



SUMMARY MONITORING REPORT

November 2023

DATE:	01 March 2024	CONFIDENTIALITY:	Restricted
SUBJECT:	Monthly Air Quality Monitoring Report – November 2023		
PROJECT:	NVCC TCAR	AUTHOR:	Sachin Kumar
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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 November 2023.

Concentrations of particulate matter (PM₁₀ and PM_{2.5}) and Nitrogen Dioxide (NO₂) have been continuously monitored at four locations within the study area (See Figure 1). There are two monitors continuously sampling for NO₂, PM₁₀ and PM_{2.5} (Zephyr monitors) located close to the Hollybush Estate site and close to the construction site entrance. There were also dedicated PM₁₀ and PM_{2.5} monitors (DM11 Pro) located outside 19 Park Road and at a location On-site. The On-site DM11 monitor was located close to the construction site entrance, however, the required power supply was removed on the 12th October and no suitable replacement power supply was available. An alternative location with adequate power and site suitability is being explored and as such only data from the DM11 at 19 Park Road is presented in this report.

The Zephyrs and DM11 Pro monitors 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 it can be viewed and downloaded by specific individuals.

Between the 10th October and 6th November both the Zephyr monitors were placed at the continuous monitor on Park Street in Bridgend to enable a co-location study to take place. This co-location study next to a Defra/Devolved

Administrations reference instrument allows an understanding on how the Zephyr monitors are performing The results of this study are presented and discussed within this monitoring report.

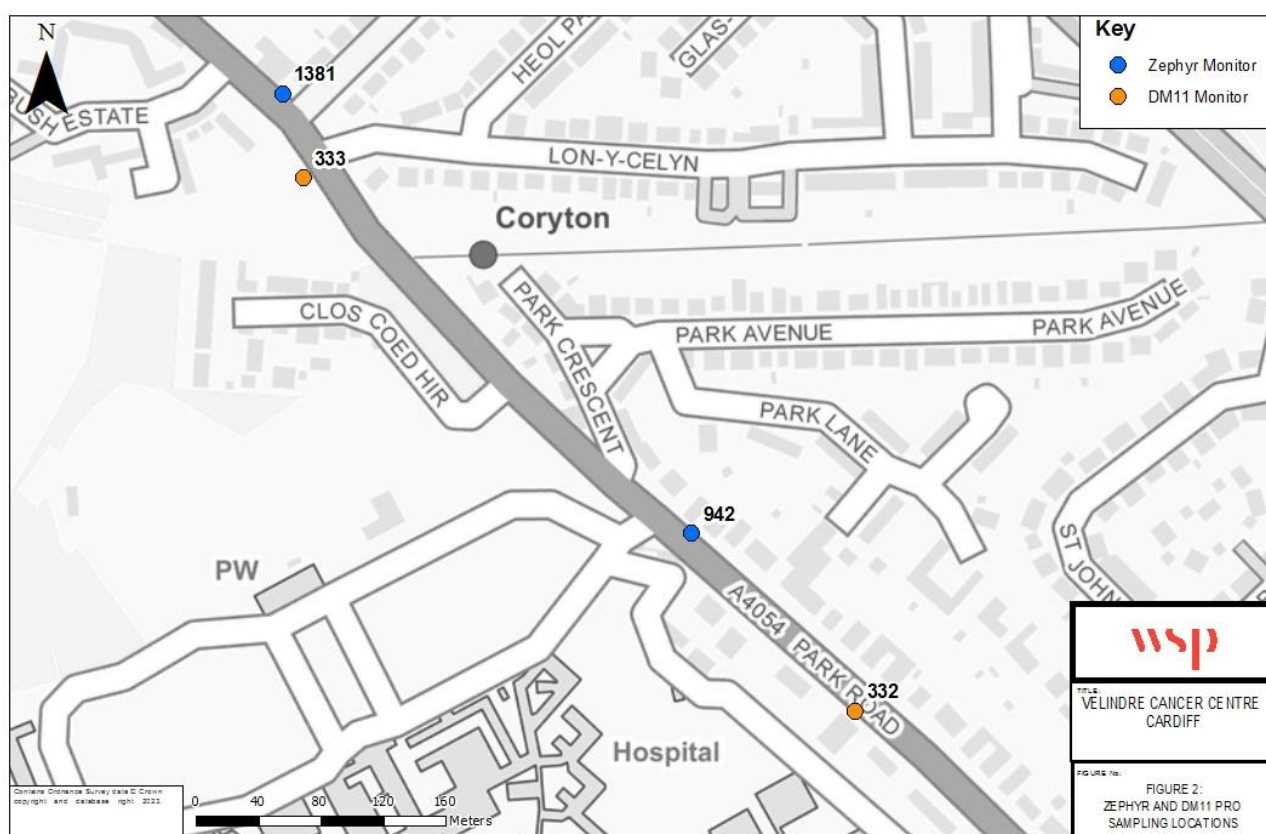


Figure 1 Air Quality Monitoring Locations

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 legislation².

