Detailed Assessment Report for North Dorset District Council

Air Quality Monitoring in Station Rd Gillingham

Document Control Sheet

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1. Executive Summary

The Environment Act 1995, Part IV places a statutory obligation on all local authorities to review and assess the air quality within their area against air quality objectives for seven pollutants. Where the risk of exceeding an air quality objective is identified through the review and assessment process, a Detailed Assessment must be carried out to identify with reasonable certainty whether an objective is likely to be breached.

J.H Rose & Sons Ltd is an aggregate and related services supplier situated in Station Yard Gillingham. Following a complaint from a neighbouring resident that dust from their lorry wash facility was leaving residue on vehicles and property a Detailed Assessment was proposed in the 2012 Updating and Screening Assessment. The owner's initially proposed to relocate or enclose this facility, however, a series of issues with the design of the structure, relating to the acoustic performance of the enclosure, have led to delays and subsequently the cancelation of the project. In the intervening period the site operators have implemented the following changes in order to mitigate some of the resident's concerns:

- The wash is no longer available to be used by other HGV operators
- They have limited times when unit can be used (i.e. only during usual 'office hours')
- Provision of instructions to operating personnel on careful use.

This Detailed Assessment is based around monitoring undertaken by the We Care 4 Air Ltd Monitoring Team from 21st October 2015 to 20th January 2016. A TEOM (Tapered Element Oscillating Microbalance) measuring PM_{10} was installed in an enclosure sympathetic to the location adjacent to the residential properties on the perimeter of the HGV wash facility.

The data was compared with available data for PM_{10} from appropriate national network sites. From this it was concluded that the possibility of the Air Quality Objectives for PM_{10} being exceeded at Gillingham was very low and that there are no grounds for declaring an Air Quality Management Area.

From the available evidence there is no recommendation for further monitoring. However it is recommended that activities at this establishment are kept under review and, assuming there is no change in the Technical Guidance, further assessment be considered if there is any substantial increase in the capacity or amendments to the above current implementations are made.

2. Introduction

2.1 Description of Local Authority Area

North Dorset is located in the south west of England, bordering Somerset and Wiltshire. It is predominantly a rural area comprising of five major market towns: Blandford Forum, Gillingham, Shaftesbury, Stalbridge and Sturminster Newton. The rural area of North Dorset covers 235 square miles. In the south and east of the District are the Dorset Downs and Cranborne Chase, both officially recognised as Areas of Outstanding Natural Beauty. The Blackmore Vale and Limestone Ridges occupies the northern and western part of the District.

According to the Office of National Statistics, the population of North Dorset was estimated to be 69,880 in 2013, dispersed over a large geographical area including the market towns and many villages. Between 2008 and 2033, the number of households in North Dorset is predicted to increase by 22.2% from 27,000 to 33,000.

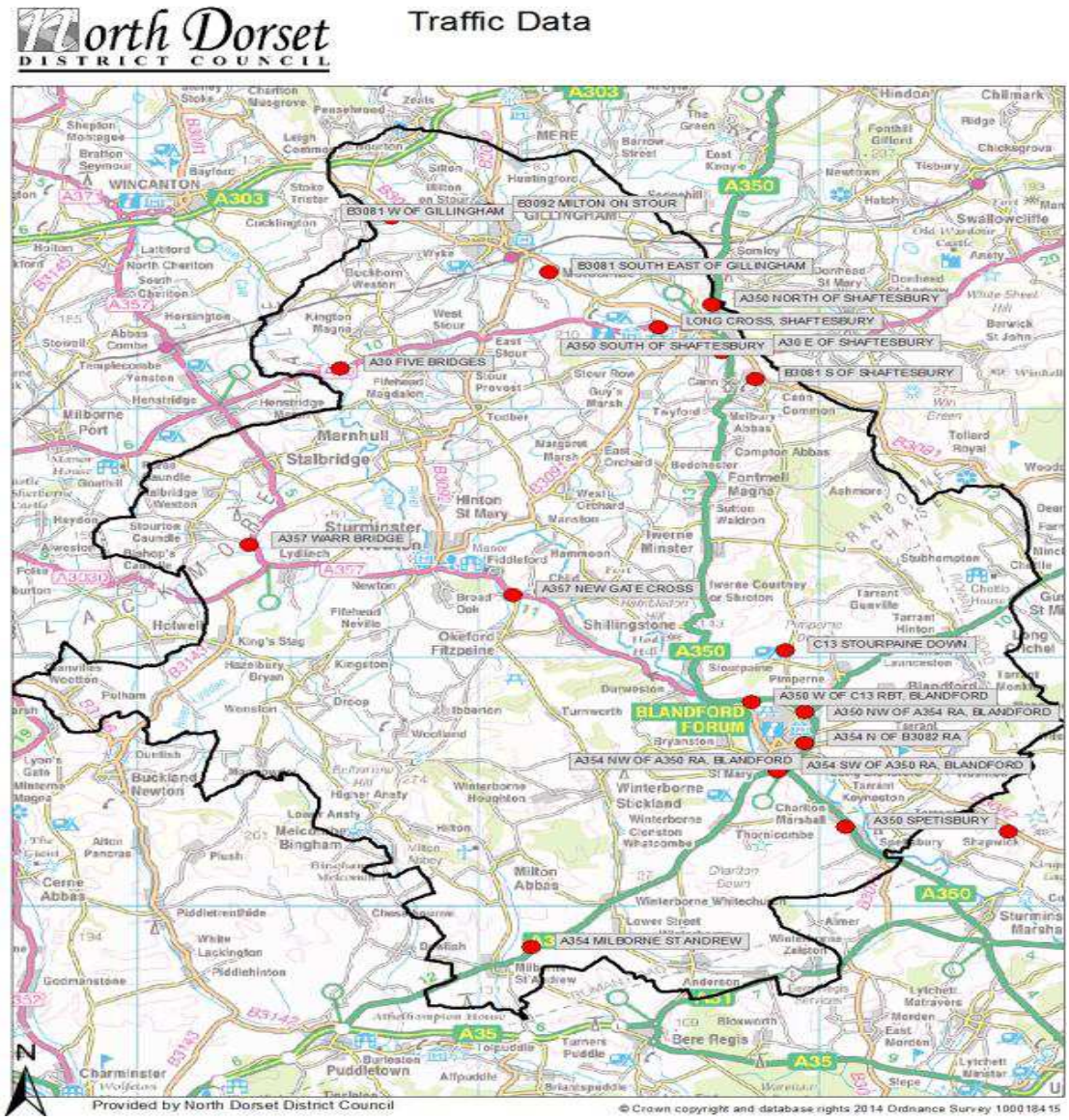

Figure 1: Boundary of the District

2.2 Summary of Previous Review & Assessments

As part of the requirement of the LAQM process, North Dorset District Council (North Dorset DC) has previous Review and Assessment reports. Set out below is a summary of these previous documents, all of which (except Round 1 and the 2003 USA) can be found here: https://www.dorsetforyou.com/airquality/north

Round 1 of the LAQM, 1999: This review concluded that none of the regulated pollutants required further assessment at that time. It showed that no exceedances of the air quality objectives were likely in North Dorset due to low level of industry and low traffic flows.

2003 Updating and Screening Assessment Report: This USA Report provided an update to the Stage 1 review of air quality in 1999. The 2003 Progress Report indicates that the UK air quality objectives for all seven regulated pollutants were likely to be met in the district.

May 2006 Updating and Screening Assessment Report: The results of this USA indicate that a Detailed Assessment will not be required for any of the seven pollutants assessed. None of the UK air quality objectives are likely to be breached within North Dorset DC.

April 2007 Progress Report: This Progress Report provided an update to the 2006 report. The April 2007 Progress Report indicates that the UK air quality objectives for all seven regulated pollutants were likely to be met in the district.

April 2008 Progress Report: This Progress Report provided an update to the April 2007 report. The April 2008 Progress Report indicates that the UK air quality objectives for all seven regulated pollutants were likely to be met. It concluded that it has not been necessary to proceed to secondary stages of the air quality management regime.

April 2009 Updating and Screening Assessment Report: The USA, undertaken on behalf of North Dorset DC by Faber Maunsell indicated that none of the UK air quality objectives for all seven pollutants excluding particulate matter (PM_{10}) are likely to be exceeded within the District. Therefore, a Detailed Assessment will not be required for six of the key pollutants. However, the USA identified potential exceedances of PM_{10} in the vicinity of a poultry farm housing in excess of 400,000 birds and equipped with mechanical ventilation. A Detailed Assessment was recommended for PM_{10} at this site.

January 2010 Detailed Assessment Report: The Detailed Assessment of the East Down Farm commenced on 8 September 2009 and was completed in 10 December 2009. The report concluded that the possibility of the Air Quality Objectives for PM_{10} being exceeded at the farm was very low and that there are no grounds for declaring an Air Quality Management Area and for proceeding further with assessment of air quality in this location.

April 2011 Progress Report: The 2011 Progress Report provided an update to the April 2008 report. The April 2011 Progress Report indicated that the UK air quality objectives for all seven regulated pollutants were likely to be met in the District.

February 2012 Updating and Screening Assessment: The USA, undertaken on behalf of North Dorset DC by the Air Quality Management Resource Centre at the University of the West of England, indicated that none of the UK air quality objectives for all seven pollutants excluding particulate matter (PM_{10}) are likely to be exceeded within the District. Therefore, a Detailed Assessment will not be required for six of the key pollutants. However, the USA identified potential exceedances of PM_{10} in the vicinity of a HGV wash facility near Gillingham Station. A Detailed Assessment was recommended for PM_{10} at this site.

March 2013 Progress Report: The 2013 Progress Report provided an update to the April 2011 Progress Report. The 2011 Progress Report indicated that the UK air quality objectives for all seven regulated pollutants were likely to be met in the district. However there was a need to undertake a Detailed Assessment in respect of particulates (PM_{10}) in the vicinity of an HGV wash facility in the north of the district, identified in the February 2012 USA. This exercise has been postponed pending the completion of construction works to enclose the HGV wash, the use of which has been substantially reduced in the meantime.

March 2014 Progress Report: The 2014 Progress Report provided an update to the March 2013 report. The 2014 Progress Report indicated that the UK air quality objectives for all seven regulated pollutants were likely to be met in the District. However there was a need to undertake a Detailed Assessment in respect of particulates (PM_{10}) in the vicinity of an HGV wash facility in the north of the district. This exercise has been further postponed pending the completion of construction works to relocate and enclose the HGV wash

March 2015 Updating and Screening Assessment: The USA indicated following the screening criteria in LAQM.TG(09), a Detailed Assessment will be required for PM_{10} at the HGV wash facility near Gillingham Station where there were previously complaints about dust / overspray if, following the enclosure of the facility, the requirement to do so remains. There are no other sources (transport, other transport, industrial, commercial/domestic and fugitive) of concern within North Dorset.

2.3 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) 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 exceedances 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 Detailed Assessment is to determine, with reasonable certainty, whether or not there is a likelihood of the objectives not being achieved.

In the previous round of Review and Assessment, North Dorset DC identified relevant exposure near to a HGV wash facility close to Gillingham Station.

