

Environmental Impact Assessment Report

## Appendix 10.1

Volume 3 Part 6



# Appendix 10.1

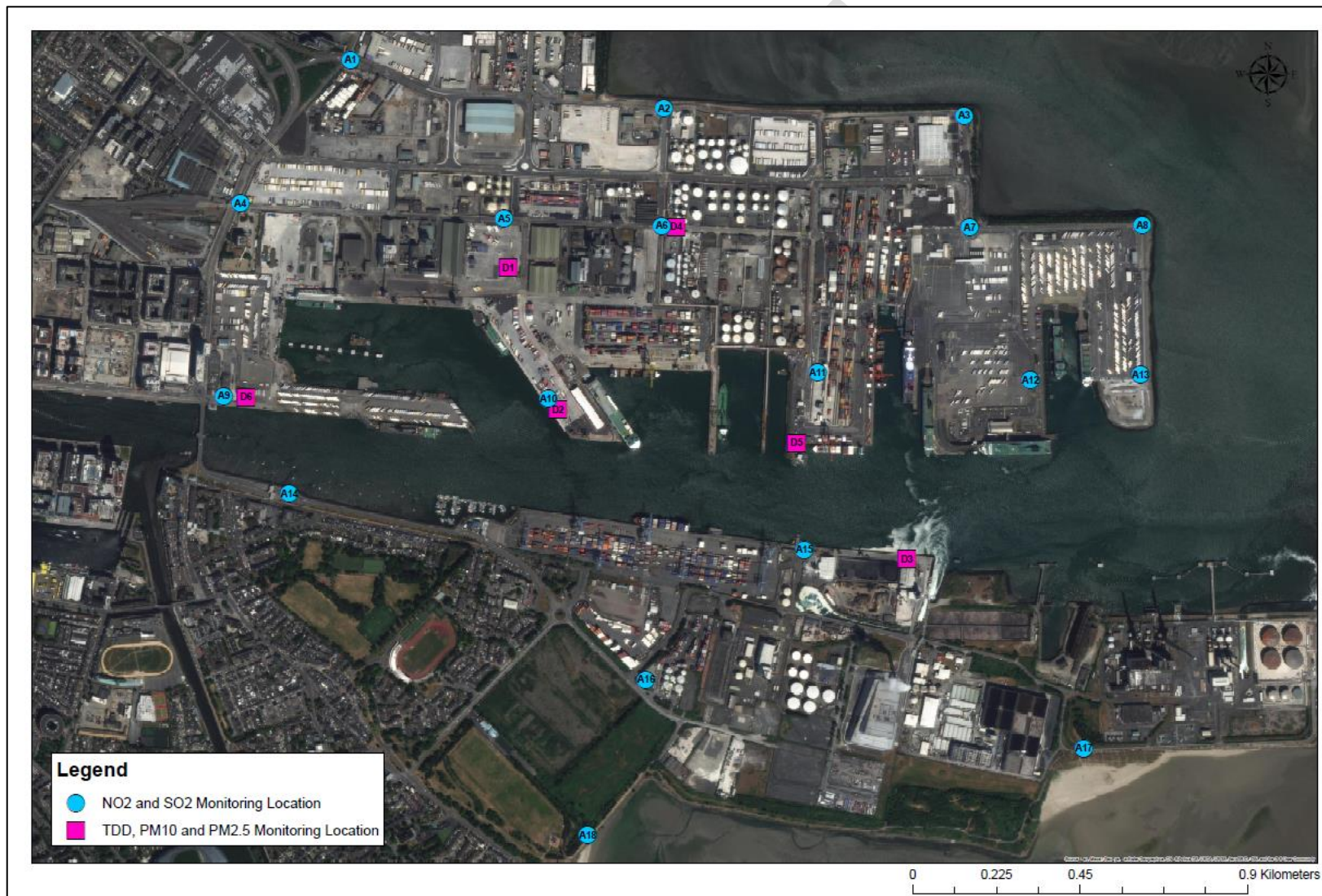
## Air Quality Data from 2014 - 2023

## Dublin Port Air Quality Monitoring Results 2014 – 2015

Air monitoring data from 18 monitoring stations over a period of 6 monitoring event was assessed against legislative limits and target values for the protection of human health and vegetation. Monitoring was carried out for NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub> and Total depositional dust.

A total of 18 individual monitoring locations (A1 to A18) were selected across the port estate area in order to monitor ambient air concentrations of Nitrogen dioxide and Sulphur dioxide. A further 4 locations were chosen for Bergerhoff total dust deposition monitoring (D1 to D4) while a further two locations were chosen for PM<sub>10</sub> and PM<sub>2.5</sub> monitoring (D5 and D6). Figure 10.1 presents an overview of each monitoring locations located with the Dublin Port and its environs.

Figure 10.1: Overview of Ambient Air Monitoring Locations Located Within Dublin Port and Surrounding Environs for Nitrogen Dioxide, Sulphur Dioxide, Total Depositional Dust and PM<sub>10/2.5</sub> from 2014 - 2015

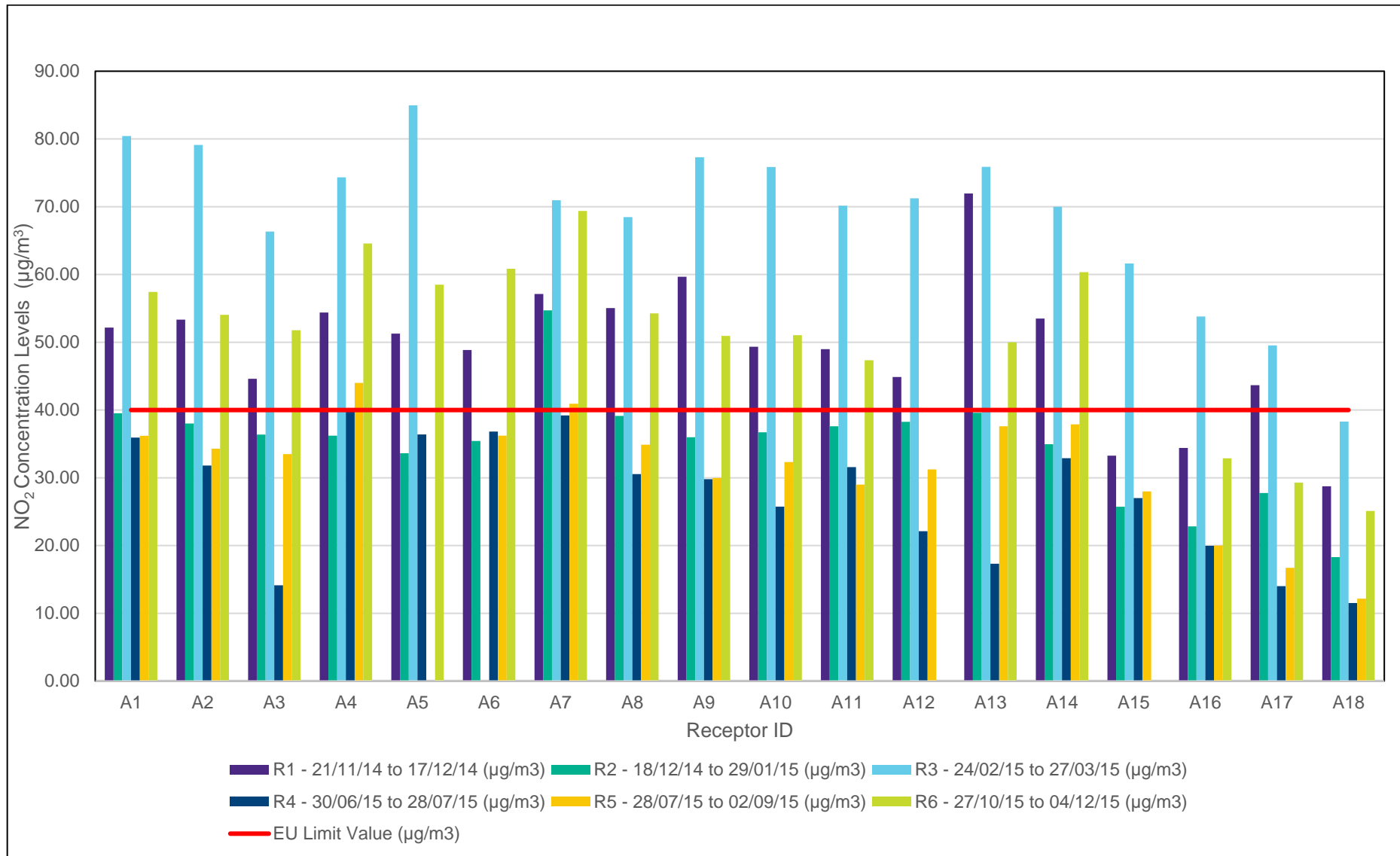


## Results from 2014 – 2015

### Nitrogen Dioxide

The NO<sub>2</sub> diffusion tubes were deployed for a period of 6 x 1 month periods between Nov 2014 and Dec 2015. Monitoring was carried out at 18 monitoring stations spatially distributed across the port estate. Monitoring was carried out in the four main seasons of Winter, Spring, Summer and Autumn. The results of the monitoring graphically represented in Figure 10.2.

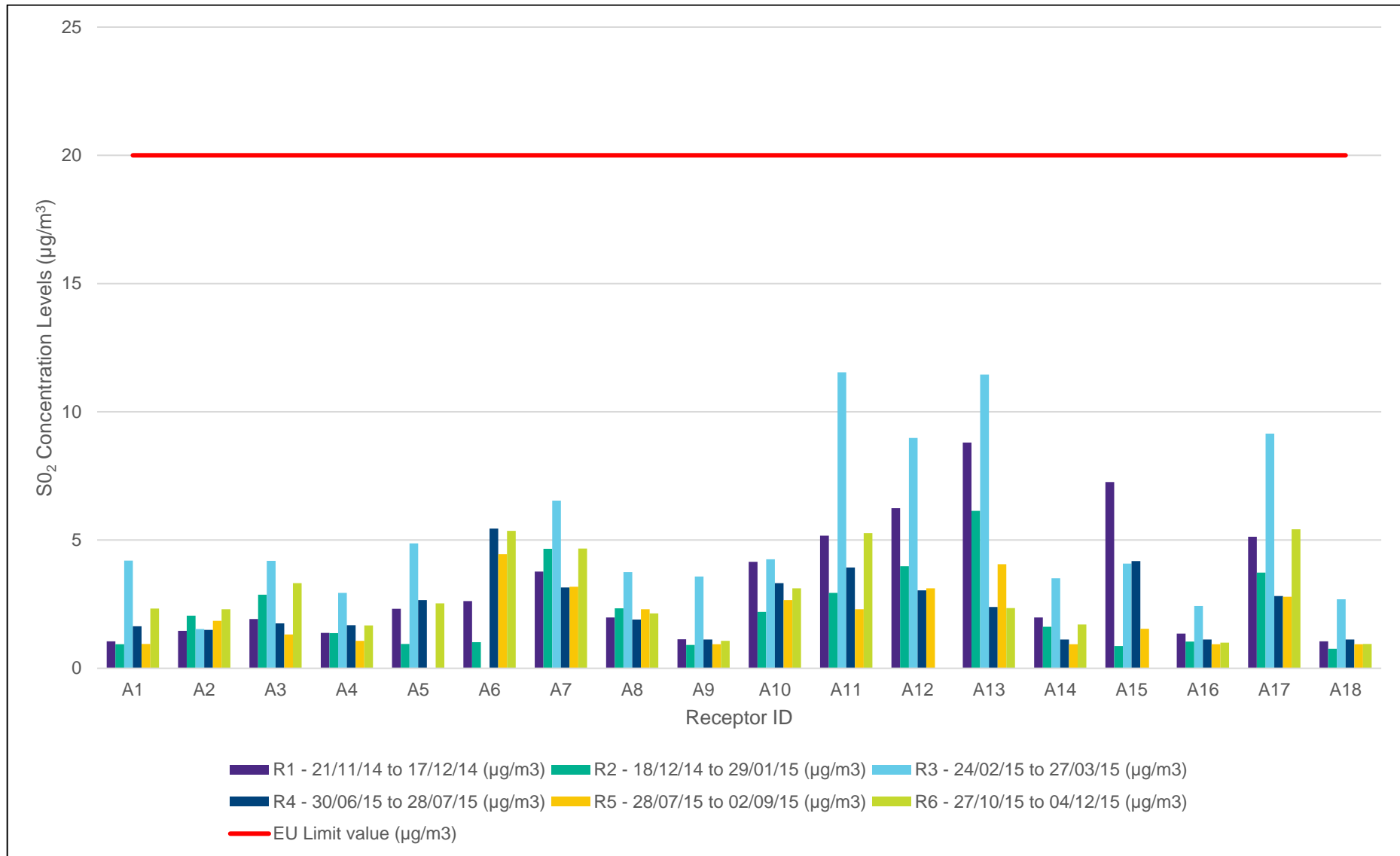
Figure 10.2: Plot of NO<sub>2</sub> Concentrations for each Monitoring Event R1 to R6 at each Monitoring Station A1 to A18



## **Sulphur Dioxide**

The SO<sub>2</sub> diffusion tubes were deployed for a period of 6 x 1 month periods between Nov 2014 and Dec 2015. Monitoring was carried out at 18 monitoring stations spatially distributed across the port estate. Monitoring was carried out in the four main seasons of Winter, Spring, Summer and Autumn. The results of the monitoring are graphically represented in Figure 10.3.

Figure 10.3: Plot of SO<sub>2</sub> Concentrations for Each Monitoring Event R1 to R6 at Each Monitoring Station A1 to A18

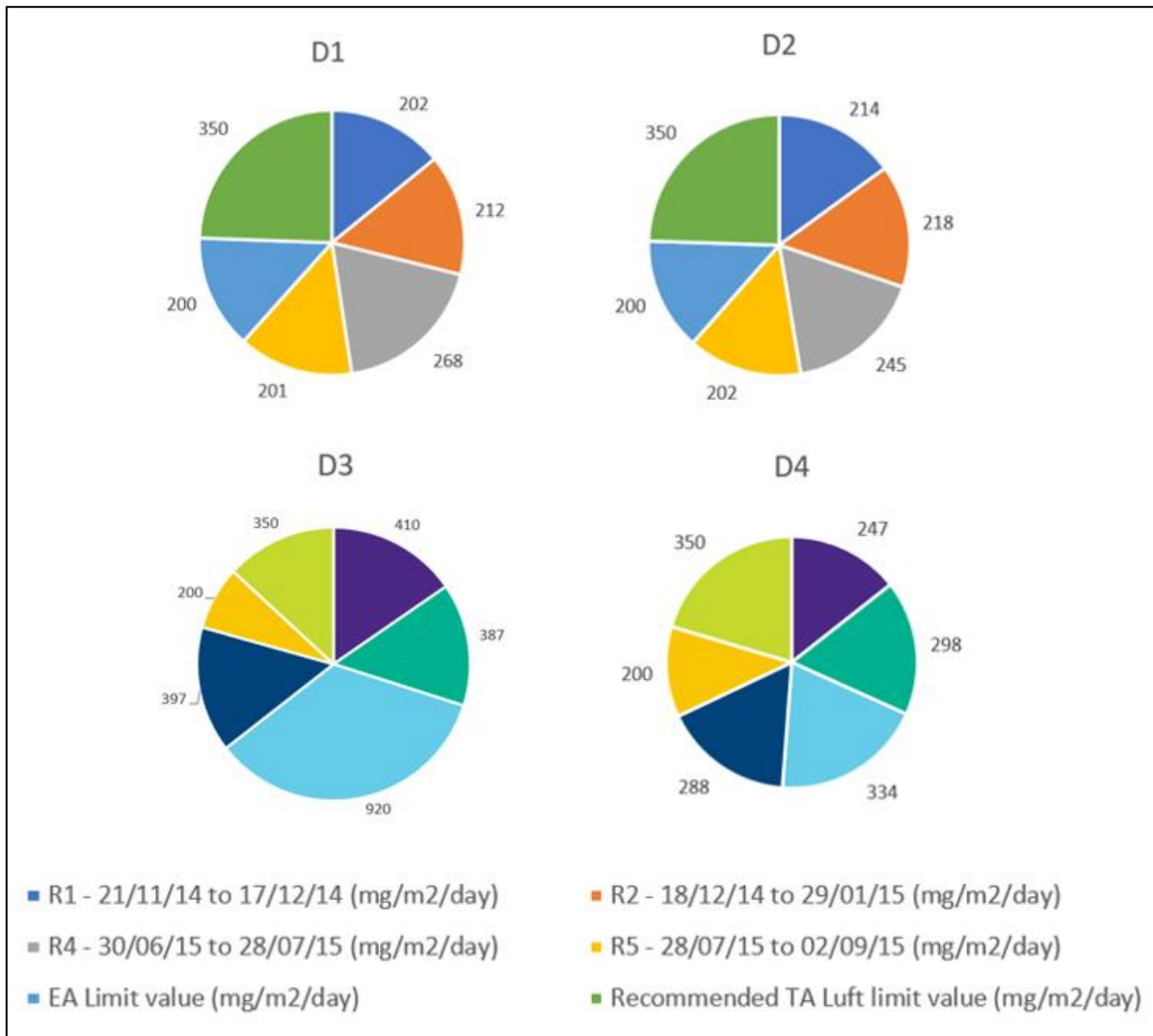




### Total Depositional Dust

The Total depositional dust monitoring stations were deployed for a period of 4 x 1 month periods between Nov 2014 and July 2015. Monitoring was carried out at 4 monitoring stations located in close proximity to locations or activities know to give rise to fugitive dust emissions. The results of the monitoring are graphically represented in Figure 10.4.

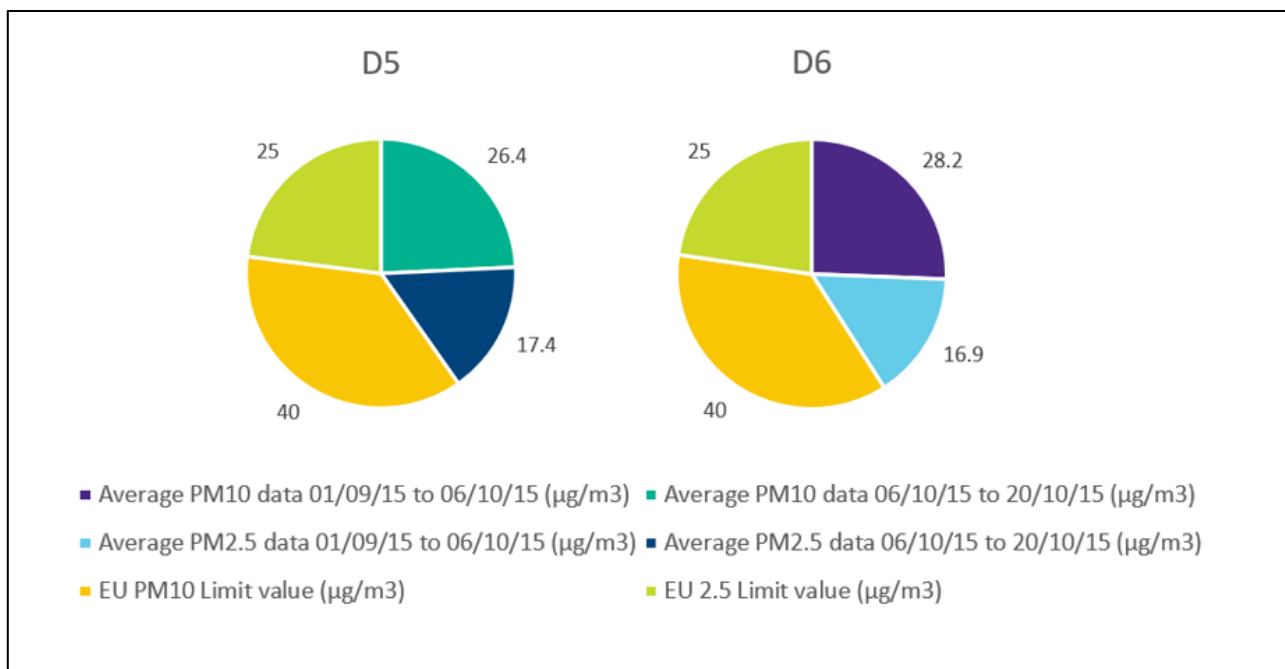
Figure 10.4: Total Depositional Dust Monitoring Results for the Dublin Port Estate and Environs



### Particulate Matter (PM<sub>10/2.5</sub>)

Particulate matter 10 and 2.5 µm monitoring stations were deployed for a period of approximately 5 and 3 week periods between Sept 2015 and Oct 2015. Monitoring was carried out at 2 monitoring stations. The results of the monitoring are graphically represented in Figure 10.5.

Figure 10.5: Particulate Matter 10 and 2.5 µm Monitoring Results for Dublin Port Estate Monitoring Stations

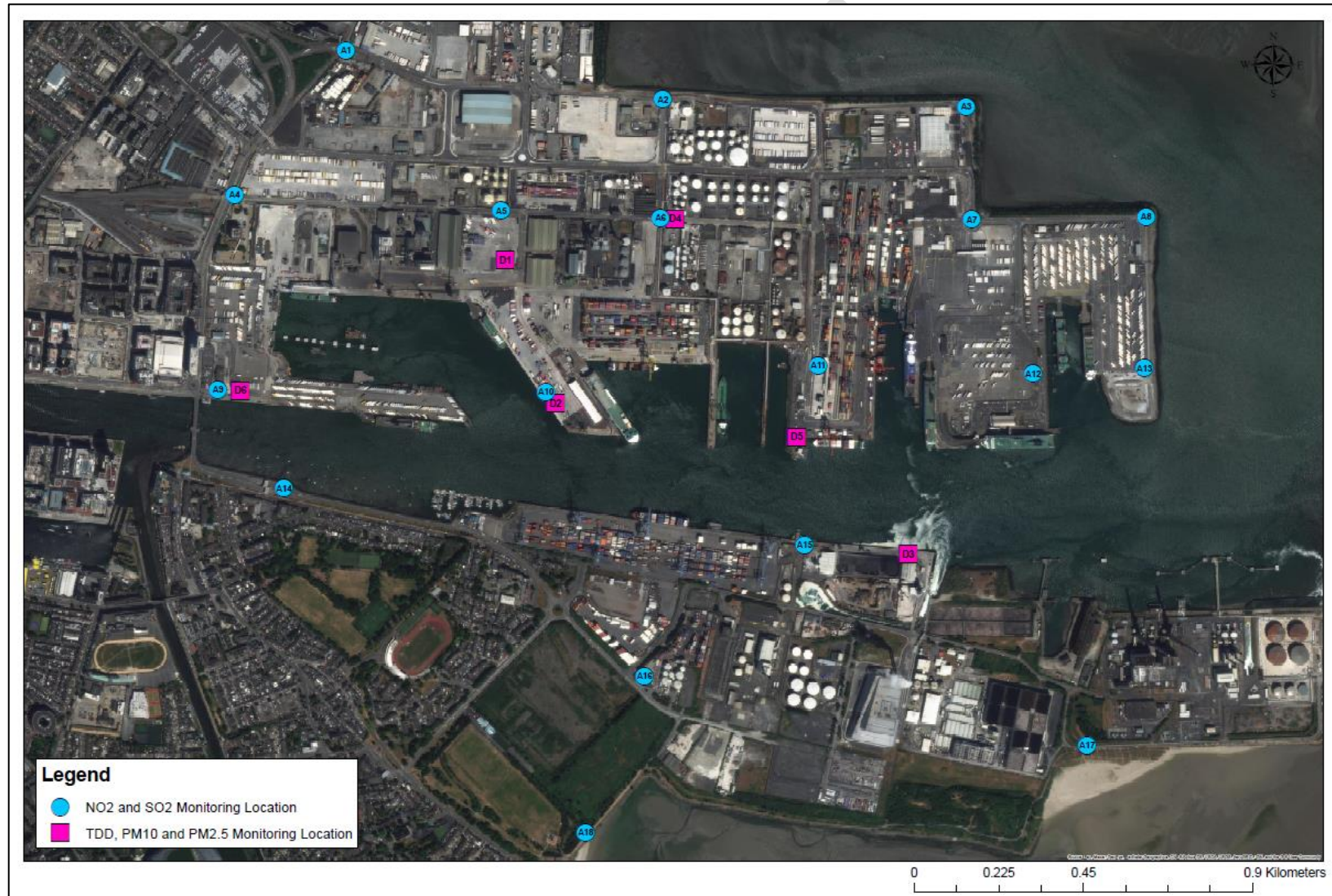


## Dublin Port Air Quality Monitoring Results 2016

Air monitoring data from 18 monitoring stations over a period of 6 monitoring event was assessed against legislative limits and target values for the protection of human health and vegetation. Monitoring was carried out for NO<sub>2</sub>, SO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub> and Total depositional dust.