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/m ³)	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.

The UK Government published its Environmental Targets (Fine Particulate Matter) (England) Regulations on 30th January 2023³. The regulations include a long-term target annual mean PM_{2.5} concentration of 10µg/m³ and an exposure reduction target of 35% when compared to 2018 levels, both to be met by 2040. There is also an interim PM_{2.5} target, which is to be met by the end of January 2028, of 12µg/m³ as an annual mean concentration and a 22% reduction in exposure when compared to 2018 levels.

DEFRA AIR QUALITY INDEX

Defra's Air Quality Index⁴ 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.

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/m ³	0-67	68-134	135-200	201-267	268-334	335-400	401-467	468-534	535-600	601 or more

PM₁₀ 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/m ³	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
µg/m ³	0-11	12-23	24-35	36-41	42-47	48-53	54-58	59-64	65-70	71 or more

Figure 2 – Defra's Air Quality Index

³ Environmental Targets (Fine Particulate Matter) (England) Regulations 2023

⁴ <https://uk-air.defra.gov.uk/air-pollution/daq>

MONITORING RESULTS

Zephyr Continuous Monitors

Data Capture

Following the co-location study the Zephyr monitors were re-installed at both Hollybush Inn and Park Road, after a period of stabilisation the Zephyrs started recording at the Hollybush Inn Zephyr (Z1381) on the 15th November and at the Park Road Zephyr (Z942) on the 24th November. There was a delay in re-instating the Zephyr at the Park Road location due to on-going issues with the sensor. Data capture for the remainder of November was 100% for Z942. However, power at the Z1381 Zephyr continued to drop out due to insufficient charging from the solar panel this will be monitored going forward.

Nitrogen Dioxide

Figure 3 shows the monitored hourly average concentrations for the period 15th to 30th November 2023 and 24th to 30th November respectively and a summary of the monitored concentrations for this period are provided in Table 2.

Average hourly NO₂ concentrations across the monitoring period at both sites were well below the air quality objective of 40µg/m³. There was one hour where hourly concentrations were measured above 200µg/m³ at the Hollybush Inn Zephyr (Z1381), however, throughout 2023 there have been no other hourly concentrations above 200µg/m³ and therefore it is considered unlikely that there will be an exceedance of the one-hour mean objective which allows up to 18 hours over 200µg/m³.

