Sacyr UK Limited

NEW VELINDRE CANCER CENTRE - AIR QUALITY SUPPORT

Air Quality Monitoring Quarterly Report

001
OCTOBER 2024

PUBLIC

Sacyr UK Limited

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Air Quality Monitoring Quarterly Report

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EXECUTIVE SUMMARY

WSP has been commissioned by Sacyr UK Limited to continue the ambient air quality monitoring in the vicinity of the Approved Velindre Cancer Centre, Park Road, Whitchurch, Cardiff, CF14 7XB. The ambient air monitoring was originally set up on behalf of NHS Wales to meet Cardiff Councils (CC) Pre-commencement planning condition 11 in relation to the Temporary Construction Access Route (TCAR) for the Construction of the Approved Velindre Cancer Centre, Cardiff, CF14 7XB. The ambient monitoring is required to allow the continued use of the TCAR during the construction of the main cancer centre site which is being completed by Sacyr UK Limited.

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.

This report provides a summary of the monitoring data for the period between 26th May and 23rd August 2024. Defra's Air Quality Index[1] has been used to provide a useful indication of the levels of air pollution (See Figure 2-1 in main report). The index is divided into four bands (low (green), moderate (yellow/orange), high (red), very high (purple)). Summary tables of the monitored concentrations are provided below, the background colour assigned to each of the cells corresponds to Defra's Air Quality Index. All concentrations were low and below the relevant Air Quality Objectives.

Summary of Average Monitored Diffusion Tube Nitrogen Dioxide (NO_2) Concentrations, 26th May to 23rd August 2024

Monitor Type	Location	NO_2 Concentration (µg/m^3)
		Annual Average (annualised and bias-adjusted to 2023)
Diffusion Tube	Vel 1: Lamppost 15, Park Road	12.9
	Vel 2: Lamppost 17, Corner of Park Road and Park Avenue	15.3
	Vel 3: Lamppost 25, Pendwyallt Road opposite Lon Y Celyn	11.4
	Vel 4: Lamppost 1, Hollybush Inn	14.0
	Vel 5: Lamppost 7, Pendywyallt Road opposite No. 32	19.4
	Vel 6: Coryton Junior School*	-
	Vel 8: Coryton Junior School – side entrance	7.2

*Access to the site was not possible due to school holidays.

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

Summary of Monitored Zephyr Nitrogen Dioxide (NO_2) Concentrations, 26th May to 23rd August 2024

Monitor Type	Location	NO_2 Concentration (µg/m³)	
		Average	Maximum Hourly
Zephyr Monitors	Lamppost 1, Z1381 Hollybush Inn	16.0	111.0
	Lamppost 15, Z942 Park Road	15.8	72.4

Summary of Monitored Zephyr Particulate Matter (PM_{10} and $PM_{2.5}$) Concentrations, 26th May to 23rd August 2024

Monitor	Location	PM_{10} Concentrations (µg/m³)			$PM_{2.5}$ Concentrations (µg/m³)	
		Average	Maximum*	Maximum 24-hour mean	Average	Maximum
Z1381	Lamppost 1, Hollybush Inn	11.5	86.6	67.3	7.2	54.2
Z942	Lamppost 15, Park Road	13.8	87.9	67.7	9.2	54.6

Summary of Monitored DM11 Pro Particulate Matter (PM_{10} and $PM_{2.5}$) Concentrations, 26th May to 23rd August 2024

Monitor Type	Location	PM_{10} Concentrations (µg/m³)			$PM_{2.5}$ Concentrations (µg/m³)	
		Average	Maximum*	Maximum 24-hour mean	Average	Maximum
332	19 Park Road	13.1	59.2	23.0	12.5	37.2

*Note that background colour applied is based on bandings which are classed for a 24-hour running mean PM_{10} concentration not an hourly PM_{10} concentration band.

1. INTRODUCTION

1.1.1. WSP has been commissioned by Sacyr UK Limited to continue the air quality monitoring in the vicinity of the Approved Velindre Cancer Centre, Whitchurch Hospital, Park Road, Whitchurch, Cardiff, CF14 7XB. The ambient monitoring was originally set up on behalf of NHS Wales to meet Cardiff Councils (CC) Pre-commencement planning condition 11 in relation to the Temporary Construction Access Route (TCAR) for the Construction of the Approved Velindre Cancer Centre. The ambient monitoring is required to allow the continued use of the TCAR during the construction of the main cancer centre site which is being completed by Sacyr UK Limited.

1.1.2. For reference, 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).'

1.1.3. 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.

1.1.4. On behalf of Sacyr UK Limited, WSP is carrying out monitoring in the study area using Nitrogen Dioxide (NO_2) diffusion tubes and 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 the period between 26th May and 23rd August 2024.

2. MONITORING METHODOLOGY

2.1. MONITORING TECHNIQUES

DIFFUSION TUBE MONITORING

2.1.1. The diffusion tubes are passive samplers which are used to measure ambient concentrations of NO_2. The tubes are designed to provide an indication of longer-term average NO_2 concentrations and are useful in identifying areas of high concentrations in relation to road traffic emissions. They are not suitable for identifying short-term pollution events. In order to compare how well the diffusion tubes are performing against a reference method (i.e. a continuous analyser), three tubes have been co-located with the Castle Street continuous monitoring site in Cardiff.

