John Sisk & Sons Ltd

Great Ormond Street Hospital

Baseline Air Quality Monitoring

Project No. 445279-01-Baseline monitoring

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RSK GENERAL NOTES

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Group Limited.

Contents

1 INTRODUCTION

RSK Environment Limited was instructed to undertake to undertake a period of three months baseline air quality monitoring before the construction works at Great Ormond Street Hospital.

The monitoring programme comprised:

- Three indicative optical particulate matter monitors, nephelometers, to measure indicative concentrations of the fine particulate matter (PM_{10}) fraction of airborne particulate matter;
- Three Stockholm Environment Institute (SEI) 'Frisbee' dust deposition gauges and;

All equipment was installed on the 22nd of June 2023. With the exception of batteries powering the nephelometers at MP2 and MP3, which were installed on the 26th of June. All equipment was demobilised on the 4th of October 2023

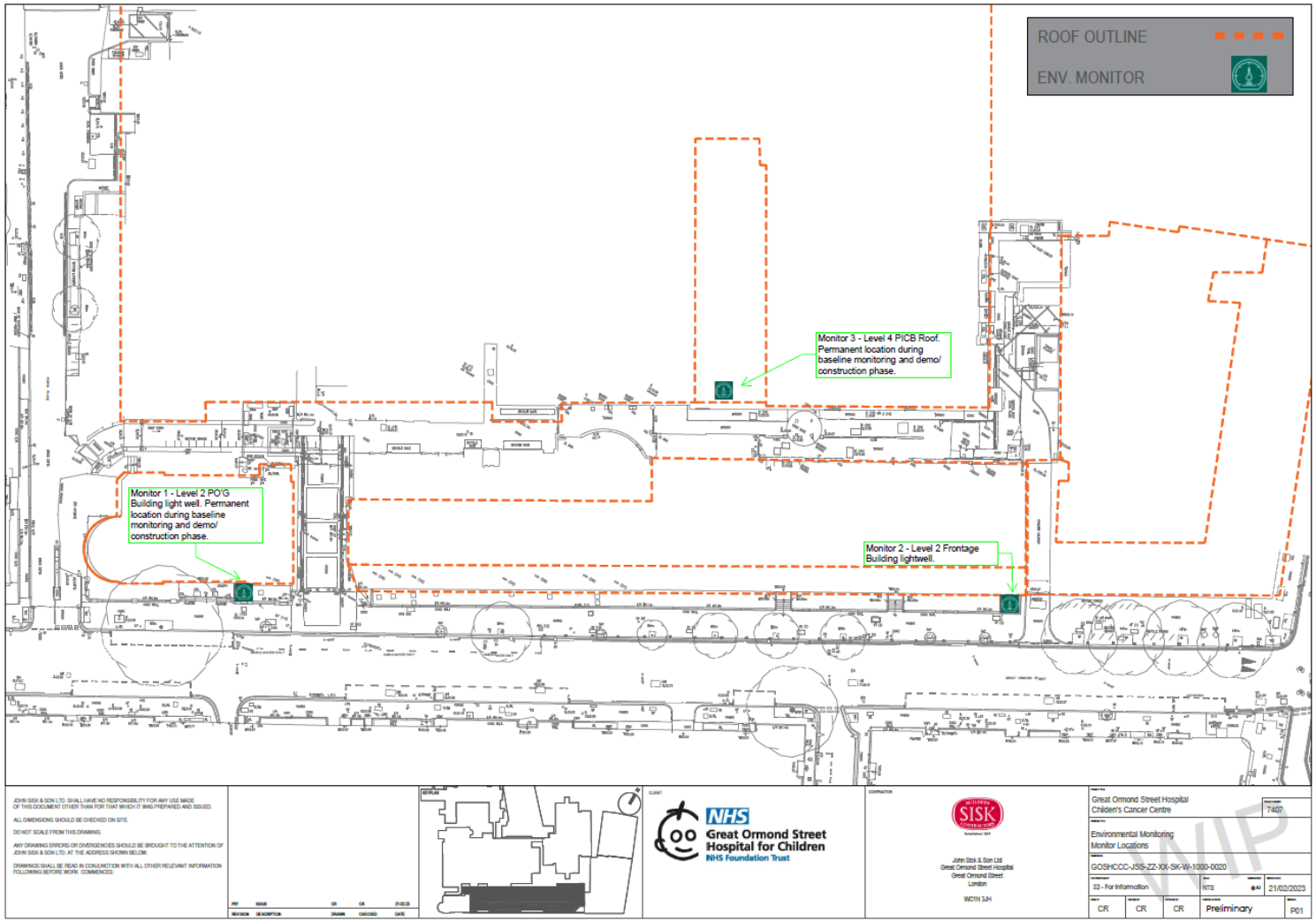
The nephelometer at MP1 was replaced on the 19th September as it was due for calibration.