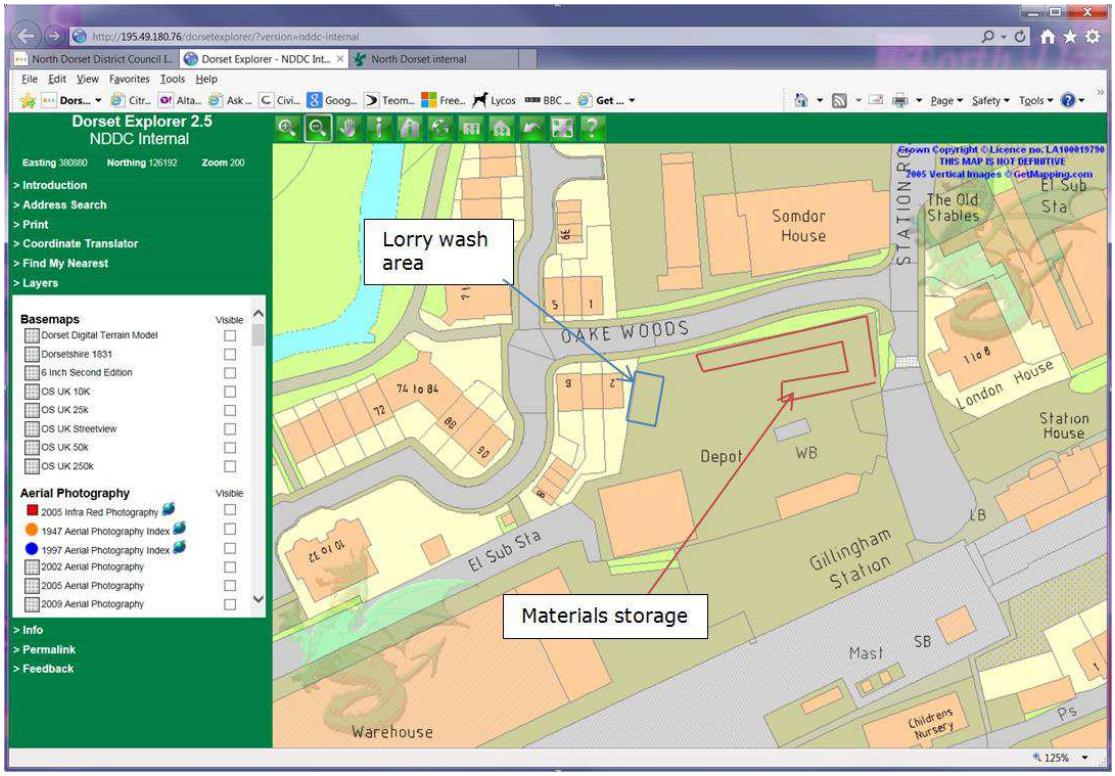

Figure 2: A site plan of the wash facility identifying area of concern

The resident's complaints indicate dust from HGVs that are being washed is leaving residues on his vehicles and property.

The operators had initially intended to enclose the whole thing in a building to address both noise and over-spray issues. This was not completed but instead other changes that have been implemented:

- No longer available to be used by other HGV operators
- Limiting times when unit can be used (i.e. only during usual 'office hours')
- Reducing hours of use – only their own small fleet, instructions to personnel on careful use, hours, etc.

3. Monitoring Programme

3.1 Detailed Assessment Introduction

Where the Updating and Screening Assessment has indicated that there is a risk of the air quality objectives not being achieved, a Detailed Assessment is required. The aim of the Detailed Assessment is to determine, with reasonable certainty, whether or not there is a likelihood of the objectives not being achieved.

3.2 Particulate Matter PM_{10}

Particulate matter is composed of a wide range of materials arising from a variety of sources, and is typically assessed as a size fraction. The European air quality standards have adopted PM_{10} for the assessment of fine particulate matter. The effect of airborne particles on health are largely linked with the worsening of pre-existing conditions in susceptible subgroups of the population, such as those with pre-existing lung, heart or other disease, and/or the elderly and children. Evidence suggests that it is combustion derived components of PM_{10} that are primarily responsible for the harmful effects. However there is generally a lack of information on quantitative relationships between adverse health effects and specific components of PM_{10}.

3.3 Objectives

The government and devolved administrations have adopted two Air Quality Objectives for PM_{10}

- When expressed as an hourly mean the PM_{10} objective is 50 micrograms per cubic metre or less. This is not to be exceeded more than thirty five times per year.
- 40 micrograms per cubic metre or less, when expressed as an annual mean.

Pollutant	National Air Quality Objectives		
	Concentration	Exceedance	Measured As
PM_{10}	50 µg/m^3	35 times a year	24 Hour Mean
	40 µg/m^3		Annual Mean

Table 1: National Air Quality Objectives

3.4 Monitoring Equipment

Continuous PM_{10} monitoring has been carried out using a TEOM (Tapered Element Oscillating Microbalance) Series 1400 AB PM_{10} Monitor manufactured by Rupprecht & Patashnick Co.

Data was downloaded remotely using a GSM modem, allowing potential problems to be addressed promptly.

The TEOM draws a precisely controlled flow of ambient air through a size selective (PM_{10}) inlet, and through a 16mm diameter filter. The filter is connected to the top of the narrow end of a hollow tapered glass tube. As the particles collect on the filter, the tubes natural frequency of oscillating decreases. The change in this frequency is directly proportional to the added mass, and hence allows continuous measurements to be made. The instrument is microprocessor controlled and the mass concentration values are updated every 13 seconds with average concentrations provided every 15 minutes.

The inlet including the sensing system is kept at a steady 50^{o}C to drive off any sampled water droplets. There is a concern regarding the potential loss of volatile material at the stable temperature of 50^{o}C. As a result DEFRA has recommended that PM_{10} data measured by TEOMs should be processed through the Volatile Correction Modem (VCM) web portal. The VCM works by using the volatile particulate matter measurements provided by nearby FDMS instruments (within 130 km) to assess the loss of PM_{10} from the TEOM; this value is then added back onto the TEOM measurements. The resulting corrected measurements have been demonstrated as equivalent to the gravimetric reference equivalent.

3.5 Monitoring Location

The truck wash is on the corner of Oake Wood and Station Rd. The monitoring station was located in the garden of 2 Oake Woods, Gillingham, SP8 4QS.

This location was mainly selected because the TEOM would be located in the garden of the residential property adjacent to the HGV lorry wash.

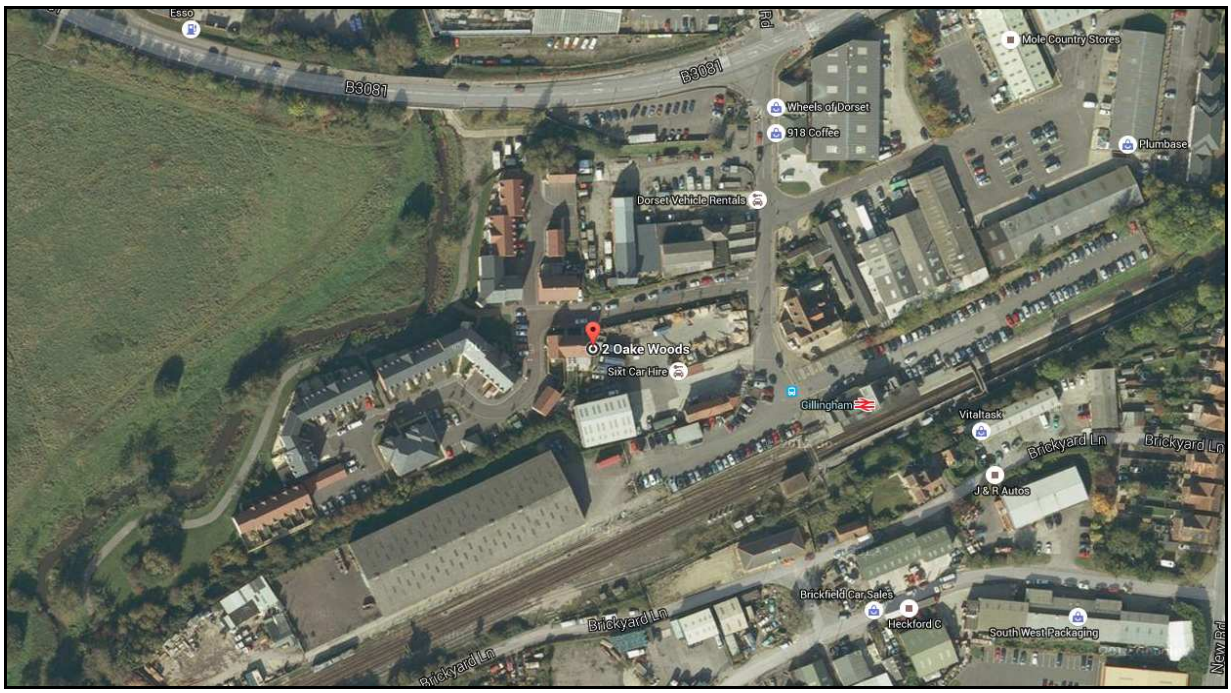

Figure 3: Map of locality

Figure 4: 2 Oake Woods is adjacent to the HGV lorry wash.

The air quality monitoring station was situated behind the driveway back gate to the property

