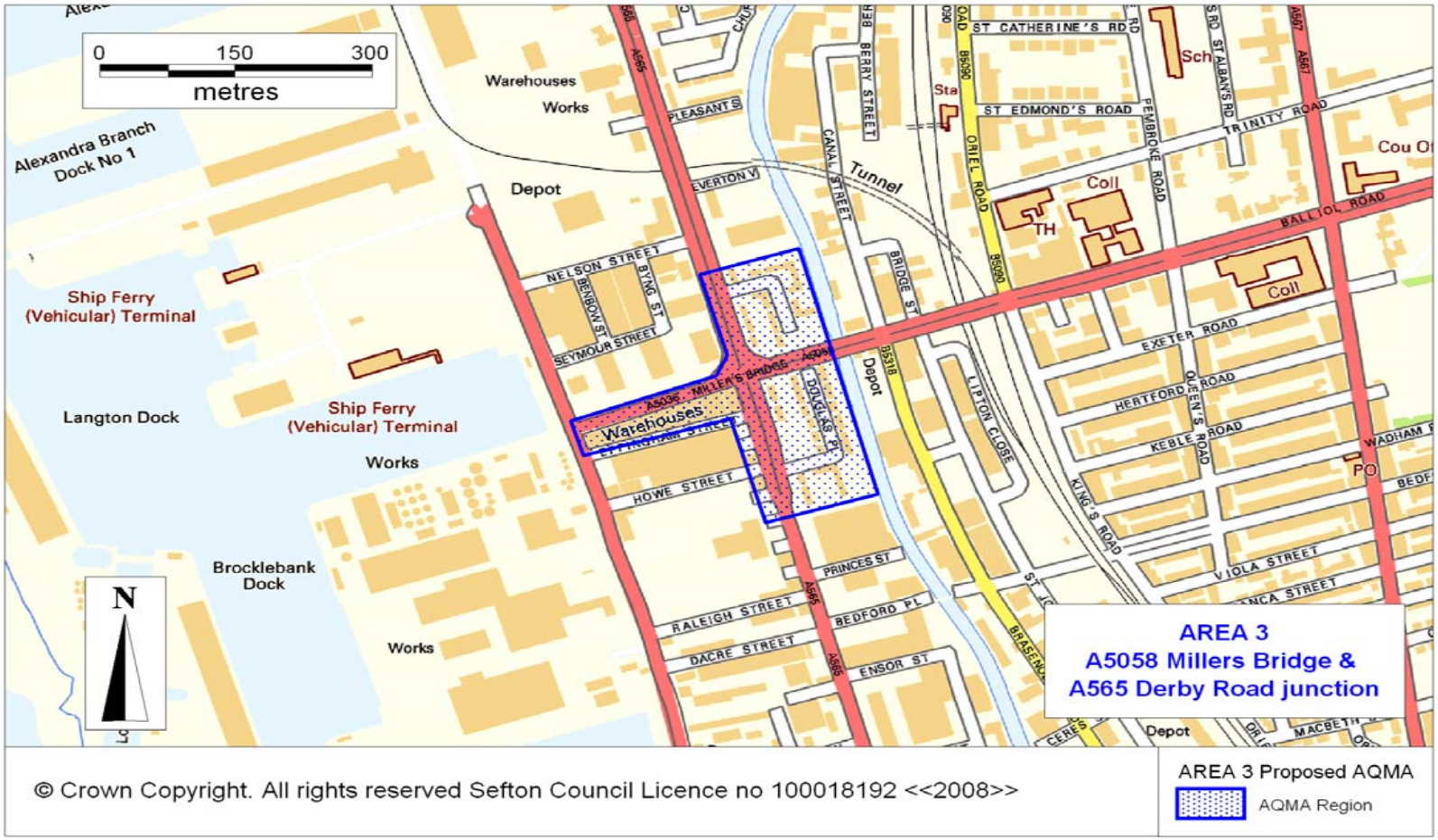
AREA 1 Proposed AQMA
AQMA Region

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Dock
Works
Tunnel
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ST CATHERINE'S RD
ST EDMOND'S ROAD
TRINITY ROAD
BALLIOL ROAD
EXETER ROAD
HERTFORD ROAD
KEBLE ROAD
VIOLA STREET
PEMBROKE ROAD
ORIEL ROAD
BERRY STREET
CANAL STREET
BRIDGE ST
NELSON STREET
SEYMOUR STREET
HOWE STREET
PRINCES ST
RALEIGH STREET
DACRE STREET
BEDFORD PL
ENSOR ST
LIPTON CLOSE
KING'S ROAD
A5036 MILLER'S BRIDGE
A565
A5058
B5090
B5318
AREA 3
A5058 Millers Bridge &
A565 Derby Road junction
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AREA 3 Proposed AQMA
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