Table 1.1: Monitoring Locations for Dust and PM_{10} monitoring

Monitor	Description	Monitoring Equipment	Nephelometer
MP1	Internal GOSH Rooftop	Frisbee and nephelometer	TNO4123 & TNO3850
MP2	GOSH Main Entrance	Frisbee and nephelometer	TNO3694
MP3	GOSH Service Entrance	Frisbee and nephelometer	TNO3603

This report covers the whole of the baseline monitoring period from 22nd June until the 4th of October 2023.

Figure 1.1: Monitoring Locations



2 MONITORING METHODS AND ASSESSMENT CRITERIA

2.1 Monitoring Methods

The proposed monitoring regime comprised:

- Dust monitoring using SEI 'Frisbee' dust deposition gauges,
- Near real-time indicative PM_{10} monitoring using nephelometers; and

2.1.1 Dust Deposition Monitoring

Disamenity due to the deposition of fugitive dust on surfaces may lead to complaints.

SEI 'Frisbee' dust deposition gauges were used for the dust monitoring at GOSH. The inverted 'Frisbee' dust deposition gauge, developed by the Stockholm Environment Institute (SEI) at the University of York, is established as a simple and robust method for the quantification of dust deposition. Dust is collected on a horizontal surface and in a collecting bottle. The dust is determined gravimetrically on a filter in the laboratory.

As shown in Figure 1.1, three dust deposition gauges were located across the site.

The dust deposition rate from the 'Frisbee' instruments was calculated as follows:

$$\text{Deposition rate, mg/m}^2\text{/day} = (W \times 24.7)/T$$

Where: W (mg) is the dry mass of insoluble solids; and
T (days) is the sampling period length.

2.1.2 PM_{10} Monitoring

Nephelometers are not a 'reference equivalent' method for the determination of airborne particulate matter concentrations; however, they provide continuous indicative data with short averaging periods and indicative PM_{10} concentrations can be related to events happening on site in near real-time and this technique is recognised as an appropriate and economic technique for construction site emissions monitoring.

Three 'Osiris' nephelometers were to be installed to provide continuous cloud-hosted, near real-time indicative data, with alert emails to nominated recipients if the pre-determined 'site action threshold' is exceeded, to allow and inform continuous management of site particulate emissions.

No permanent electricity supply was available therefore the instruments were powered using batteries which were charged and exchanged regularly by the John Sisk & Sons Ltd site team.

2.2 Assessment Criteria

The assessment criteria are set out below:

2.2.1 For PM_{10}:

- An '1-hour average' 'site action threshold' (SAT) of 190µg/m^3 PM_{10}, based on research on construction site emissions and recommended in the IAQM *Guidance on Monitoring in the Vicinity of Demolition and Construction Sites*;
- A 24-hour average PM_{10} criterion equivalent to the 24-hour mean air quality standard of 50µg/m^3 (35 exceedances are allowed per annum); and,
- A long-term criterion equivalent to the annual mean air quality standard of 40µg/m^3 (to be applied to the monitoring period reported).

2.2.2 For Dust Deposition:

The site is located in a busy area of Central London area; however for a conservative approach and in line with the IAQM Monitoring in the Vicinity of Demolition and Construction Sites 2018 the 'Residential areas & urban outskirts' threshold is applied, according to the *Suggested Guidelines for Deposited Ambient Dust* (H. W. Vallack and D.E. Shillito) reproduced in Table 2.1, below. Dust deposition rates will be compared with the criterion of 200mg/m^2/day, as the threshold when complaints are 'likely'.

Table 2.1: Suggested Guidelines for Ambient Deposited Dust

Site environs	Dust deposition rate (mg/m^2/day)	
Open Country	100	140
Residential areas & urban outskirts	150	200
Commercial town centre	200	260
Likelihood of complaint	**Possible**	**Likely**

Source: Suggested Guidelines for Deposited Ambient Dust, H. W. Vallack and D.E. Shillito, Published in Atmospheric Environment, Vol. 32, pp. 2737-2744.

3 AIR QUALITY MONITORING RESULTS

3.1 Particulate Matter (PM) Monitoring

Table 3.1 summarises the baseline airborne PM_{10} particulate matter results recorded by the nephelometer instruments at GOSH. The results are presented graphically in Figures 3.1 to 3.6, below.

The long-term monthly criterion equivalent to the annual mean air quality standard of 40µg/m^3 was not exceeded at any monitoring position, although the results should be treated with caution as the period mean is not equal to one calendar year.

The daily mean standard for ambient air of 50µg/m^3 was not exceeded at any monitoring position during the baseline monitoring period.

The SAT 190µg/m^3 threshold was not exceeded at any monitoring position during the baseline monitoring period.