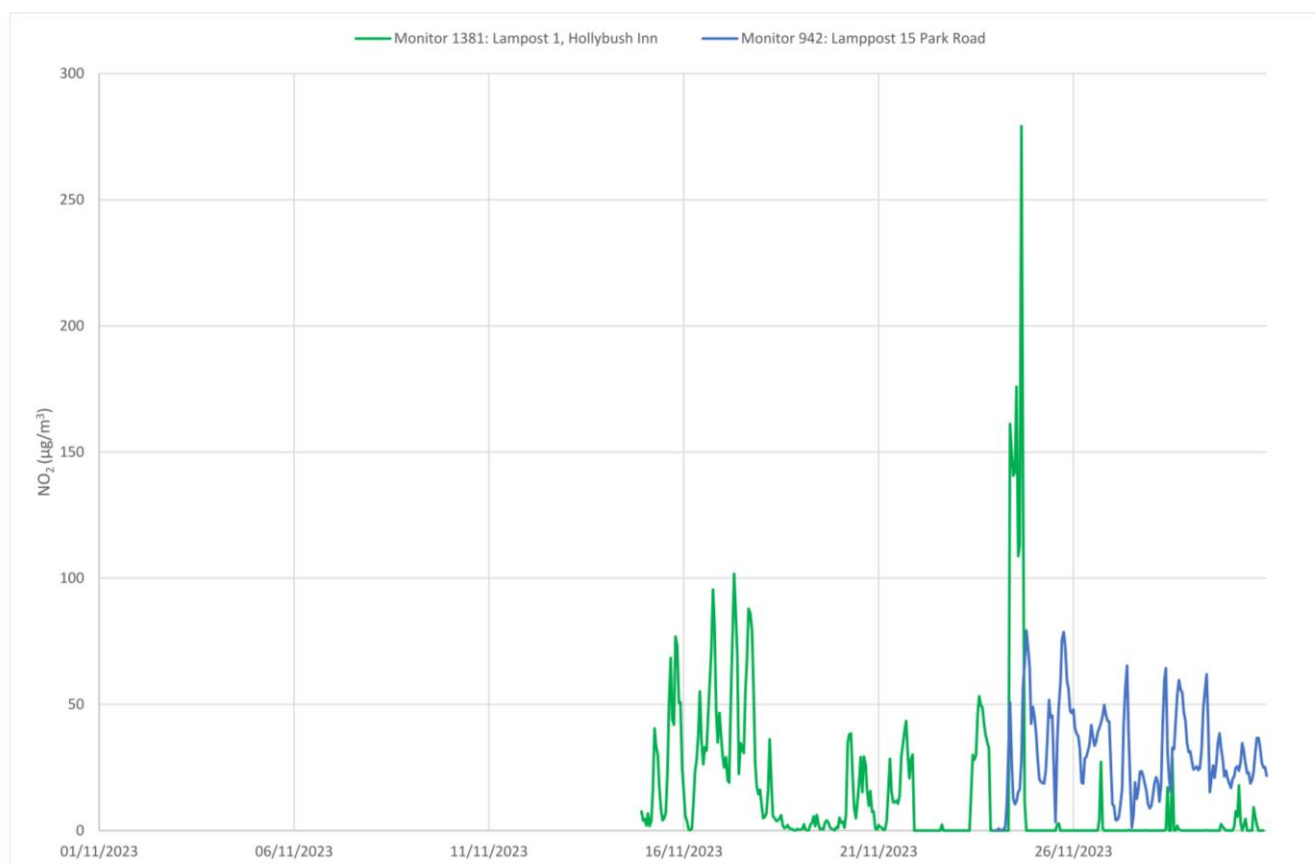


Figure 3- Monitored Zephyr NO₂ Hourly Concentrations (µg/m³)

Table 2 – NO₂ Concentrations, November 2023

Monitor	Location	NO ₂ Concentration Summary (µg/m ³)	
		Average	Hourly Maximum
Z1381	Lamppost 1, Hollybush Inn	16.2	279.2

Z942	Lamppost 15, Park Road	30.7	79.2
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Particulate Matter (PM₁₀ and PM_{2.5})

Figure 4 and Figure 5 show the hourly average monitored concentrations for the period 15th to 30th November 2023 and 24th to 30th November for Z1381 and Z942, respectively and a summary of the monitored concentrations for these periods are provided in Table 3.

Average hourly concentrations of PM₁₀ and PM_{2.5} at both the Zephyr monitors were below the respective annual mean objectives of 40µg/m³ and 20µg/m³ during the monitoring period. In addition, there was only 1 exceedance of the 24-hour mean concentrations above the 24-hour mean air quality objective of 50µg/m³.

Overall, the PM₁₀ and PM_{2.5} concentrations follow a similar trend at both monitor locations, there were several peaks in PM₁₀ and PM_{2.5} monitored at both sample locations; however, these were over for a short period of time. Several of the peaks were recorded at both sites, which suggests more of a regional influence driving the spikes in ambient PM₁₀ and PM_{2.5}.