A total of 18 individual monitoring locations (A1 to A18) were selected across the port estate area in order to monitor ambient air concentrations of Nitrogen dioxide and Sulphur dioxide. These locations were established during the 2014/2015 monitoring program and data collected in 2016 will facilitate comparison between the data sets in terms of improvement/dis-improvements in ambient air quality within the port environs. A further 4 locations were chosen for Bergerhoff total dust deposition monitoring (D1 to D4) while a further two locations were chosen for PM<sub>10</sub> and PM<sub>2.5</sub> monitoring (D5 and D6). Figure 10.6 presents an overview of each monitoring locations located with the Dublin Port and its environs.

Figure 10.6: Overview of Ambient Air Monitoring Locations Located Within Dublin Port and Surrounding Environs for Nitrogen Dioxide, Sulphur Dioxide, Total Depositional Dust and PM<sub>10/2.5</sub>

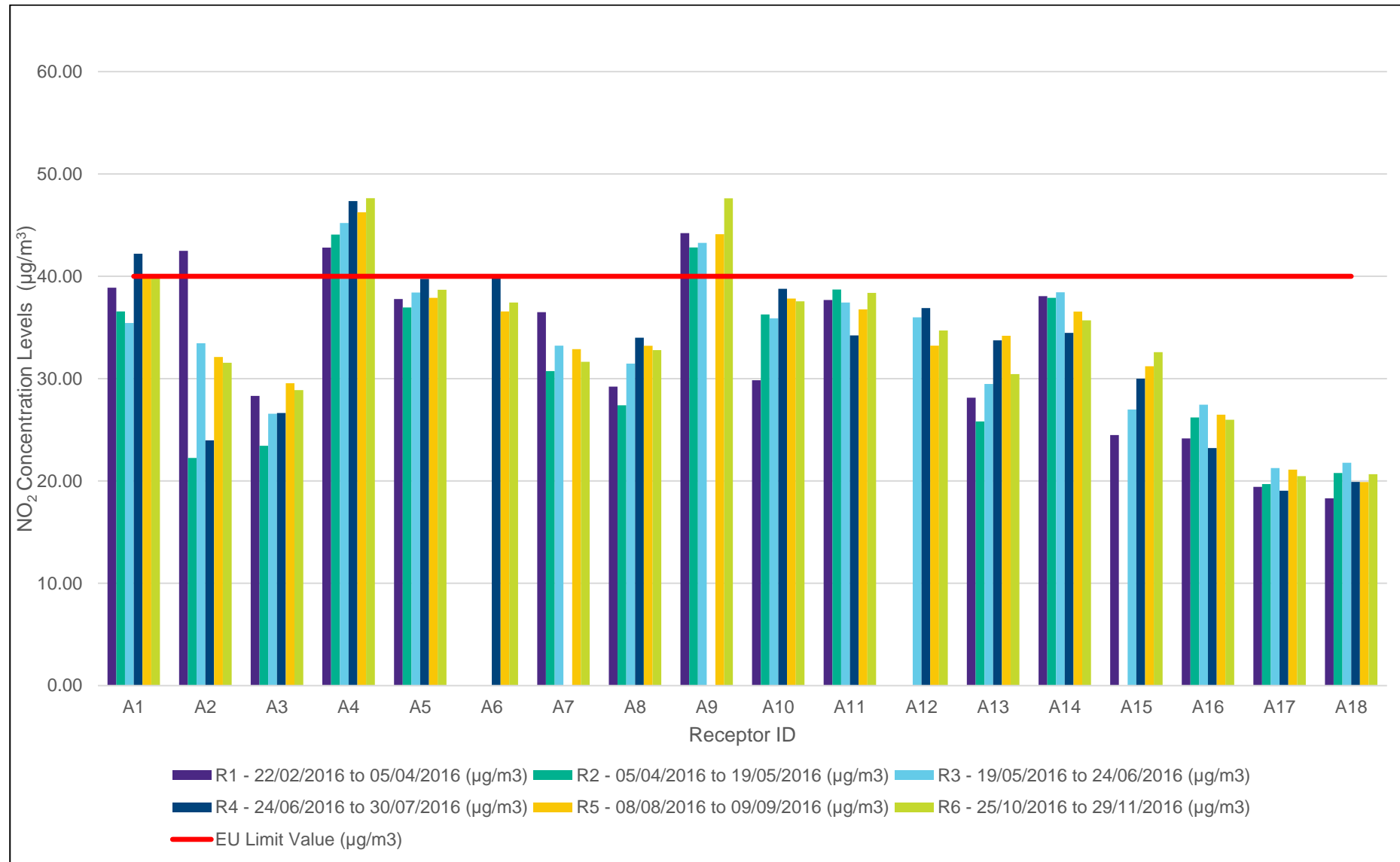


## Results

### Nitrogen Dioxide

The NO<sub>2</sub> diffusion tubes were deployed for a period of 6 x circa 1 month periods between Feb and Nov 2016. Monitoring was carried out at 18 monitoring stations spatially distributed across the port estate. Monitoring was carried out in the four main seasons of Winter, Spring, Summer and Autumn. The results of the monitoring are graphically represented in Figure 10.7.

Figure 10.7: Plot of NO<sub>2</sub> Concentrations for Each Monitoring Event R1 to R6 at Each Monitoring Station A1 to A18



### **Comparison Between Average Monitoring Data Collected in Event 1 Year 2014/2015 and Event 2 (2016) for NO<sub>2</sub>**

Figure 10.8 present the comparison between the average monitoring data collected over the 6 monitoring events in Event 1 Year 2014/2015 and Event 2 Year 2016 for both NO<sub>2</sub>.

As can be observed for NO<sub>2</sub> average monitoring data, there is a significant improvement in the average monitoring data for average NO<sub>2</sub> concentrations across each of the monitoring stations over the monitoring period.

Figure 10.8: Graphical Comparison Between Average NO<sub>2</sub> Concentration Values for Event 1 Year 2014/2015 and Event 2 Year 2016

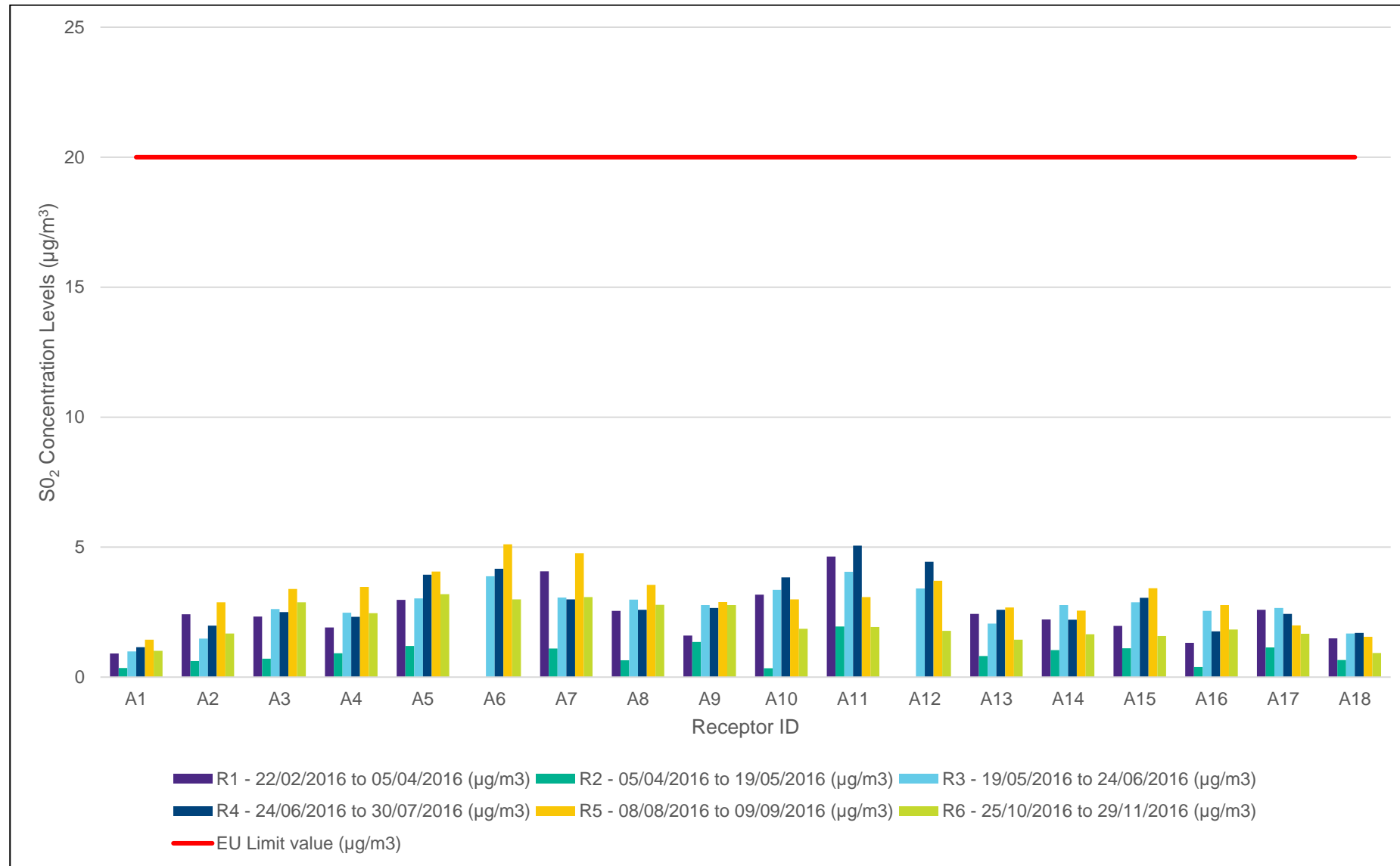




## **Sulphur Dioxide**

The SO<sub>2</sub> diffusion tubes were deployed for a period of 6 x circa 1 month periods between Feb and Nov 2016. Monitoring was carried out at 18 monitoring stations spatially distributed across the port estate. Monitoring was carried out in the four main seasons of Winter, Spring, Summer and Autumn. The results of the monitoring are graphically represented in Figure 10.9.

Figure 10.9: Plot of SO<sub>2</sub> Concentrations for Each Monitoring Event R1 to R6 at Each Monitoring Station A1 to A18

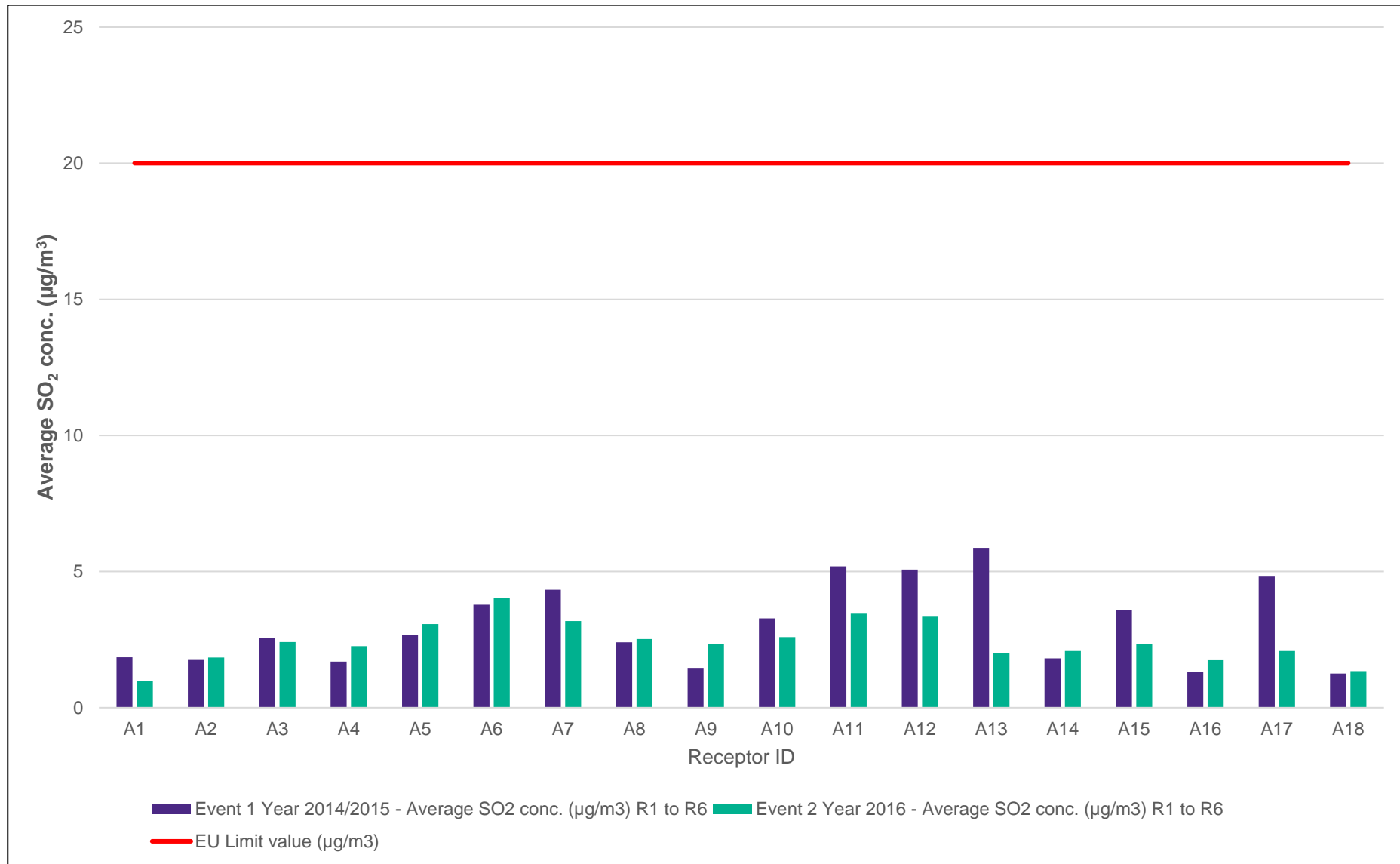


## **Comparison Between Average Monitoring Data Collected in Event 1 Year 2014/2015 and Event 2 (2016) for SO<sub>2</sub>**

Figure 10 presents the comparison between the average monitoring data collected over the 6 monitoring events in Event 1 Year 2014/2015 and Event 2 Year 2016 for both SO<sub>2</sub>.

With regards to SO<sub>2</sub> monitoring data, monitoring data collected during Event 2 Year 2016 were similar in nature across the monitoring area in comparison to Event 1 Year 2014/2015. Nine monitoring stations were lower while nine monitoring stations were higher. All monitoring stations were well in compliance with the statutory limit value of 20 µg/m<sup>3</sup> with the highest value recorded only 20.2% of the limit value.

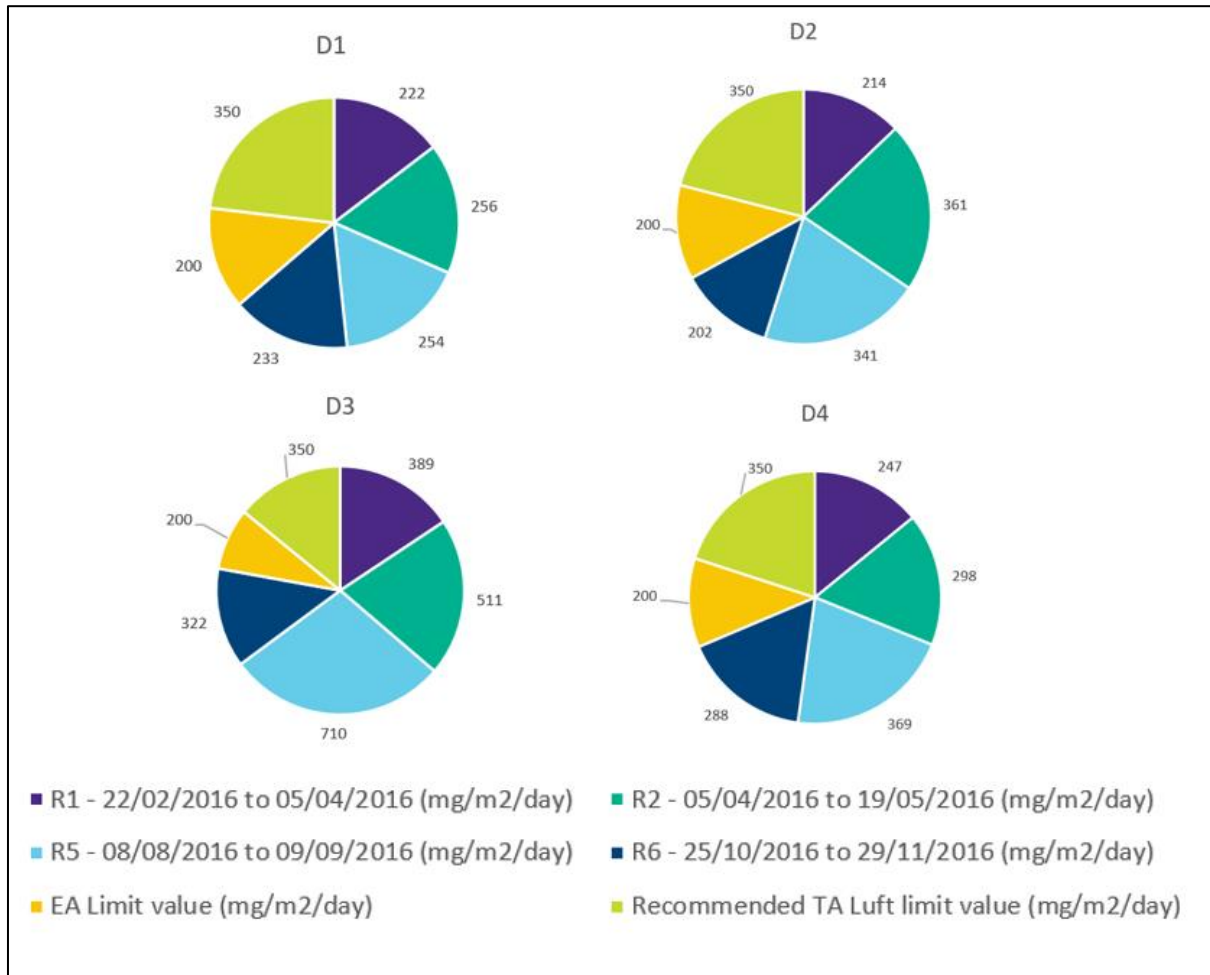
Figure 10.10: Comparison Between Average SO<sub>2</sub> Concentration Values for Event 1 Year 2014/2015 and Event 2 2016



## Total Depositional Dust

The Total depositional dust monitoring stations were deployed for a period of 4 x 1 month periods between Feb 2016 and Nov 2016. Monitoring was carried out at 4 monitoring stations located in close proximity to locations or activities know to give rise to fugitive dust emissions. The results of the monitoring are graphically shown in Figure 10.11.

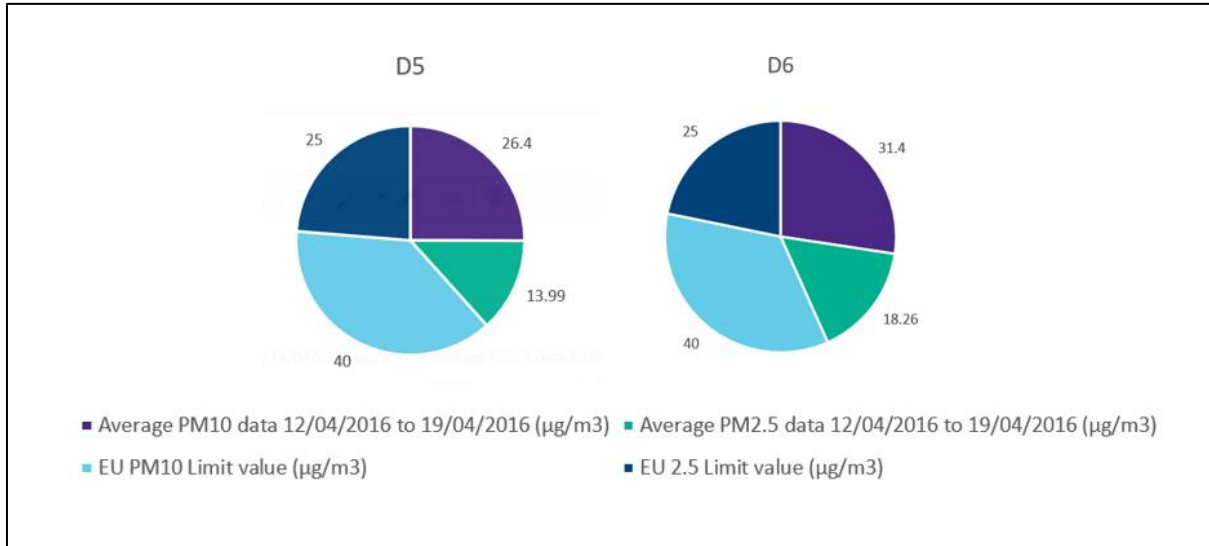
Figure 10.11: Total Depositional Dust Monitoring Results for the Dublin Port Estate and Environs



### Particulate Matter (PM<sub>10/2.5</sub>)

Particulate matter 10 and 2.5 µm monitoring stations were deployed for a period of approximately 1 week period between 12/04/2016 and 19/02/2016. Monitoring was carried out at 2 monitoring stations. The results of the monitoring are graphically shown in Figure 10.12.

Figure 10.12: Particulate Matter 10 and 2.5 µm Monitoring Results for Dublin Port Estate Monitoring Stations



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## Dublin Port Air Quality Monitoring Results 2017 - 2018

Air monitoring data from 18 monitoring stations over a period of 4 monitoring event was assessed against legislative limits and target values for the protection of human health and vegetation. Monitoring was carried out for NO<sub>2</sub> and SO<sub>2</sub> at 18 locations over 4 monitoring events. Monitoring for PM<sub>10</sub> and PM<sub>2.5</sub> was carried out at 2 locations over 1 monitoring event while monitoring for Benzene, Toluene, Ethylbenzene, Xylene isomers and Ammonia was carried on 7 locations over 2 monitoring events. Total depositional dust was carried out on 4 locations over 1 monitoring event.

A total of 18 individual monitoring locations (A1 to A18) were selected across the port estate area in order to monitor ambient air concentrations of Nitrogen dioxide and Sulphur dioxide. These locations were established during the 2014/2015 monitoring program and data collected in 2017 will facilitate comparison between the data sets in terms of improvement / dis-improvements in ambient air quality within the port environs.

A total of 7 individual monitoring locations (A1, A2, A3, A8, A9, A12, A13, A15, A16, A17 and A18) were chosen from the stated location for the monitoring of BTEX and Ammonia. This monitoring only commenced in 2017 and therefore no comparison can be made between the collected dataset and previous results.