Table 3.1: Summary of Baseline PM_{10} Monitoring at the GOSH

	MP1 Main Entrance	MP2 Service Entrance	MP3 Roof
Period Mean PM_{10}	10.4	9.0	8.3
Number of days exceeding 50 µg/m^3	0	0	0
Number of SAT exceedances	0	0	0

Figure 3.1: 1-Hourly Mean Indicative PM_{10} Concentrations, MP1

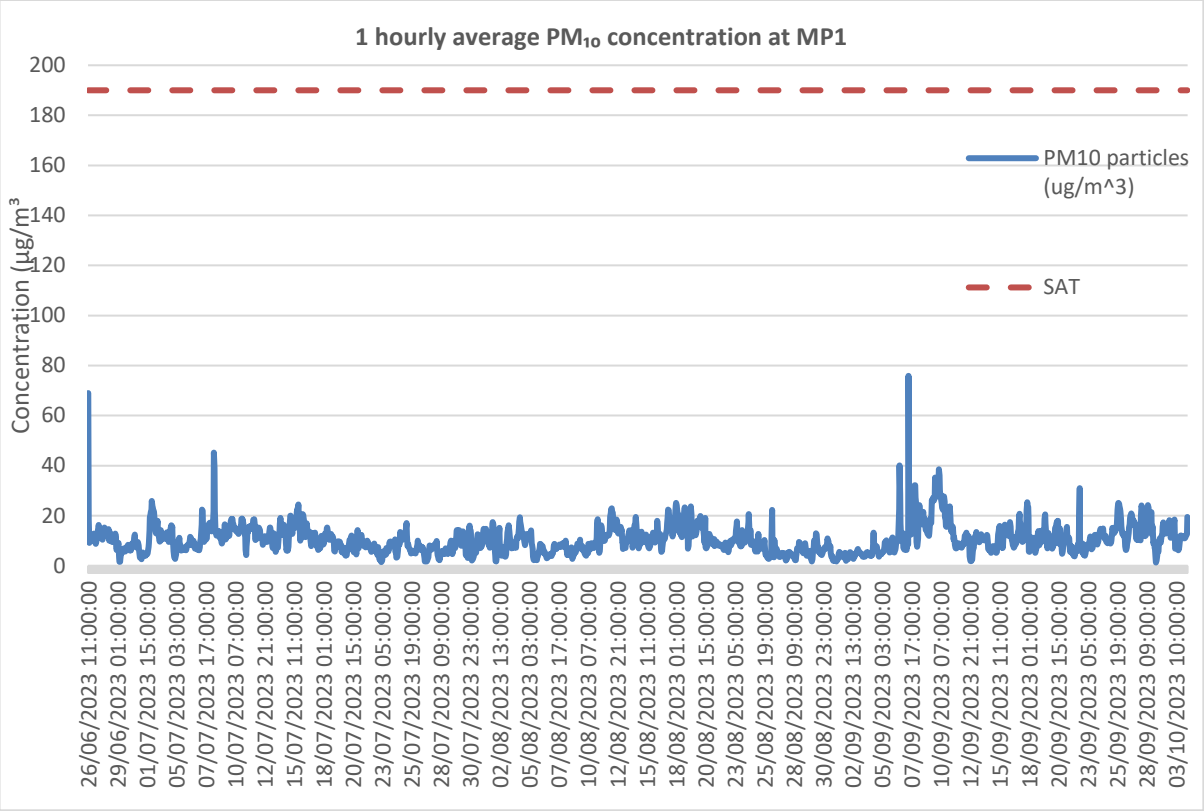


Figure 3.2: 1-Hourly Mean Indicative PM_{10} Concentrations, MP2