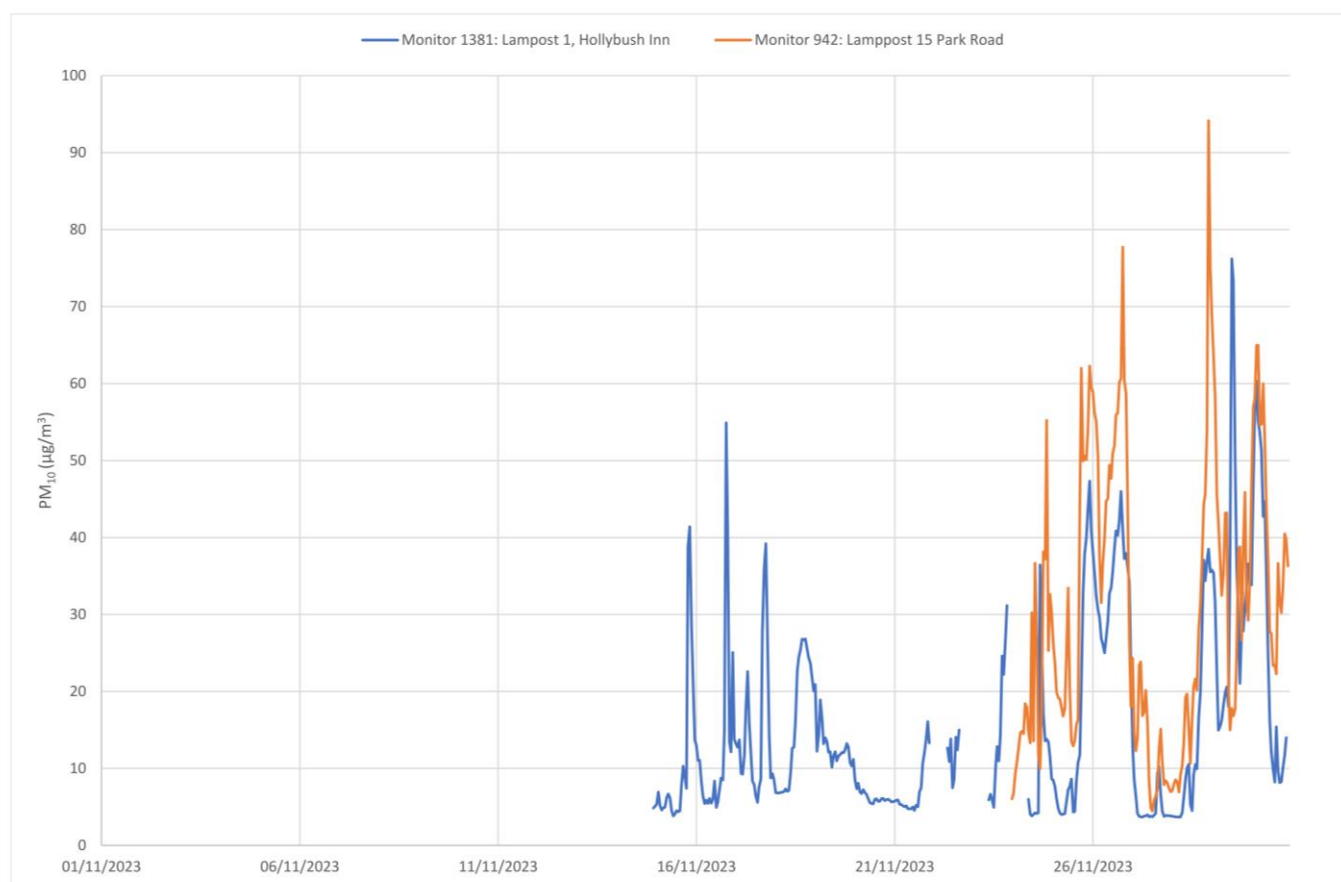


Figure 4 – Monitored Zephyr PM₁₀ Hourly Concentrations (µg/m³)

