SUMMARY MONITORING REPORT SEPTEMBER 2022

DATE:	31 October 2022	**CONFIDENTIALITY:**	Restricted
SUBJECT:	Monthly Air Quality Monitoring Report – September 2022		
PROJECT:	NVCC TCAR	**AUTHOR:**	Caroline Odbert and Adam Davison
CHECKED:	Peter Walsh	**APPROVED:**	Peter Walsh

INTRODUCTION

WSP has been commissioned by NHS Wales to undertake air quality monitoring to meet Cardiff Councils (CC) Pre-commencement planning condition 11 in relation to the Temporary Construction Access Route for the Construction of the Approved Velindre Cancer Centre, Whitchurch Hospital, Park Road, Whitchurch, Cardiff, CF14 7XB.

Condition 11 (CC Reference: 20/01110/MJR) states that:

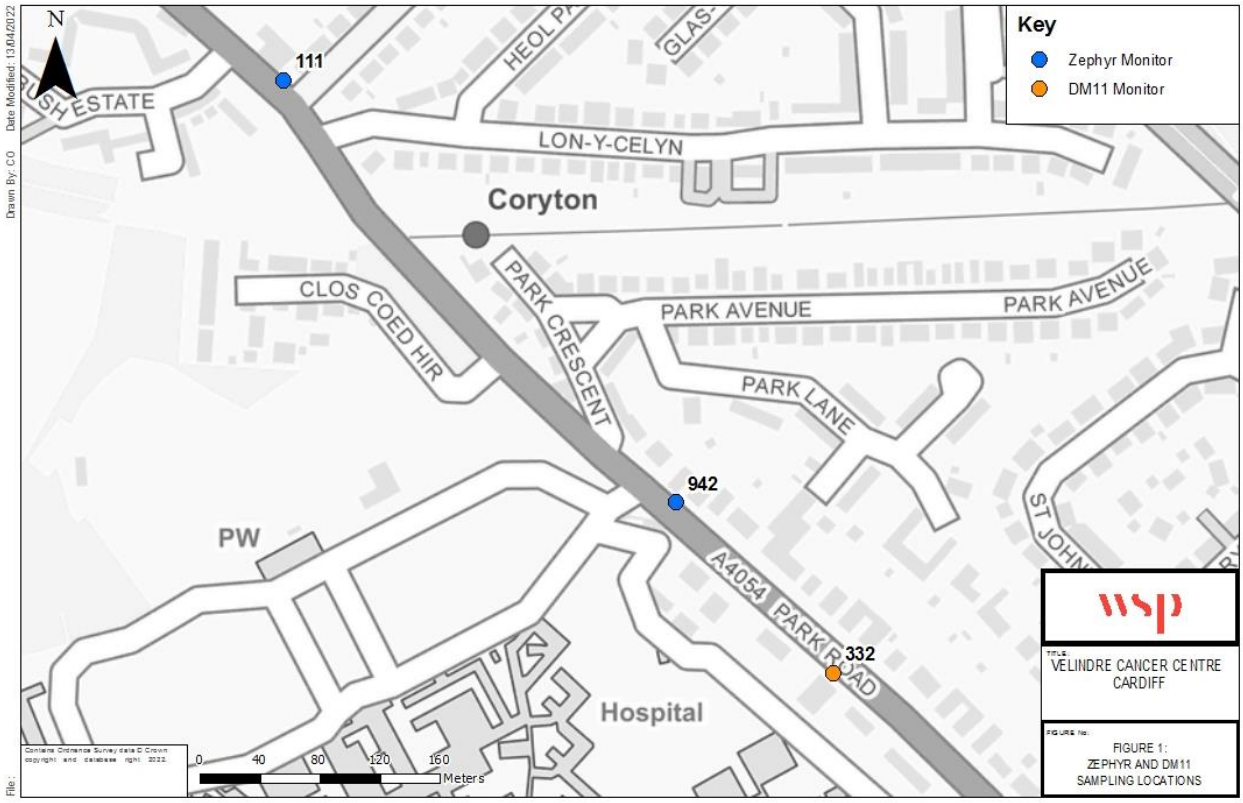
> *"Prior to commencement of the development hereby approved details of an air monitoring unit and its location shall be submitted to and approved in writing with the Local Planning Authority. The monitoring unit shall be implemented in accordance with the approved details and remain operational until cessation of the development. Data from the air monitoring unit shall be provided to the Local Planning Authority on request.*
>
> *Reason: To monitor air quality in accordance with Policy EN13 of the adopted Cardiff Local Plan (2006-2026).'*