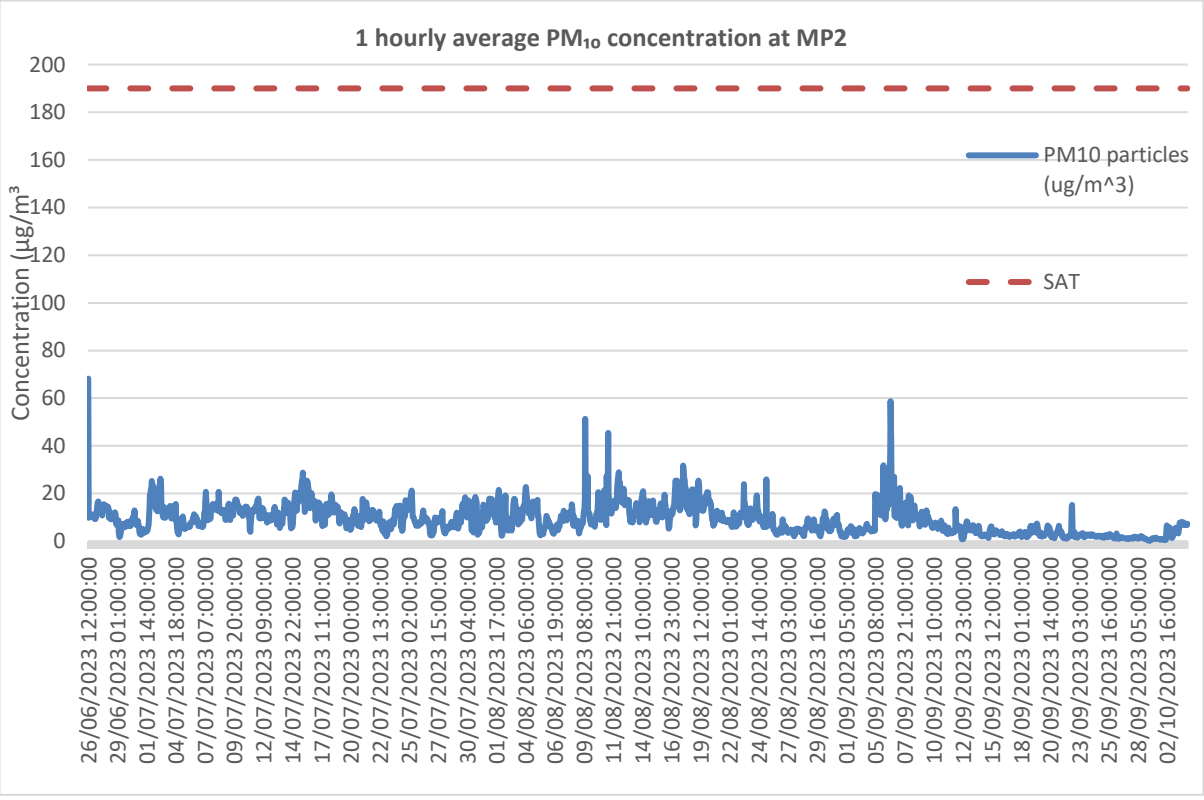


Figure 3.3: 1-Hourly Mean Indicative PM_{10} Concentrations, MP3

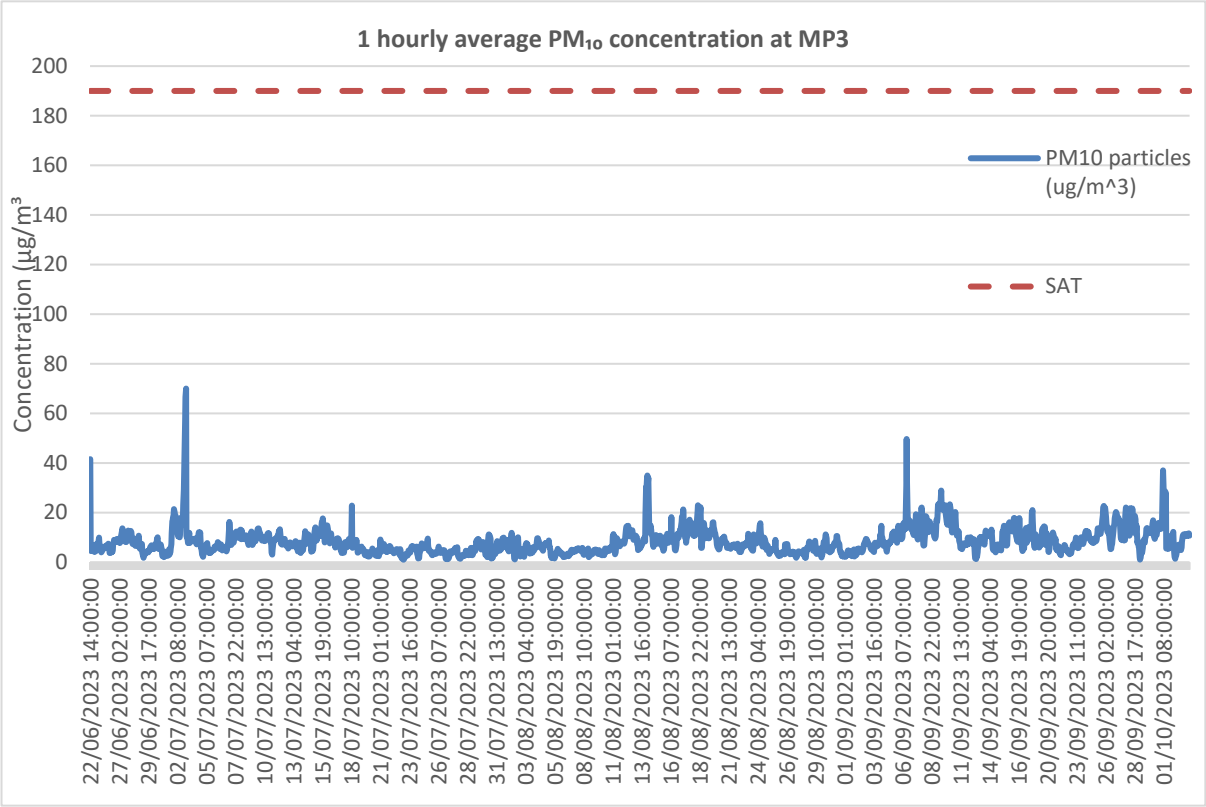


Figure 3.4: Daily Mean PM_{10} Concentrations, MP1