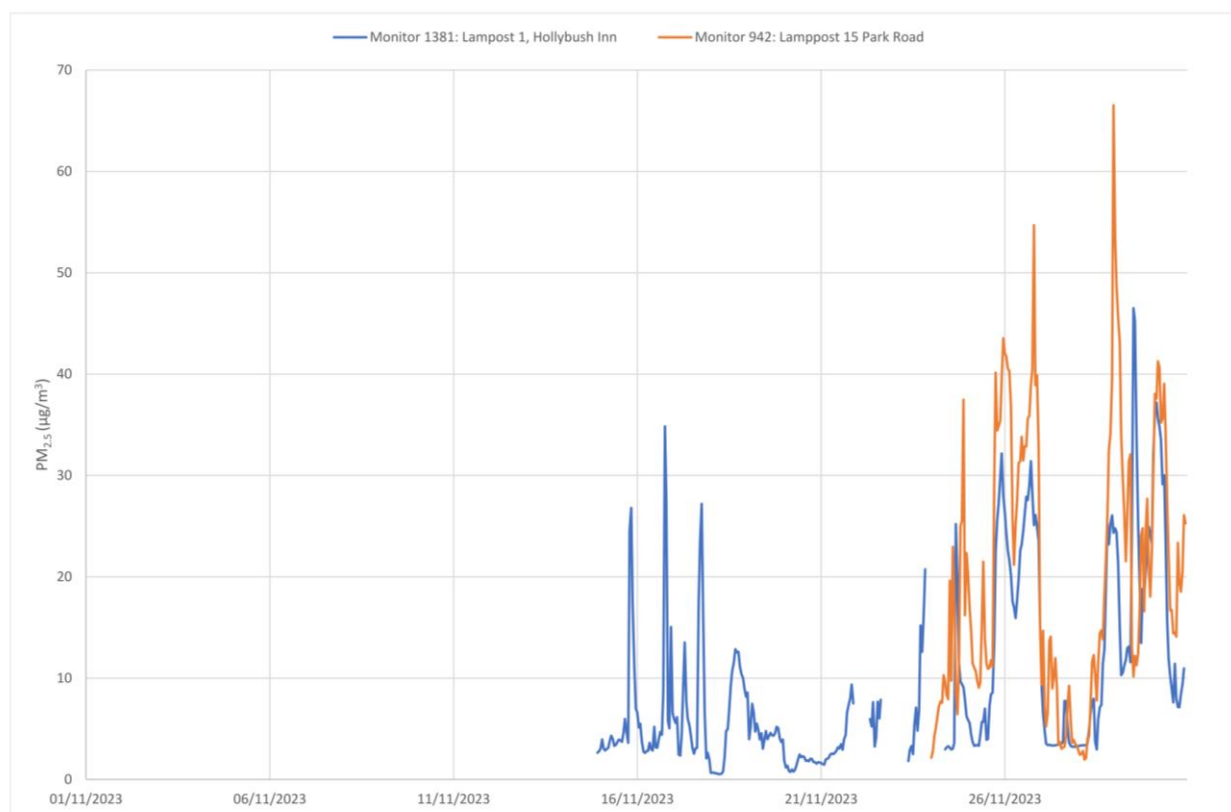


Figure 5 – Monitored Zephyr PM_{2.5} Hourly Concentrations (µg/m³)

Table 3 – PM₁₀ and PM_{2.5} Concentrations Recorded by Zephyr Monitors, November 2023

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
Z1381	Lampost 1, Hollybush Inn	15.7	76.2	35.7	9.5	46.5
Z942	Lampost 15, Park Road	30.7	94.1	50.8	20.1	66.5

DM11 Pro Continuous Monitors

Data Capture

As stated above, the On-site DM11 monitor was located close to the construction site entrance, however, the required power supply was removed on the 12th October and no suitable replacement power supply was available. An alternative location with adequate power and site suitability is currently being explored.

Concentrations at the Park Road monitor continued and recorded 100% data capture for November.

Particulate Matter (PM₁₀ and PM_{2.5})

Figure 3 show the hourly average PM₁₀ and PM_{2.5} concentrations monitored at the DM11 Pro continuous monitor located at Park Road. A summary of the monitored concentrations is provided in Table 2.

Average hourly concentrations of PM₁₀ and PM_{2.5} 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 50µg/m³.