During construction works there is the potential for air quality impacts from the generation of dust and particulate matter, which could lead to dust soiling and human health impacts at relevant sensitive receptors. There is also the potential for increases in pollutant emissions from construction vehicles using the local road network.

In order to discharge the pre-commencement planning condition 11, on behalf of NHS Wales, WSP is carrying out monitoring in the study area using Zephyr and DM11 Pro continuous monitors. The air quality monitoring within the study area is being undertaken to ensure that dust and vehicle exhaust emissions from construction traffic are monitored and effectively managed. This report provides a summary of the monitoring data for September 2022.

Concentrations of particulate matter (PM_{10} and $PM_{2.5}$) and Nitrogen Dioxide (NO_2) are being continuously monitored at three locations within the study area (See Figure 1). There are two monitors continuously sampling for NO_2, PM_{10} and $PM_{2.5}$ (Zephyr monitors) located close to the Hollybush Estate site and close to the construction site entrance. There is also a dedicated PM_{10} and $PM_{2.5}$ monitor (DM11 Pro) located outside 19 Park Road.

Figure 1 Air Quality Monitoring Locations



The Zephyrs and DM11 Pro are able to detect localised pollution events and fluctuations in the concentrations and can send alerts to the project team when concentrations go above a certain threshold. The Zephyr continuous monitoring devices are supplied by Earthsense and the DM11 Pros by Air Quality Monitors, data from each of the monitors is uploaded onto a cloud system/website where is can be viewed and downloaded by specific individuals.

AIR QUALITY OBJECTIVES AND STANDARDS

The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS)[1]. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation[2].

The air quality standards are levels recommended by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO) with regards to current scientific knowledge about the effects of each pollutant on health and the environment.

The air quality objectives are policy-based targets set by the Government, which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

The relevant standards and objectives for this monitoring programme are given in Table 1.

[1] Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2)

[2] The UK formally left the EU on 31st January 2020 and new air quality legislation for the UK will be brought forward in due course. The Air Quality (Miscellaneous Amendment and Revocation of Retained Direct EU Legislation) (EU Exit) Regulations 2018 (SI 2018/1407) (see Regulation 5) makes changes to retained direct EU legislation relating to air quality, to ensure that it continues to operate effectively.

Table 1 – Relevant Air Quality Objectives and Standards

Pollutant	Concentration (µg/m³)	Duration	Exceedances permitted per 12 month period
Nitrogen Dioxide	200	1-hour mean	18
	40	Annual mean	-
Particulate matter (PM_{10})	40	Annual mean	-
	50	24-hour mean	35
Particulate matter ($PM_{2.5}$) *	20	Annual mean	-

* Local Authorities are required to work towards reducing emissions/concentrations of particulate matter within their administrative area, however, there is no statutory objective given in the AQS for $PM_{2.5}$ at this time, only a framework.

DEFRA AIR QUALITY INDEX

Defra's Air Quality Index[3] provides a useful indication of the levels of air pollution. The index is divided into four bands (low, moderate, high, very high), and the index is numbered from 1 to 10 within these bands (Figure 2). The bandings are based on hourly/24-hour mean concentrations depending on the pollutant.

Figure 2 – Defra Air Quality Index

Nitrogen Dioxide

Based on the hourly mean concentration.

Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
µg/m³	0-67	68-134	135-200	201-267	268-334	335-400	401-467	468-534	535-600	601 or more

PM_{10} Particles

Based on the daily mean concentration for historical data, latest 24 hour running mean for the current day.

Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
µg/m³	0-16	17-33	34-50	51-58	59-66	67-75	76-83	84-91	92-100	101 or more

$PM_{2.5}$ Particles

Based on the daily mean concentration for historical data, latest 24 hour running mean for the current day.

Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Moderate	Moderate	Moderate	High	High	High	Very High
µgm^{-3}	0-11	12-23	24-35	36-41	42-47	48-53	54-58	59-64	65-70	71 or more

[3] https://uk-air.defra.gov.uk/air-pollution/daqi

MONITORING RESULTS

Zephyr Continuous Monitors

Nitrogen Dioxide

Concentrations of NO_2 were monitored at both of the Zephyr continuous monitors over the period 1st to 30th September 2022 (Figure 3), a summary of the monitored concentrations is provided in Table 2. Both continuous monitors had 100% data capture over the monitoring period.

Average hourly NO_2 concentrations across the monitoring period at both monitoring sites were well below the air quality objective of 40µg/m³. There were no exceedances of the one-hour objective (200µg/m³) at either of the sites, and NO_2 concentrations follow a similar trend in data at both monitoring locations.

Figure 3 – Monitored Zephyr NO_2 Hourly Concentrations (µg/m³)

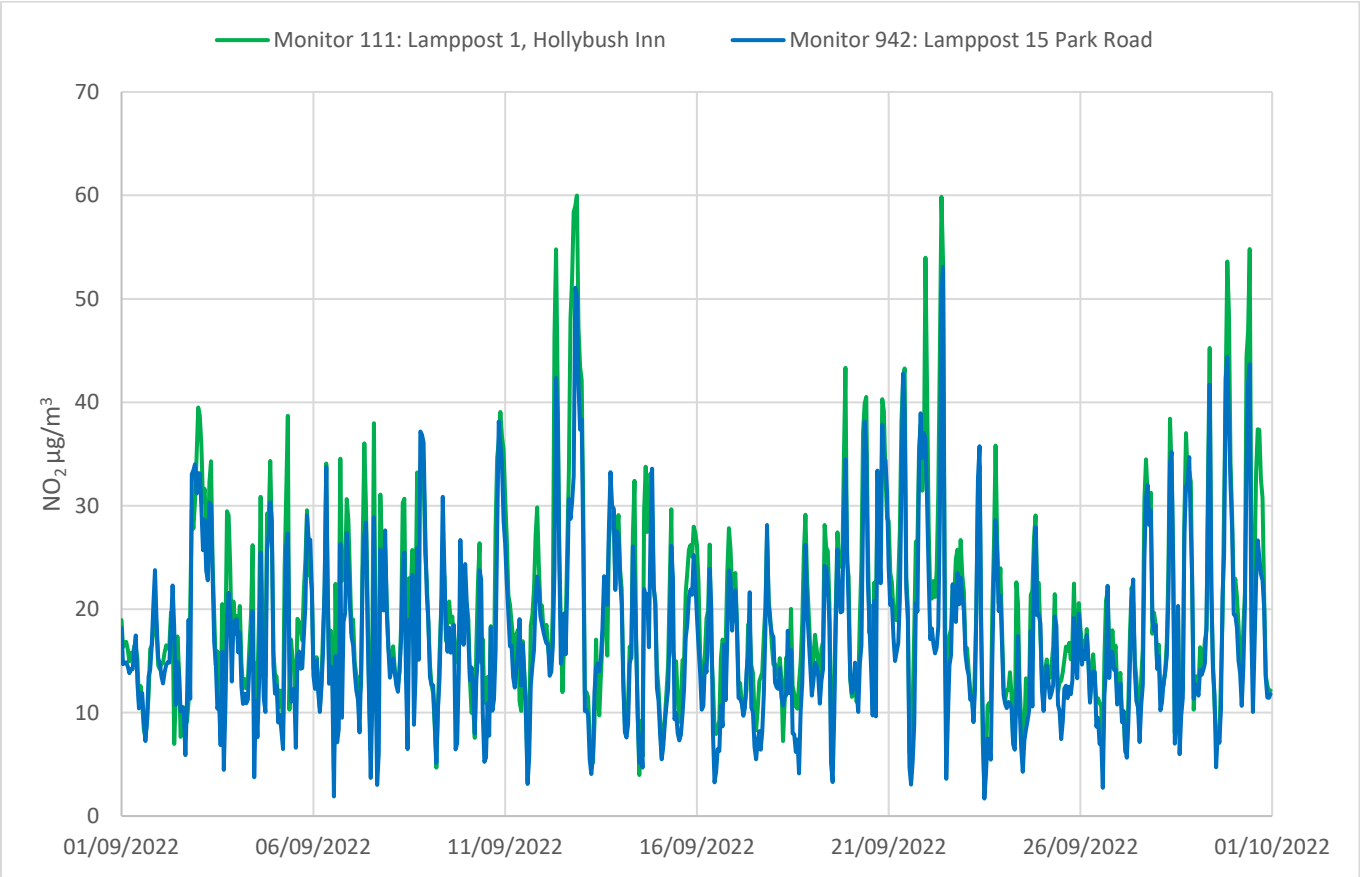


Table 2 – NO_2 Concentrations, September 2022

Monitor	Location	NO_2 Concentration Summary (µg/m³)	
		Average	Hourly Maximum
111	Lamppost 1, Hollybush Inn	19.7	60.0
942	Lamppost 15, Park Road	17.3	53.1