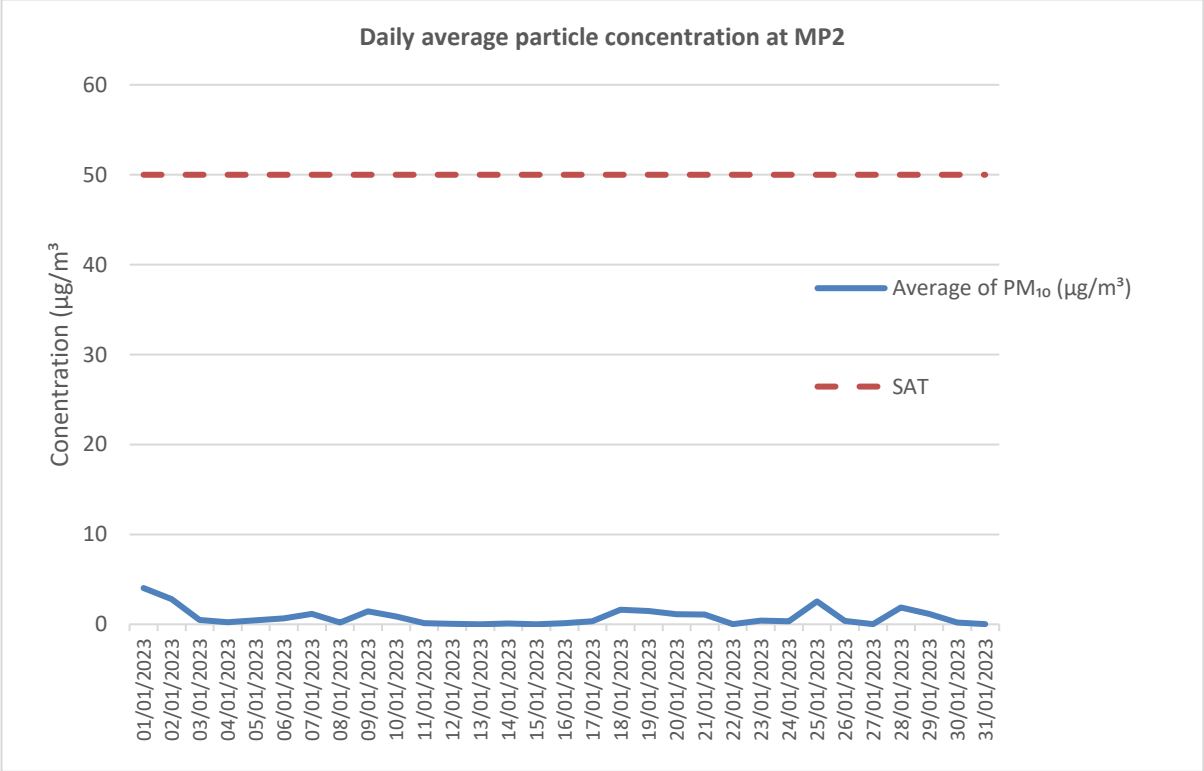


Figure 3.5: Daily Mean PM_{10} Concentrations, MP2

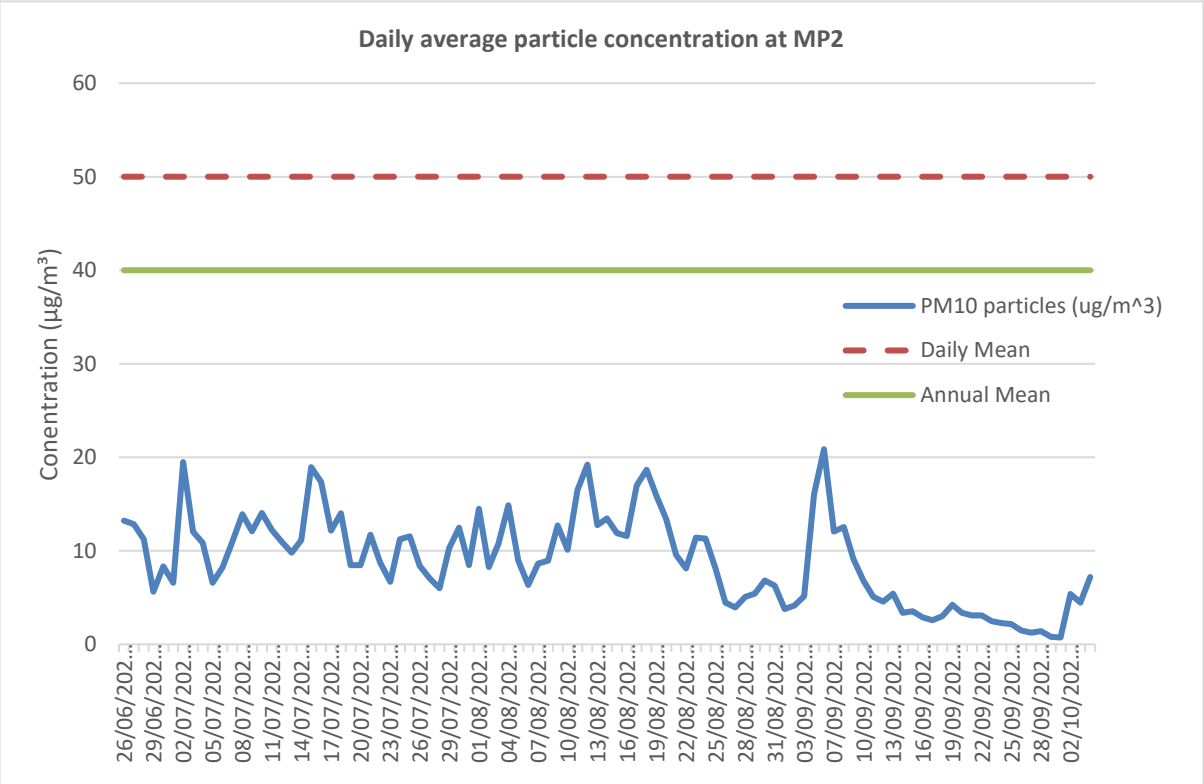
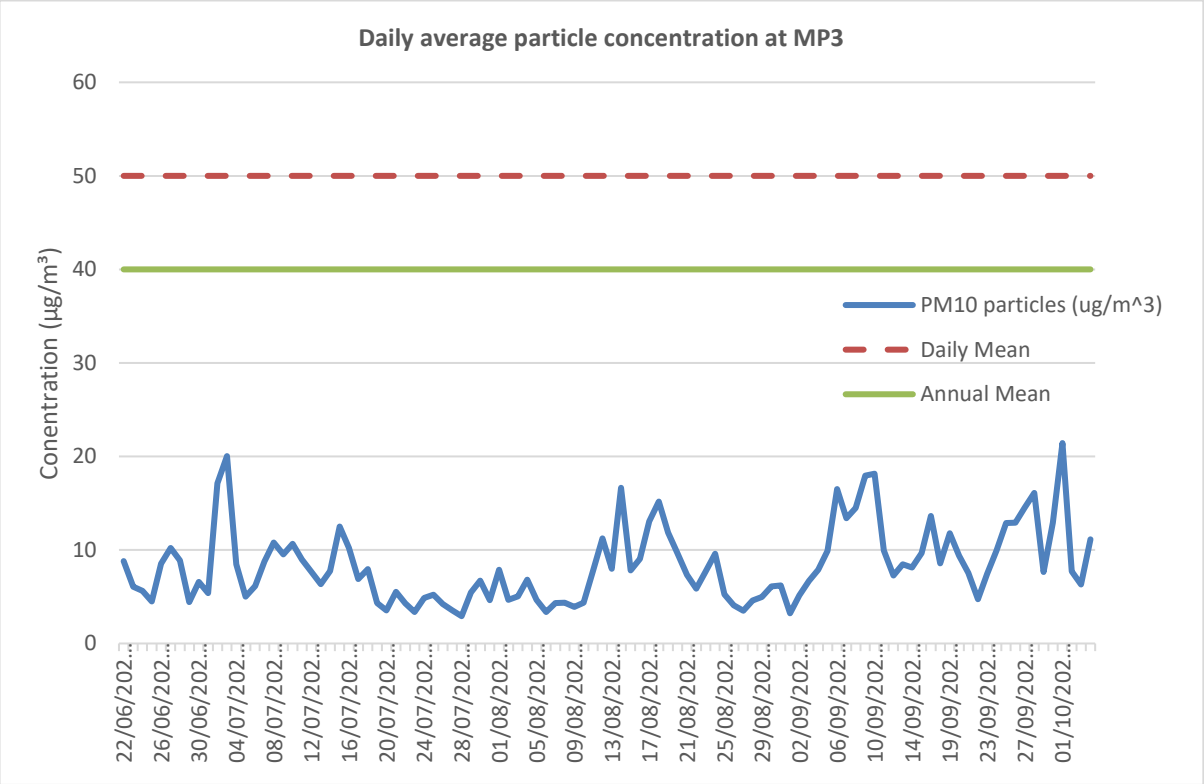