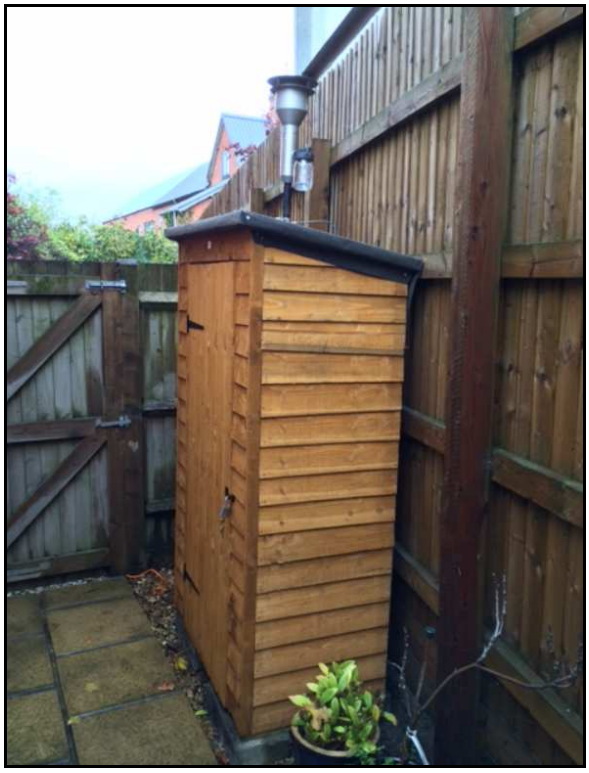

Figure 5: Large fence behind monitor borders HGV site

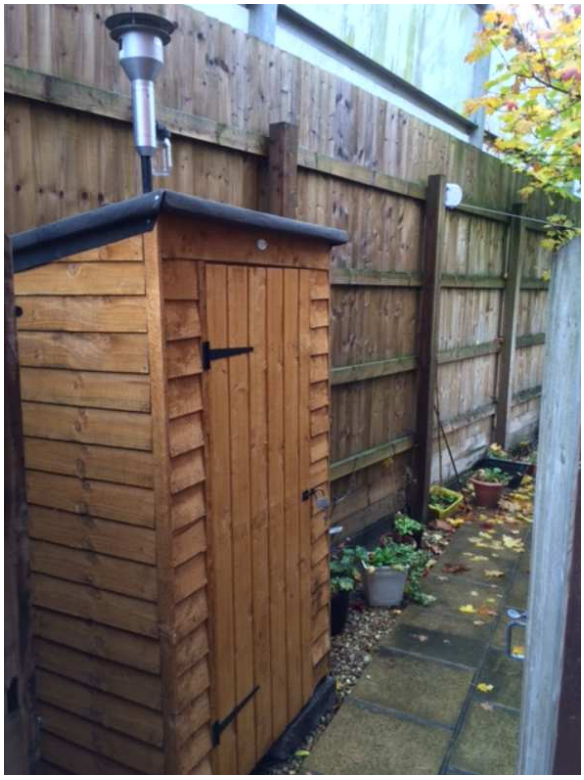

Figure 6: Large fence behind monitor borders HGV site

3.6 Meteorological Instrumentation

It is important to link the air quality measurements with meteorological measurements, especially wind direction and speed. As it has proved impossible to trace any local measurements of these parameters data for comparison data from the following Automated Urban and Rural Network (AURN) sites, Bristol St Pauls, Harwell, Narberth, Portsmouth and Plymouth Centre, were downloaded from www.uk-air.defra.gov.uk for the period of the monitoring exercise. PM_{10}, Wind Direction & Wind Speed was downloaded for the sites. The Bristol, Portsmouth and Plymouth sites were selected as being the closest sites where particles are measured whilst Harwell and Narberth are rural sites where particles are measured. It is fully appreciated that these data can only be indicative but they do provide some useful information in this analysis.

4. Results and discussion

4.1 Monitoring Period

Monitoring commenced on 21st October 2015 and concluded on 20th January 2016. An overall data capture of 91.3% was achieved for PM_{10} with some data being lost due to power interruptions to the air quality monitoring station. These periods were 27th October 10:15 – 28th October 18:45 and 5th November 13:30 – 6th November 13:15. There was one short period where data were eliminated from the final dataset. This was from 30th November – 1st December as the PM_{10} data became unstable. A replacement filter was installed 1st December which resolved the issue.

4.2 Data Processing

The output from the TEOM gives 15 minute average concentrations which were processed to give hourly average data for analysis. The hourly data is processed using the Volatile Correction Model (VCM) portal. This data is then converted to 24 hour averages in comparison with the objectives

4.3 Comparison Air Quality Monitoring Stations

For comparison, data from the following Automated Urban and Rural Network (AURN) sites, Bristol St Pauls, Harwell, Narberth, Portsmouth and Plymouth Centre, were downloaded from www.uk-air.defra.gov.uk for the period of the monitoring exercise. The Bristol, Portsmouth and Plymouth sites were selected as being the closest sites where particles are measured whilst Harwell and Narberth are rural sites where particles are measured.

4.4 Data Results Summary

This table and the following graphical representations show that the concentrations of PM_{10} at Gillingham during this period were substantially higher than at Narberth but only slightly higher than at Harwell and Bristol St Pauls. They were comparable with those at Plymouth and Portsmouth.

	PM_{10} Average (µg/m^3)	**Number of Exceedance of 24 hour mean (50 µg/m^3)**
Gillingham	18.8	1
Bristol St Pauls	15.3	1
Portsmouth	18.5	0
Plymouth	19.5	1
Harwell	14.7	1
Narberth	10.6	0

Table 2: Summary of PM_{10} (24-hour mean) data statistics

Figure 7, 8 & 9 shows the daily average concentrations of PM_{10} all five sites compared with Gillingham. There is a reasonably good agreement between the daily average concentrations recorded at Plymouth & Portsmouth sites compared with Gillingham.