2.1.2. The diffusion tubes have been located at 7 locations on accessible points along the main road network and where possible at relevant receptors (e.g. school) to assess any changes in NO_2 concentrations at those locations as a result of the construction traffic (see **Table 2-1** and Figure in **Appendix A**). The tubes are changed over typically every 4 weeks and are then sent to Gradko Laboratories for analysis.

Table 2-1 - Diffusion Tube Monitoring Locations

Tube ID	Location	X (m)	Y (m)
Vel 1	Lamppost 15, Park Road	314782	180711
Vel 2	Lamppost 17, Corner of Park Road and Park Avenue	314723	180758
Vel 3	Lamppost 25, Pendwyallt Road opposite Lon Y Celyn	314537	180951
Vel 4	Lamppost 1, Hollybush Inn	314520	180993
Vel 5	Lamppost 7, Pendywyallt Road opposite No. 32	314348	181128
Vel 6	Coryton Junior School	314321	181107
Vel 8	Coryton Junior School – side entrance	314291	181157

CONTINUOUS MONITORS

2.1.3. Historically, concentrations of Particulate Matter (PM_{10} and $PM_{2.5}$) and NO_2 have been continuously monitored at four locations within the study area (See **Table 2-2 a**nd Figure in **Appendix A**). Two monitors have been continuously sampling for NO_2, PM_{10} and $PM_{2.5}$ using Zephyr monitor located close to the Hollybush Estate site (Z1381) and close to the construction site entrance on Park Road (Z942). There have also been dedicated PM_{10} and $PM_{2.5}$ monitors (DM11 Pro) located outside 19 Park Road close to the construction site entrance (332) and at a location On-site, however, power to the On-site monitor was removed in October 2023 and no suitable alternative location has yet been identified

2.1.1. The Zephyr 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.

Table 2-2 - Continuous Monitor Locations

Monitor ID		Location	X (m)	Y (m)
Zephyr	Z1381	Lamppost 1, Hollybush Inn	314520	180993
	Z942	Lamppost 15, Park Road	314782	180711
DM11 Pro	332	19 Park Road	314887	180597

2.2. AIR QUALITY OBJECTIVES AND STANDARDS

2.2.1. 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)[2]. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation[3].

2.2.2. 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.

2.2.3. 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.

2.2.4. The relevant standards and objectives for this monitoring programme are given in **Table 2-3**.

Table 2-3 – Relevant Air Quality Objectives and Standards

Pollutant	Concentration (µg/m^3)	Duration	Exceedances Allowed
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.

[2] 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)

[3] 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.

2.2.5. The UK Government published its Environmental Targets (Fine Particulate Matter) (England) Regulations on 30th January 2023[4]. The regulations include a long-term target annual mean $PM_{2.5}$ concentration of 10µg/m^3 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/m^3 as an annual mean concentration and a 22% reduction in exposure when compared to 2018 levels.

2.3. DEFRA AIR QUALITY INDEX

2.3.1. A summary of available monitored concentrations for the period between 26th May to 23rd August 2024 are provided in Section 3. In addition, to the monitored concentrations, reference is also made to Defra's Air Quality Index[5] which 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 2-1**). The bandings are based on hourly/24-hour mean concentrations depending on the pollutant, however, can be used in relation to the diffusion tube monitoring results to provide an indication of the levels of air pollution.

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

Figure 2-1 – Defra Air Quality Index

[4] Environmental Targets (Fine Particulate Matter) (England) Regulations 2023

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

3. MONITORING RESULTS

3.1. NO_2 DIFFUSION TUBES

3.1.1. The results of the monitoring completed across the study area between 26th May and 23rd August 2024 are provided in **Table 3-1** below. The background colour assigned to each of the results corresponds to Defra's Air Quality Index.

3.1.2. The raw monthly monitored concentrations were below the annual mean objective of 40µg/m^3 for each of the monitoring periods. Once annualised and bias adjusted the results are well below the annual mean objective. Due to the school holidays it was not possible to access Site Vel 6 and therefore no results are presented for tube within this quarterly report.

3.1.3. As with the previous monitoring reports, monitored concentrations were highest overall at the Vel 5 diffusion tube site which is located at Lamppost 7, Pendywyallt Road opposite No. 32. This location is closer to the roadside than residential premises, or nearby footpaths, and will be impacted from emissions from vehicle exhausts. Concentrations will be lower at the nearby residential properties which are set further back from the roadside. Monitored concentrations were lowest at the Vel 8 diffusion tube site which is located next to the Coryton Junior School and considered representative of background concentrations.