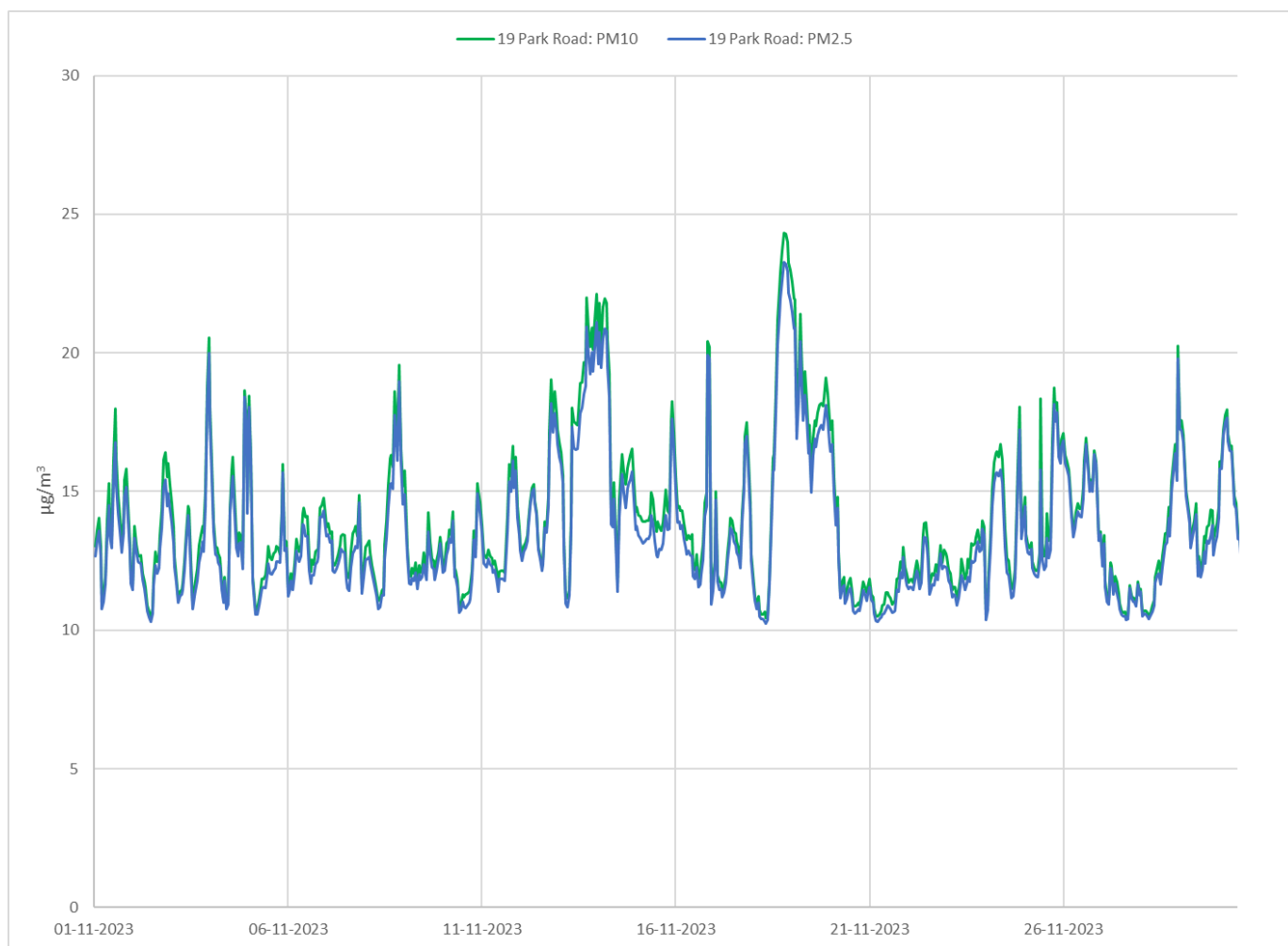


Figure 3 – Monitored DM11 PM₁₀ and PM_{2.5} Concentrations 19 Park Road (µg/m³)

Table 4 – PM₁₀ and PM_{2.5} Concentrations 19 Park Road November 2023

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	13.9	24.3	18.4	13.5	23.3
*Note that background colour applied is based on bandings which are classed for a 24-hour running mean PM concentration not an hourly concentration.						

Zephyr Co-Location Study

As highlighted in the October monitoring report, on the 10th of October both Zephyr monitors were placed at the continuous monitor located on Park Street in Bridgend to enable of co-location study to take place. This co-location study next to a Defra/Devolved Administrations reference instrument allows an understanding on how the Zephyr monitors are performing.

The co-location occurred from 10th October to 6th November and a summary of the average monitored NO₂ and PM₁₀ concentrations during this time is provided in Table 5 and shown in Figure 6 and Figure 7.

The co-location exercise showed that monitored NO₂ concentrations at the Z1381 Zephyr followed a similar trend to the Park Street Bridgend continuous monitor, with some off-set and higher peaks in concentrations across the period at Z1381 resulting in the higher period average. The Z942 Zephyr monitor consistently measured higher than the Park Street Bridgend during the co-location period. This was reported to Earthsense and it was advised that the sensor on the Z942 Zephyr be replaced. This was undertaken before the Zephyr was re-instated back at 19 Park Road.

The magnitude of monitored PM₁₀ concentrations at both Zephyrs (Z1381 and Z942) were lower than those detected at the Bridgend continuous monitor. As a result it was found that a post monitoring adjustment factor of 2.00 was required to bring the Zephyr data and the reference data to an acceptable agreement of magnitude. Therefore, a post monitoring adjustment factor of 2.00 has been applied to both PM₁₀ and PM_{2.5} data post-monitoring. In addition, data logging of Zephyr data was found to be -01:00hrs for device 982 and -2.00hrs for device 1381. This has had no impact upon the concentration data detected, though has been adjusted in the temporal plots within this report.