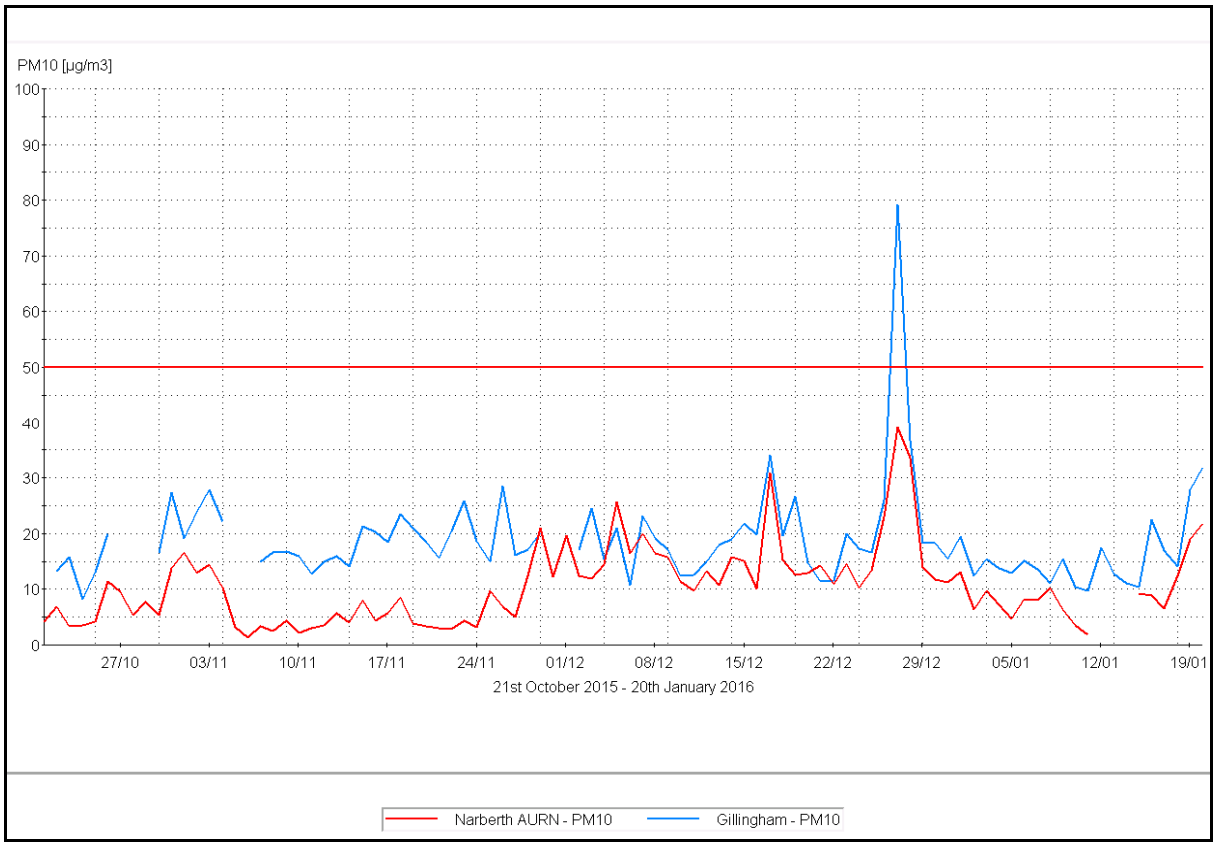

Figure 7: Gillingham & Narberth PM_{10} Daily Concentrations

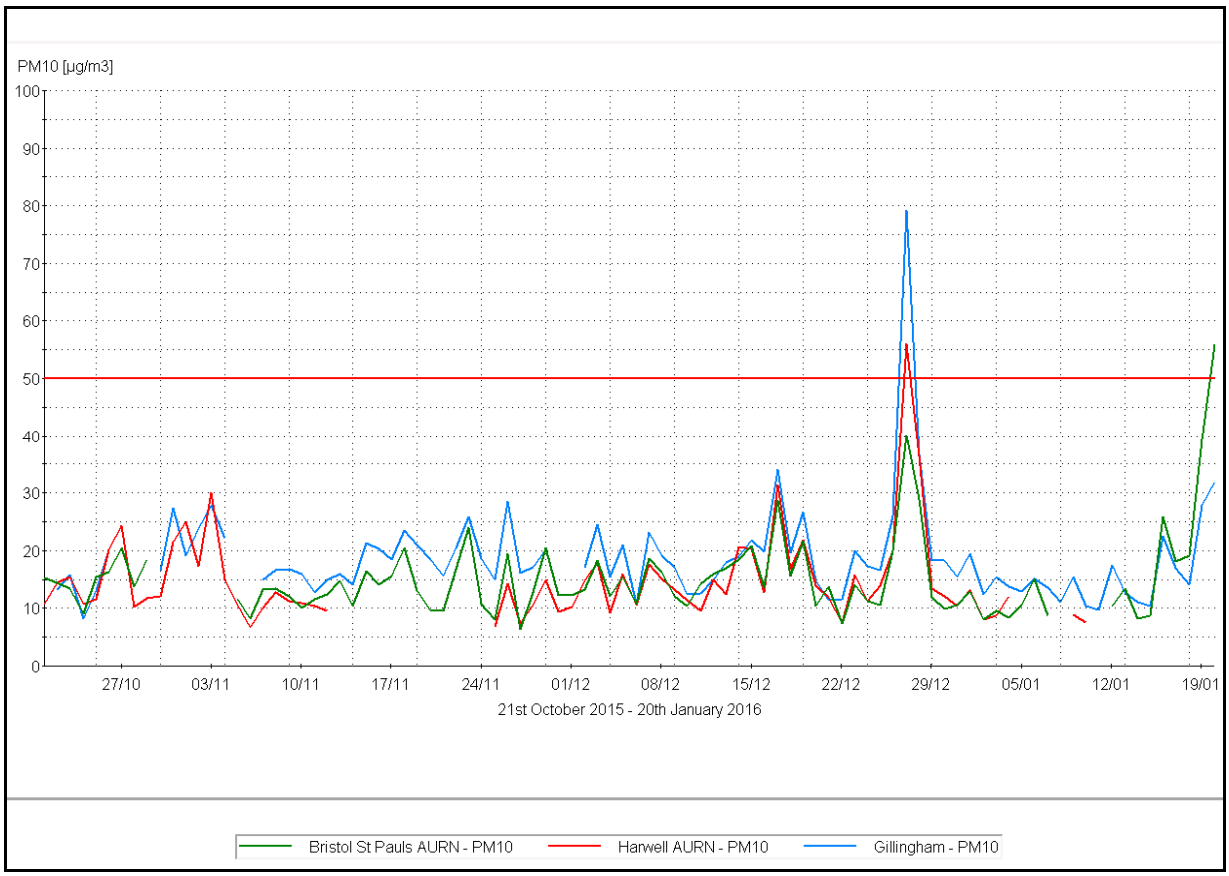

Figure 8: Gillingham & Bristol St Pauls & Harwell PM_{10} Daily Concentrations

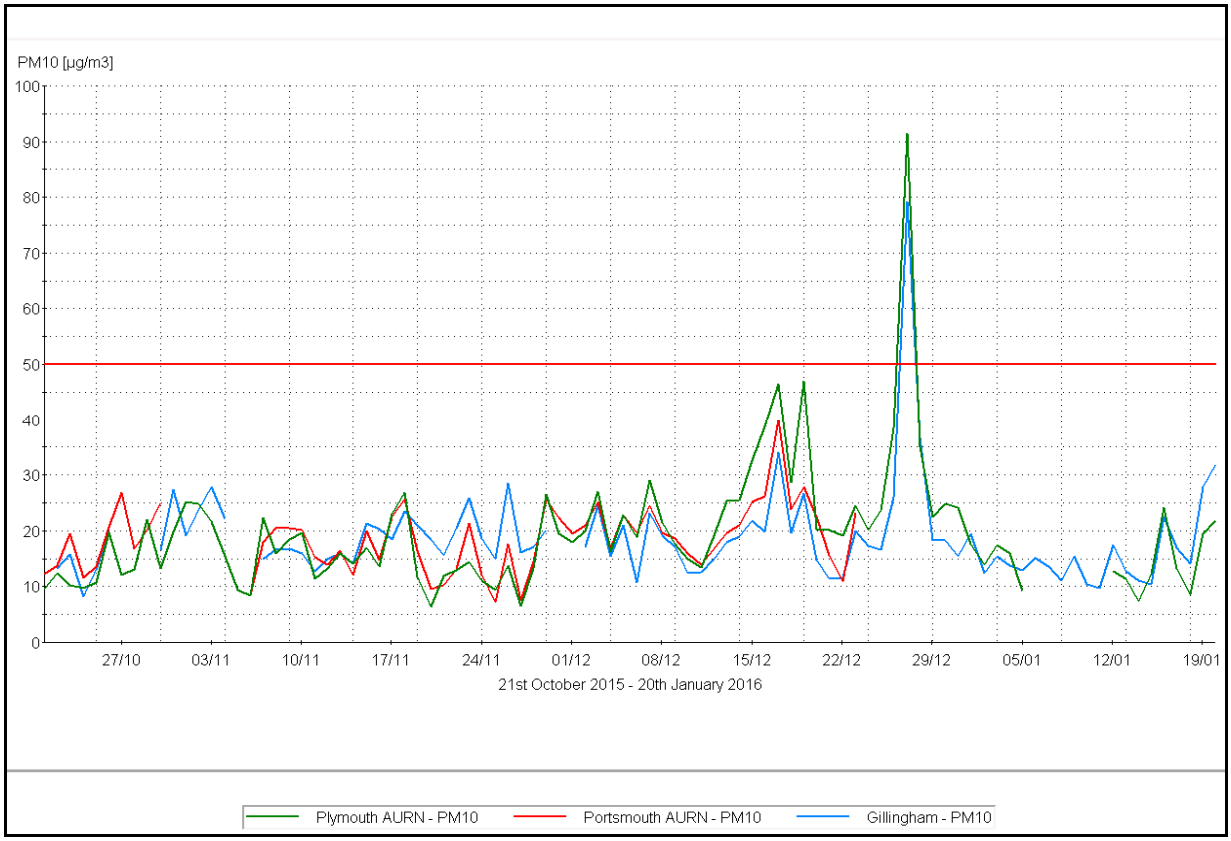

Figure 9: Gillingham & Plymouth & Portsmouth PM_{10} Daily Concentrations

4.5 Meteorological Results Summary

It is important to link the air quality measurements with meteorological measurements, especially wind direction and speed. As it has proved impossible to trace any local measurements of these parameters data for comparison data from the following Automated Urban and Rural Network (AURN) sites, Bristol St Pauls, Harwell, Narberth, Portsmouth and Plymouth Centre, were downloaded from www.uk-air.defra.gov.uk for the period of the monitoring exercise. PM_{10}, Wind Direction & Wind Speed was downloaded for the sites. The Bristol, Portsmouth and Plymouth sites were selected as being the closest sites where particles are measured whilst Harwell and Narberth are rural sites where particles are measured. It is fully appreciated that these data can only be indicative but they do provide some useful information in this analysis.

Figure 10, 11, 12, 13, 14 shows the wind directions for the complete period all five sites