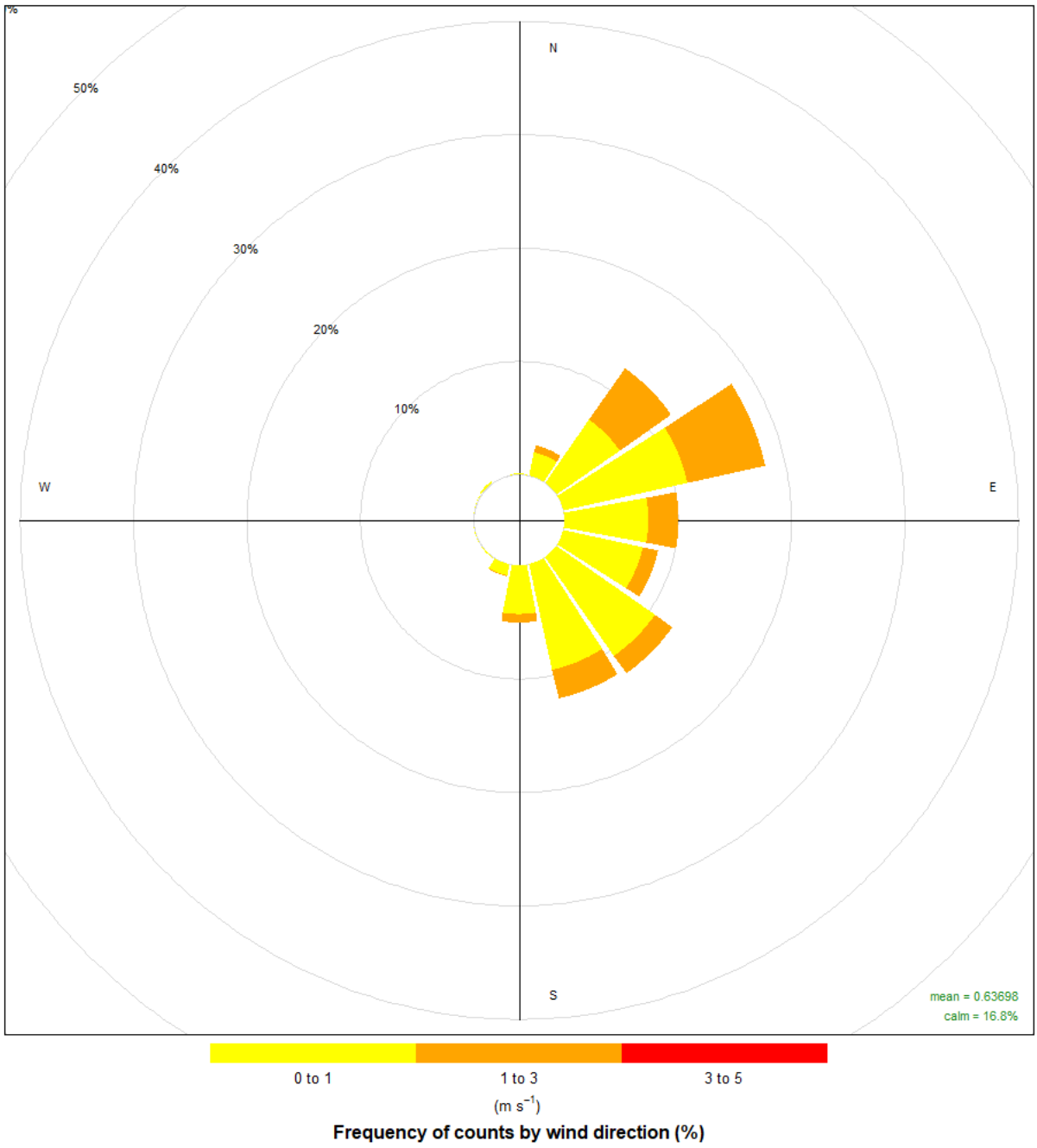
Figure 3.6: Daily Mean PM_{10} Concentrations, MP3



3.2 Meteorological Monitoring

During the monitoring period presented in this report, the meteorological monitoring recorded that the winds were predominantly from the north east, east and south east. The data is graphically presented in Figures 3.7

Figure 3.7: Windrose at MP3



3.3 Dust Deposition

The results of dust deposition monitoring conducted for the three monitoring periods are presented in Tables 3.2 to 3.4and Figure 3.8 below.

The dust deposition rate (mg/m^2/day) was below both the 'complaints possible' threshold (200 mg/m^2/day) and 'complaints likely' threshold (260 mg/m^2/day) for an 'urban centre' location at all monitoring locations for each monitoring period with the exception of MP2 which exceeded the complaints likely threshold during the 1st monitoring period (26th June to 1st August 2023).