A total of 4 locations were chosen for Bergerhoff total dust deposition monitoring (D1 to D4) while a further two locations were chosen for PM<sub>10</sub> and PM<sub>2.5</sub> monitoring (D5 and D6). Figure 10.13 presents an overview of each monitoring locations located with the Dublin Port and its environs.

Figure 10.13: Overview of Ambient Air Monitoring Locations Located Within Dublin Port and Surrounding Environs for Nitrogen Dioxide, Sulphur Dioxide, BTEX, Ammonia, Total Depositional Dust and PM<sub>10/2.5</sub>



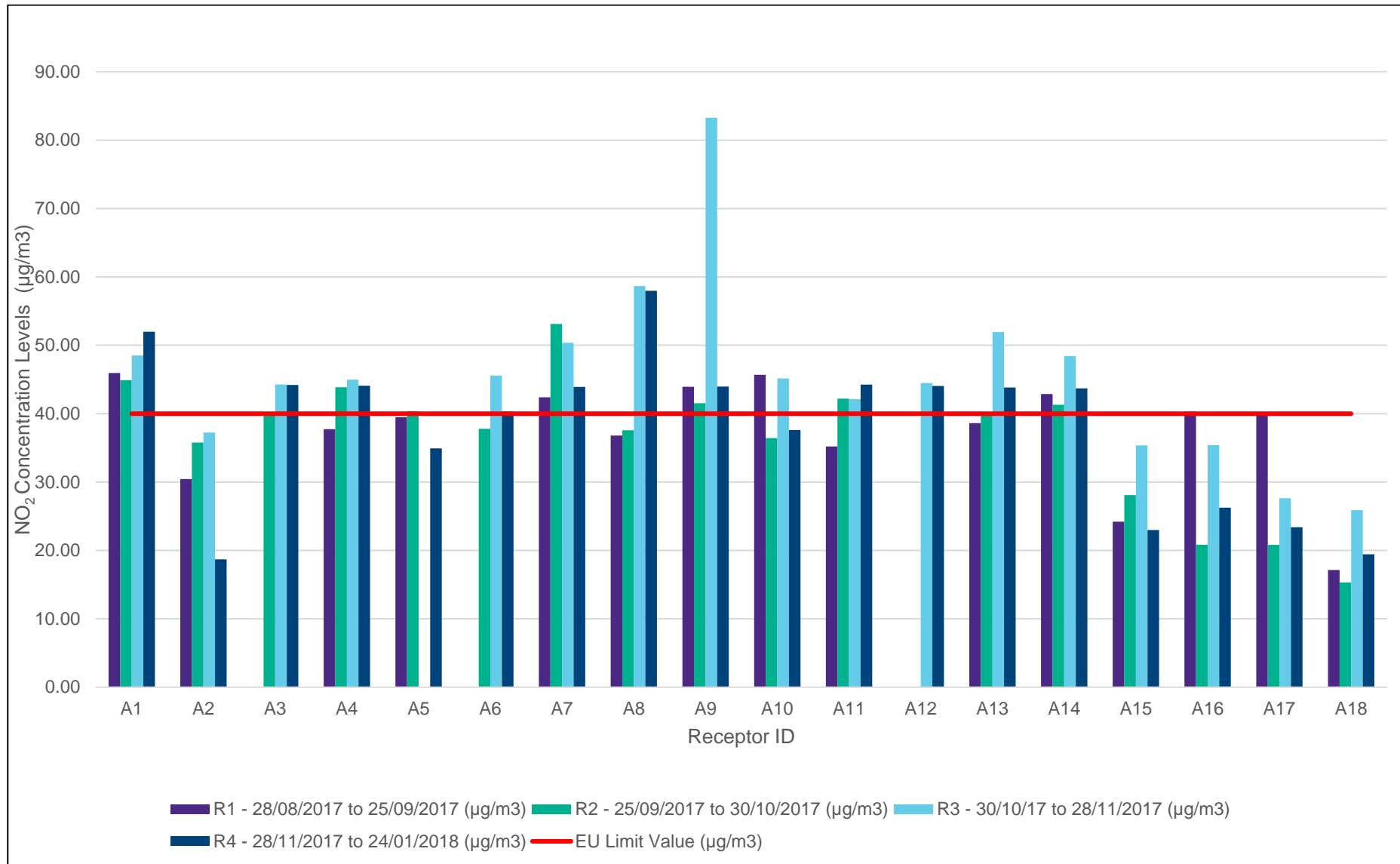


## Results

### Nitrogen Dioxide

The NO<sub>2</sub> diffusion tubes were deployed for a period of 4 x circa 1 month periods between Aug and Dec 2017. Monitoring was carried out at 18 monitoring stations spatially distributed across the port estate. The results of the monitoring are and graphically represented in Figure 10.14.

Figure 10.14: Plot of NO<sub>2</sub> Concentrations For Each Monitoring Event R1 to R4 at Each Monitoring Station A1 to A18



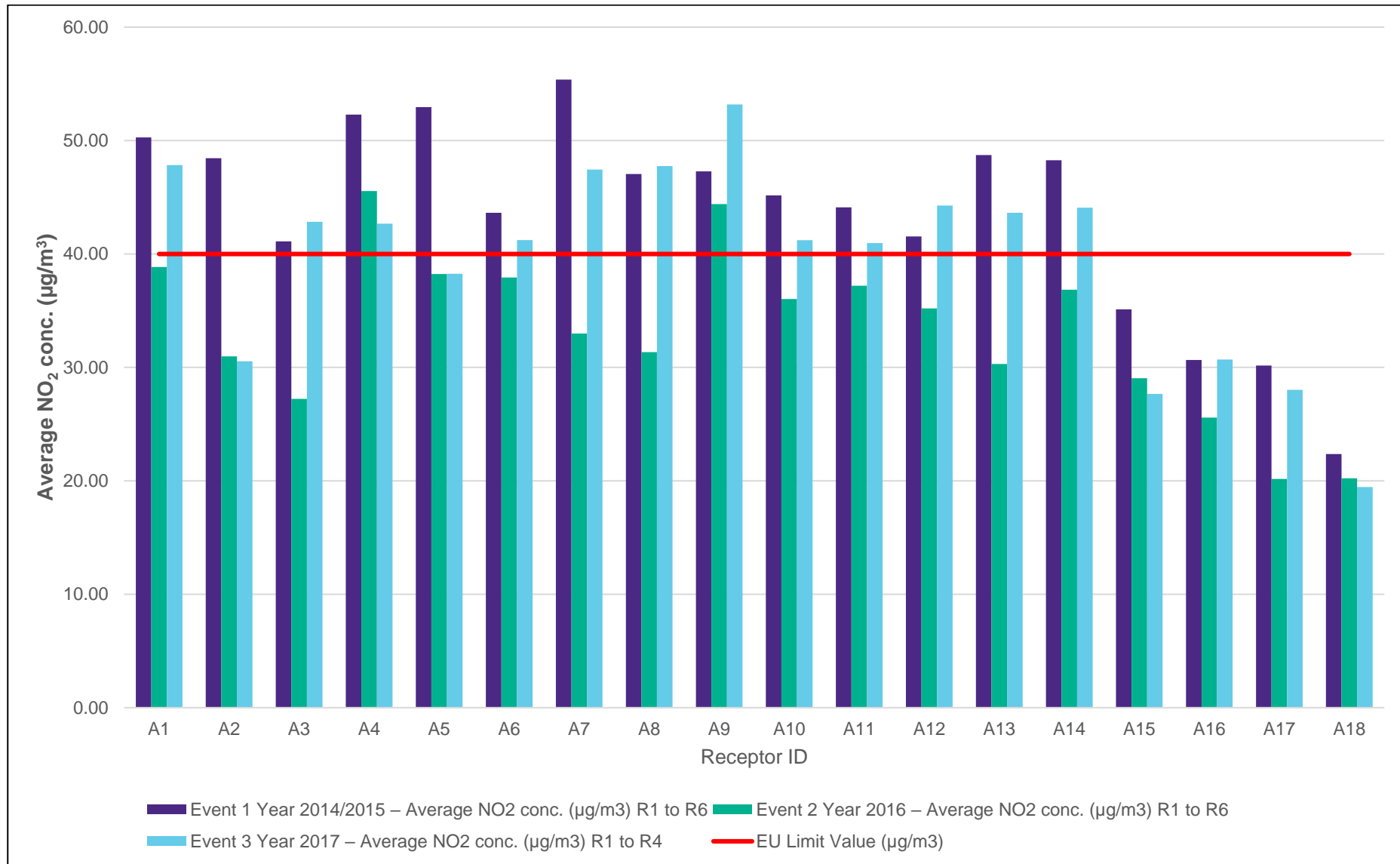
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### **Comparison between average monitoring data collected in Event 1 Year 2014/2015, Event 2 Year 2016 and Event 3 Year 2017 for NO<sub>2</sub>**

Figure 10.15 present the comparison between the average monitoring data collected over the 6 monitoring events in Event 1 Year 2014/2015, Event 2 Year 2016 and Events 3 Year 2017 for NO<sub>2</sub>.

As can be observed for NO<sub>2</sub> average monitoring data, comparison between Event 3 Year 2017 and Event 2 Year 2016 demonstrates a marked dis-improvement in the average monitoring data for average NO<sub>2</sub> concentrations across each of the monitoring stations over the monitoring period. In terms of monitoring data, a total of 12 monitoring stations were in excess of the annual average limit value of 40µg/m<sup>3</sup>. When compared with monitoring event 1 Year 2014/2015, there is a net overall improvement with two fewer stations in excess of the annual average limit value of 40µg/m<sup>3</sup>.

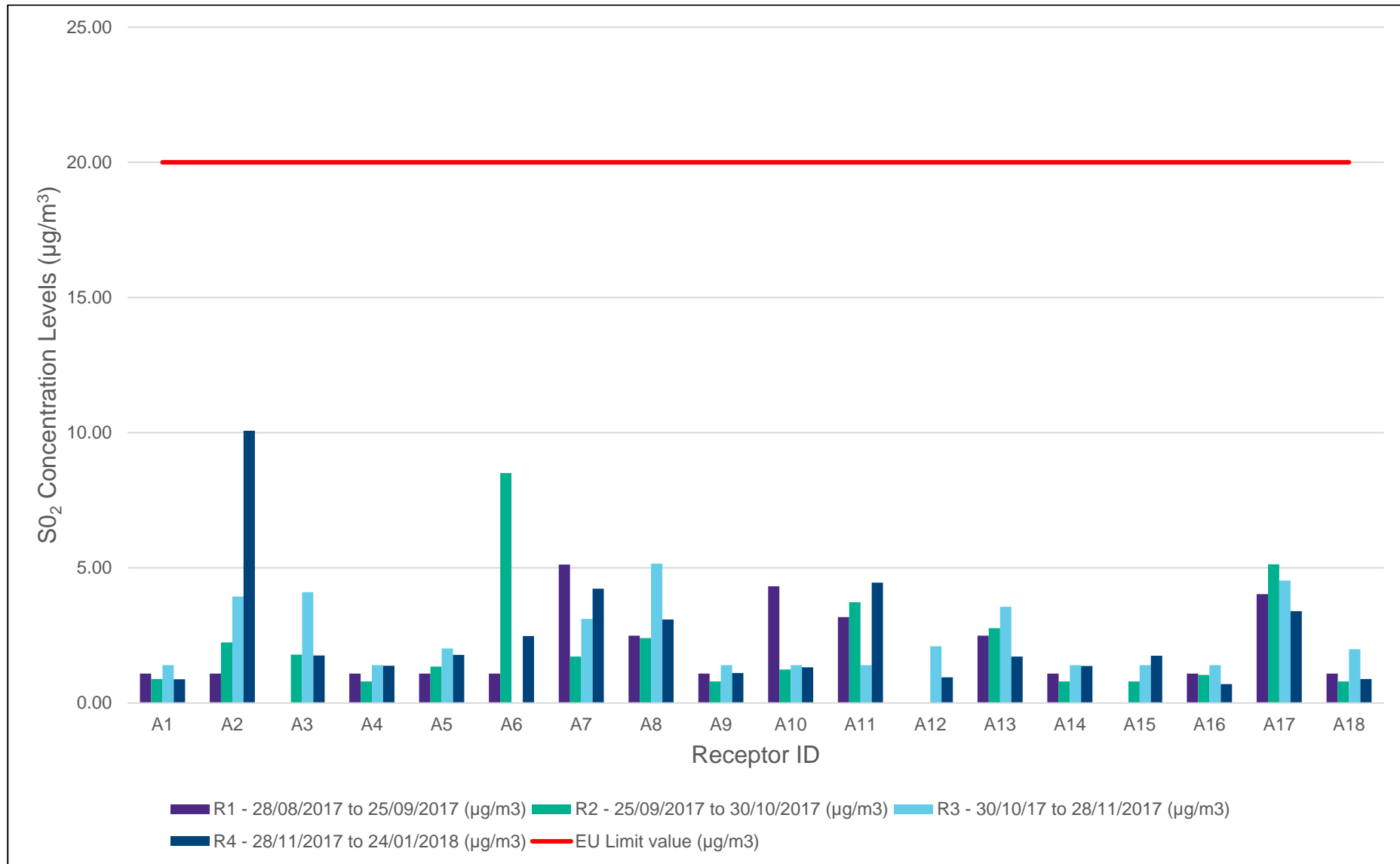
Figure 10.15: Graphical Comparison Between Average NO<sub>2</sub> Concentration Values for Event 1 Year 2014/2015, Event 2 Year 2016 and Event 3 Year 2017



## **Sulphur Dioxide**

The SO<sub>2</sub> diffusion tubes were deployed for a period of 4 x circa 1 month periods between Aug and Dec 2017. Monitoring was carried out at 18 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically represented in Figure 10.16.

Figure 10.16: Plot of SO<sub>2</sub> Concentrations For Each Monitoring Event R1 to R4 at Each Monitoring Station A1 to A18



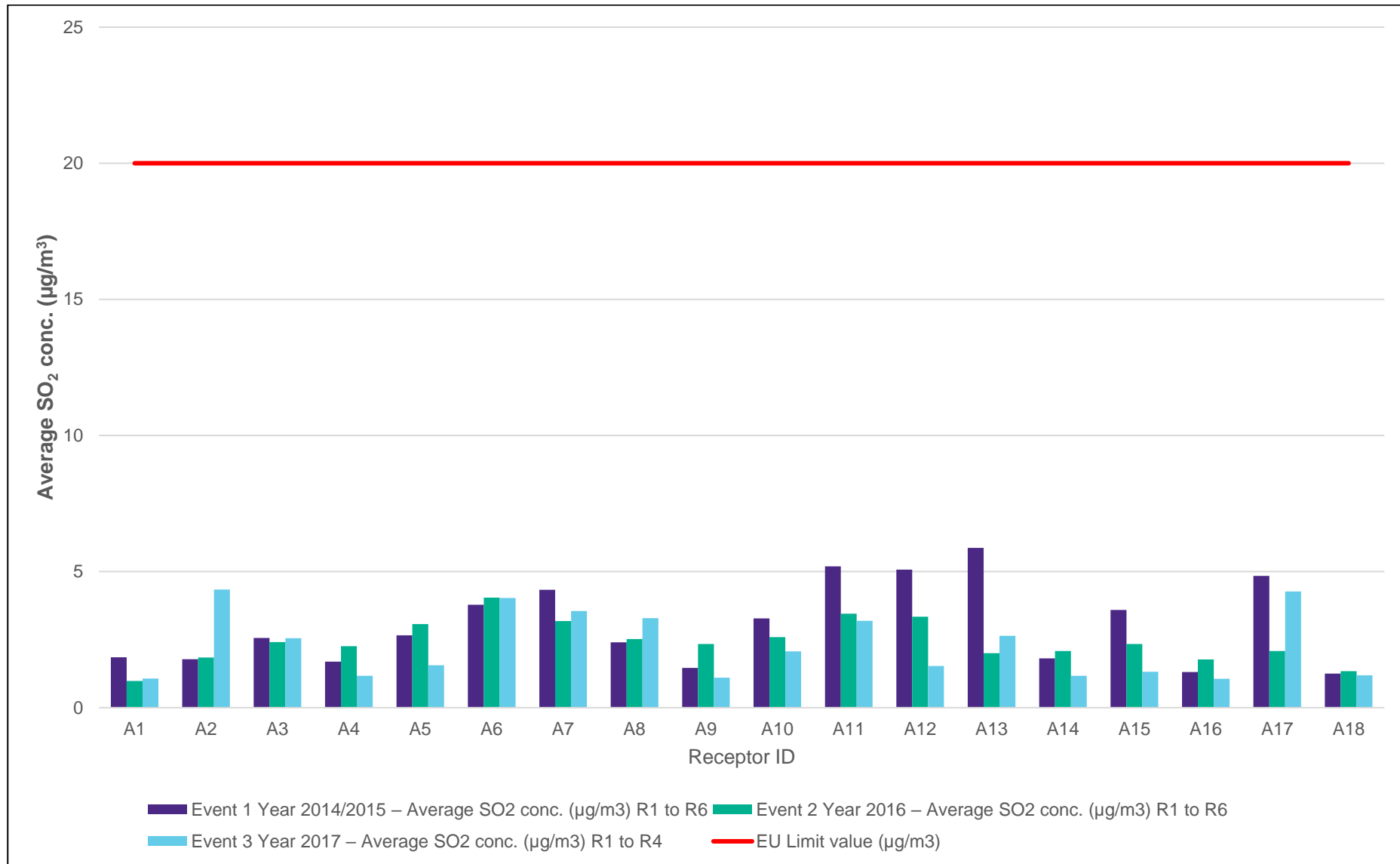
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### **Comparison between average monitoring data collected in Event 1 Year 2014/2015, Event 2 Year 2016 and Event 3 Year 2017 for SO<sub>2</sub>**

Figure 10.17 present the comparison between the average monitoring data collected over the 6 monitoring events in Event 1 Year 2014/2015, Event 2 Year 2016 and Events 3 Year 2017 for SO<sub>2</sub>.

With regards to SO<sub>2</sub> monitoring data, monitoring data collected during Event 3 Year 2017 all stations were similar in nature across the monitoring area in comparison to Event 1 Year 2014/2015 and Event 2 Year 2016. Eleven monitoring stations were lower for SO<sub>2</sub> concentrations in comparison to Event 2 Year 2016 while seven monitoring stations were higher. When Event 3 Year 2017 is compared against Event 1 Year 2014/2015, fourteen locations were lower while 4 locations were higher. All monitoring stations were well in compliance with the statutory limit value of 20 µg/m<sup>3</sup> with the highest value recorded only 29.37% of the limit value.

Figure 10.17: Comparison Between Average SO<sub>2</sub> Concentration Values For Event 1 Year 2014/2015, Event 2 Year 2016 and Event 3 Year 2017





### Total Depositional Dust

The Total depositional dust monitoring stations were deployed for a period of 1 x 1 month periods between Sept 2017 and Oct 2017. Monitoring was carried out at 4 monitoring stations located in close proximity to locations or activities know to give rise to fugitive dust emissions. The results of the monitoring are graphically shown in Figure 10.18.

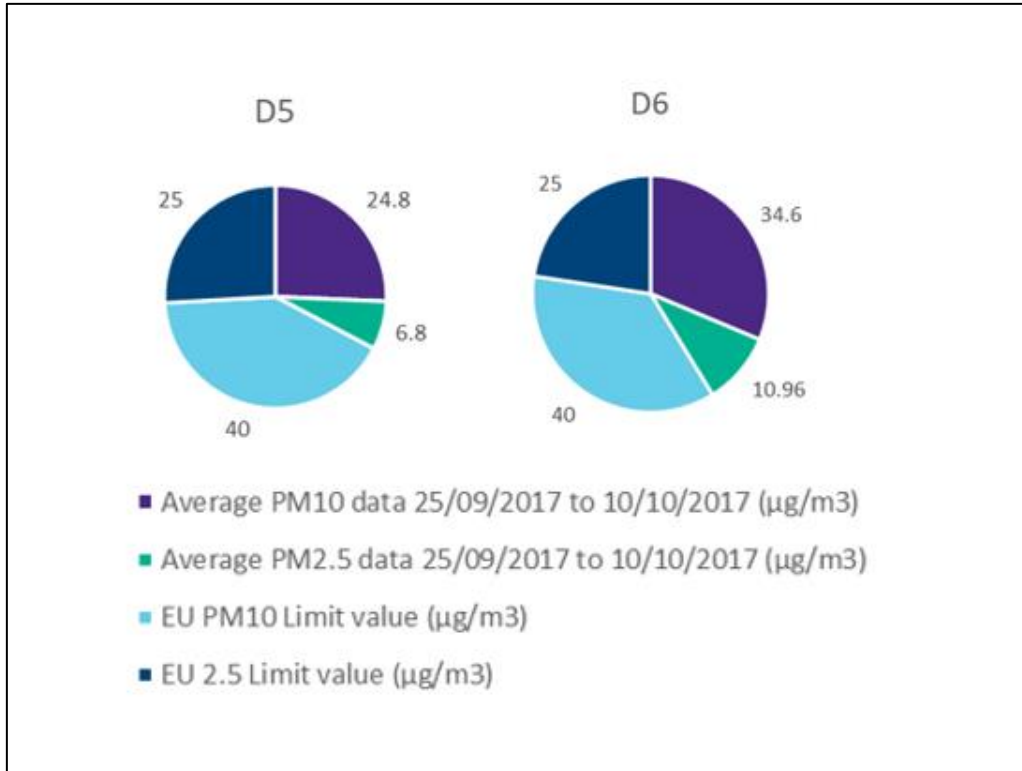
Figure 10.18: Total Depositional Dust Monitoring Results for the Dublin Port Estate and Environs



### Particulate Matter (PM<sub>10/2.5</sub>)

Particulate matter 10 and 2.5 µm monitoring stations were deployed for a period of approximately 2 week period between 25/06/2017 and 10/10/2017. Monitoring was carried out at 2 monitoring stations. The results of the monitoring are graphically shown in Figure 10.19.

Figure 10.19: Particulate Matter 10 and 2.5 µm Monitoring Results for Dublin Port Estate Monitoring Stations



## Ammonia

The NH<sub>3</sub> diffusion tubes were deployed for a period of 2 x circa 1 month periods between August and December 2017. Monitoring was carried out at 7 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.20 and Figure 10.21.