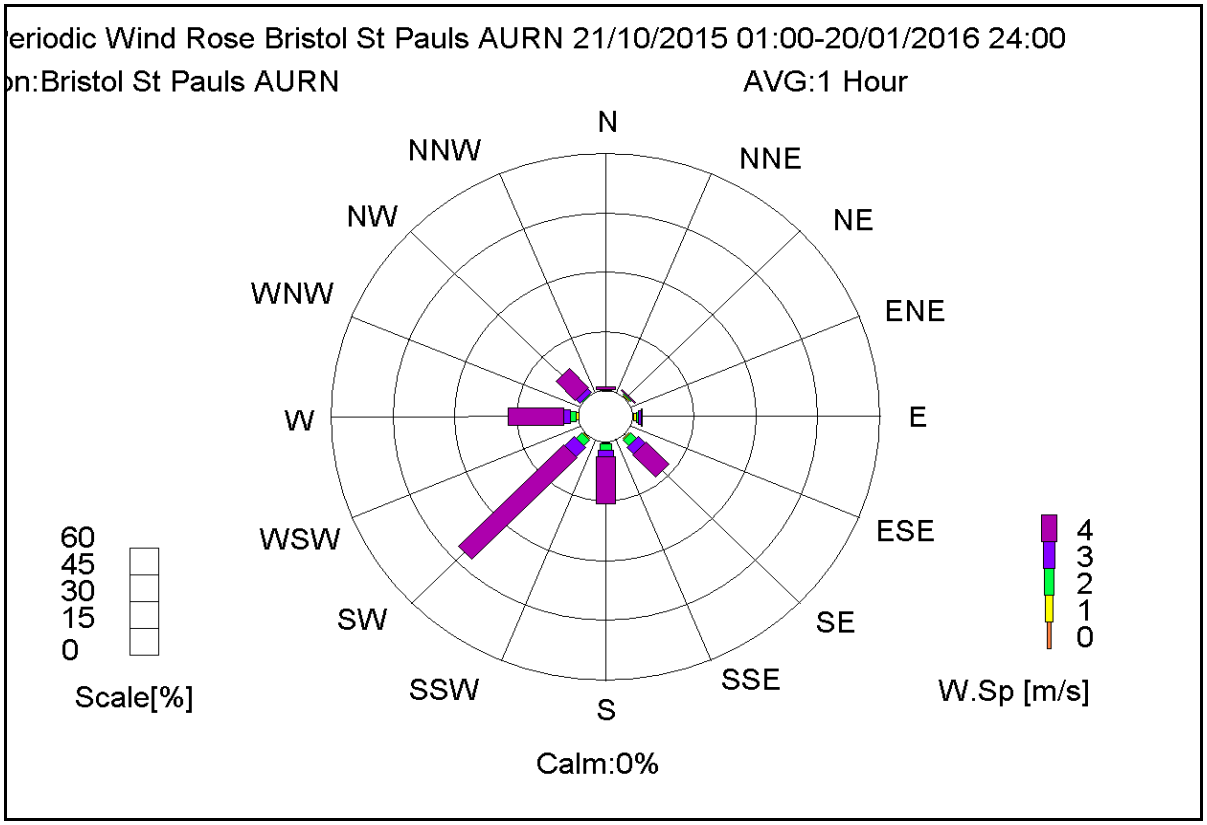

Figure 10: Bristol St Pauls Wind Rose

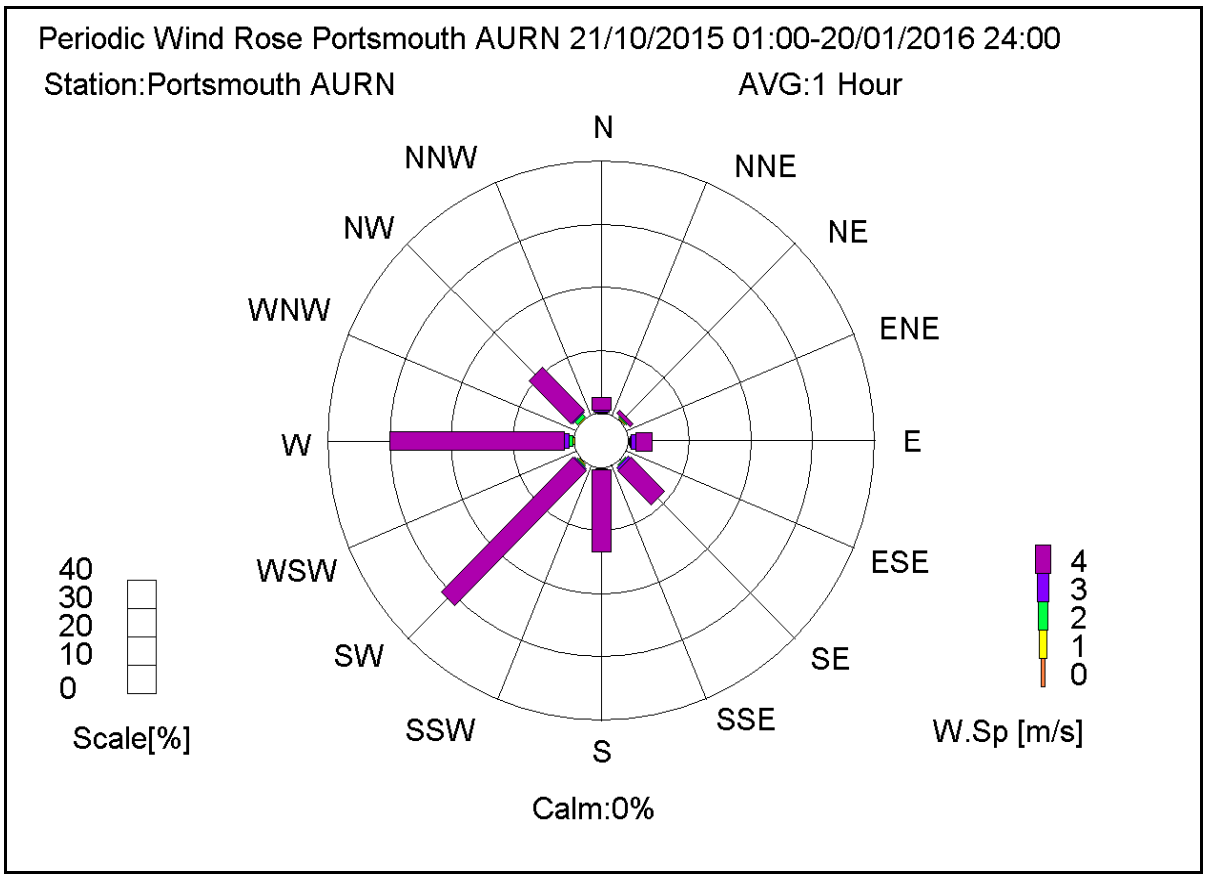

Figure 11: Portsmouth Wind Rose

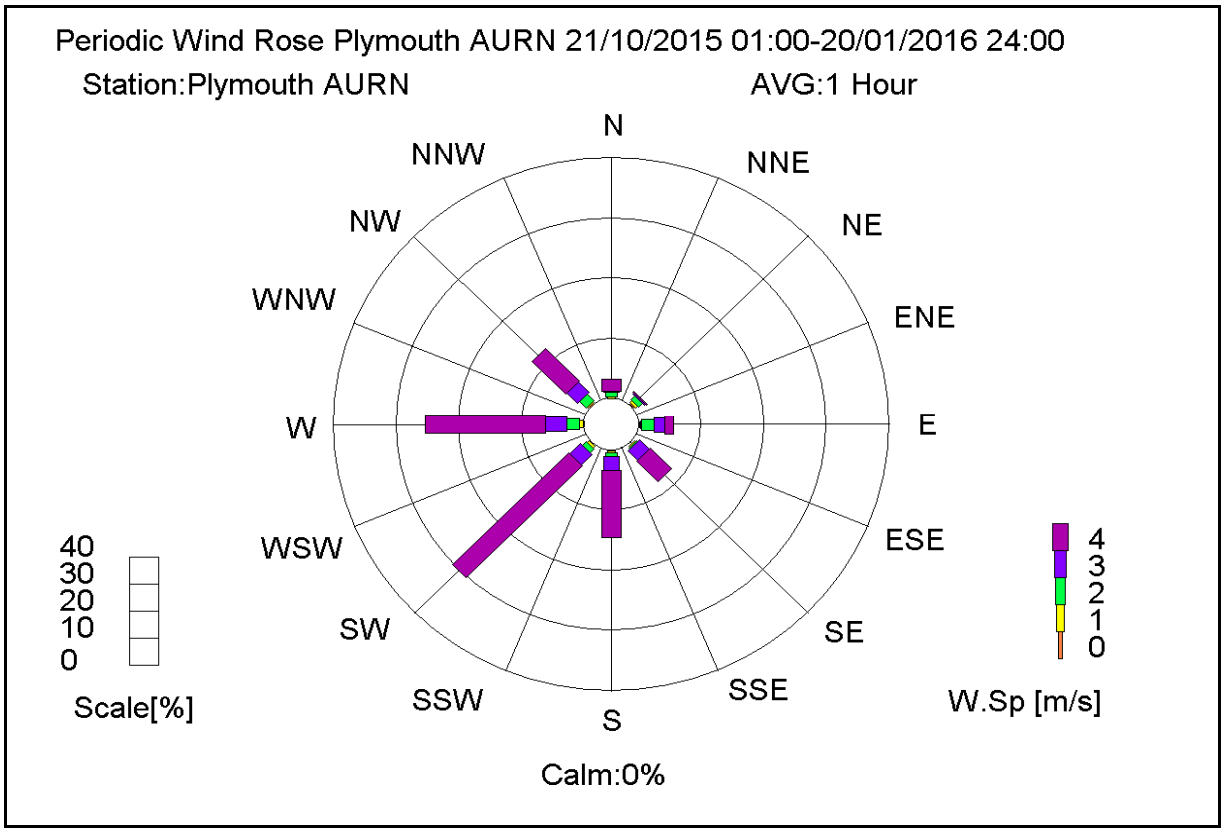

Figure 12: Plymouth Wind Rose

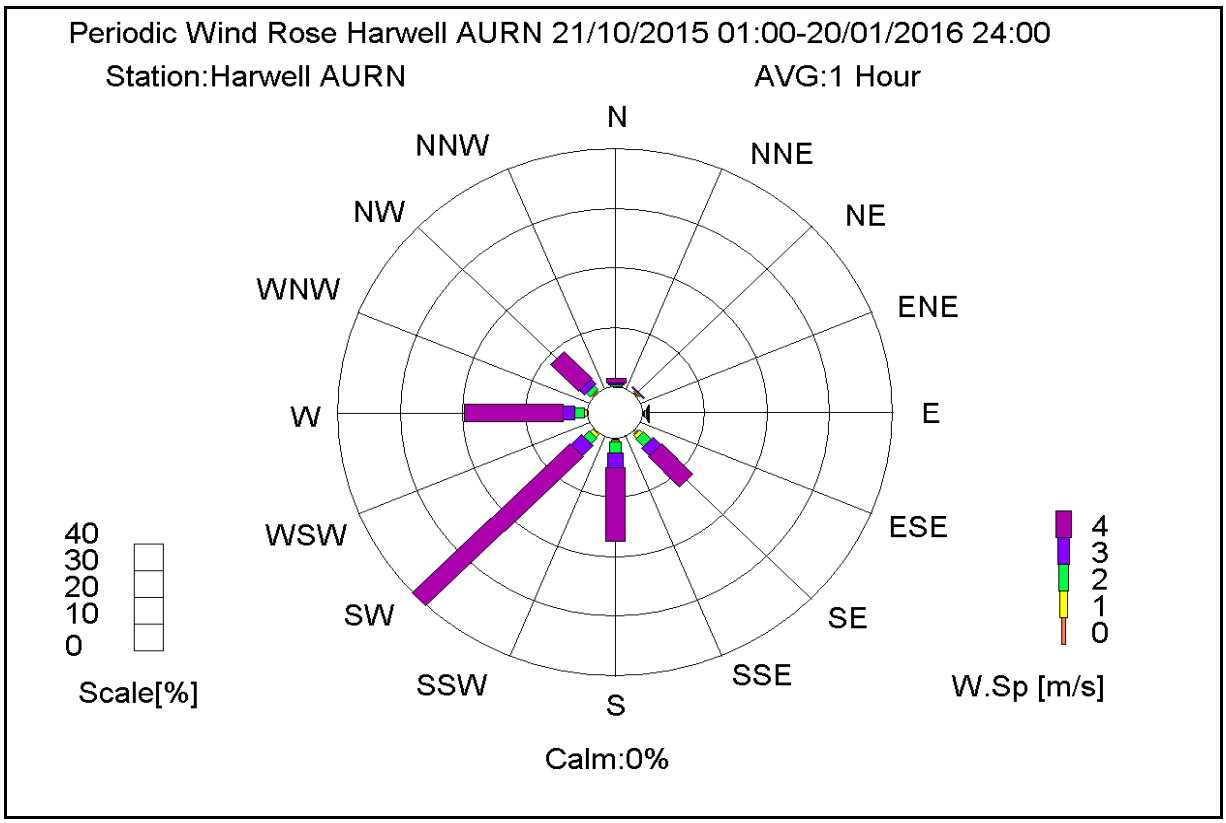

Figure 13: Harwell Wind Rose

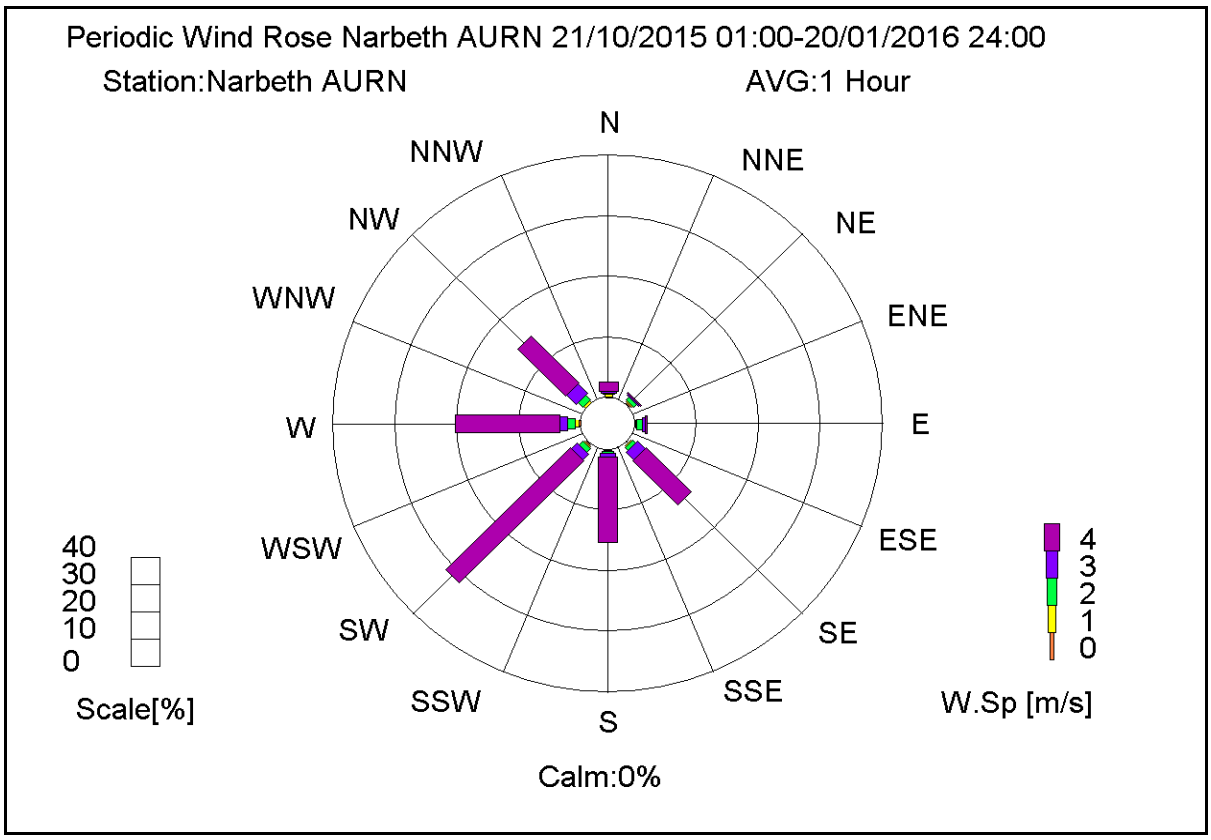

Figure 14: Narberth Wind Rose

The overall distribution of wind directions is typical of the UK in general with a predominance of winds from the South West/West.