Table 3-1 - Summary of NO_2 Diffusion Tube Concentrations between 26th May to 23rd August 2024

Sampling Location	NO_2 Concentration (µg/m^3)			
	Monthly concentrations			Annual Average (annualised and bias-adjusted for 2023)
	From: 26/05/2024 To: 01/07/2024	From: 01/07/2024 To: 26/07/2024	From: 26/07/2024 To: 23/08/2024	
Vel 1	14.26	15.50	-	12.9
Vel 2	16.79	18.08	18.2	15.3
Vel 3	12.74	13.60	13.0	11.4
Vel 4	15.65	17.30	15.6	14.0
Vel 5	20.04	23.07	24.4	19.4
Vel 6	-	-	-	-
Vel 8	8.13	8.17	8.4	7.2

* Results have been annualised following the methodology in LAQM.TG (22)[6], a local bias adjustment factor was used. The annualization process used a combination of urban background, urban centre (UC) and roadside (RS) sites. Although it is not ideal to use UC and RS sites, they have been used due to being only available sites with sufficient data capture.

[6] Defra (2022) Local Air Quality Management Technical Guidance (TG22) Sept 2022.

3.2. ZEPHYR CONTINUOUS MONITOR

Data Capture

3.2.1. During the monitoring period 26th May to 23rd August 2024, both the Hollybush Inn (Z1381) Zephyr and Park Road (Z942) Zephyr had a data capture of 100%.

Nitrogen Dioxide

3.2.2. **Figure 3-1** shows the NO_2 data monitored at each of the Zephyr continuous monitors for the monitoring period and a summary of the monitored concentrations is provided in **Table 3-2.**

3.2.3. Average NO_2 concentrations across the monitoring period at both the monitoring sites were well below the air quality objective of 40µg/m^3. There were also no exceedances of the one-hour objective (200µg/m^3) at either of the sites.

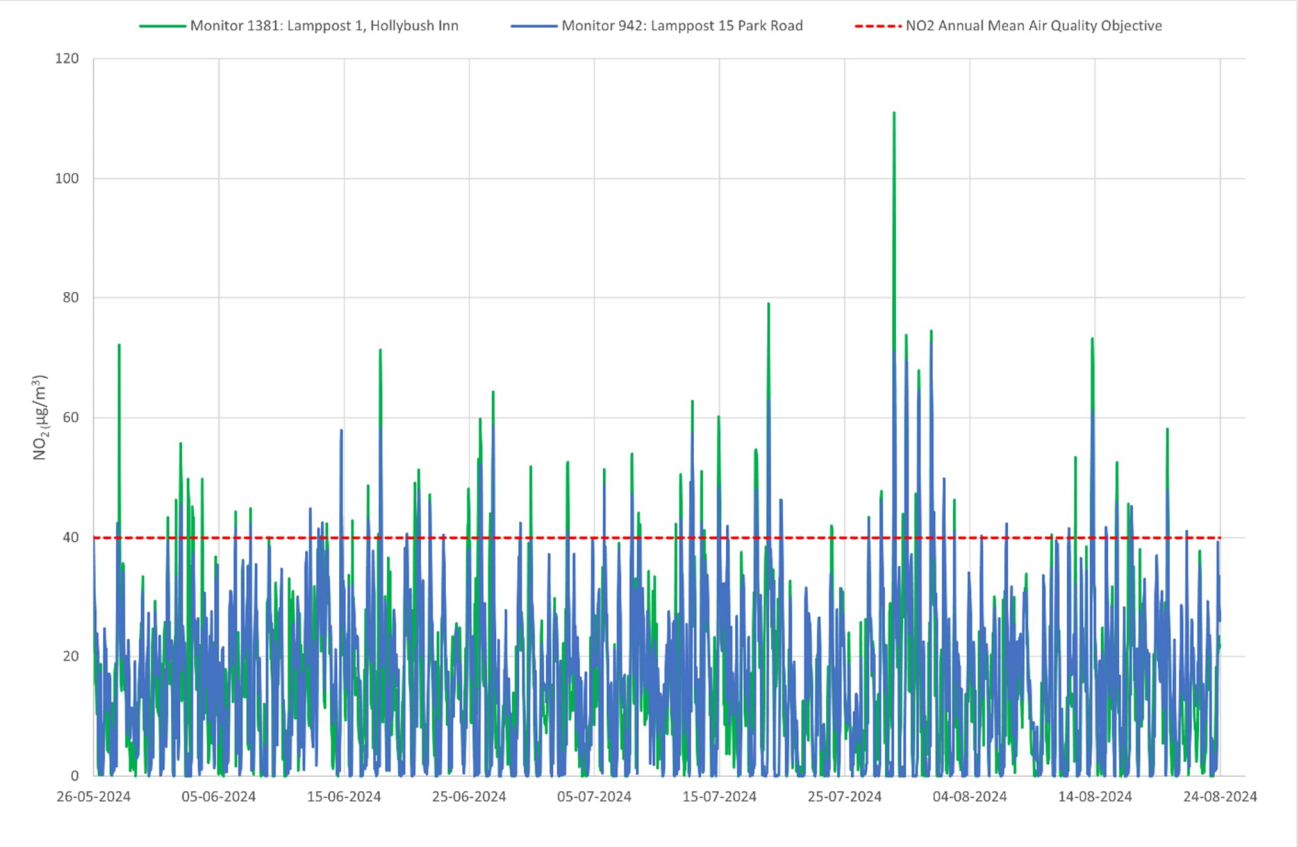


Figure 3-1 - Monitored Zephyr NO_2 Concentrations (µg/m^3)