Figure 10.20: NH<sub>3</sub> Monitoring Results at Each of the 7 Monitoring Stations R1 - 28/08/2017 to 25/09/2017 (µg/m<sup>3</sup>)

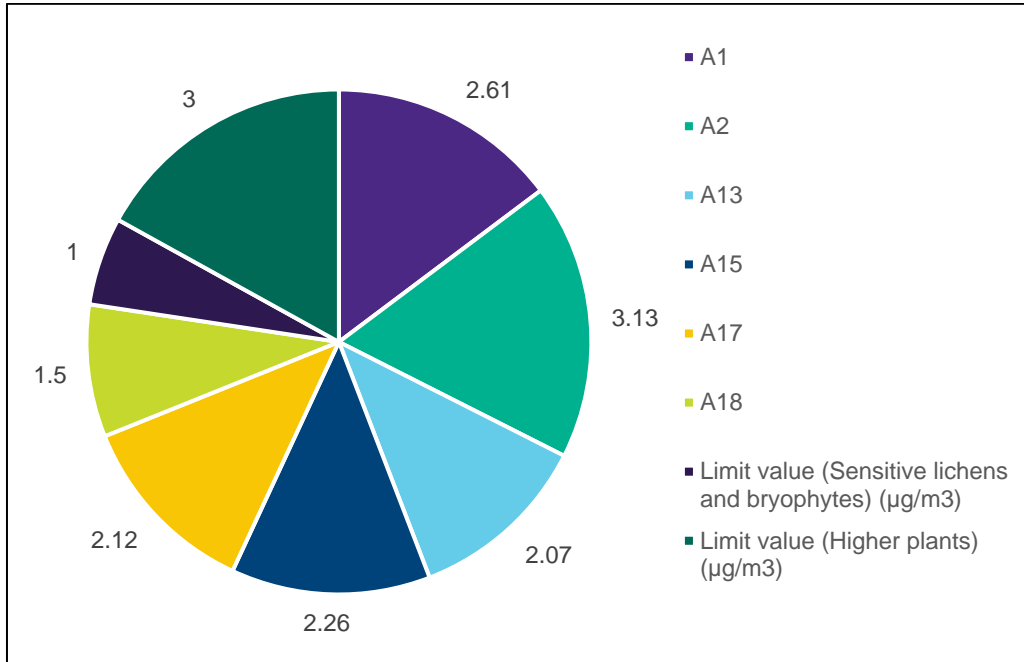
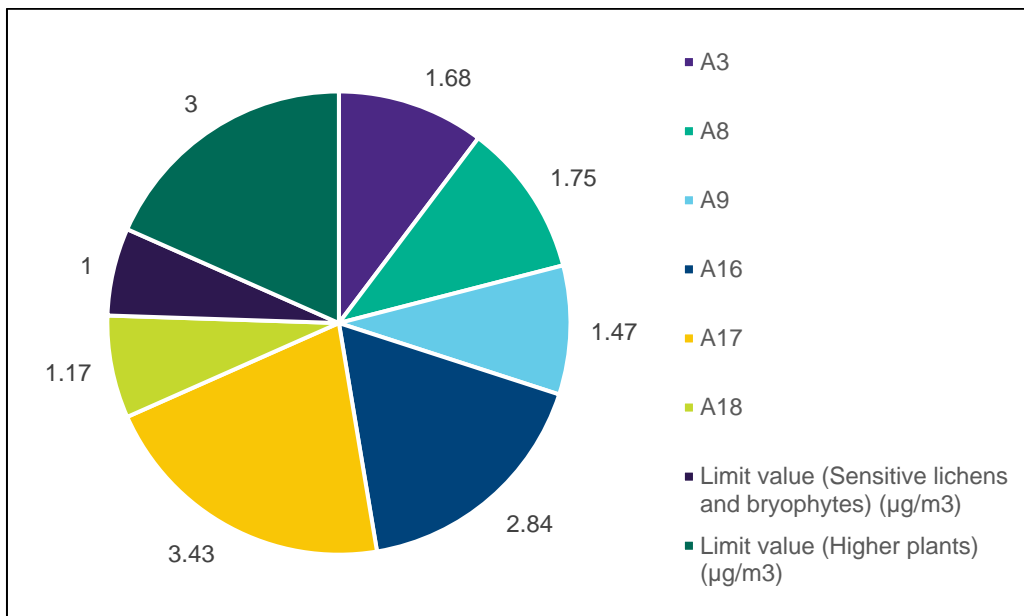


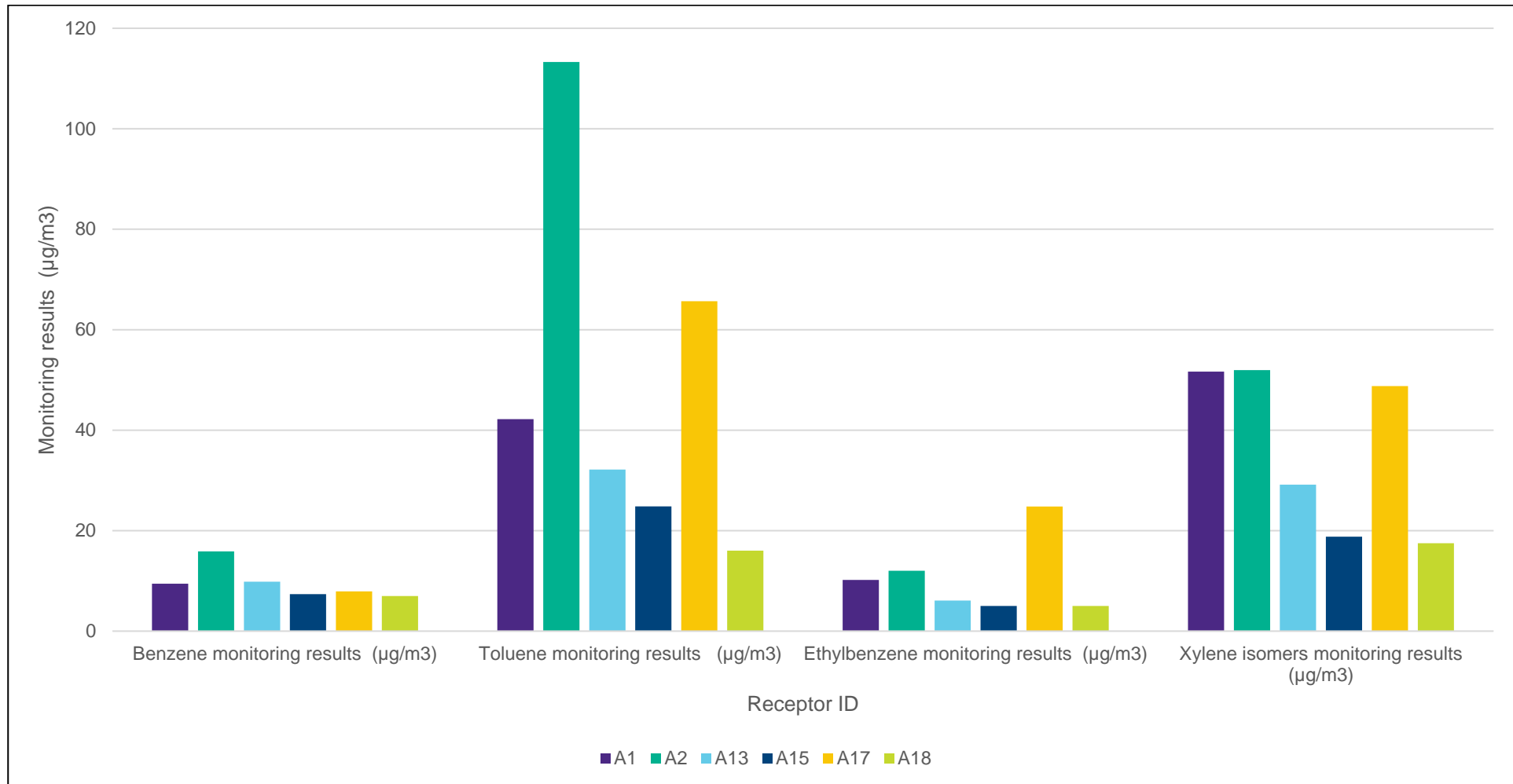
Figure 10.21: NH<sub>3</sub> Monitoring Results at Each of the 7 Monitoring Stations R2 - 28/11/17 to 24/01/2018 (µg/m<sup>3</sup>)



## **BTEX**

The BTEX diffusion tubes were deployed for a period of 2 x circa 1 month periods between Aug and Dec 2017. Monitoring was carried out at 7 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.22 – Figure 10.23.

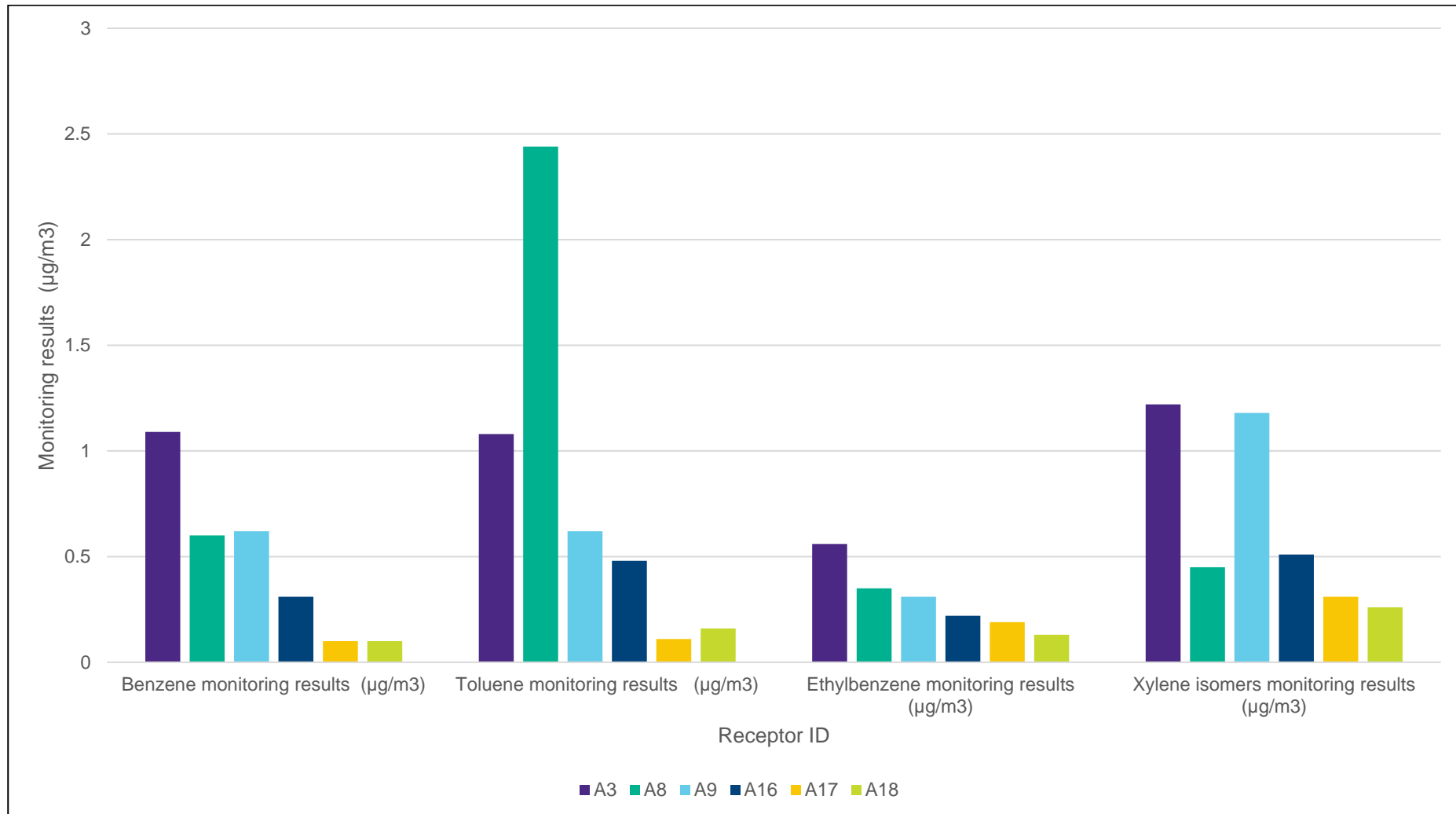
Figure 10.22: BTEX monitoring results at each of the 7 monitoring stations over R1 - 28/08/2017 to 25/09/2017



**\*\*Note – Limit Values Include:**

**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**

Figure 10.23: BTEX monitoring results at each of the 7 monitoring stations over R2 - 28/11/17 to 24/01/2018



**\*\*Note – Limit Values Include:**

**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**

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## Dublin Port Air Quality Monitoring Results 2019

Air monitoring data from 18 monitoring stations over a period of 6 monitoring event was assessed against legislative limits and target values for the protection of human health and vegetation. Monitoring was carried out for NO<sub>2</sub> and SO<sub>2</sub> at 18 locations over 6 monitoring events. Monitoring for PM<sub>10</sub> and PM<sub>2.5</sub> was carried out at 2 locations over 2 monitoring event while monitoring for Benzene, Toluene, Ethyl Benzene, Xylene isomers and Ammonia was carried at 7 locations over 3 monitoring events. Total depositional dust was carried out at 4 locations over 2 monitoring event while Lead monitoring was carried out at 3 locations over 3 monitoring events.

A total of 18 individual monitoring locations (i.e. A1 to A18) were selected across the port estate area in order to monitor ambient air concentrations of Nitrogen dioxide and Sulphur dioxide. These locations were established during the 2014/2015 monitoring program and data collected in 2019 will facilitate comparison between the data sets in terms of improvement / dis-improvements in ambient air quality within the port environs.

A total of 7 individual monitoring locations (i.e. A2, A3, A4, A8, A15, A17 and A18) were chosen from the stated location for the monitoring of BTEX and Ammonia.

A total of 4 locations were chosen for Bergerhoff total dust deposition monitoring (i.e. D1 to D4) while a further two locations were chosen for PM<sub>10</sub> and PM<sub>2.5</sub> monitoring (i.e. D5 and D6). A total of three monitoring locations were chosen for Lead (i.e. D1, D2 and D6). Figure 10.24 presents an overview of each monitoring locations located with the Dublin Port and its environs.

Figure 10.24: Overview of Ambient Air Monitoring Locations Located Within Dublin Port and Surrounding Environs for Nitrogen Dioxide, Sulphur Dioxide, BTEX, Ammonia, Total Depositional Dust, PM<sub>10/2.5</sub> and Lead



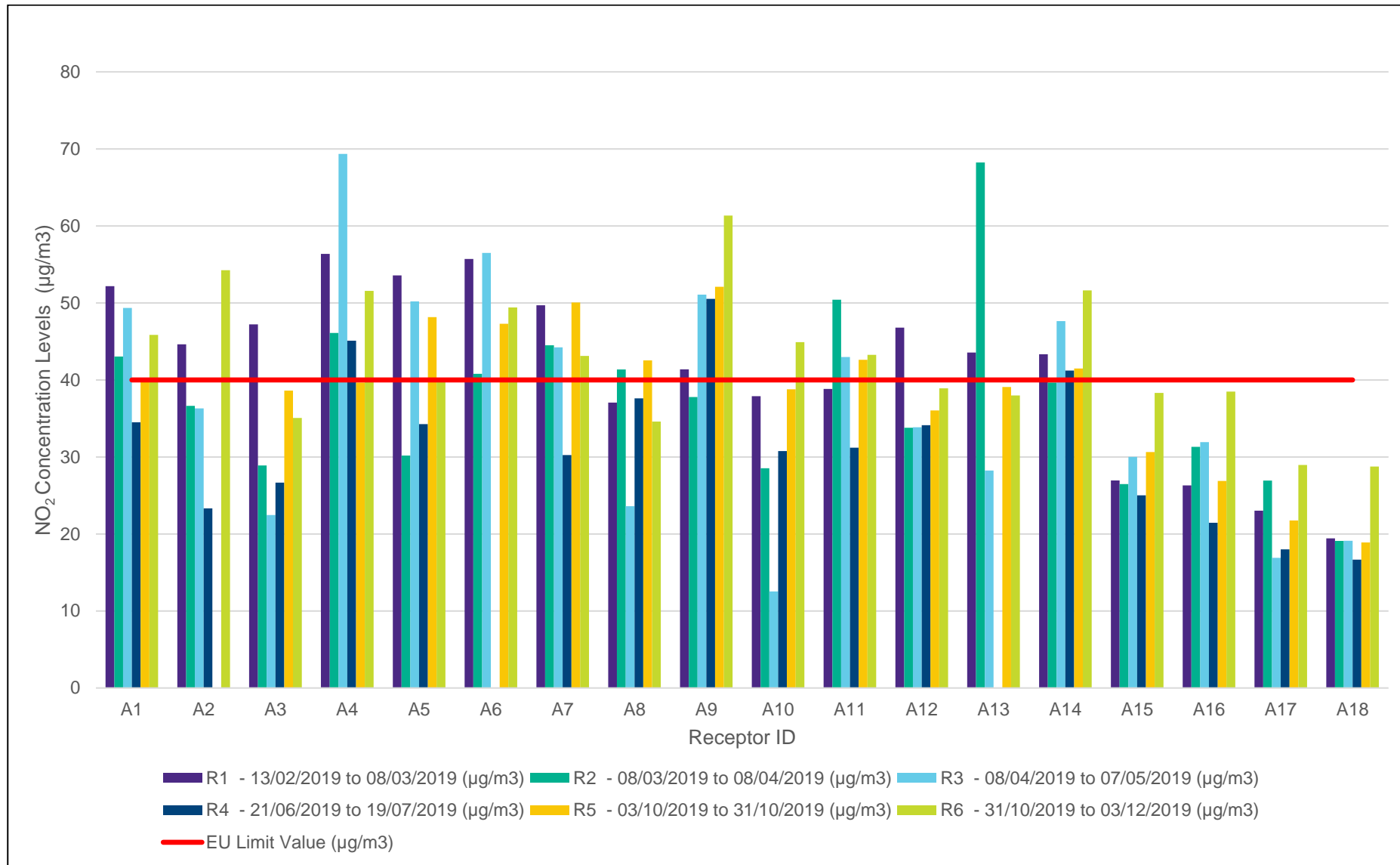


## Results

### Nitrogen Dioxide

The NO<sub>2</sub> diffusion tubes were deployed for a period of 6 x circa 1 month periods between Jan and Dec 2019. Monitoring was carried out at 18 monitoring stations spatially distributed across the port estate. The results of the monitoring are and graphically represented in Figure 10.26.

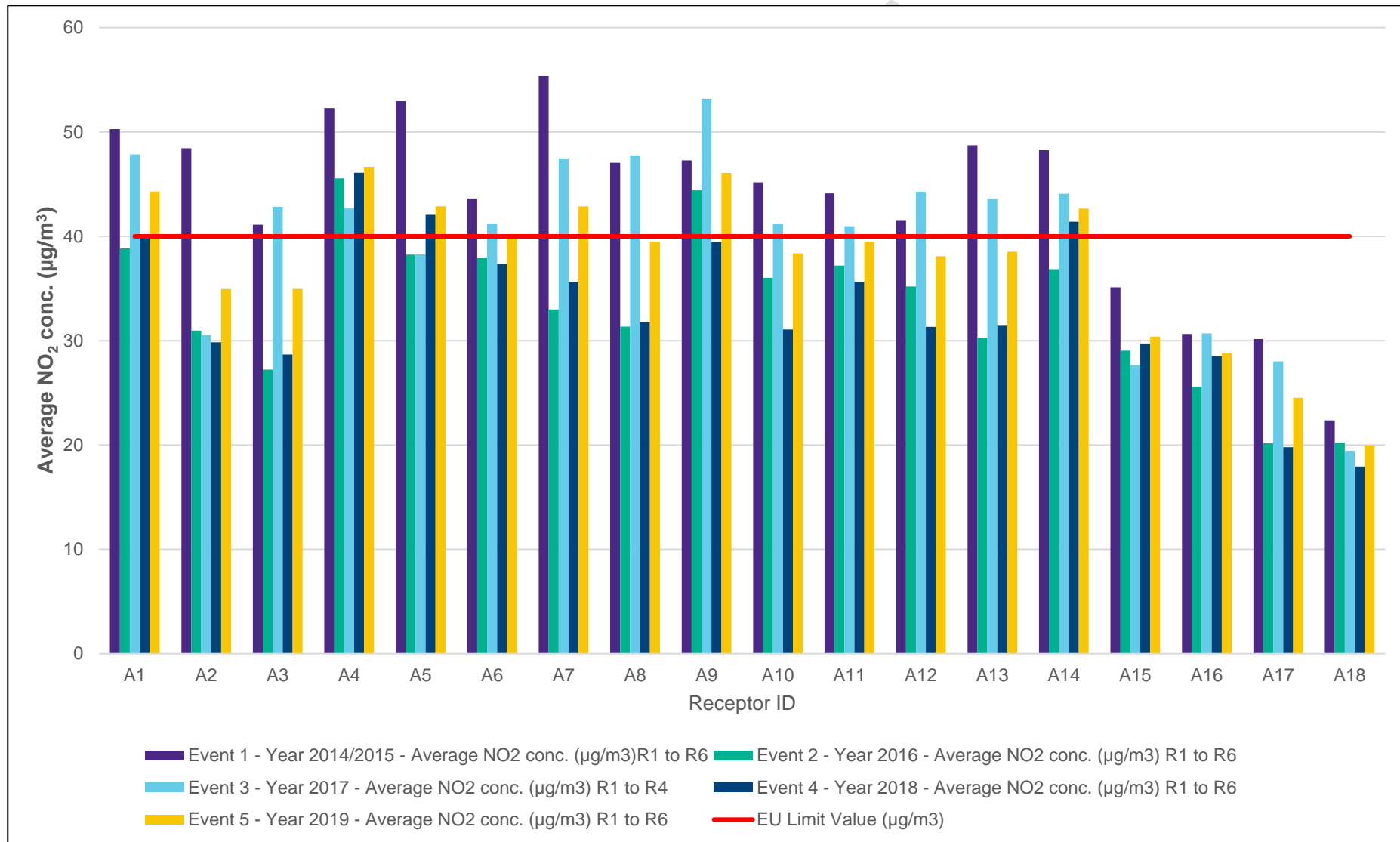
Figure 10.25: Plot of NO<sub>2</sub> Concentrations For Each Monitoring Event R1 to R6 at Each Monitoring Station A1 to A18



## **Comparison between average monitoring data collected in Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018 and Event 5 2019 for NO<sub>2</sub>**

Figure 10.26 present the comparison between the average monitoring data collected over the 6 monitoring events in Event 1 Year 2014/2015, Event 2 Year 2016, Events 3 Year 2017, Event 4 Year 2018 and Event 5 2019 for NO<sub>2</sub>.

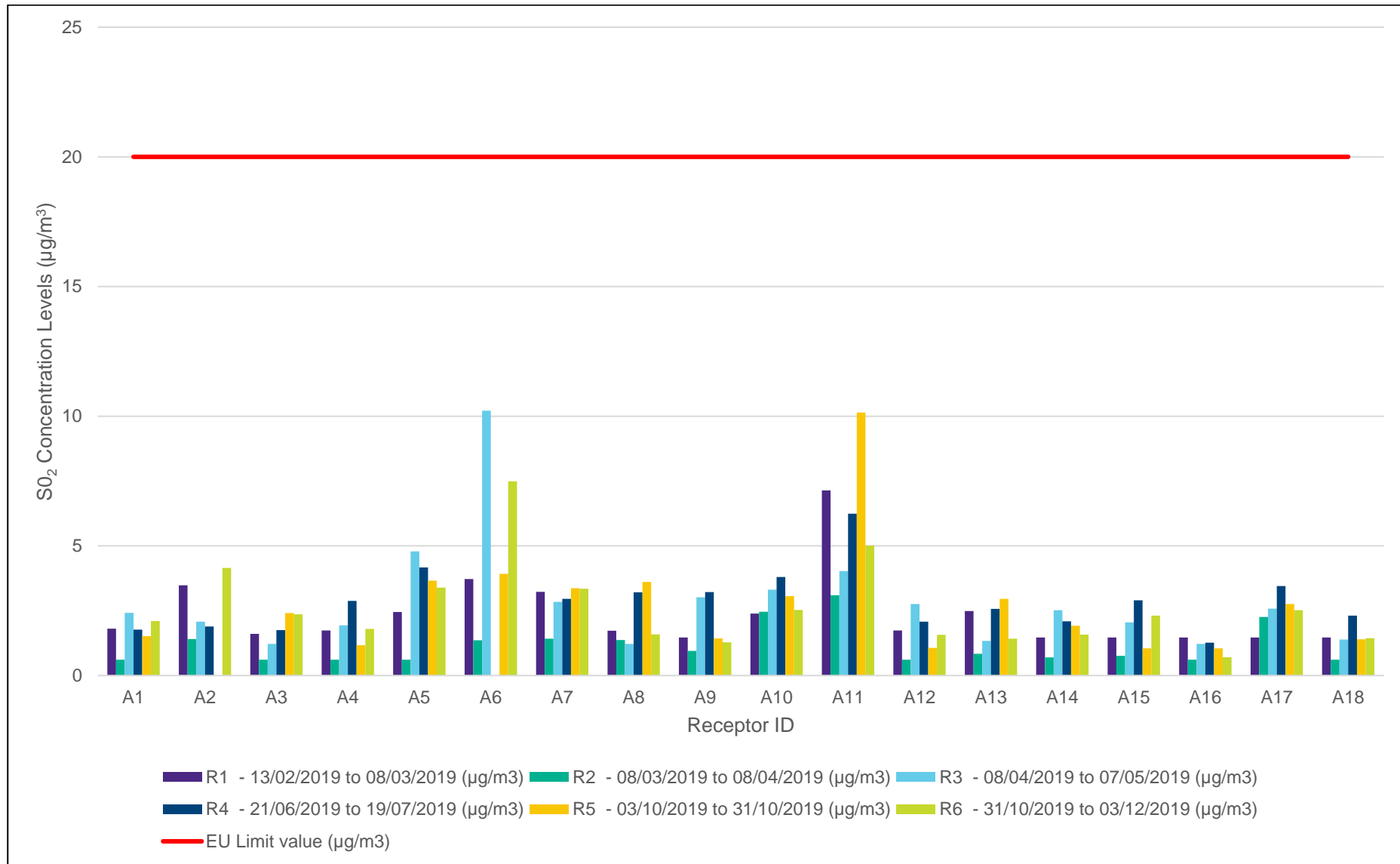
Figure 10.26: Graphical Comparison Between Average NO<sub>2</sub> Concentration Values for Event 1 Year 2014/2015, Event 2 Year 2016, Events 3 Year 2017, Event 4 Year 2018 and Event 5 Year 2019



## **Sulphur Dioxide**

The SO<sub>2</sub> diffusion tubes were deployed for a period of 6 x circa 1 month periods between Jan and Dec 2019. Monitoring was carried out at 18 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically represented in Figure 10.27.