Figure 15, 16, 17, 18, 19 are pollution roses comparing Gillingham PM_{10} values with the meteorological data for the complete period all five sites

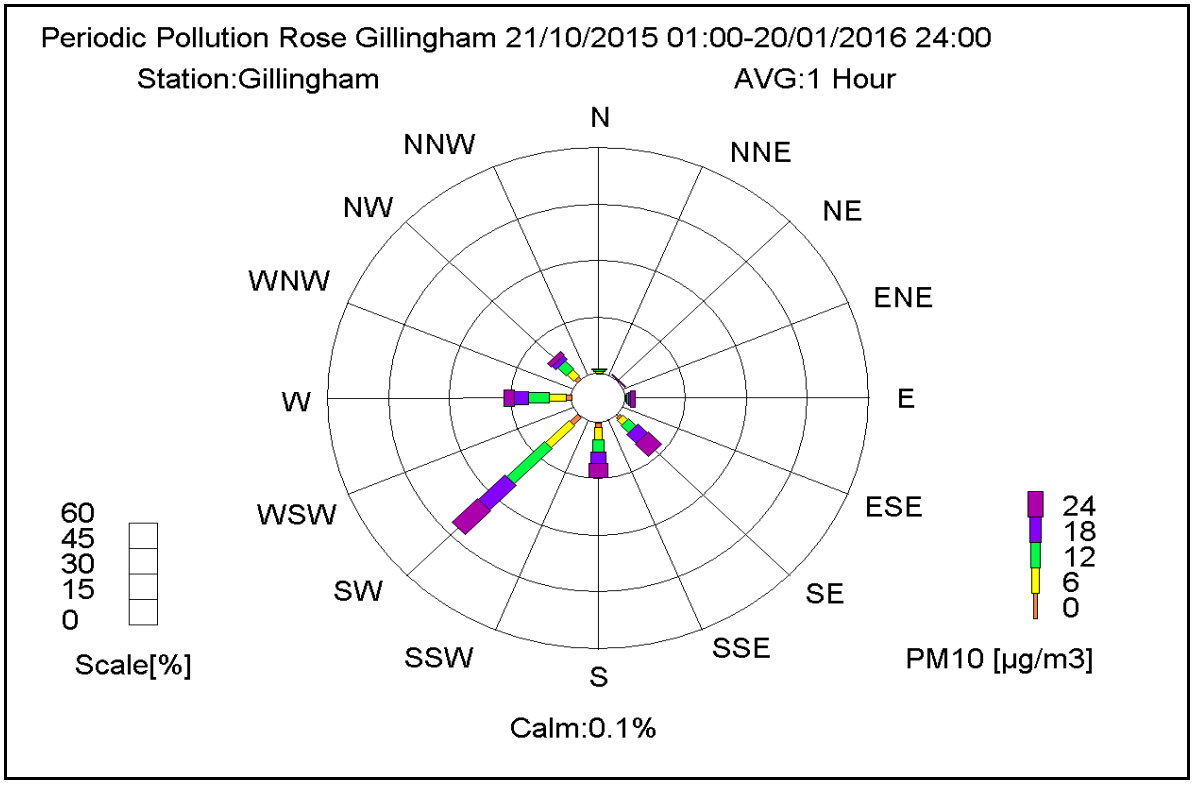

Figure 15: Gillingham PM_{10} & Bristol St Pauls Wind Speed & Direction - Wind Rose