It is recommended that if monitoring is to continue another co-location exercise should be completed in 12 months time.

Table 5 – Monitored Concentrations, 10th October to 6th November 2023

Monitor	NO ₂ Concentrations (µg/m ³)		PM ₁₀ Concentrations (µg/m ³)		
	Average	Maximum Hourly	Average	Maximum Hourly	Maximum 24-hour mean
Park Street Bridgend	28.6	110.0	16.5	67.0	36.9
Z942	54.7	102.9	8.0	35.2	18.4
Z1381	34.8	241.2	6.4	33.7	17.5

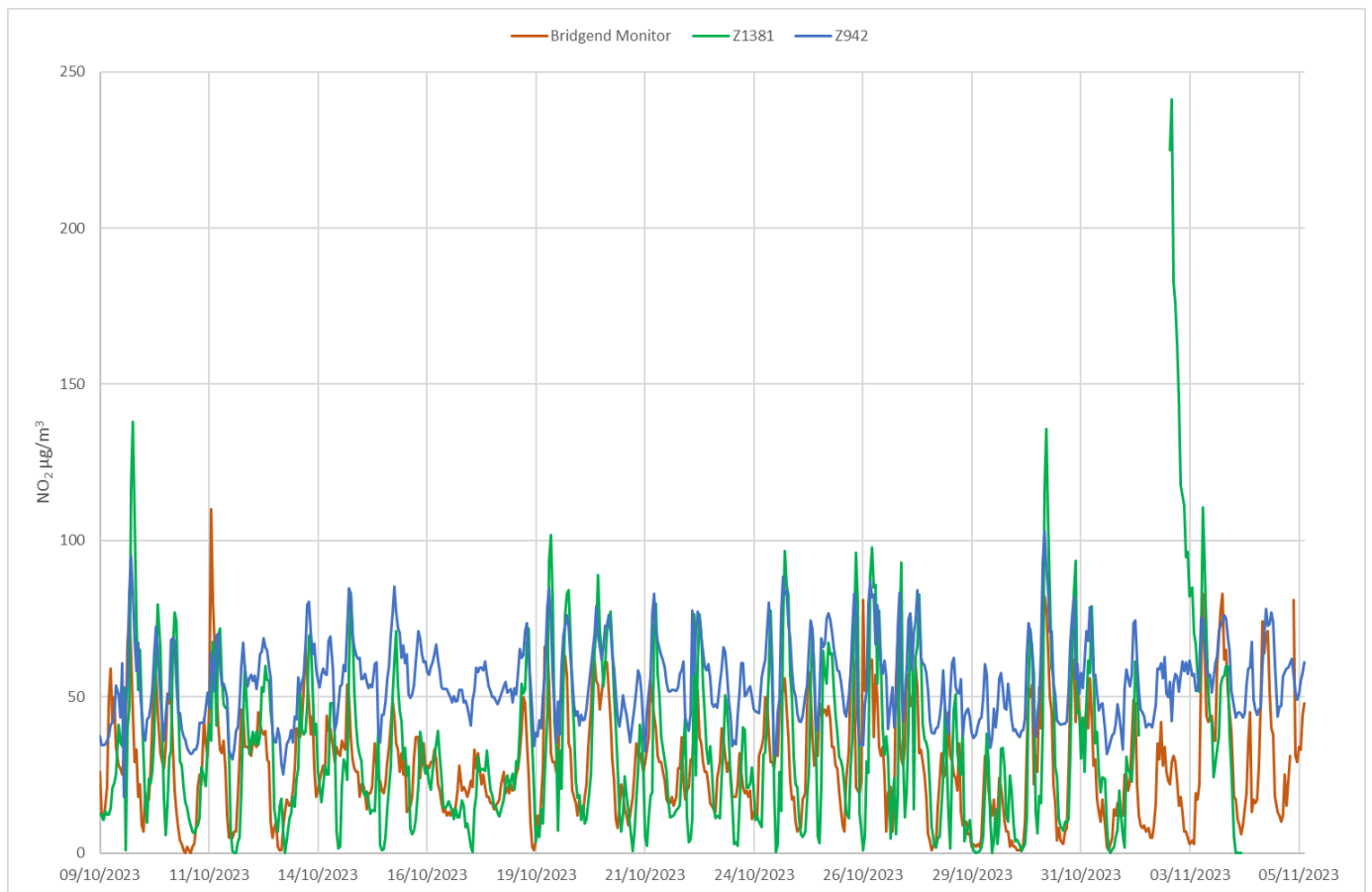


Figure 6 Monitored NO₂ Concentrations (µg/m³)