Particulate Matter (PM_{10} and $PM_{2.5}$)

Concentrations of both PM_{10} and $PM_{2.5}$ were monitored at both of the Zephyr continuous monitors over the period 1st to 30th September 2022 (Figure 4 and Figure 5), a summary of the monitored concentrations is provided in Table 3. Both continuous monitors had 100% data capture during the monitoring period.

Average hourly concentrations of PM_{10} and $PM_{2.5}$ at both the Zephyr continuous monitors were below the respective annual mean objectives of 40µg/m³ and 20µg/m³ during the monitoring period. In addition, there were no

24-hour mean concentrations above the 24-hour mean air quality objective of 50µg/m^3, and PM_{10} as well as $PM_{2.5}$ concentrations follow a similar trend at both monitor locations.

A distinct peak in both PM_{10} and $PM_{2.5}$ concentrations occurred at both monitors in the morning of September 3rd 2022 (the maximum concentration outside Hollybush Inn was 32.5 and 22.3µg/m^3 for PM_{10} and $PM_{2.5}$ respectively). Given that nitrogen dioxide concentrations remained within a typical range during this time, it is unlikely that road traffic emissions were solely responsible for this peak in concentrations. Moreover, the short, pronounced nature of the peak suggests that the emissions source was local, rather than driven my macro scale weather conditions.

Figure 4 – Monitored Zephyr Hourly PM_{10} Concentrations (µg/m^3)