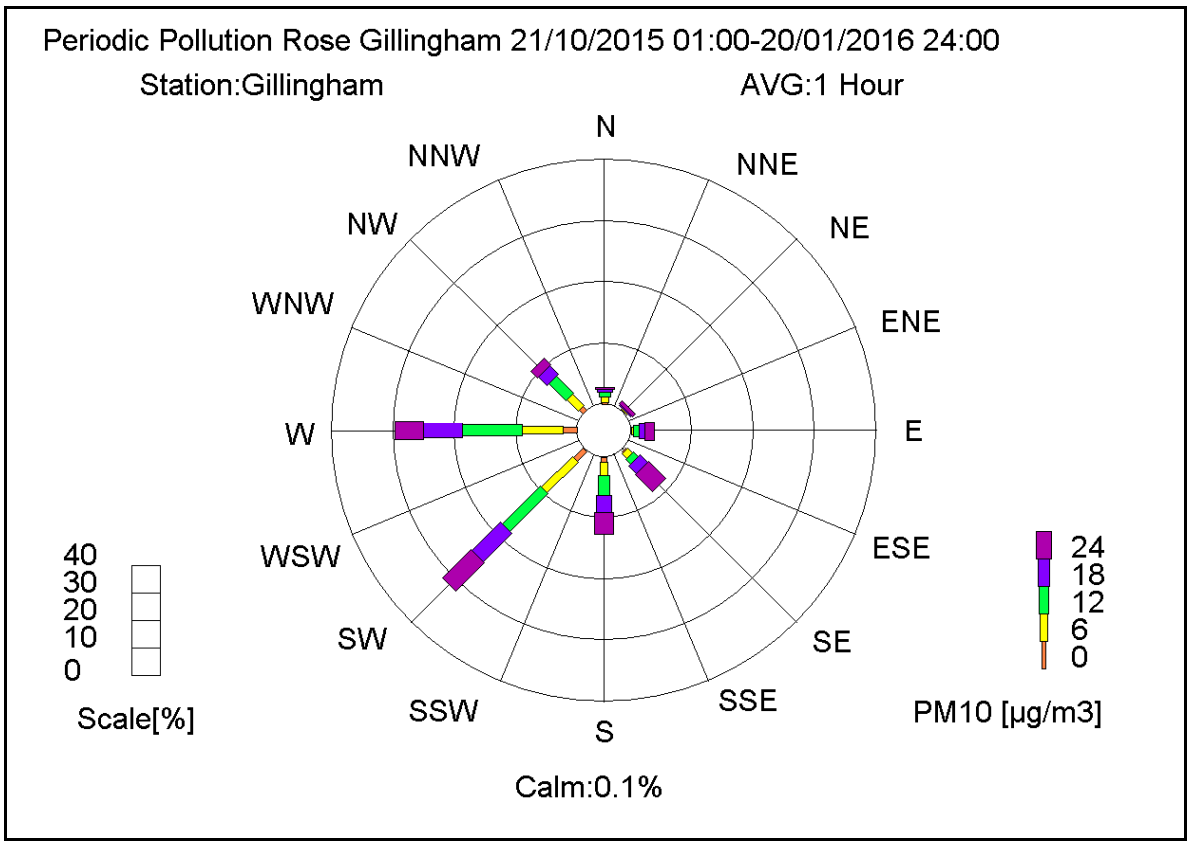

Figure 16: Gillingham PM_{10} & Portsmouth Wind Speed & Direction - Wind Rose

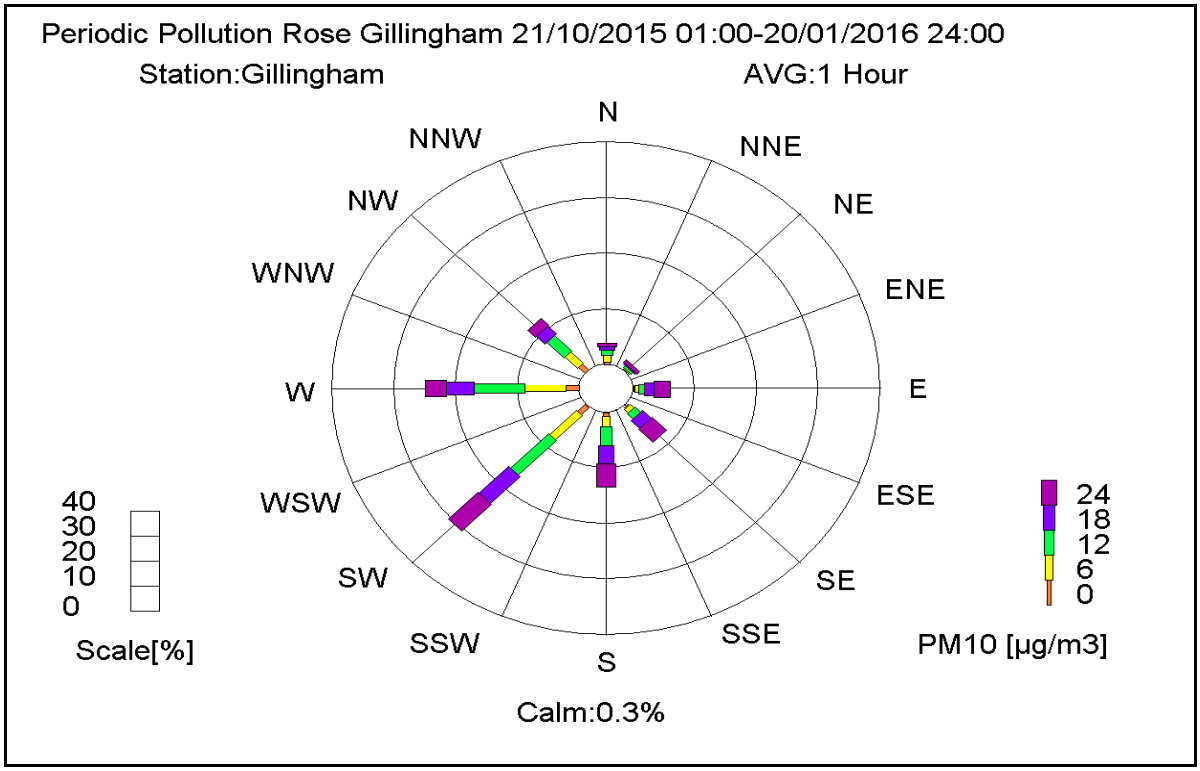

Figure 17: Gillingham PM_{10} & Plymouth Wind Speed & Direction - Wind Rose

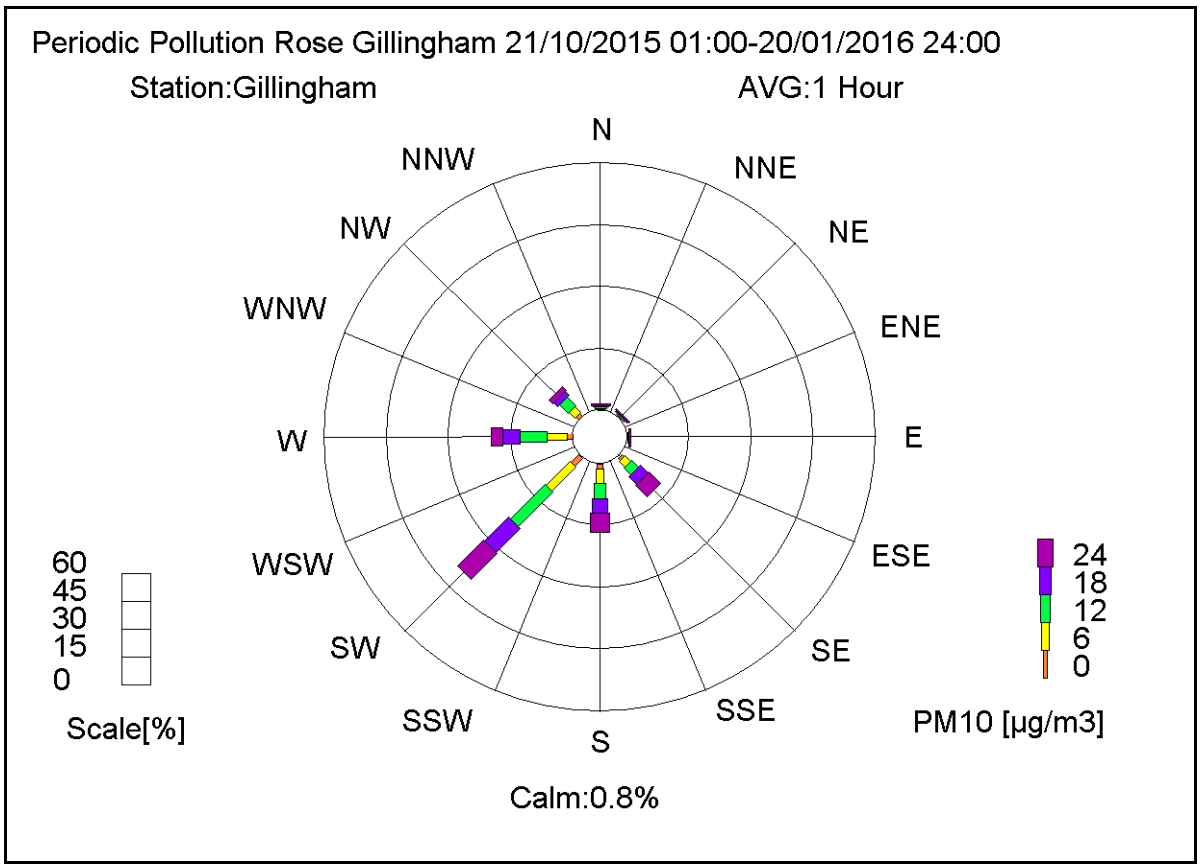

Figure 18: Gillingham PM_{10} & Harwell Wind Speed & Direction - Wind Rose

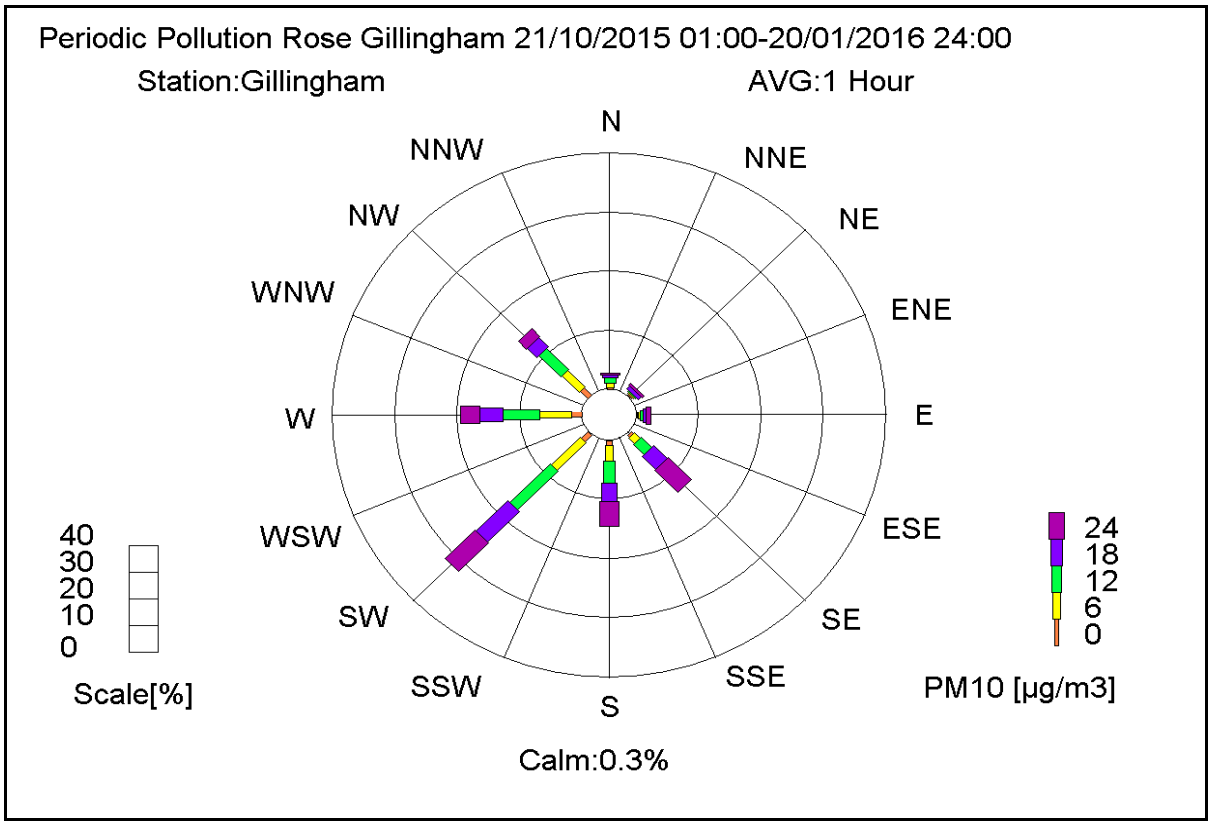

Figure 19: Gillingham PM_{10} & Narberth Wind Speed & Direction - Wind Rose

The overall distribution of wind directions is typical of the UK in general with a predominance of winds from the South West/West.

The contribution from the southerly direction cannot be overlooked and, as this area is predominantly agricultural, it would seem that these activities are also contributing the overall PM_{10} at the monitoring site.

The following Figures 20, 21, 22, 23, 24 are scatter roses for PM_{10} values at the AURN comparison sites with the meteorological data for the complete period all five sites. They were comparable with the pollution roses for Gillingham PM_{10} & AURN sites.