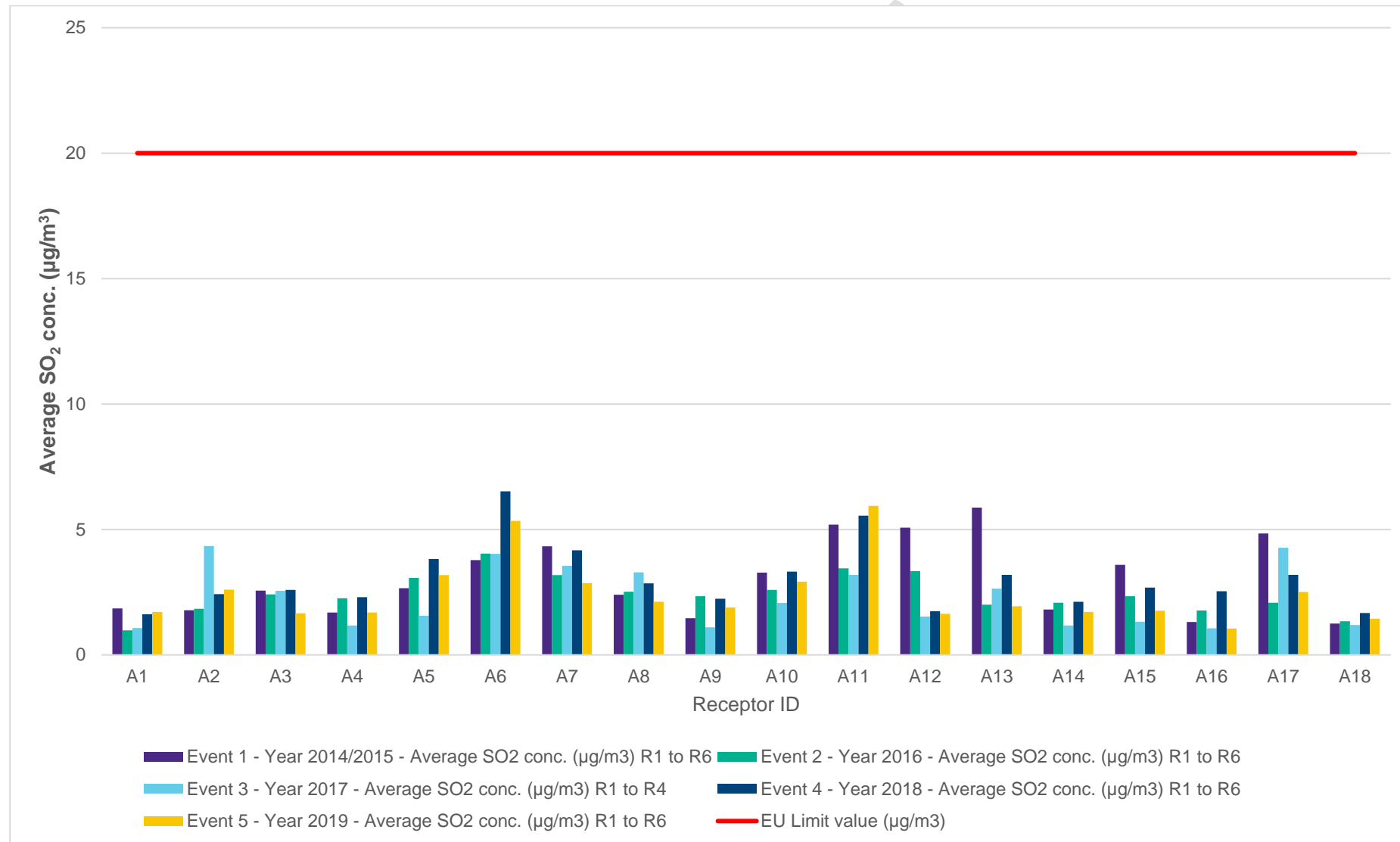
Figure 10.27: Plot of SO<sub>2</sub> Concentrations for Each Monitoring Event R1 to R6 at Each Monitoring Station A1 to A18



### **Comparison between average monitoring data collected in Event 1 Year 2014/2015, Event 2 Year 2016 and Event 3 Year 2017 for SO<sub>2</sub>**

Figure 10.28 presents the comparison between the average monitoring data collected over the 6 monitoring events in Event 1 Year 2014/2015, Event 2 Year 2016, Events 3 Year 2017, Event 4 Year 2018 and Event 5 2019 for SO<sub>2</sub>.

Figure 10.28: Comparison Between Average SO<sub>2</sub> Concentration Values for Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018 and Event 5 Year 2019

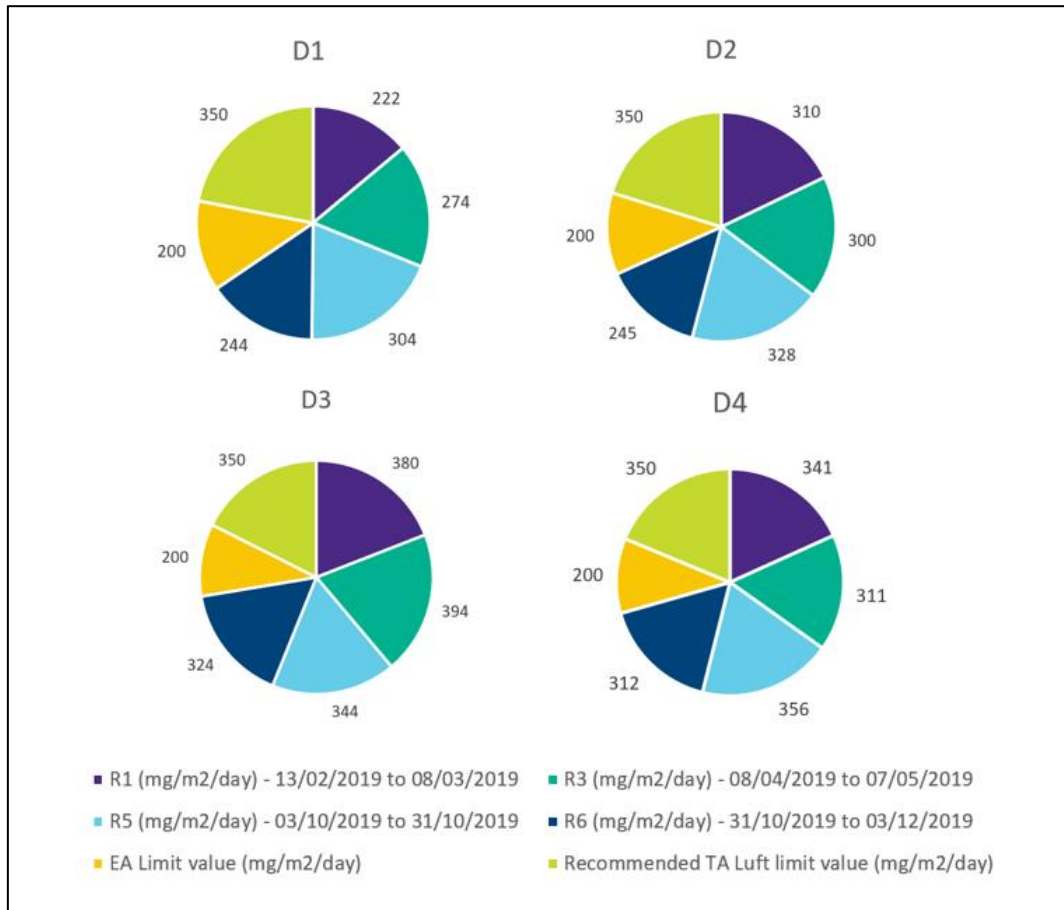




## Total Depositional Dust

The Total depositional dust monitoring stations were deployed for a period of 4 x 1 month periods between February 2019 and December 2019. Monitoring was carried out at 4 monitoring stations located in close proximity to locations to activities know to give rise to fugitive dust emissions. The results of the monitoring are graphically shown in Figure 10.29.

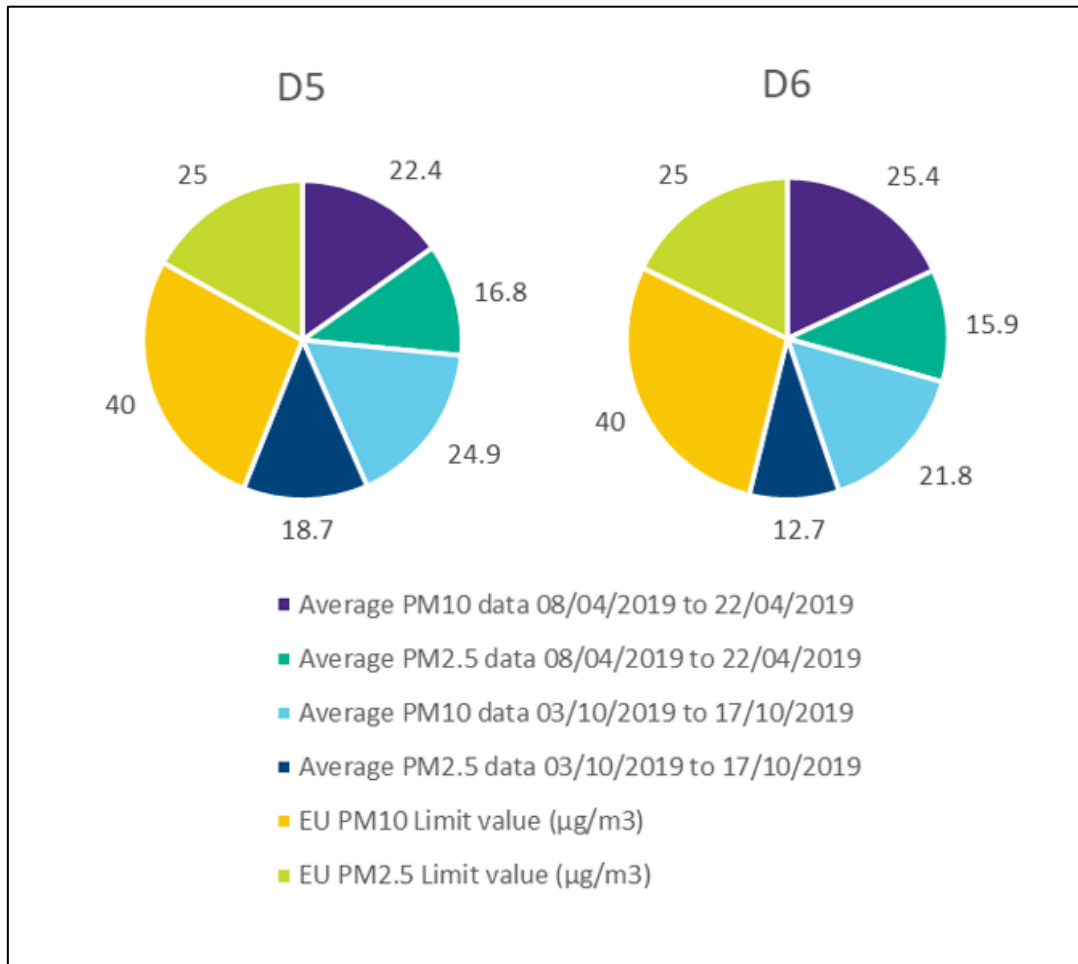
Figure 10.29: Total Depositional Dust Monitoring Results for the Dublin Port Estate and Environs



### Particulate Matter (PM<sub>10/2.5</sub>)

Particulate matter 10 and 2.5 µm monitoring stations were deployed for a period of approximately 2 off 2 week periods 08/04/2019 and 07/05/2019 and 03/10/2019 to 31/10/2019. Monitoring was carried out at 2 monitoring stations. The results of the monitoring are graphically shown in Figure 10.30.

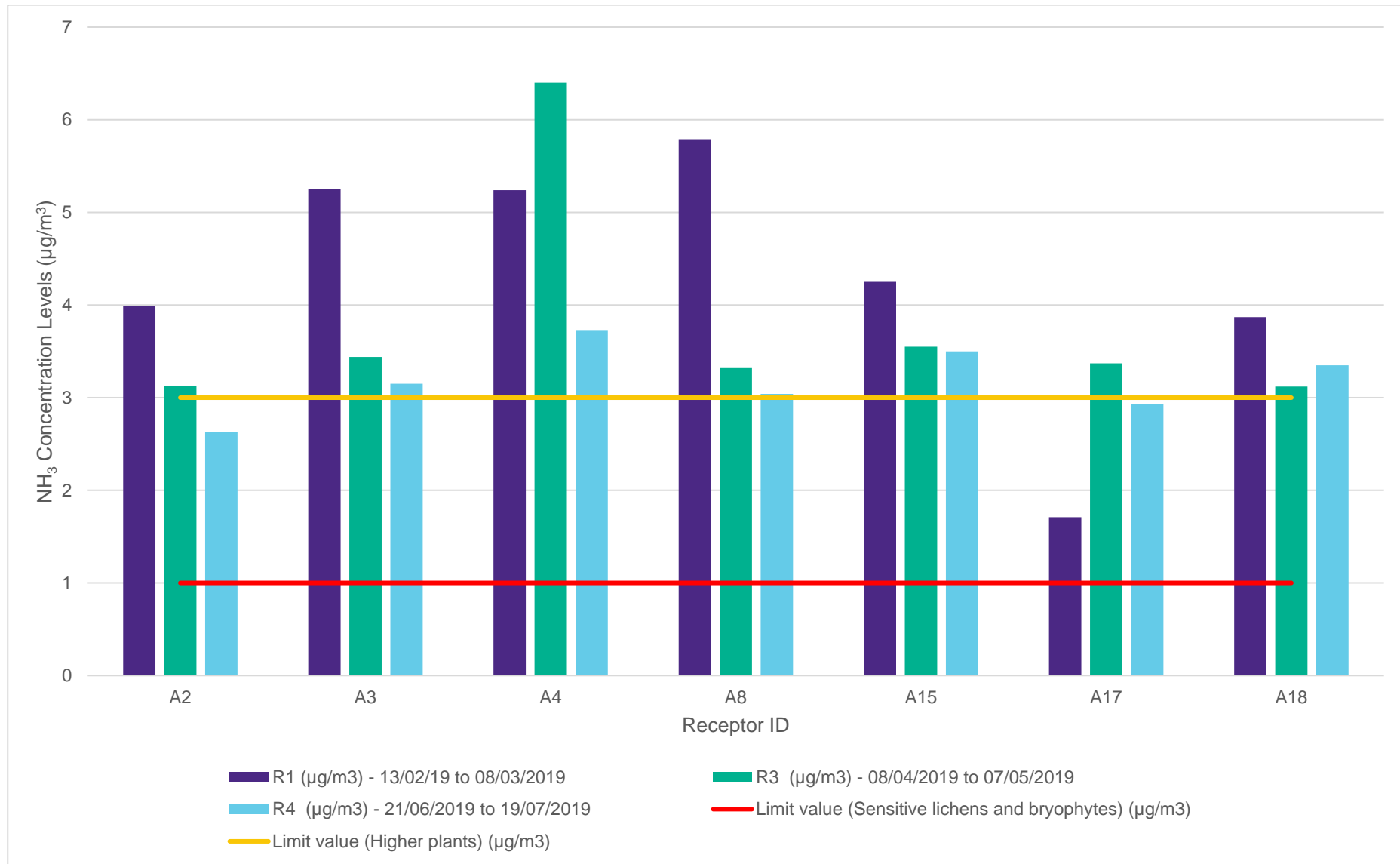
Figure 10.30: Particulate Matter 10 and 2.5 µm Monitoring Results for Dublin Port Estate Monitoring Stations



## **Ammonia**

The NH<sub>3</sub> diffusion tubes were deployed for a period of 3 x circa 1 month periods between February and July 2019. Monitoring was carried out at 7 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.31.

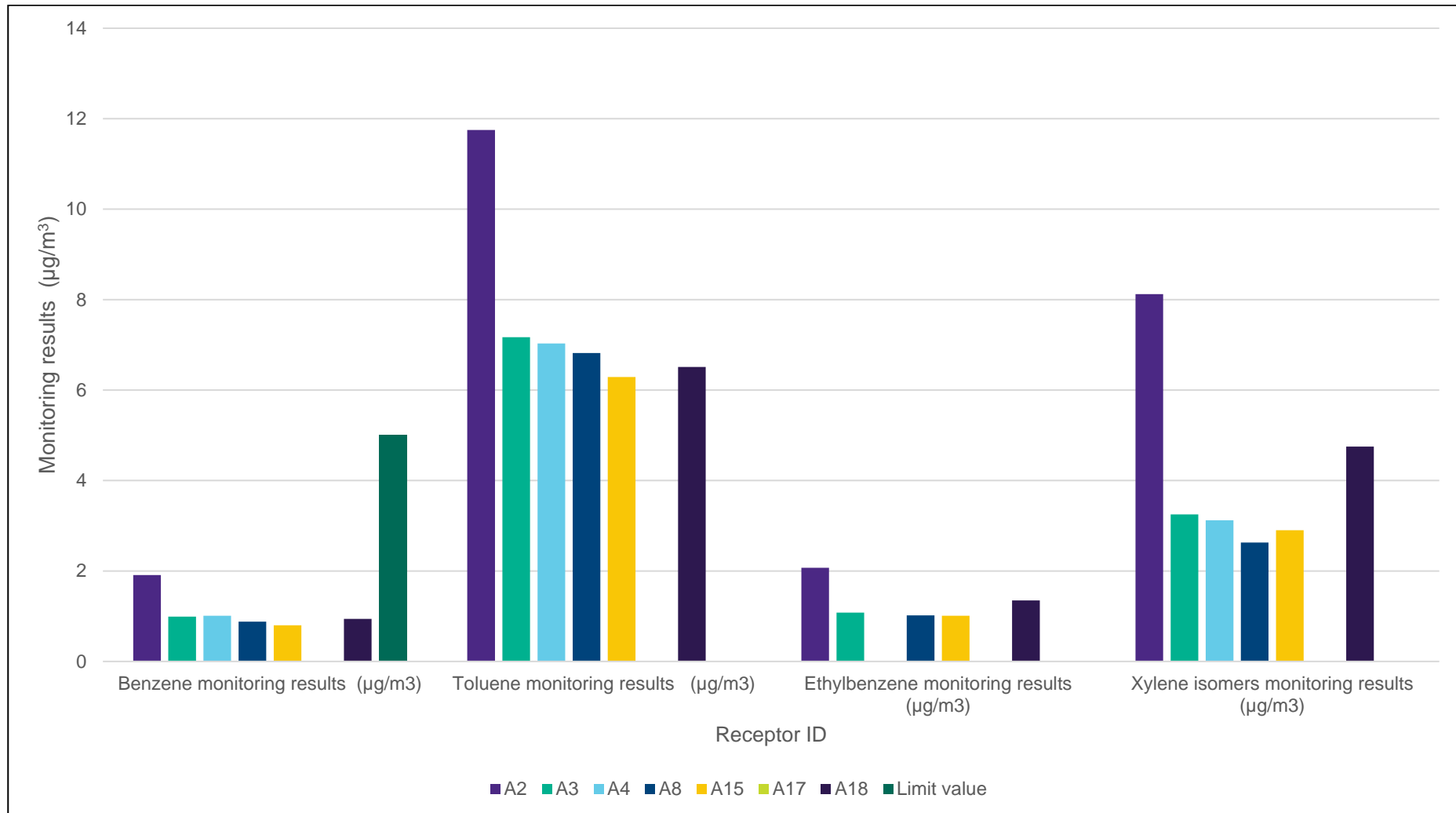
Figure 10.31: NH<sub>3</sub> Monitoring Results at Each of the 7 Monitoring Stations Over 3 Monitoring Events



## **BTEX**

The BTEX diffusion tubes were deployed for a period of 3 x circa 1 month periods between February and July 2019. Monitoring was carried out at 7 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.32 - Figure 10.34.