Table 3.2: Dust Deposition Monitoring Results for GOSH, 26th June to 1st August 2023

Location	Number of Days	Mass of Dust (mg)	Dust Deposition Rate, mg/m^2/day	Likelihood of complaint
MP1	36	85	58	Below 'complaints possible'
MP2	36	639	438	Above 'complaints likely'
MP3	36	168	115	Below 'complaints possible'

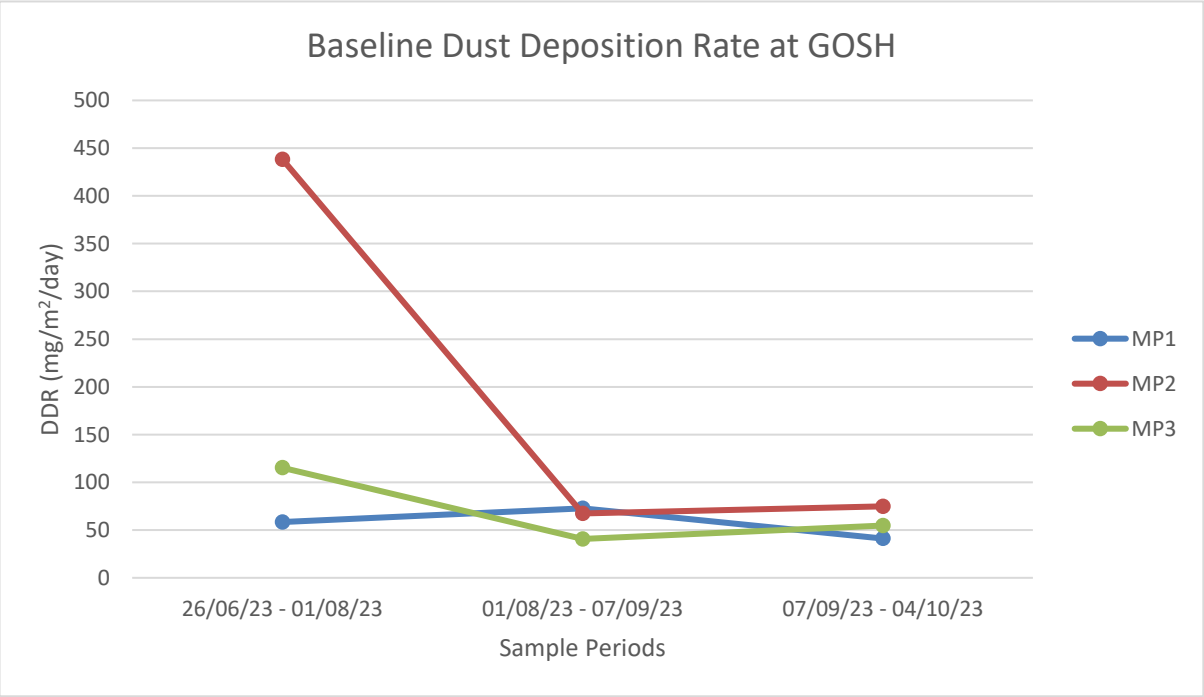
Table 3.3: Dust Deposition Monitoring Results for GOSH, 1st August to 7th September 2023

Location	Number of Days	Mass of Dust (mg)	Dust Deposition Rate, mg/m^2/day	Likelihood of complaint
MP1	37	109	73	Below 'complaints possible'
MP2	37	101	67	Below 'complaints possible'
MP3	37	61	41	Below 'complaints possible'

Table 3.4: Dust Deposition Monitoring Results for GOSH, 7th September to 4th October 2023

Location	Number of Days	Mass of Dust (mg)	Dust Deposition Rate, mg/m^2/day	Likelihood of complaint
MP1	27	45	41	Below 'complaints possible'
MP2	27	82	75	Below 'complaints possible'
MP3	27	60	55	Below 'complaints possible'

Figure 3.8: Dust Deposition at GOSH



4 CONCLUSIONS

RSK was instructed to undertake baseline air quality monitoring at Great Ormond Street Hospital, at three locations using three types of instrumentation/ monitor - nephelometers (which record data in real-time) and 'Frisbee' dust deposition gauges. This report presents the results for the entire baseline period from the 22nd June to 4th October 2023.

Data collected at the nephelometer monitoring locations have been compared with the annual, daily and hourly PM_{10} thresholds of 40 µg/m^3, 50µg/m^3 and 190µg/m^3 respectively. The long-term monthly criterion equivalent to the annual mean air quality standard of 40µg/m^3 was not exceeded at any location. The daily mean standard for ambient air of 50 µg/m^3 was not exceeded at any location. The 1-hourly 'site action threshold' (SAT) of 190µg/m^3 PM_{10} was not exceeded at any location.

The dust deposition rate (mg/m^2/day) was below both the 'complaints possible' threshold (200 mg/m^2/day) and 'complaints likely' threshold (260 mg/m^2/day) at all monitoring locations for each monitoring period except for MP2 which exceeded the complaints likely threshold during the 1st monitoring period (26th June to 1st August 2023).