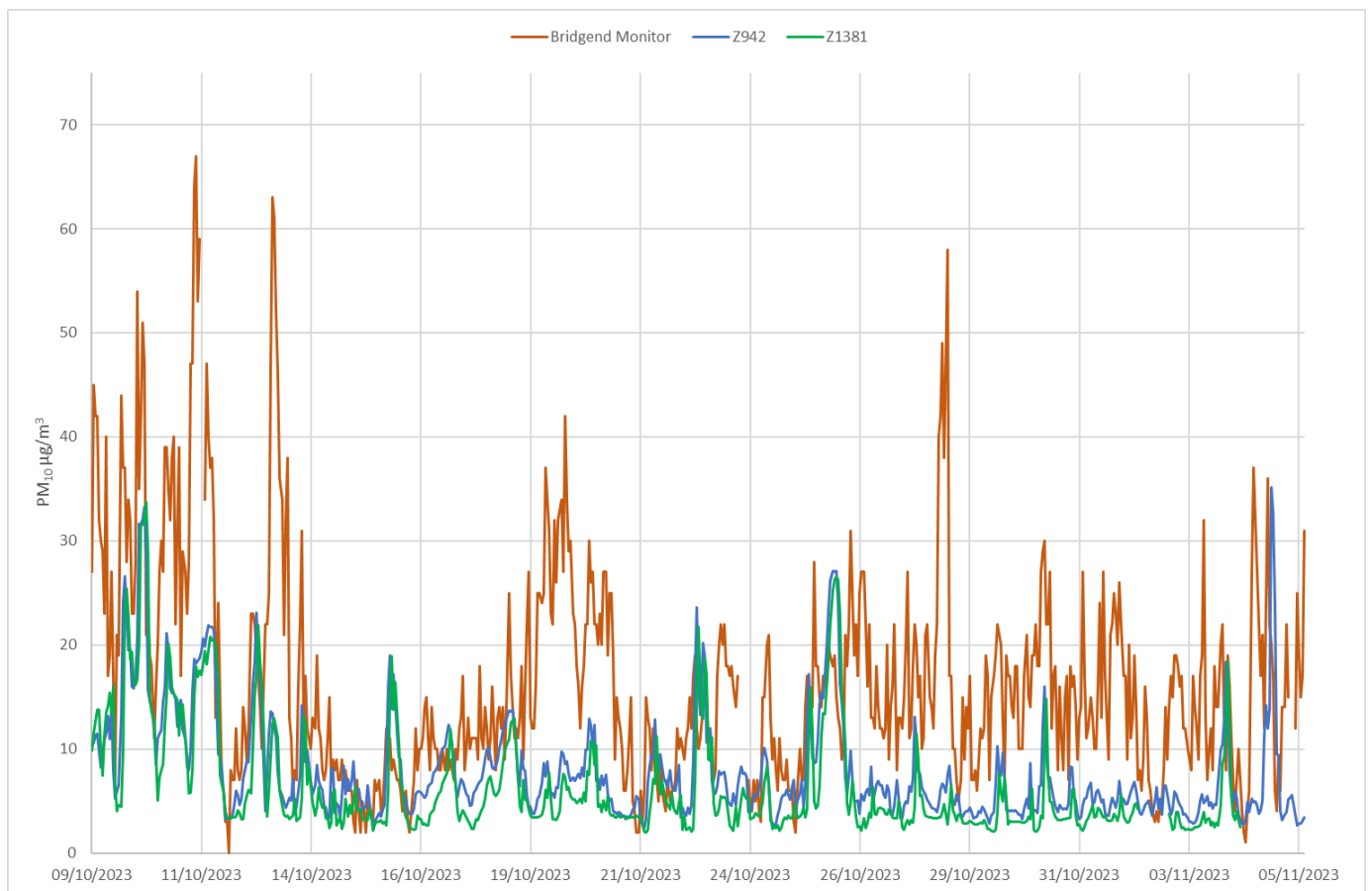


Figure 7 Monitored PM₁₀ Concentrations (µg/m³)