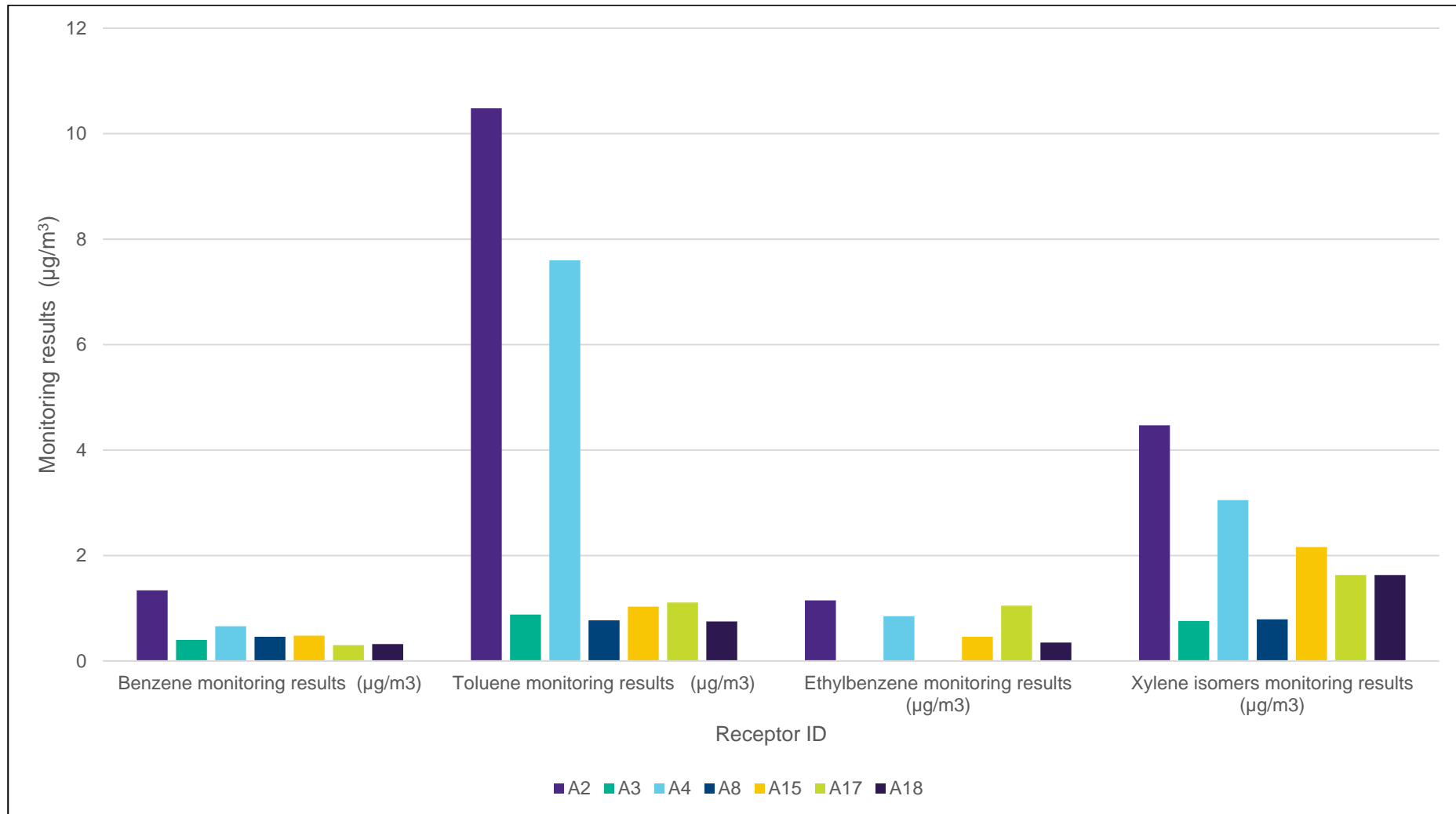
Figure 10.32: BTEX monitoring results at each of the 7 monitoring stations over R1 - 13/02/2019 to 08/03/2019



**\*\*Note – Limit Values Include:**

**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**

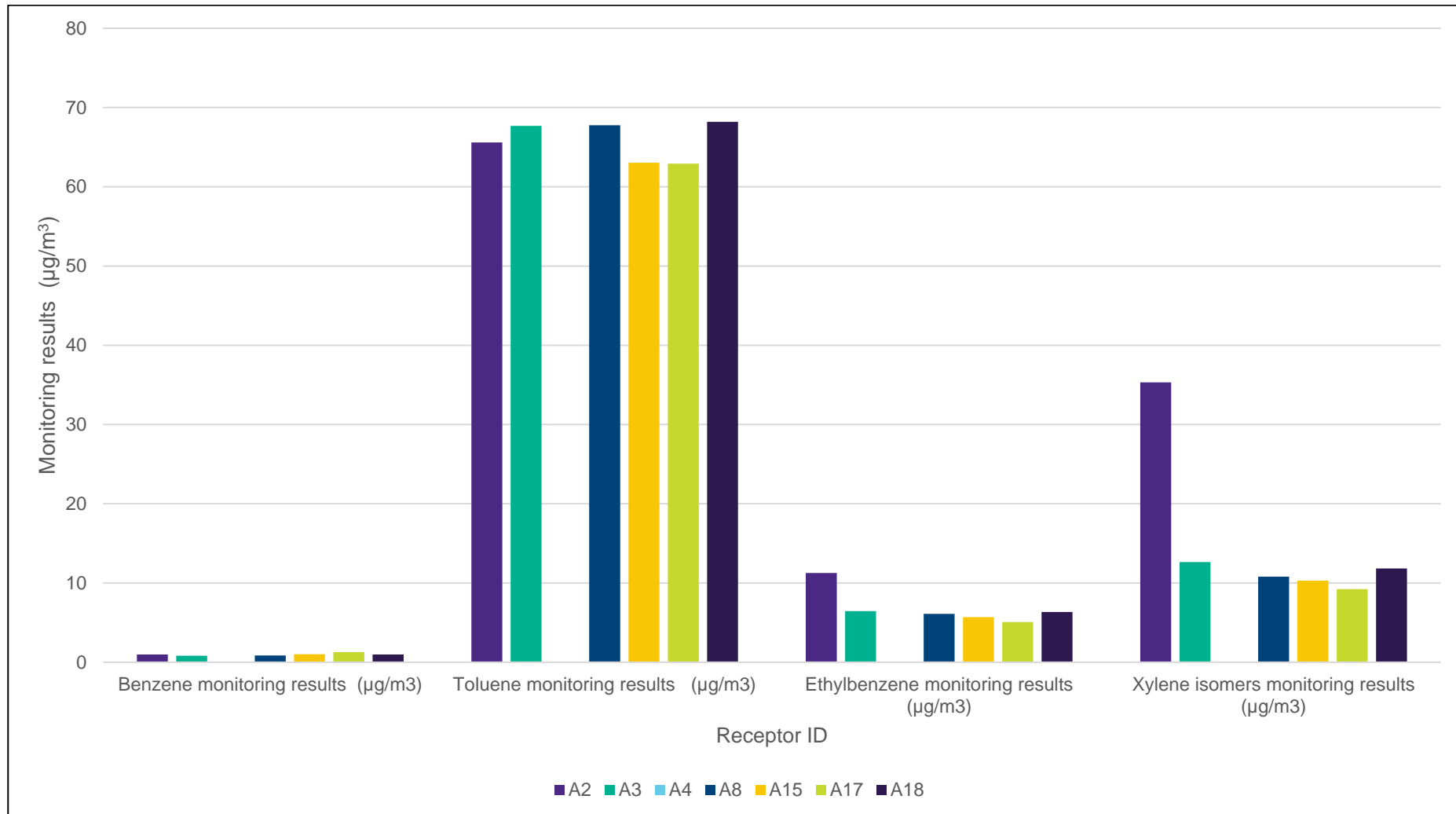
Figure 10.33: BTEX monitoring results at each of the 7 monitoring stations over R3 - 08/04/2019 to 07/05/2019



**\*\*Note – Limit Values Include:**

**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**

Figure 10.34: BTEX monitoring results at each of the 7 monitoring stations over R4 - 21/06/2019 to 19/07/2019



**\*\*Note – Limit Values Include:**

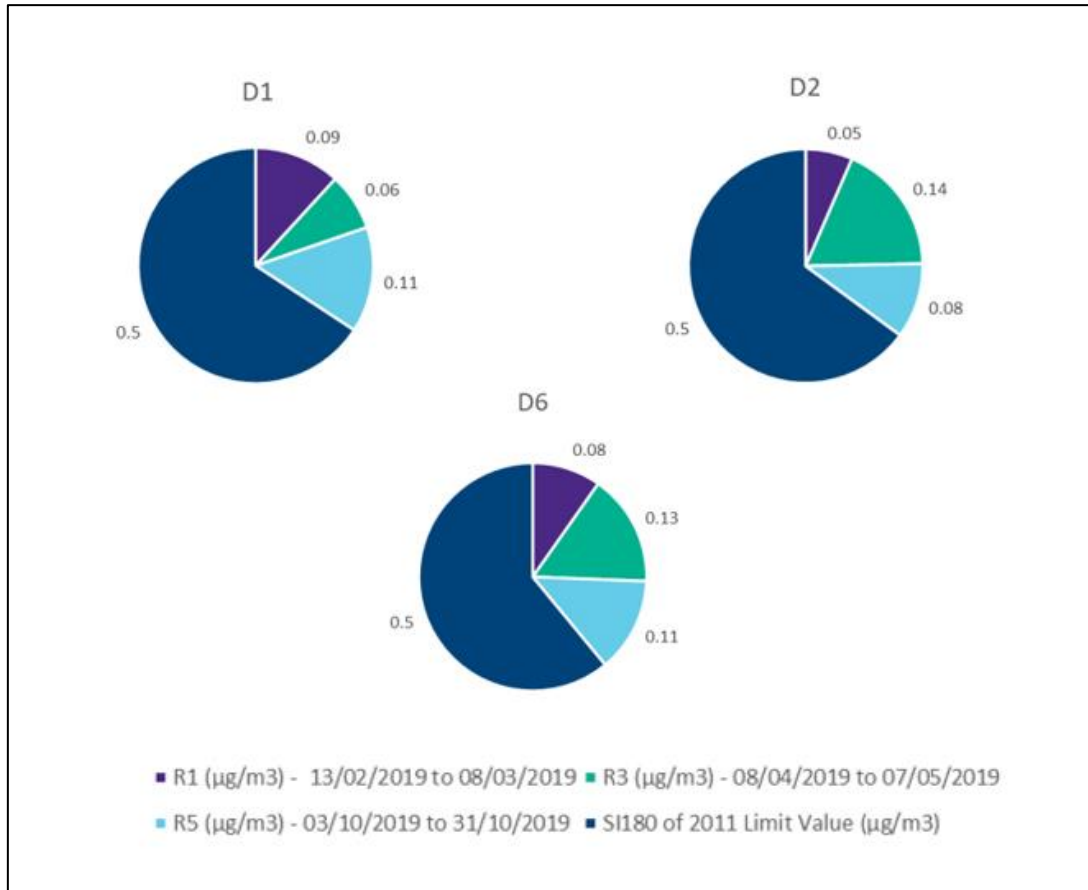
**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**



## Lead

The Lead samplers were deployed for a period of 3 times between February and December 2019. Monitoring was carried out at 3 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.35.

Figure 10.35: Lead Monitoring Results at each of 3 Monitoring Stations Over 3 Monitoring Events



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## Dublin Port Air Quality Monitoring Results 2020

Air monitoring data from 18 monitoring stations over a period of 6 monitoring event was assessed against legislative limits and target values for the protection of human health and vegetation. Monitoring was carried out for NO<sub>2</sub> and SO<sub>2</sub> at 18 locations over 6 monitoring events. Monitoring for PM<sub>10</sub> and PM<sub>2.5</sub> was carried out at 2 locations over 2 monitoring event while monitoring for Benzene, Toluene, Ethyl Benzene, Xylene isomers and Ammonia was carried at 7 locations over 3 monitoring events. Total depositional dust was carried out at 4 locations over 2 monitoring event while Lead monitoring was carried out at 3 locations over 3 monitoring events.

A total of 18 individual monitoring locations (i.e. A1 to A18) were selected across the port estate area in order to monitor ambient air concentrations of Nitrogen dioxide and Sulphur dioxide. These locations were established during the 2014/2015 monitoring program and data collected in 2020 will facilitate comparison between the data sets in terms of improvement / dis-improvements in ambient air quality within the port environs.

A total of 7 individual monitoring locations (i.e. A2, A3, A4, A8, A15, A17 and A18) were chosen from the stated location for the monitoring of BTEX and Ammonia.

A total of 4 locations were chosen for Bergerhoff total dust deposition monitoring (i.e. D1 to D4) while a further two locations were chosen for PM<sub>10</sub> and PM<sub>2.5</sub> monitoring (i.e. D5 and D6). A total of three monitoring locations were chosen for Lead (i.e. D1, D2 and D6). X presents an overview of each monitoring locations located with the Dublin Port and its environs.

Figure 10.36: Overview of Ambient Air Monitoring Locations Located Within Dublin Port and Surrounding Environs for Nitrogen Dioxide, Sulphur Dioxide, BTEX, Ammonia, Total Depositional Dust, PM<sub>10/2.5</sub> and Lead

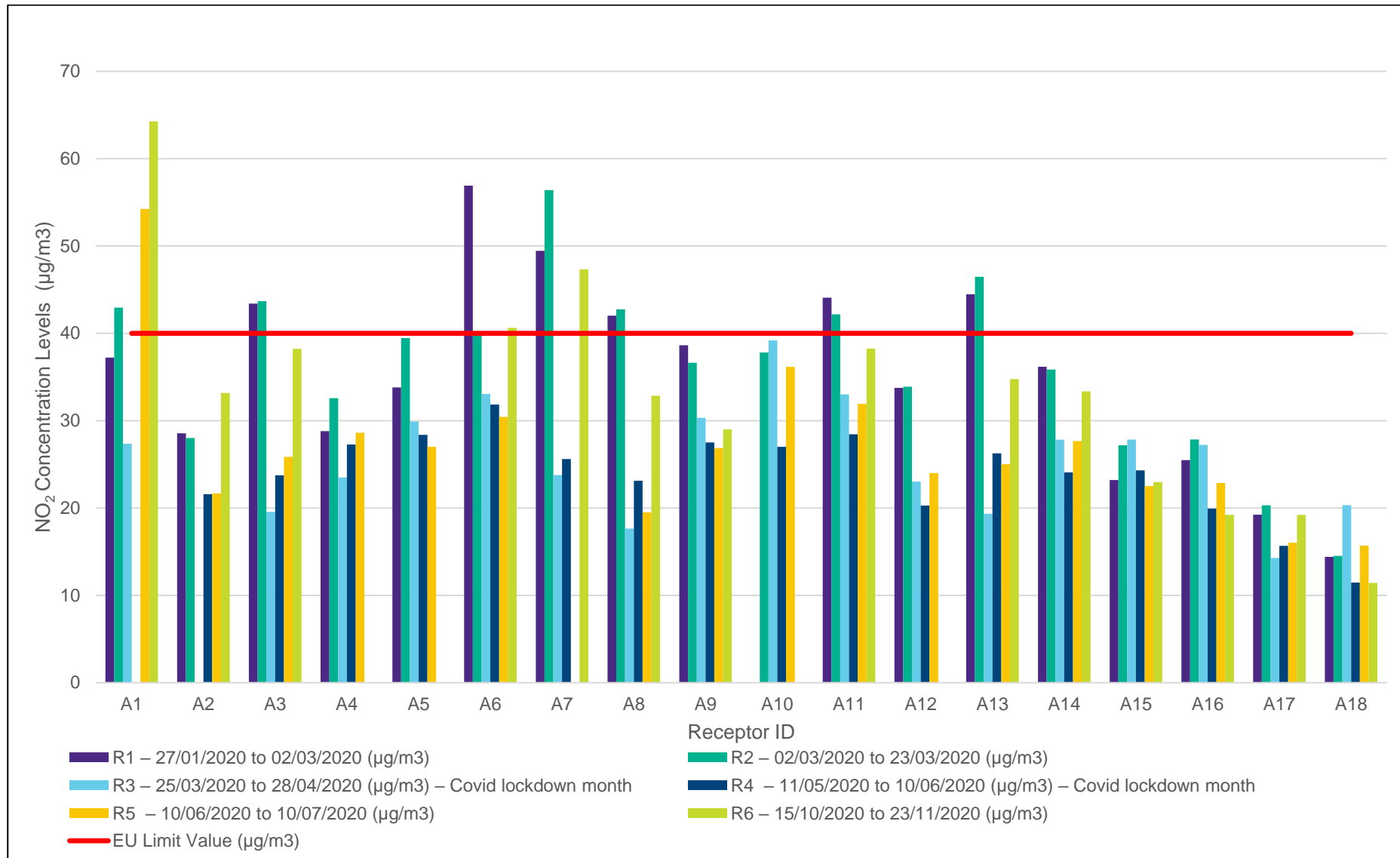


## Results

### Nitrogen Dioxide

The NO<sub>2</sub> diffusion tubes were deployed for a period of 6 x circa 1 month periods between Jan and Dec 2020. Monitoring was carried out at 18 monitoring stations spatially distributed across the port estate. The results of the monitoring are and graphically represented in Figure 10.37.

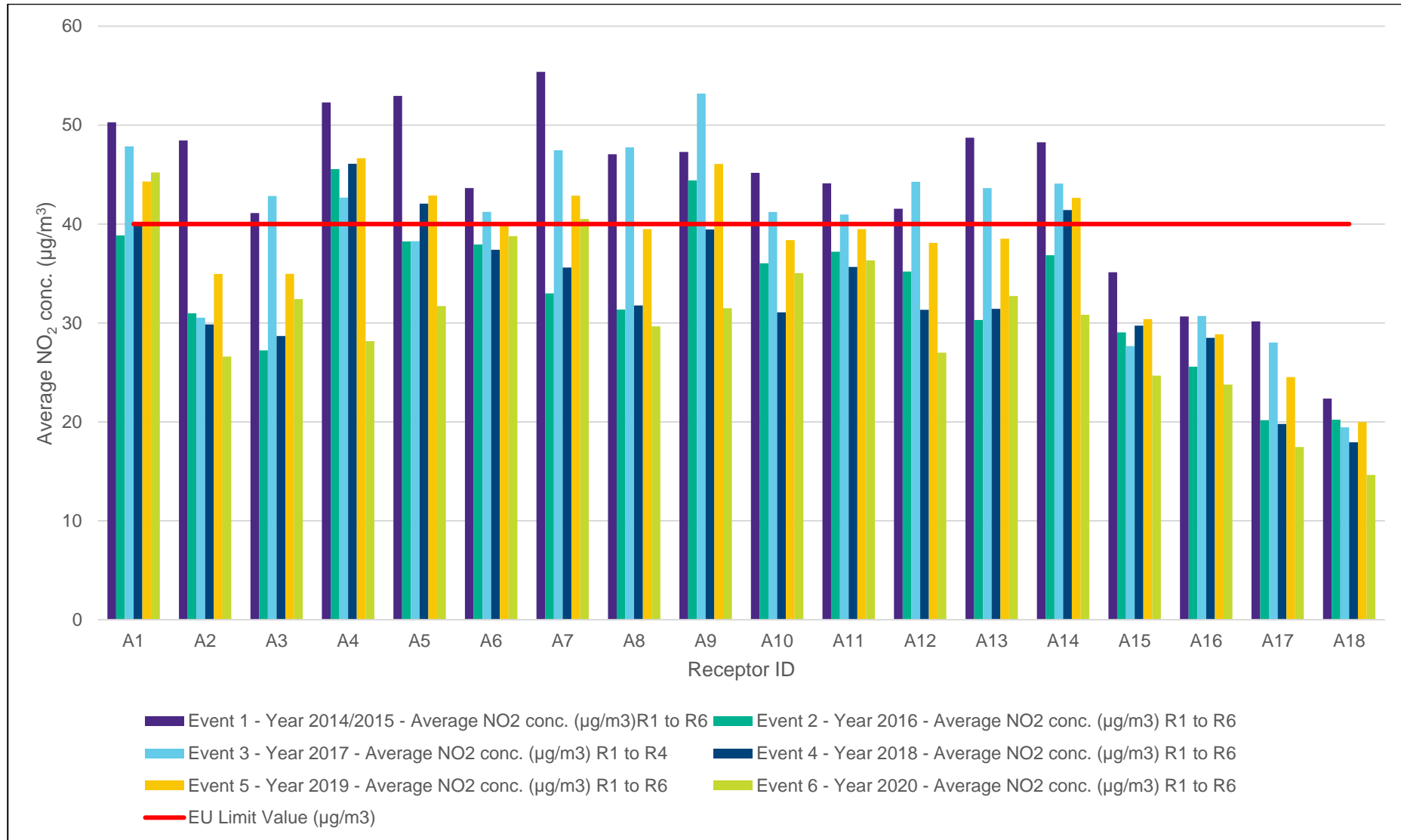
Figure 10.37: Plot of NO<sub>2</sub> Concentrations for Each Monitoring Event R1 to R6 at Each Monitoring Station A1 to A18



**Comparison between average monitoring data collected in Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019 and Event 6 Year 2020 for NO<sub>2</sub>**

Figure 10.38 present the comparison between the average monitoring data collected over the 6 monitoring events in Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019 and Event 6 Year 2020 for NO<sub>2</sub>.

Figure 10.38: Graphical Comparison Between Average NO<sub>2</sub> Concentration Values for Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019 and Event 6 Year 2020

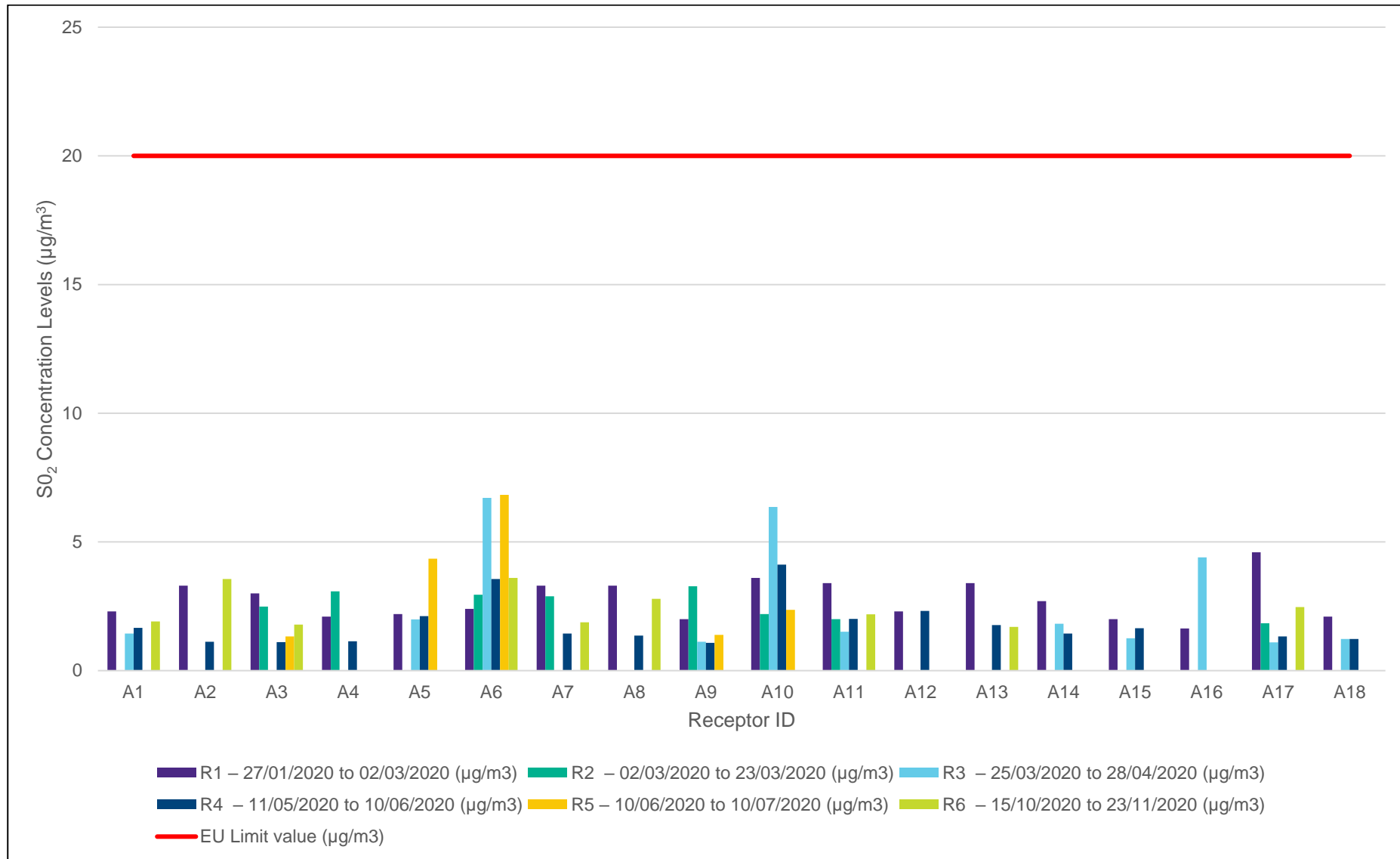


## **Sulphur Dioxide**

The SO<sub>2</sub> diffusion tubes were deployed for a period of 6 x circa 1 month periods between Jan and Dec 2020. Monitoring was carried out at 18 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically represented in Figure 10.39.