Table 3-2 - Summary of NO_2 Concentrations (26th May to 23rd August 2024)

Monitor	Location	NO_2 Concentration Summary	
		Average of Hourly Concentrations	Maximum Hourly Concentration
Z1381	Lamppost 1, Hollybush Inn	16.0	111.0
Z942	Lamppost 15, Park Road	15.8	72.4

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

3.2.4. **Figure 3-2** and **Figure 3-3** respectively, show the PM_{10} and $PM_{2.5}$ data monitored at each of the Zephyr continuous monitors for the monitoring period. A summary of the monitored concentrations is provided in **Table 3-3.**

3.2.5. Average concentrations of PM_{10} and $PM_{2.5}$ at both the continuous monitors are below the respective annual mean objectives of 40µg/m^3 and 20µg/m^3 during the monitoring period. Additionally, the average concentrations of $PM_{2.5}$ were also below the target concentration of 10µg/m^3.There was an exceedance of the 24-hour mean concentrations where a value of 67.3 µg/m^3 was recorded at Hollybush Inn (Z1381) and 67.7µg/m^3 recorded at Park Road (Z942) Zephyrs on 1st June 2024, both values surpassed the 24-hour mean air quality objective of 50µg/m^3. The permitted number of exceedances is 35 within a 12-month period, and only one exceedance at each Zephyr was recorded between 26th May to 23rd August 2024. Historically, there have been few 24-hour periods where concentrations have been above 50µg/m^3, the data will be reviewed going forward to determine whether exceedance of the objective is likely.

3.2.6. Overall, the PM_{10} and $PM_{2.5}$ concentrations follow a similar trend at both monitor locations, there were several peaks in both PM_{10} and $PM_{2.5}$ monitored at both sample locations. Given the peaks were recorded at both sites, it suggests more of a regional influence driving the spike in ambient PM_{10} and $PM_{2.5}$ and the peaks in concentrations only lasted for a short period of time.

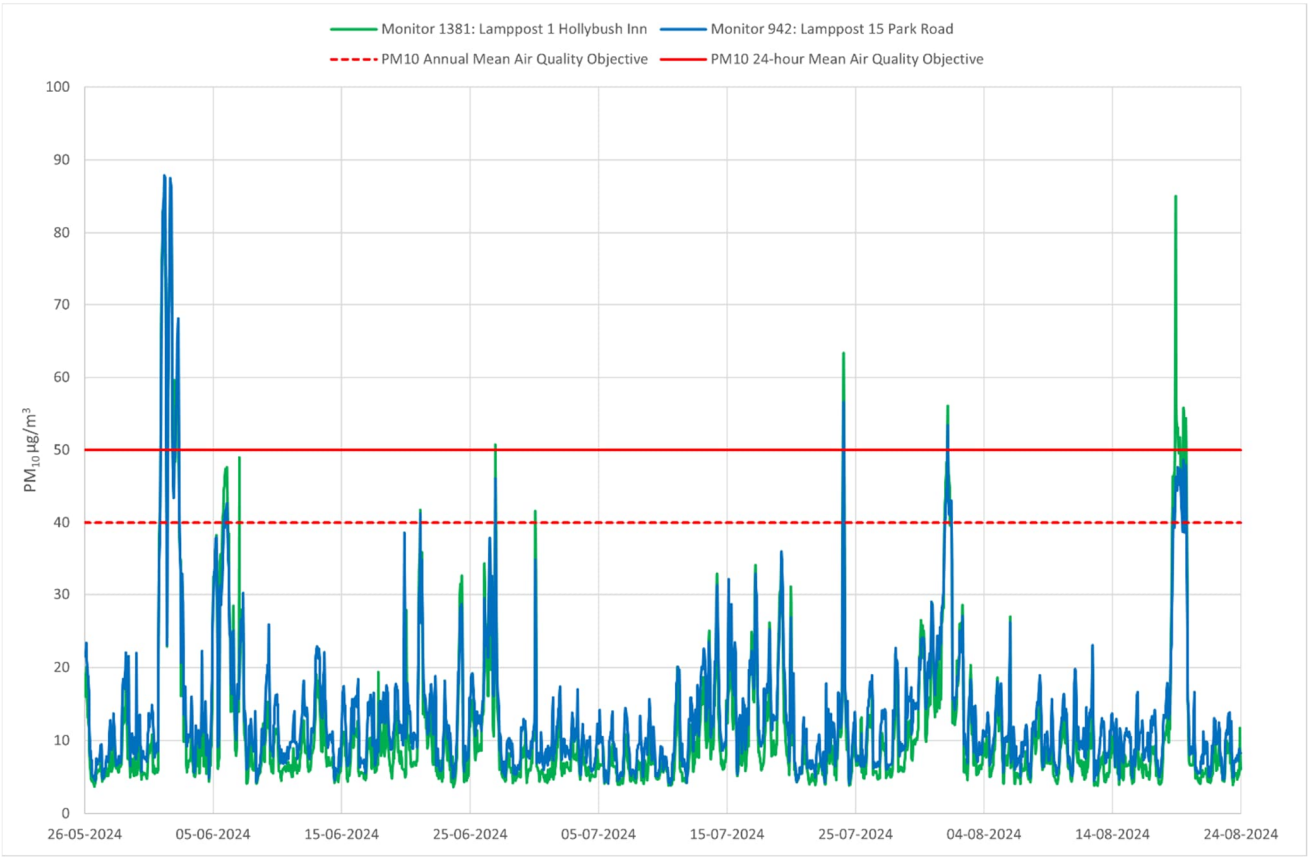


Figure 3-2 - Monitored Zephyr PM_{10} Concentrations (µg/m^3)