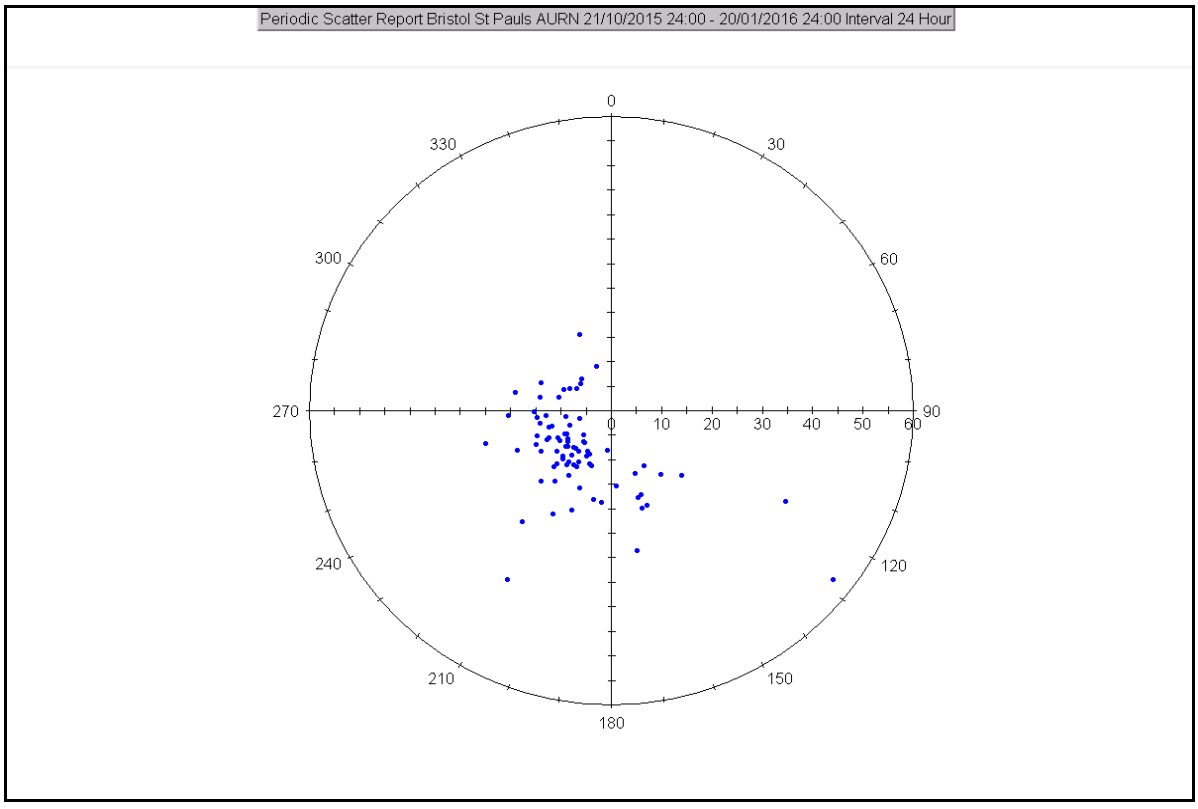

Figure 20: Bristol St Pauls Scatter Rose

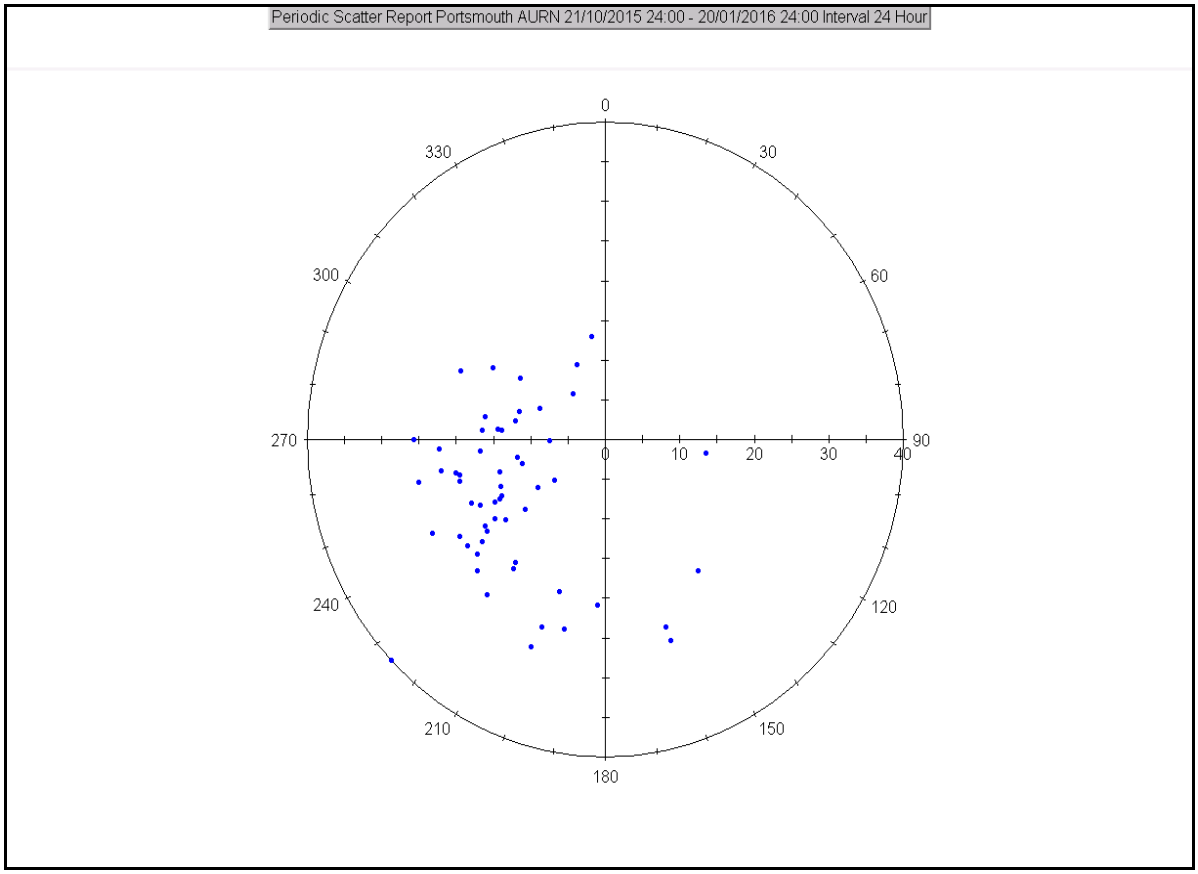

Figure 21: Portsmouth Scatter Rose

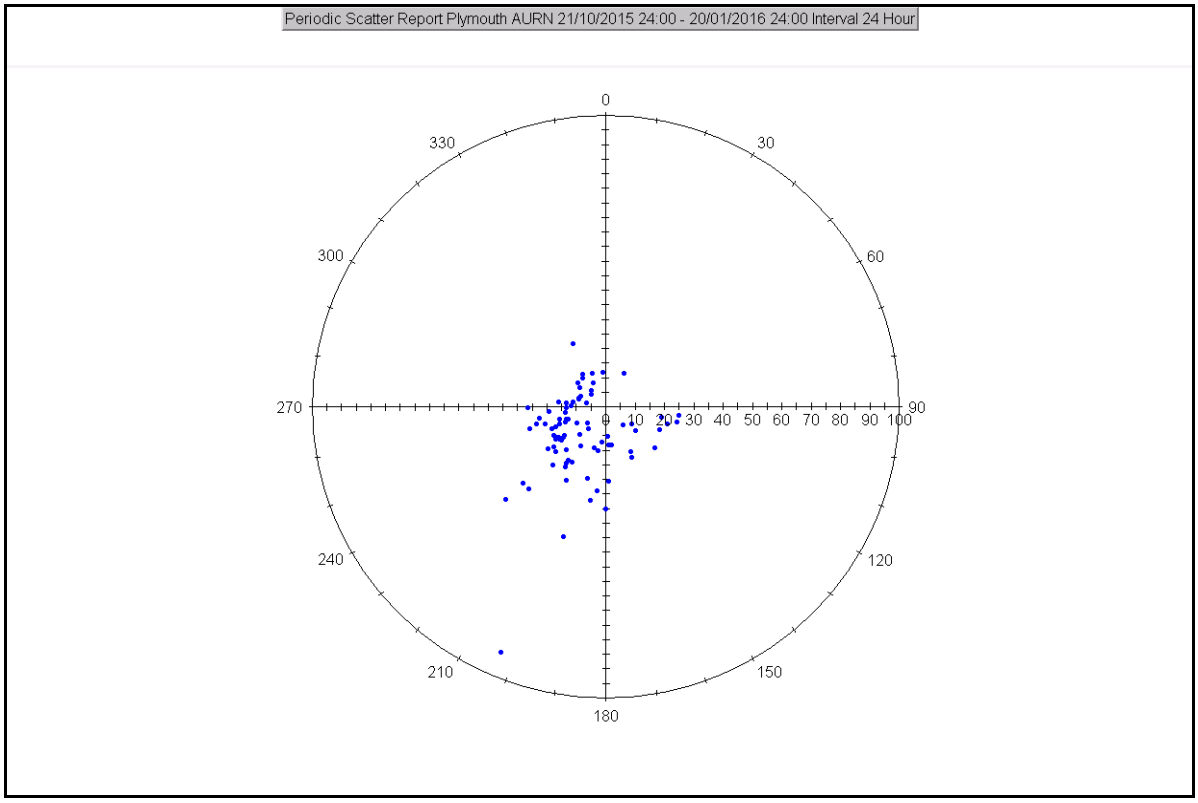

Figure 22: Plymouth Scatter Rose

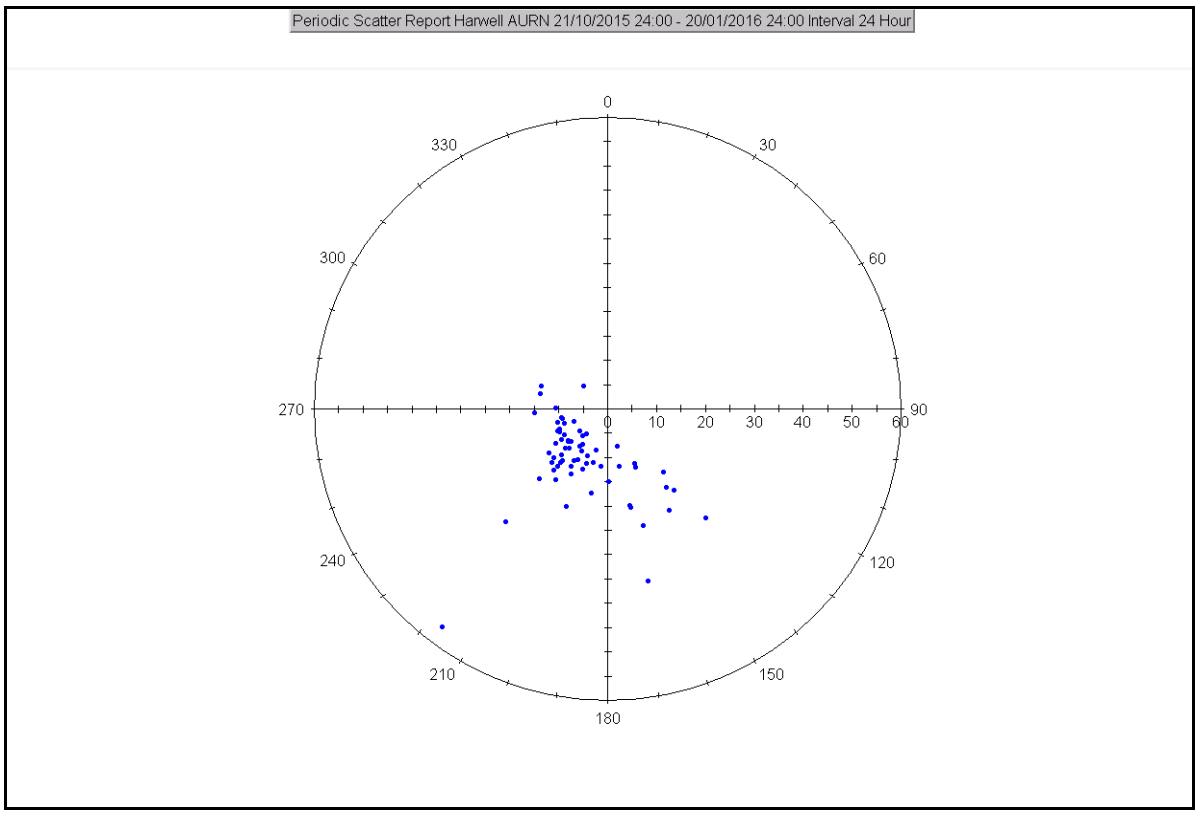

Figure 23: Harwell Scatter Rose

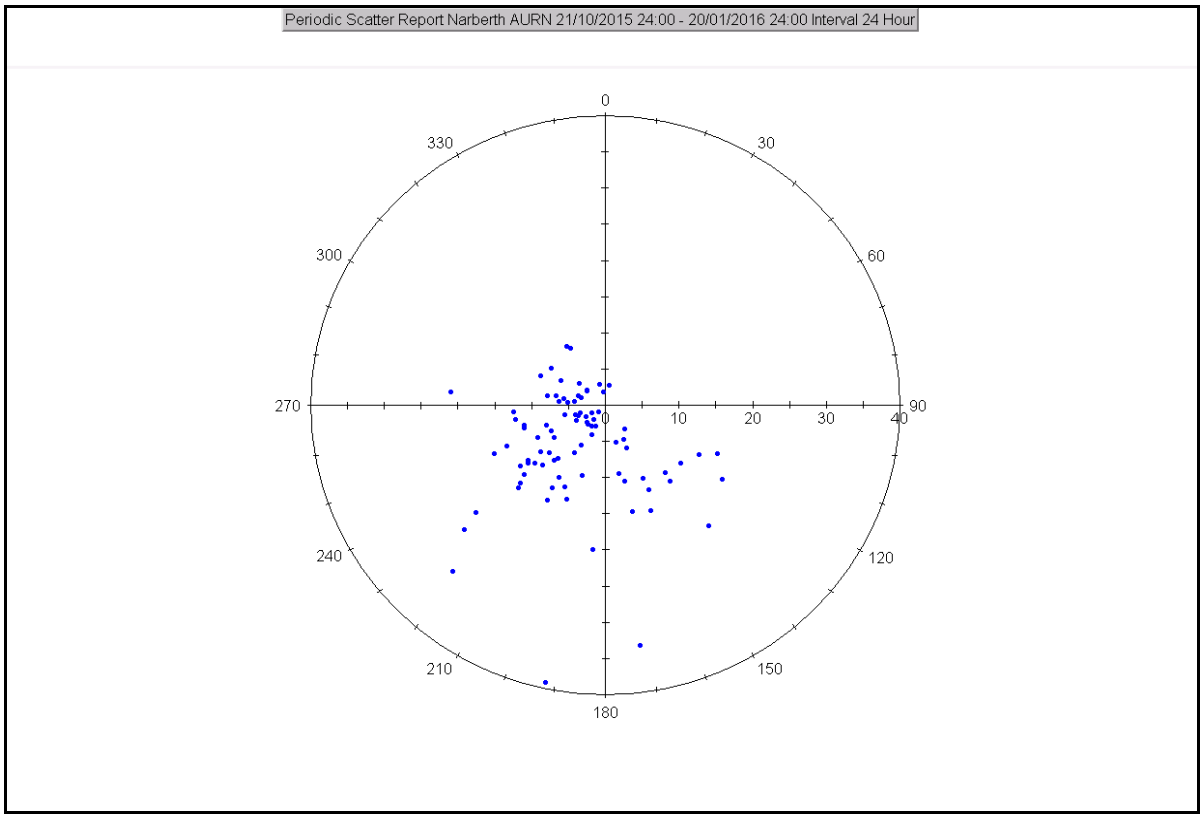

Figure 24: Narberth Scatter Rose

4.6 Historical Data Summary

Data from the AURN show that the annual averages for those years for which valid datasets are available are as given in Table 3.

	2013 PM_{10} Annual Average ($\mu g/m^3$)	**2014 PM_{10} Annual Average ($\mu g/m^3$)**
Bristol St Pauls	18	17
Portsmouth	N/A	18
Plymouth	18	17
Harwell	N/A	14
Narberth	16	14

Table 3: Summary of PM_{10} (annual mean) data statistics

Taking these figures as a baseline, and based on the methodology given in TG(09), it appears reasonable to assume that the annual average concentration of PM_{10} at Gillingham is highly unlikely to be in excess of 25 $\mu g/m^3$ and is more probably in the range 18 - 20 $\mu g/m^3$. This would mean that there is a low likelihood of the Air Quality Objectives for PM_{10} being exceeded at Gillingham.

5. Conclusions and recommendations

It is unlikely that the Air Quality Objectives for PM_{10} will be exceeded at Gillingham.

In view of this there is no need for the declaration of an Air Quality Management Area in this locality.

Since the 2012 Updating & Screening Assessment the operators had initially intended to enclose the wash facility in a building to address both noise and over-spray issues. This was not deemed practical by the operator but instead other changes that have been implemented:

- The wash is no longer available to be used by other HGV operators
- They have limited times when unit can be used (i.e. only during usual 'office hours')
- Provision of instructions to operating personnel on careful use.

From the available evidence there is no recommendation for further monitoring as it has shown that the HGV lorry wash does not appear to contribute to local concentrations of PM_{10} there is no recommendation for further monitoring.

However it is recommended that activities at this establishment are kept under review and, assuming there is no change in the Technical Guidance, further assessment be considered if there is any substantial increase in the capacity or amendments to the above current implementations are made.

6. References

- DEFRA Local Air Quality Management Technical Guidance LAQM, TG09
- DEFRA www.uk-air.defra.gov.uk
- North Dorset District Council, Detailed Assessment, 2010
- North Dorset District Council, Updating & Screening Assessment Report 2015
- National Atmospheric Emissions Inventory Website www.naei.org.uk

END OF REPORT