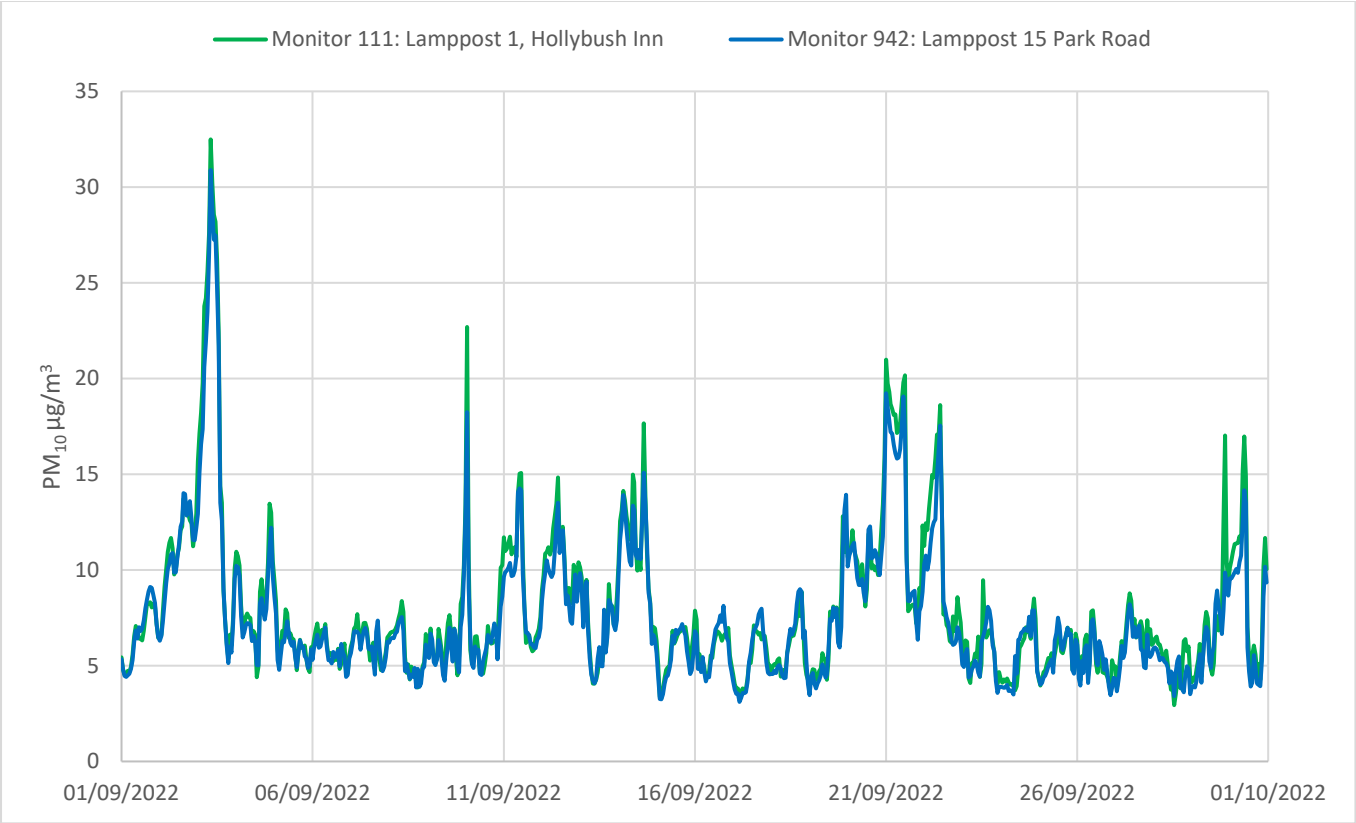


Figure 5 – Monitored Zephyr Hourly $PM_{2.5}$ Concentrations (µg/m^3)