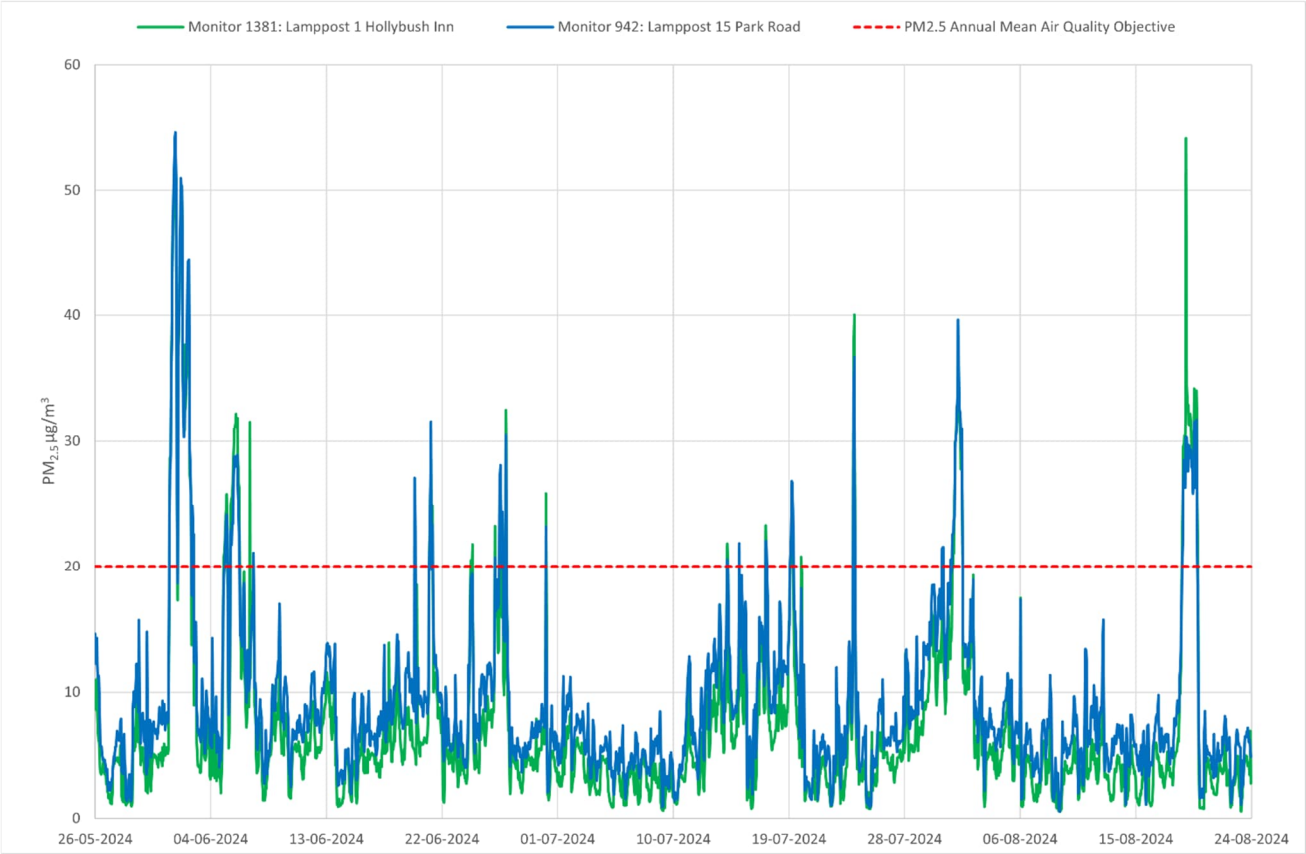


Figure 3-3 - Monitored Zephyr $PM_{2.5}$ Concentrations (µg/m^3)

Table 3-3 - Summary of PM_{10} and $PM_{2.5}$ Concentrations (26th May to 23rd August 2024)

Monitor	Location	PM_{10} Concentrations (µg/m^3)			$PM_{2.5}$ Concentrations (µg/m^3)	
		Average	Maximum	Maximum 24-hour mean	Average	Maximum
Z1381	Lamppost 1, Hollybush Inn	11.5	86.6	67.3	7.2	54.2
Z942	Lamppost 15, Park Road	13.8	87.9	67.7	9.2	54.6

3.3. DM11

Data Capture

3.3.1. During the monitoring period 26th May to 23rd August 2024, the DM11 Pro continuous monitor (332) located on Park Road had 100% data capture.

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

3.3.2. **Figure 3-4** show the PM_{10} and $PM_{2.5}$ data monitored at the DM11 Pro monitor (332) for the period 26th May to 23rd August 2024. A summary of the monitored concentrations is provided in **Table 3-4**.