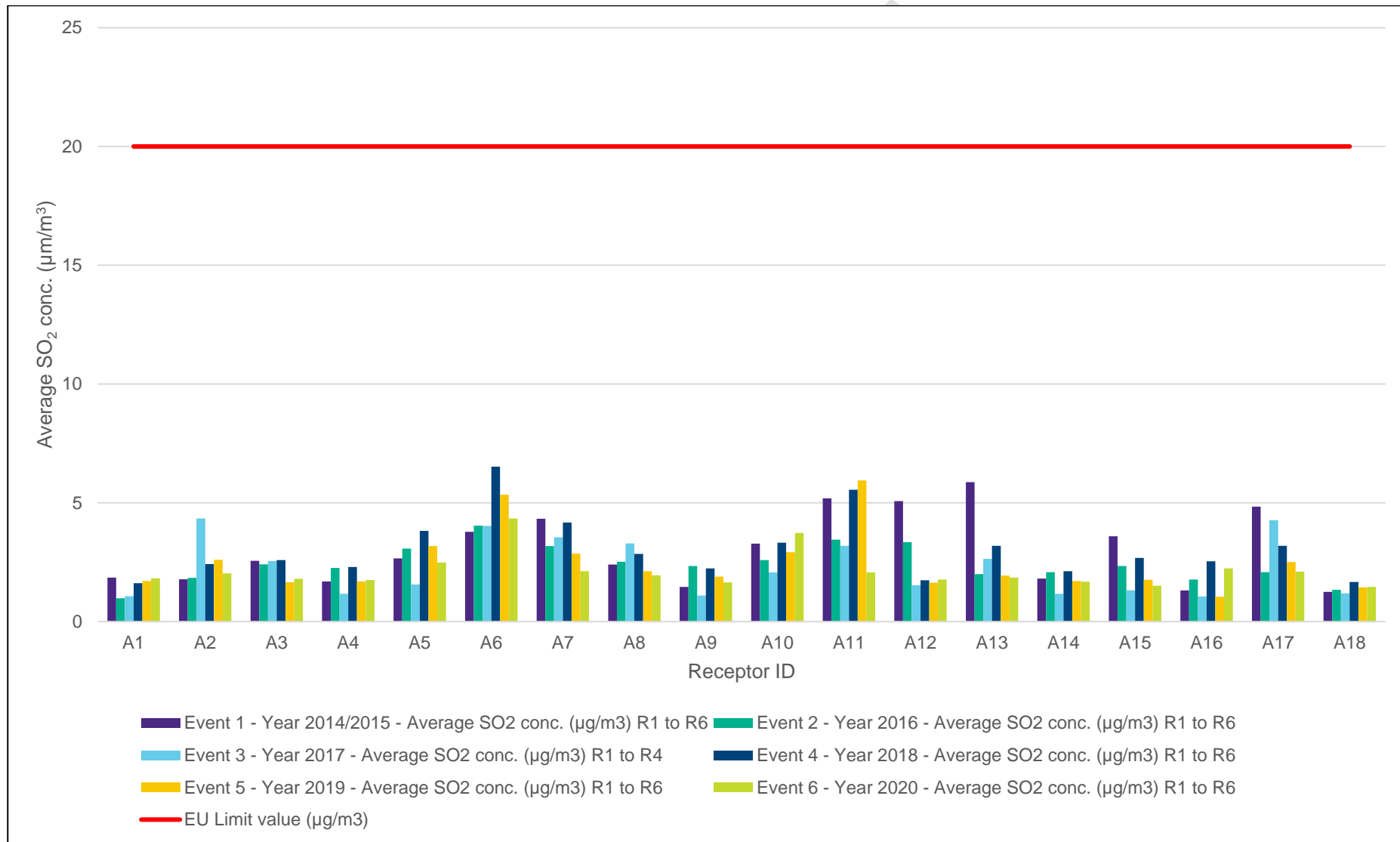
Figure 10.39: Plot of SO<sub>2</sub> Concentrations for Each Monitoring Event R1 to R6 at Each Monitoring Station A1 to A18



**Comparison between average monitoring data collected in Event 1 Year 2014/2015, Event 2 Year 2016, Events 3 Year 2017, Event 4 Year 2018, Event 5 2019 and Event 6 2020 for SO<sub>2</sub>**

Figure 10.40 present the comparison between the average monitoring data collected over the 6 monitoring events in Event 1 Year 2014/2015, Event 2 Year 2016, Events 3 Year 2017, Event 4 Year 2018, Event 5 2019 and Event 6 2020 for SO<sub>2</sub>.

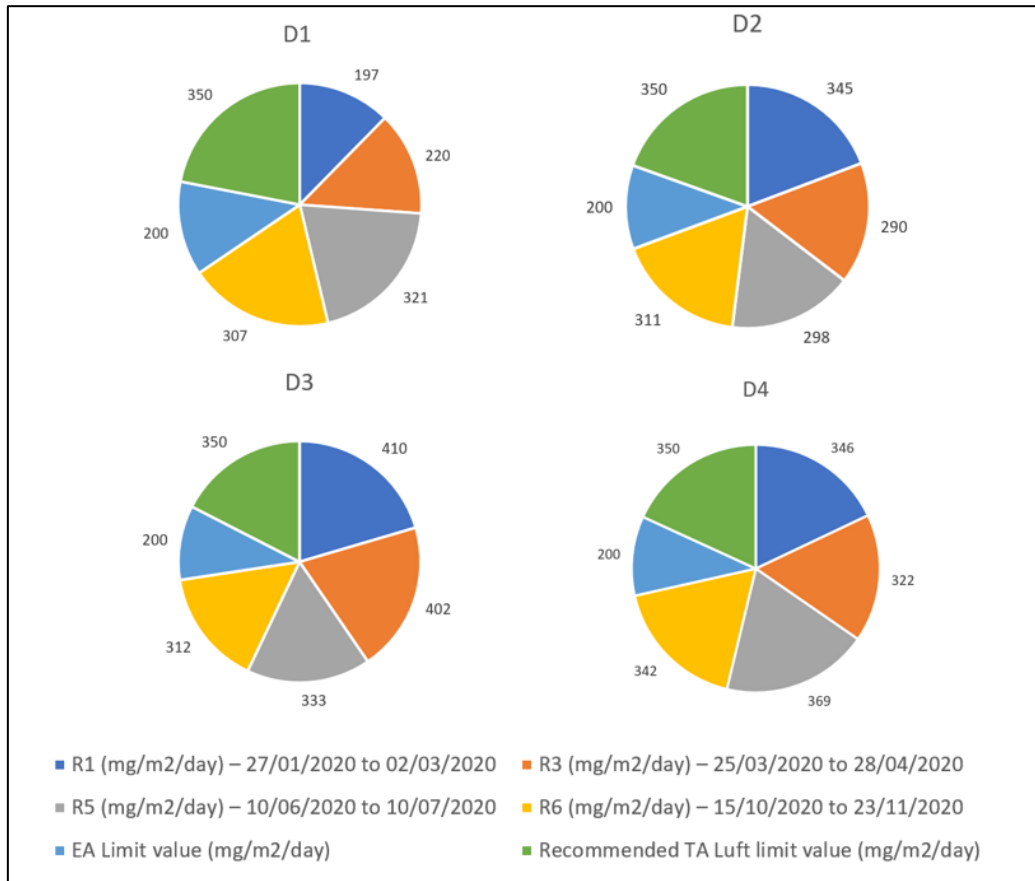
Figure 10.40: Comparison Between Average SO<sub>2</sub> Concentration Values For Event 1 Year 2014/2015, Event 2 Year 2016, Events 3 Year 2017, Event 4 Year 2018, Event 5 2019 and Event 6 2020



### Total Depositional Dust

The Total depositional dust monitoring stations were deployed for a period of 4 x 1 month periods between January 2020 and November 2020. Monitoring was carried out at 4 monitoring stations located in close proximity to locations / activities know to give rise to fugitive dust emissions. The results of the monitoring are graphically shown in Figure 10.41.

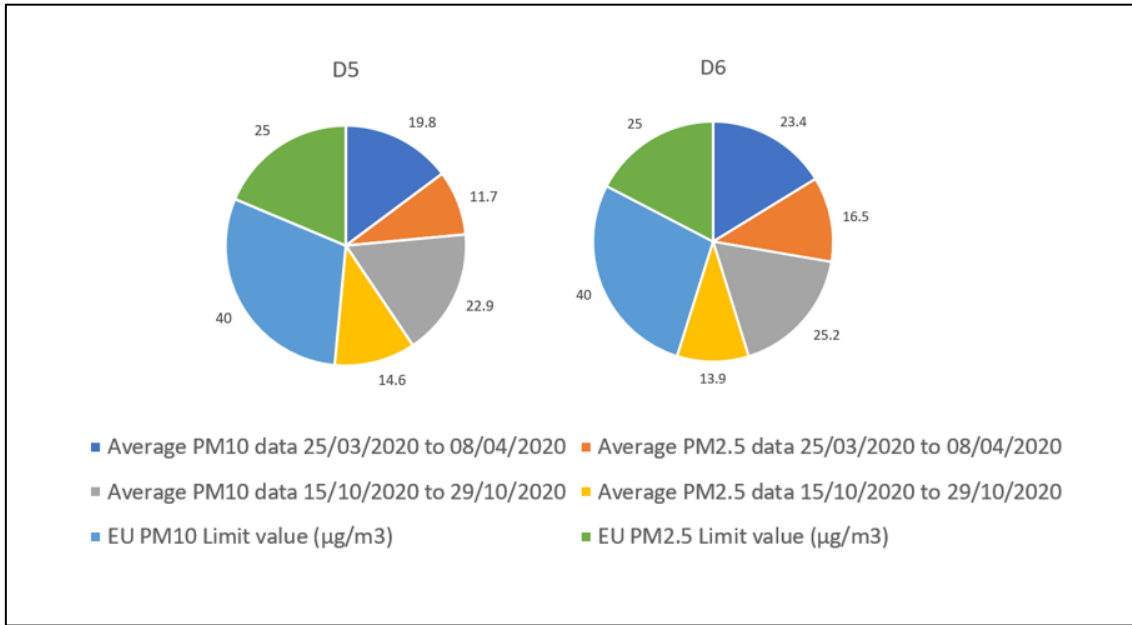
Figure 10.41: Total Depositional Dust Monitoring Results for the Dublin Port Estate and Environs



### Particulate Matter (PM<sub>10/2.5</sub>)

Particulate matter 10 and 2.5 µm monitoring stations were deployed for a period of approximately 2 off 2 week periods 25/03/2020 and 08/04/2020 and 15/10/2020 to 29/10/2020. Monitoring was carried out at 2 monitoring stations. The results of the monitoring are graphically shown in Figure 10.42.

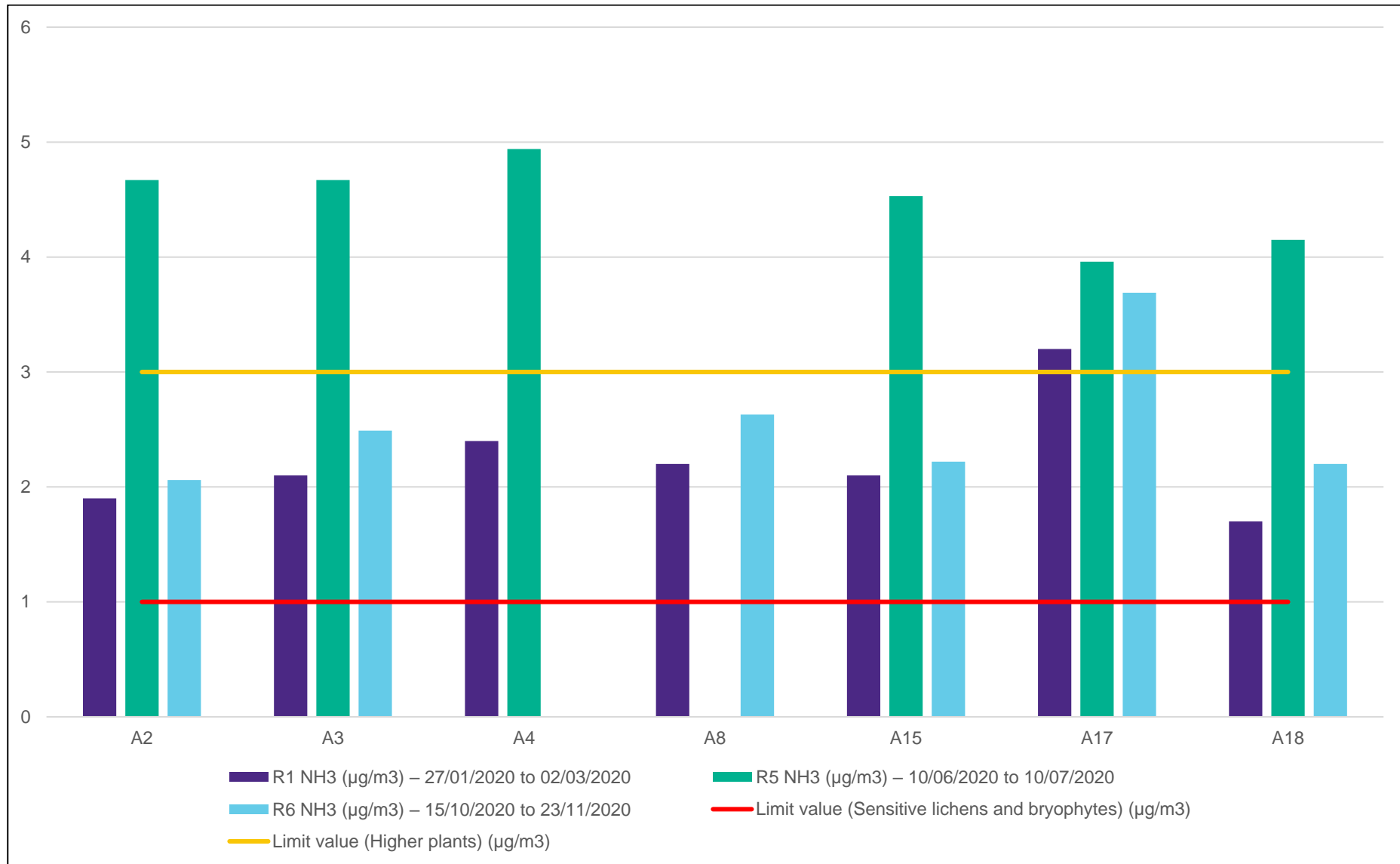
Figure 10.42: Particulate Matter 10 and 2.5 µm Monitoring Results for Dublin Port Estate Monitoring Stations



## **Ammonia**

The NH<sub>3</sub> diffusion tubes were deployed for a period of 3 x circa 1 month periods between January and November 2019. Monitoring was carried out at 7 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.43.

Figure 10.43: NH3 Monitoring Results at Each of the 7 Monitoring Stations Over 3 Monitoring Events

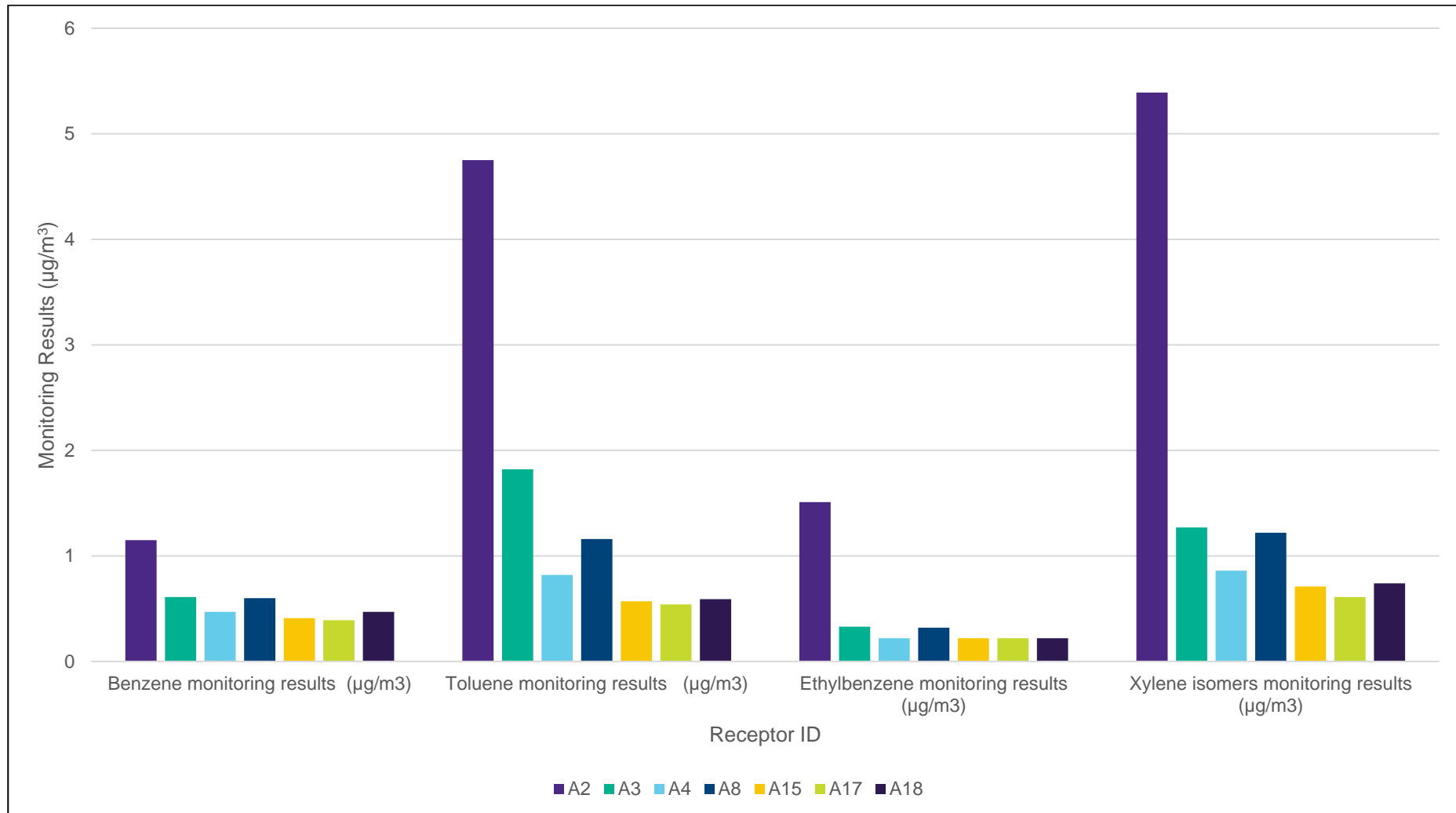


## **BTEX**

The BTEX diffusion tubes were deployed for a period of 3 x circa 1 month periods between January and November 2020. Monitoring was carried out at 7 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.44 - Figure 10.46.



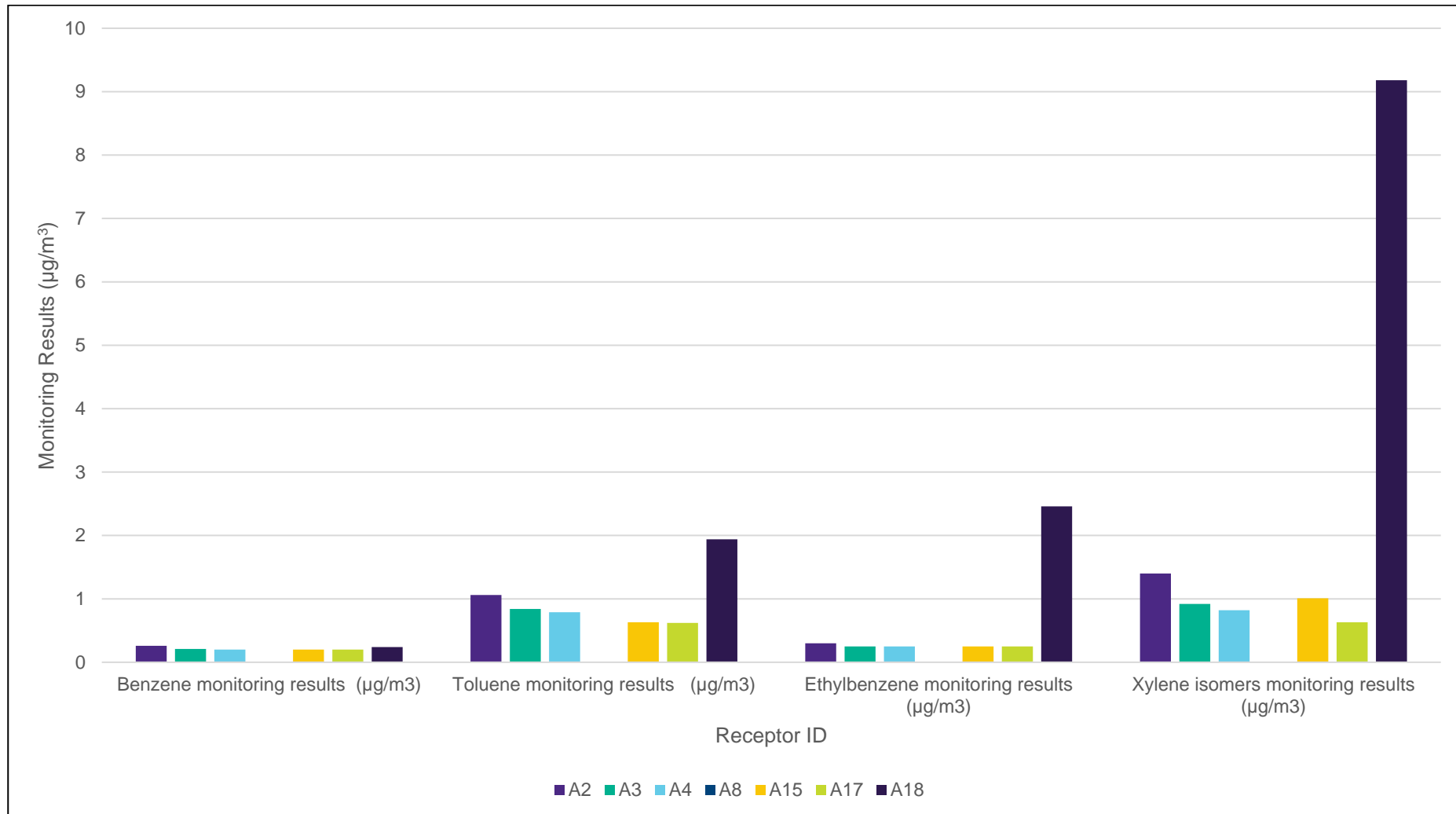
Figure 10.44: BTEX monitoring results at each of the 7 monitoring stations over R1 – 27/01/2020 to 02/03/2020



**\*\*Note – Limit Values Include:**

**Benzene <5.0 ( $\mu\text{g}/\text{m}^3$ ), Toluene 1,920 ( $\mu\text{g}/\text{m}^3$ ), Ethylbenzene 2,210 ( $\mu\text{g}/\text{m}^3$ ), Xylene 4,420 ( $\mu\text{g}/\text{m}^3$ )**