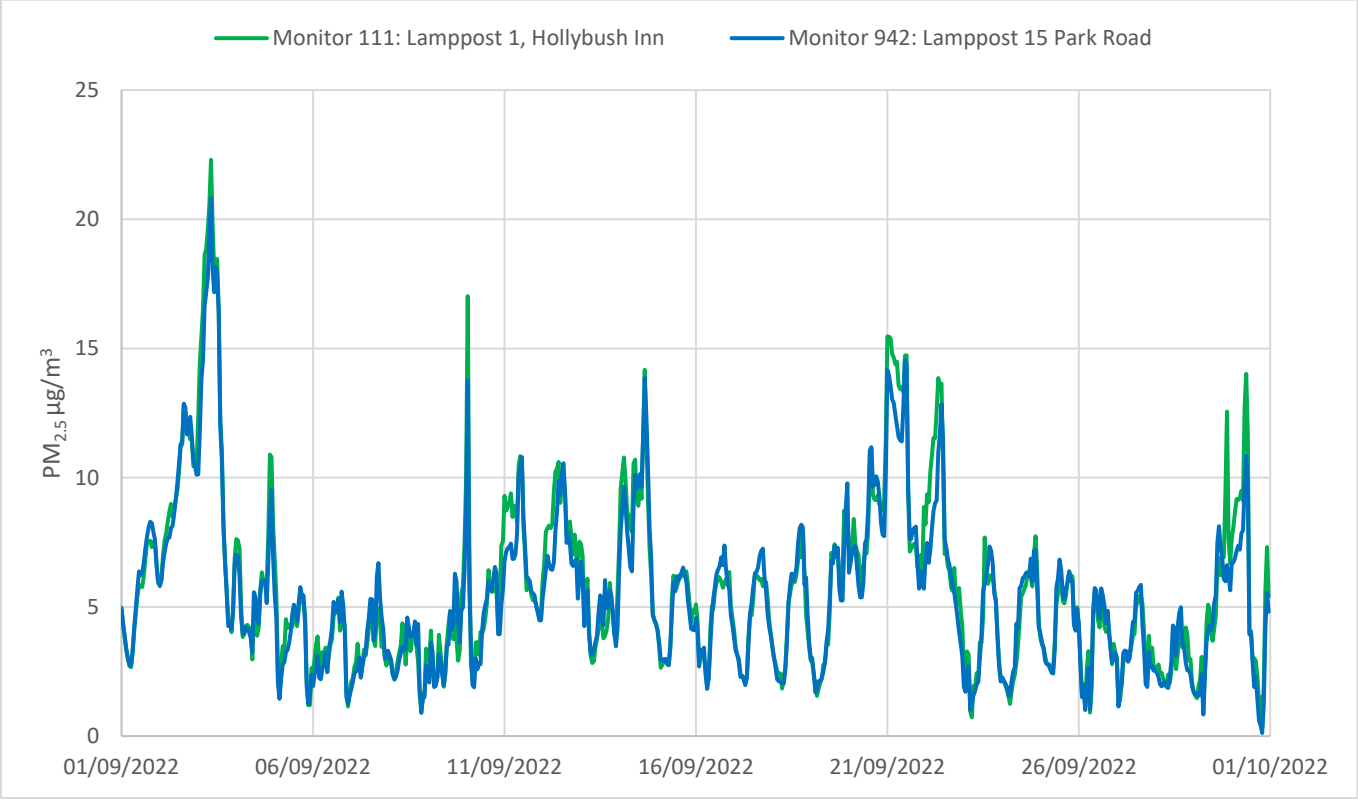


Table 3 – PM_{10} and $PM_{2.5}$ Concentrations Recorded by Zephyr Monitors, September 2022

Monitor	Location	PM_{10} Concentrations (µg/m³)			$PM_{2.5}$ Concentrations (µg/m³)	
		Average	Maximum Hourly	Maximum 24-hour mean	Average	Maximum Hourly
111	Lamppost 1, Hollybush Inn	7.9	32.5	17.8	5.7	22.3
942	Lamppost 15, Park Road	7.5	30.9	16.6	5.5	20.8

DM11 Pro Continuous Monitor

Particulate Matter (PM_{10} and $PM_{2.5}$)

Figure 6, shows the PM_{10} and $PM_{2.5}$ data monitored at the DM11 Pro continuous monitor for the period 1st to 30th September 2022. A summary of the monitored concentrations is provided in Table 4. The DM11 continuous monitor had 100% data capture during the monitoring period. Average hourly concentrations of PM_{10} and $PM_{2.5}$ are below the respective annual mean objectives of 40µg/m³ and 20µg/m³ during the monitoring period. In addition, there were no 24-hour mean concentrations above 50µg/m³. The distinct peak recorded by the Zephyrs on September 3rd is still apparent on Figure 6, albeit to a far lesser extent, this is consistent with the notion that the emissions source for this pollution event was local, likely closer to the Hollybush Inn.