3.3.3. Average concentrations of PM_{10} and $PM_{2.5}$ at the continuous monitor 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 PM_{10} concentrations above 50µg/m³.

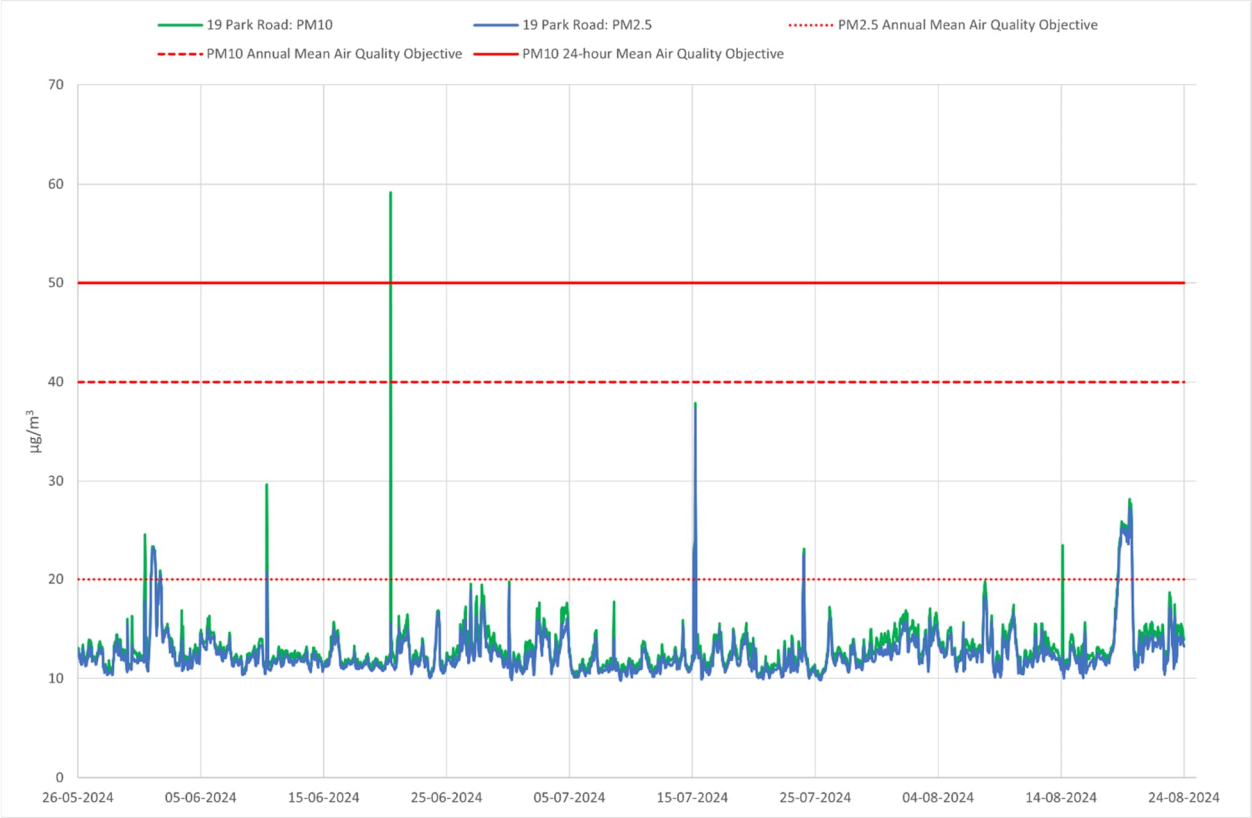


Figure 3-4 - Monitored DM11 Particulate Matter Concentrations (PM_{10} & $PM_{2.5}$) (µg/m³)

Table 3-4 - Summary of PM_{10} and $PM_{2.5}$ Concentrations (26th May to 23rd August 2024)

Monitor	Location	PM_{10} Concentrations (µg/m³)			$PM_{2.5}$ Concentrations (µg/m³)	
		Average	Maximum Hourly	Maximum 24-hour mean	Average	Maximum Hourly
332	19 Park Road	13.1	59.2	23.0	12.5	37.2

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

4. SUMMARY

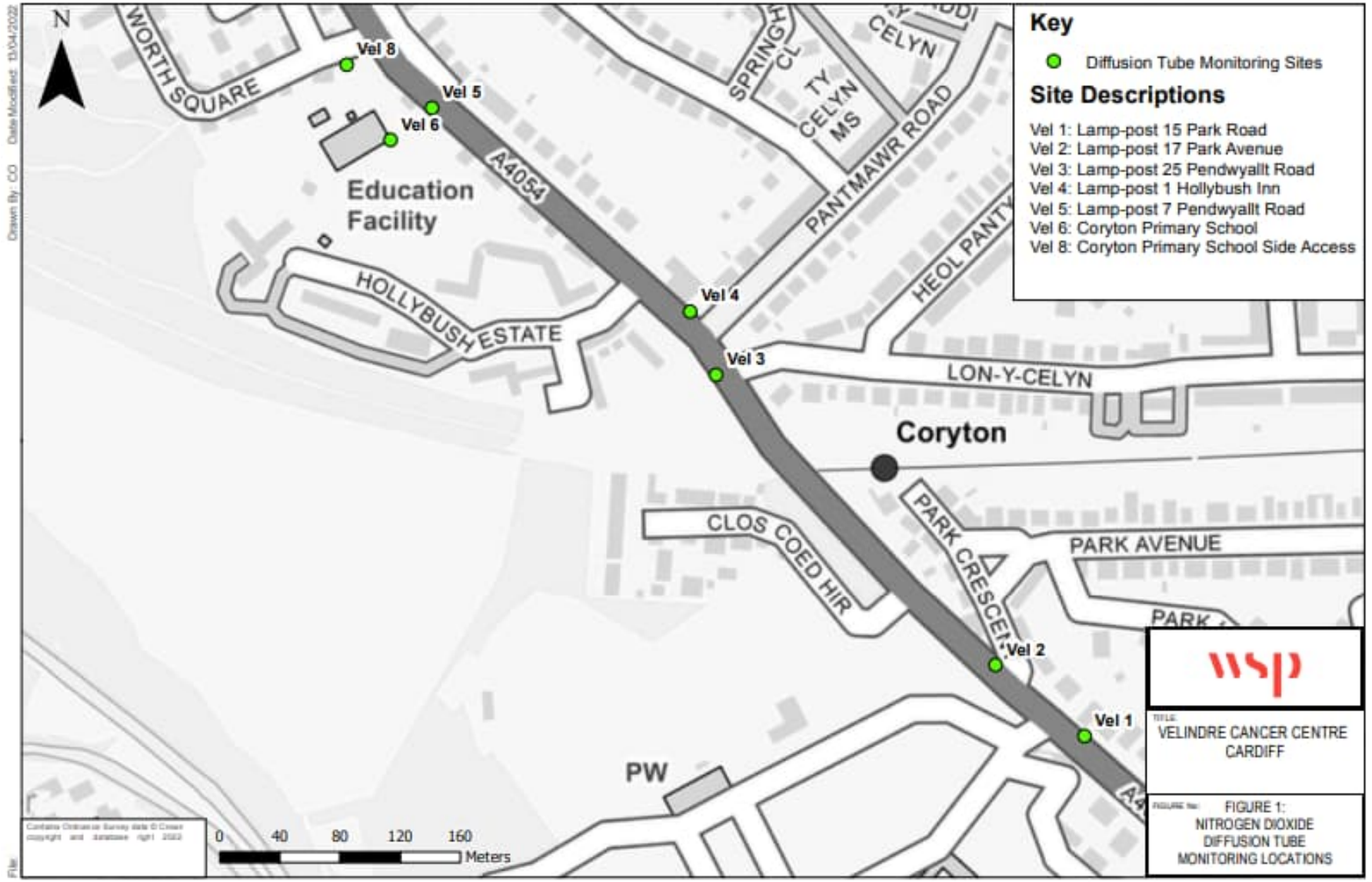
4.1.1. NO_2 diffusion tube monitoring was carried out at seven locations during the period 26th May to 23rd August 2024. Concentrations were continuously monitored at two locations using Zephyr monitors (NO_2, PM_{10} and $PM_{2.5}$) and at one location using a DM11 Pro (PM_{10} and $PM_{2.5}$) during the period.