Figure 6 – Monitored DM11 PM_{10} and $PM_{2.5}$ Concentrations (µg/m³)

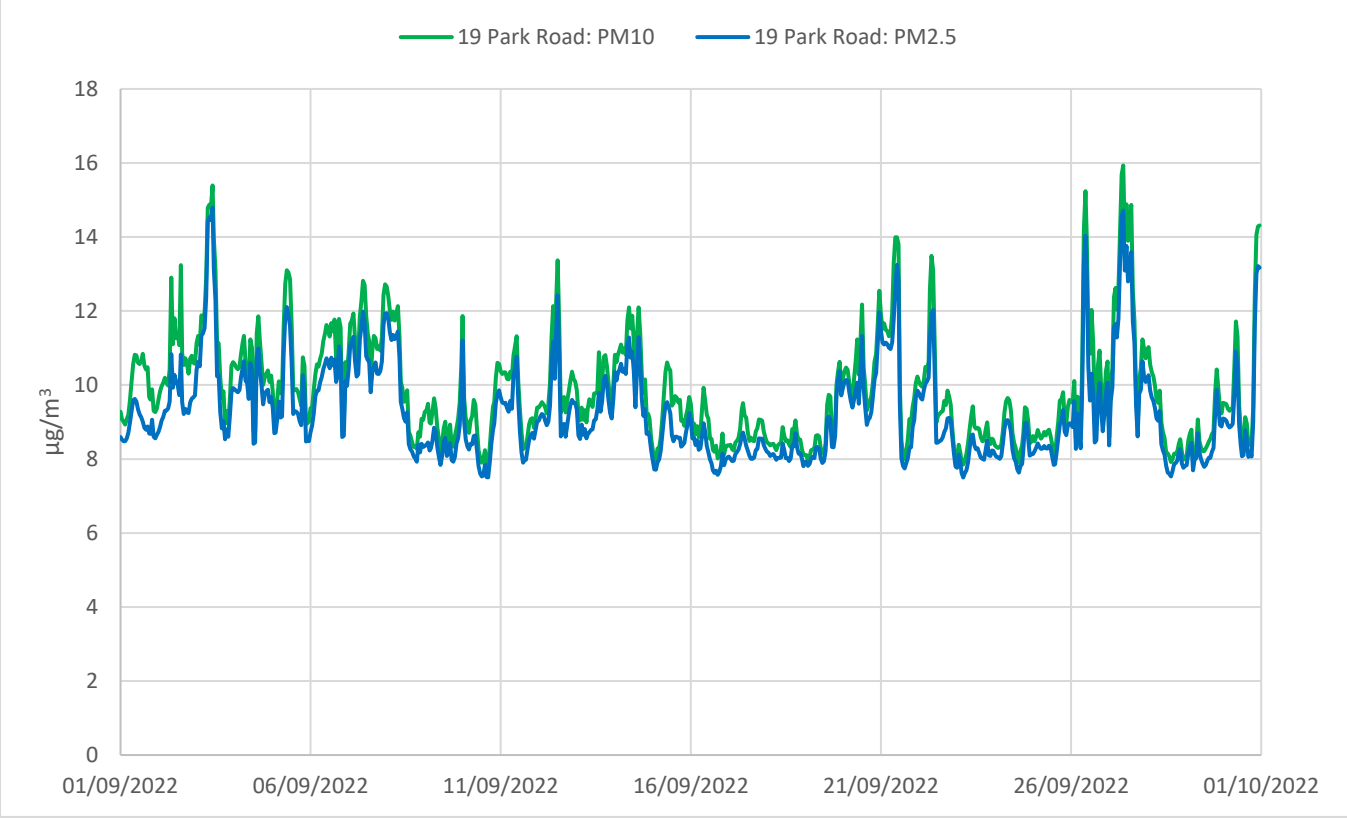


Table 4 – PM_{10} and $PM_{2.5}$ Concentrations, September 2022

Monitor	Location	PM_{10} Concentrations (µg/m^3)			$PM_{2.5}$ Concentrations (µg/m^3)	
		Average	Maximum Hourly	Maximum 24-hour mean	Average	Maximum Hourly
332	19 Park Road	9.9	15.9	12.5	9.3	14.8