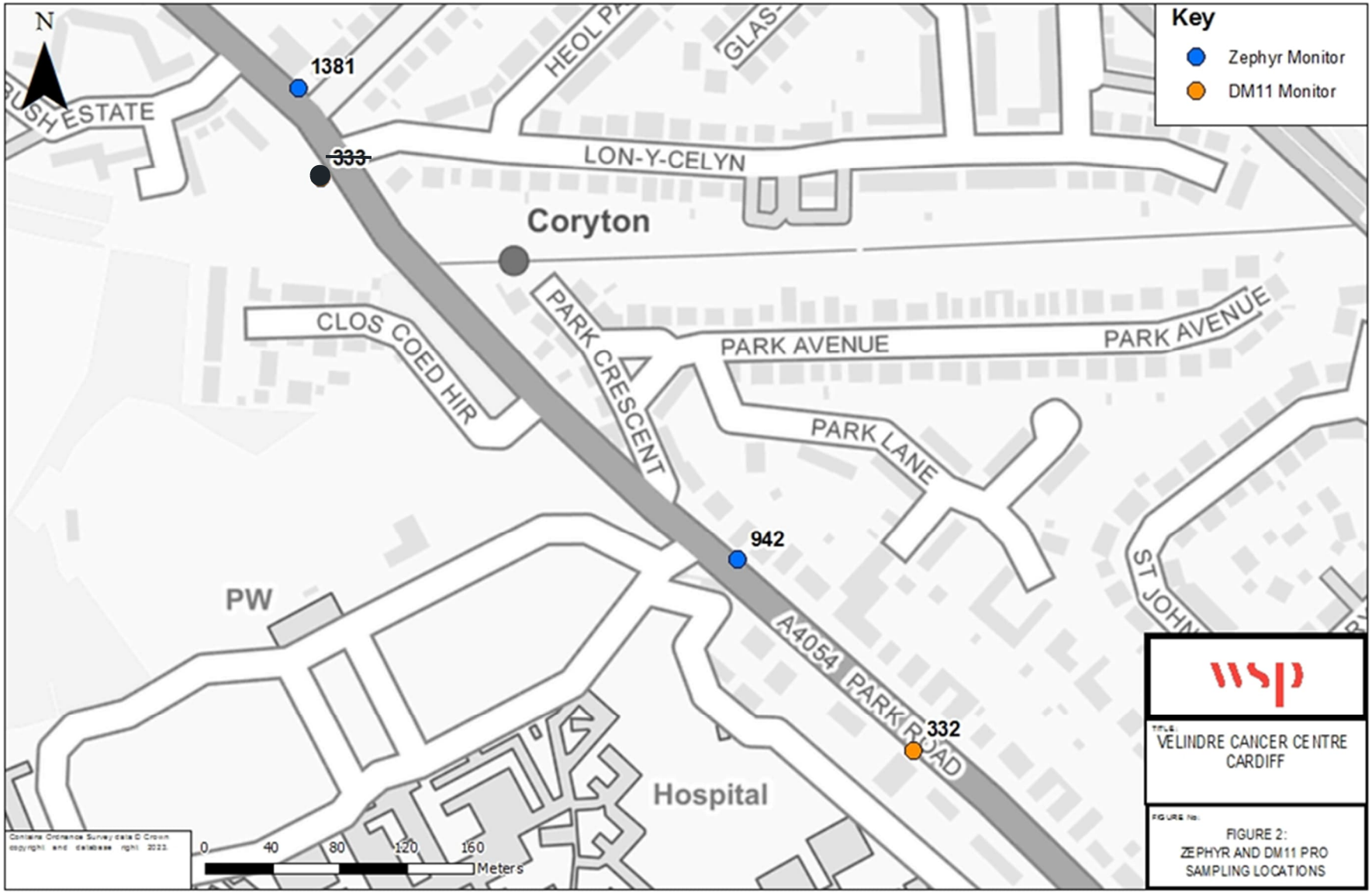
4.1.2. Monitored concentrations of NO_2 across the study area has been below the relevant objective within this monitoring period. NO_2 concentrations were highest overall at the Vel 5 diffusion tube site which is located at Lamppost 7, Pendywyallt Road opposite No. 32. This sample location is closer to the roadside than residential premises, or nearby footpaths, and will be impacted from emissions from vehicle exhausts. Monitored concentrations were lowest at the Vel 8 diffusion tube site which is located next to the Coryton Junior School and considered representative of background concentrations.

4.1.3. Monitored concentrations of NO_2, PM_{10} and $PM_{2.5}$ using the Zephyr monitors followed similar trends at both locations. The average NO_2, PM_{10}, $PM_{2.5}$ concentrations across the monitoring period at both the monitoring sites were well below the air quality objectives. A peak in PM_{10} and $PM_{2.5}$ concentrations were detected during the period, with 24-hour mean concentrations above 50µg/m^3 on some occasions at the Zephyr monitors. Peaks were also seen at the DM11 Pro monitor, however, not to the same magnitude as seen at the Zephyrs. The DM11 Pro monitor is set slightly back from the roadside and is more representative of exposure of residential receptors along Park Road, than the two Zephyr monitoring locations, which are mounted upon lamp posts at the kerbside. Therefore, maximum concentrations detected by the DM11 Pro at 19 Park Road were lower than the maximum concentrations detected by the two kerbside Zephyrs, as traffic movement and emissions are considered the principal source of particulate matter along Park Road.

Appendix A

MONITORING LOCATIONS


Key
Diffusion Tube Monitoring Sites
Site Descriptions
Vel 1: Lamp-post 15 Park Road
Vel 2: Lamp-post 17 Park Avenue
Vel 3: Lamp-post 25 Pendwyallt Road
Vel 4: Lamp-post 1 Hollybush Inn
Vel 5: Lamp-post 7 Pendwyallt Road
Vel 6: Coryton Primary School
Vel 8: Coryton Primary School Side Access
N
Vel 8
Vel 5
Vel 6
Vel 4
Vel 3
Vel 2
Vel 1
Education Facility
A4054
PANTMAWR ROAD
HOLLYBUSH ESTATE
LON-Y-CELYN
Coryton
CLOS COED HIR
PARK AVENUE
PARK CRESCENT
PW
0 40 80 120 160
Meters
VELINDRE CANCER CENTRE
CARDIFF
FIGURE 1:
NITROGEN DIOXIDE
DIFFUSION TUBE
MONITORING LOCATIONS


N
Key
Zephyr Monitor
DM11 Monitor
1381
333
942
332
LON-Y-CELYN
Coryton
CLOS COED HIR
PARK CRESCENT
PARK AVENUE
PARK AVENUE
PARK LANE
PW
A4054 PARK ROAD
Hospital
0
40
80
120
160
Meters
VELINDRE CANCER CENTRE
CARDIFF
FIGURE 2:
ZEPHYR AND DM11 PRO
SAMPLING LOCATIONS

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