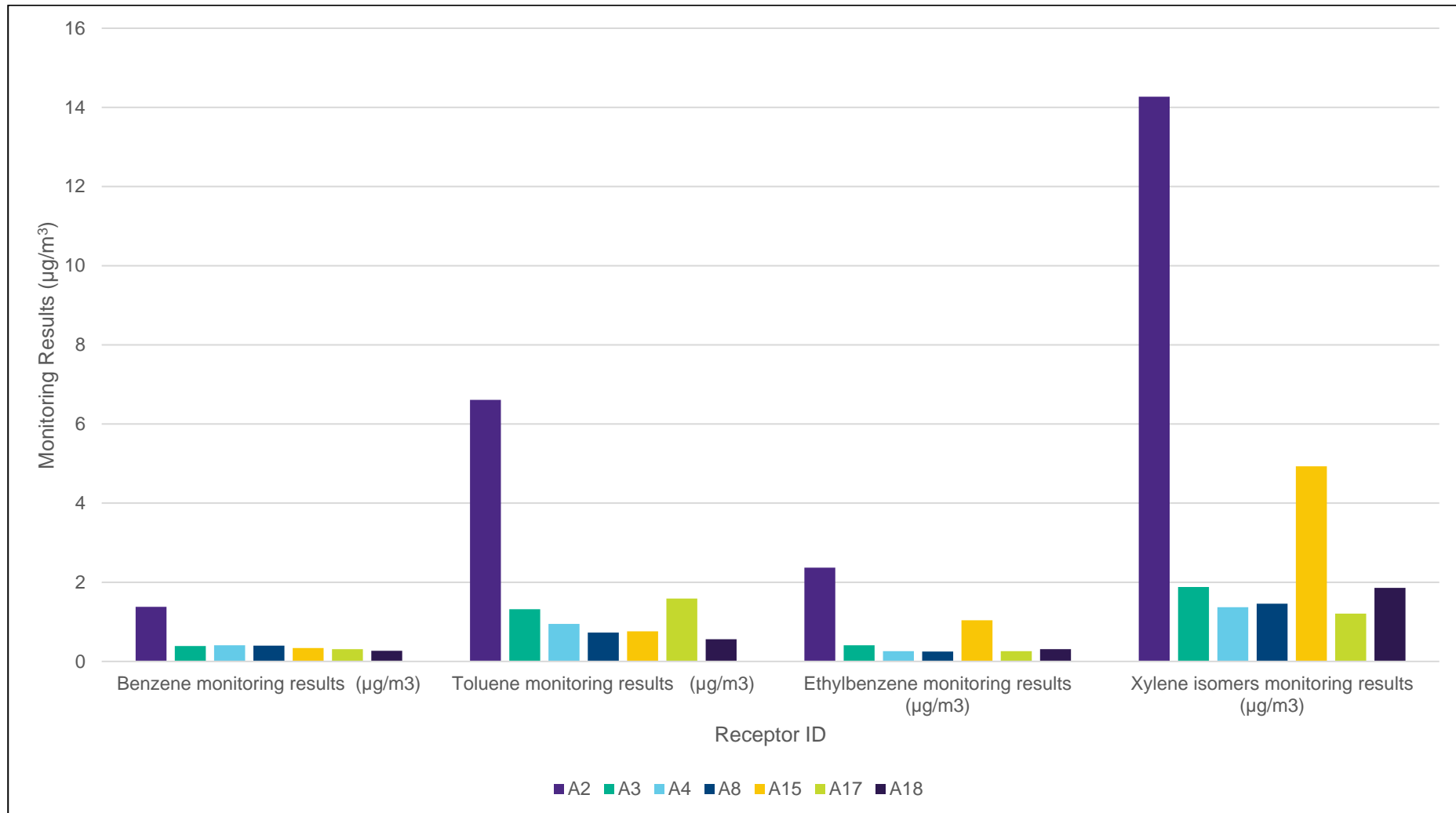
Figure 10.45: BTEX monitoring results at each of the 7 monitoring stations over R5 – 10/06/2020 to 10/07/2020



**\*\*Note – Limit Values Include:**

**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**

Figure 10.46: BTEX monitoring results at each of the 7 monitoring stations over R6 – 15/10/2020 to 23/11/2020



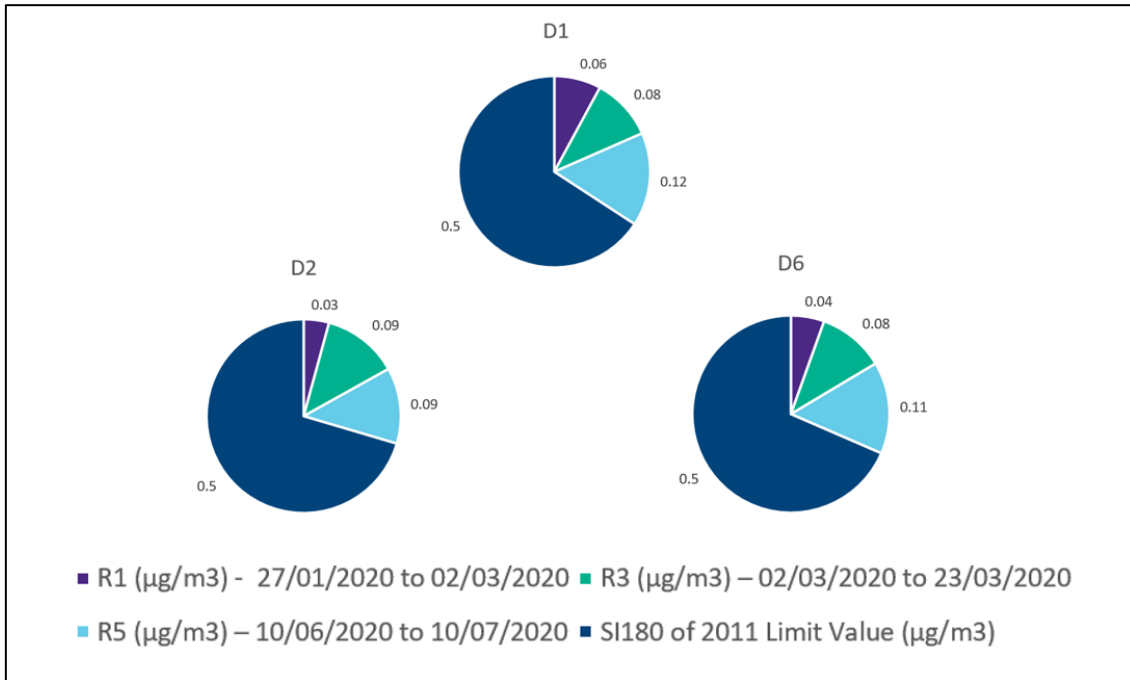
**\*\*Note – Limit Values Include:**

**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**

## Lead

The Lead samplers were deployed for a period of 3 times between January and July 2020. Monitoring was carried out at 3 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.47.

Figure 10.47: Lead Monitoring Results at each of 3 Monitoring Stations Over 3 Monitoring Events



## Dublin Port Air Quality Monitoring Results 2021

Air monitoring data from 22 monitoring stations over a period of 9 monitoring event was assessed against legislative limits and target values for the protection of human health and vegetation. Monitoring was carried out for NO<sub>2</sub> and SO<sub>2</sub> at 22 locations over 9 monitoring events in Year 2021. Monitoring for PM<sub>10</sub> and PM<sub>2.5</sub> was carried out at 2 locations over 2 monitoring event while monitoring for Benzene, Toluene, Ethyl Benzene, Xylene isomers and Ammonia was carried at 7 locations over 4 monitoring events in Year 2021. Total depositional dust was carried out at 4 locations over 2 monitoring event while Lead monitoring was carried out at 3 locations over 3 monitoring events in Year 2021.

A total of 22 individual monitoring locations (i.e. A1 to A22) were selected across the port estate area in order to monitor ambient air concentrations of Nitrogen dioxide and Sulphur dioxide. These locations were established during the 2014/2015 monitoring program and data collected in 2020 will facilitate comparison between the data sets in terms of improvement / dis-improvements in ambient air quality within the port environs.

A total of 7 individual monitoring locations were taken from 10 locations (i.e. A1, A2, A3, A4, A8, A12, A15, A16, A17 and A18) were chosen from the stated location for the monitoring of BTEX and Ammonia.

A total of 4 locations were chosen for Bergerhoff total dust deposition monitoring (i.e. D1 to D4) while a further two locations were chosen for PM<sub>10</sub> and PM<sub>2.5</sub> monitoring (i.e. D5 and D6). A total of three monitoring locations were chosen for Lead (i.e. D1, D2 and D6). X presents an overview of each monitoring locations located with the Dublin Port and its environs.

Figure 10.48: Overview of Ambient Air Monitoring Locations Located Within Dublin Port and Surrounding Environs for Nitrogen Dioxide, Sulphur Dioxide, BTEX, Ammonia, Total Depositional Dust, PM<sub>10/2.5</sub> and Lead

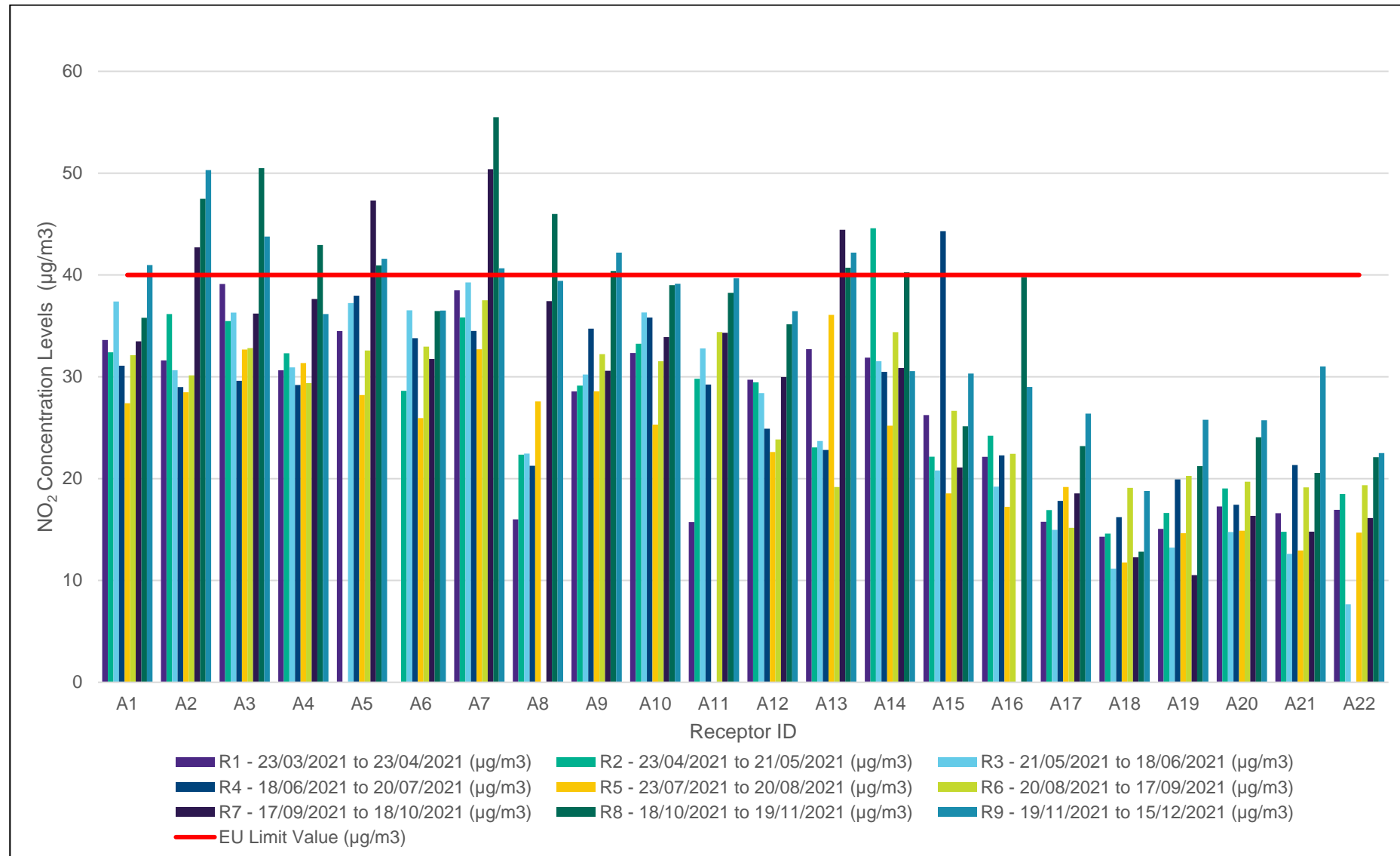


## Results

### Nitrogen Dioxide

The NO<sub>2</sub> diffusion tubes were deployed for a period of 9 x circa 1 month periods between March and Dec 2021. Monitoring was carried out at 22 monitoring stations spatially distributed across the port estate. The results of the monitoring are and graphically represented in Figure 10.49.

Figure 10.49: Plot of NO<sub>2</sub> Concentrations for Each Monitoring Event R1 to R9 at Each Monitoring Station A1 to A22

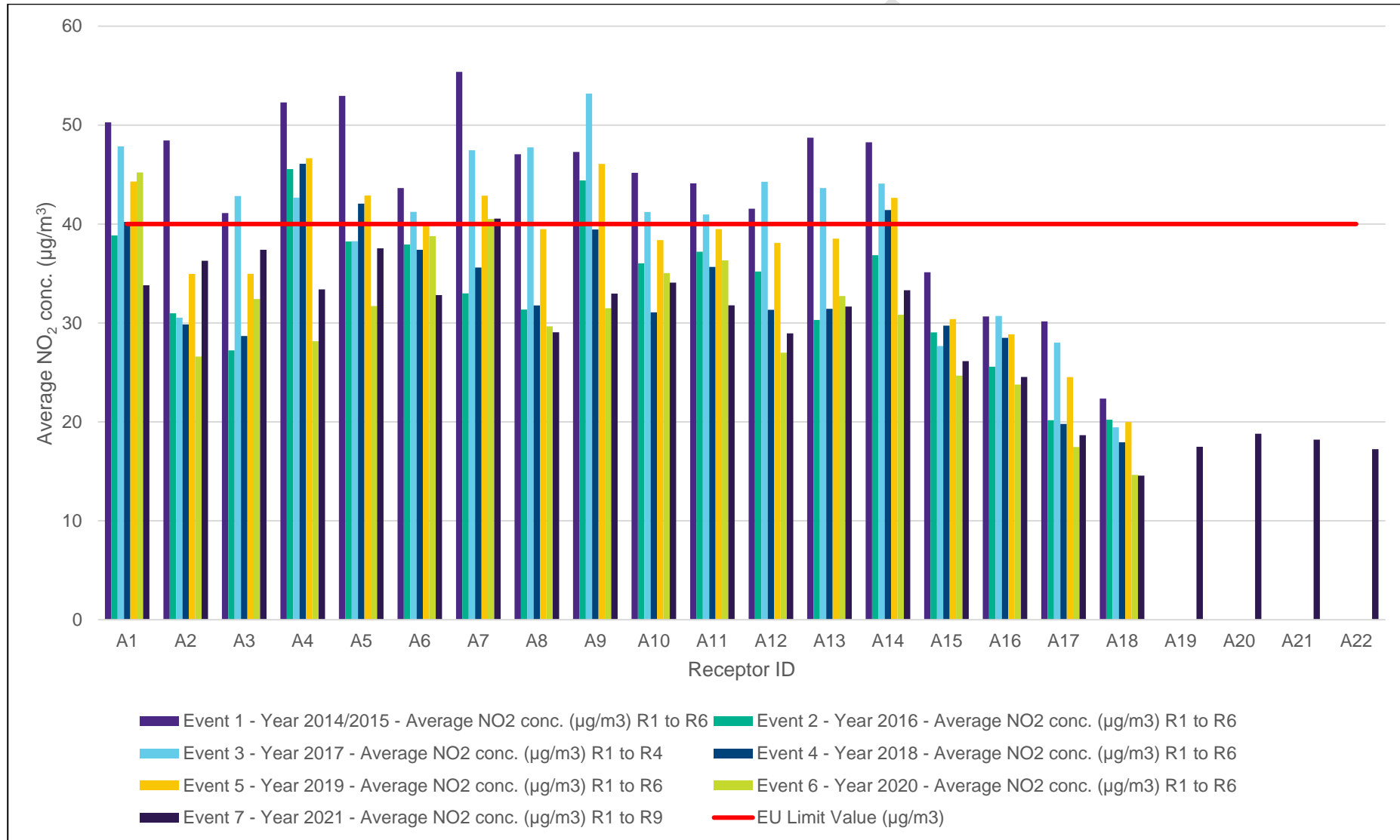




**Comparison between average monitoring data collected in Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019, Event 6 Year 2020 and Event 7 Year 2021 for NO<sub>2</sub>**

Figure 10.50 present the comparison between the average monitoring data collected over the 6 monitoring events in Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019, Event 6 Year 2020 and Event 7 Year 2021 for NO<sub>2</sub>.

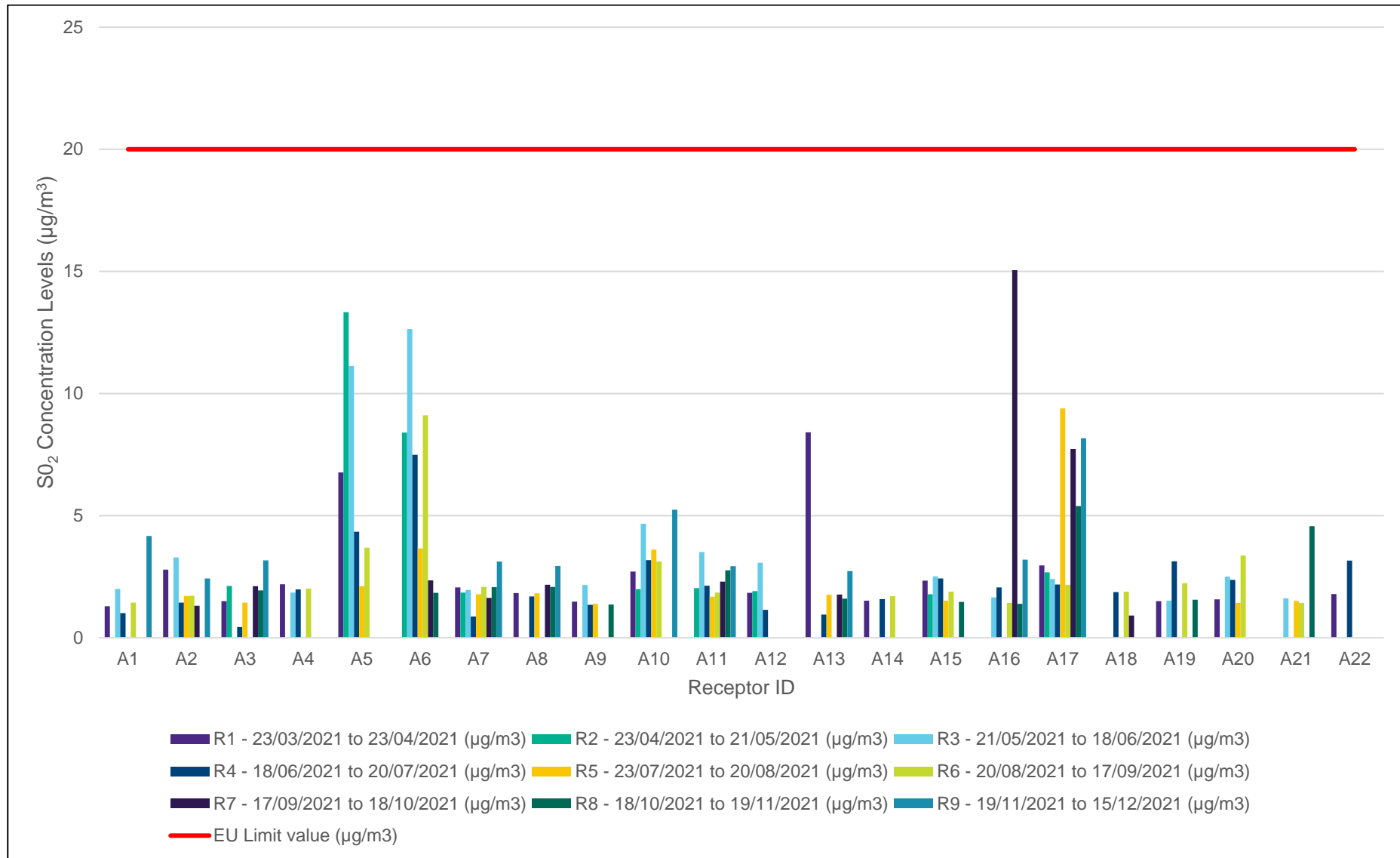
Figure 10.50: Graphical Comparison Between Average NO<sub>2</sub> Concentration Values for Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019, Event 6 Year 2020 and Event 7 Year 2021



## **Sulphur Dioxide**

The SO<sub>2</sub> diffusion tubes were deployed for a period of 9 x circa 1 month periods between March and Dec 2021. Monitoring was carried out at 22 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically represented in Figure 10.51.

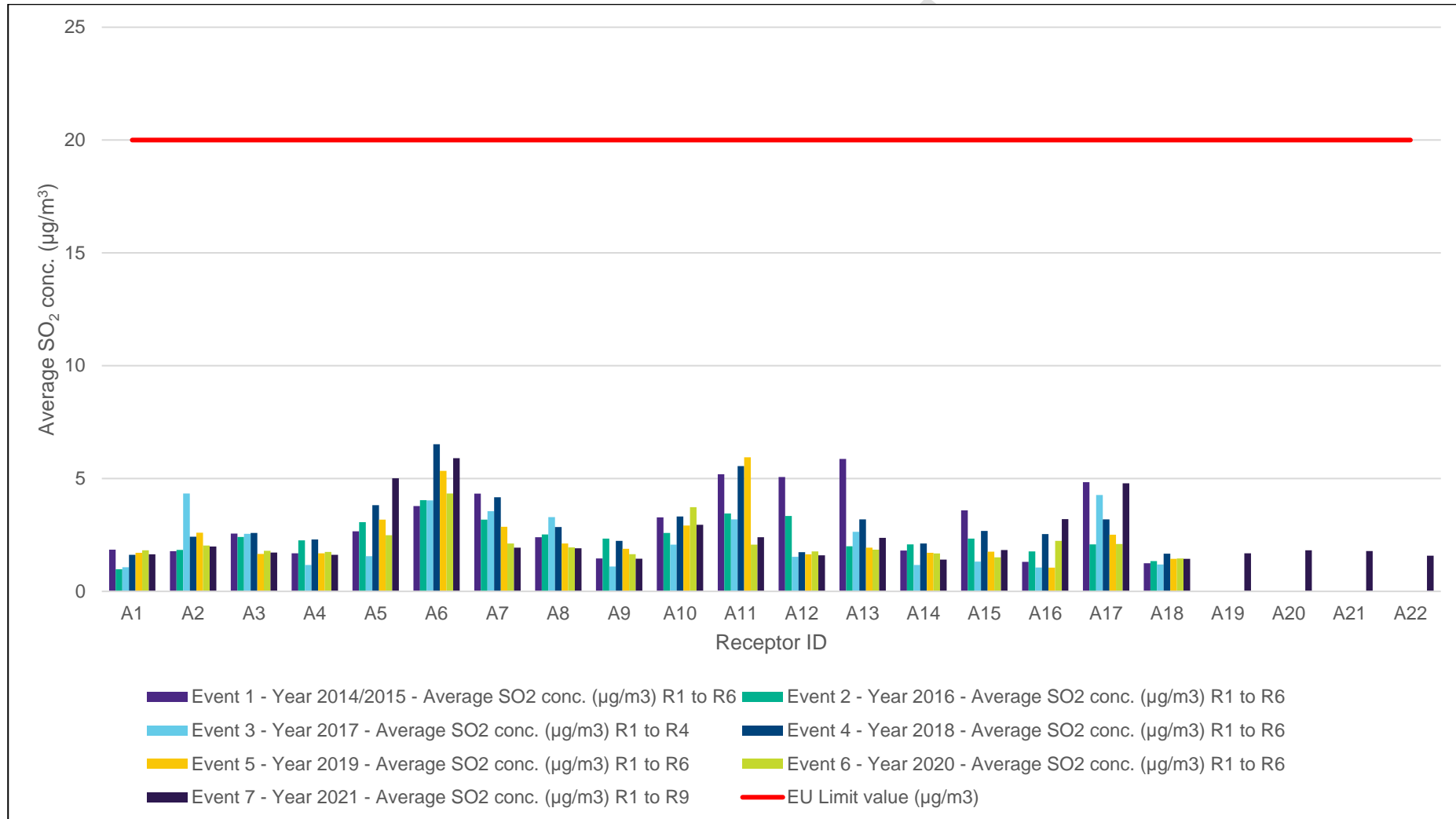
Figure 10.51: Plot of SO<sub>2</sub> Concentrations For Each Monitoring Event R1 to R9 at Each Monitoring Station A1 to A22



**Comparison between average monitoring data collected in Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019, Event 6 Year 2020 and Event 7 Year 2021 for SO<sub>2</sub>**

Figure 10.52 presents the comparison between the average monitoring data collected over the 6 monitoring events in Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019, Event 6 Year 2020 and Event 7 Year 2021 for SO<sub>2</sub>.

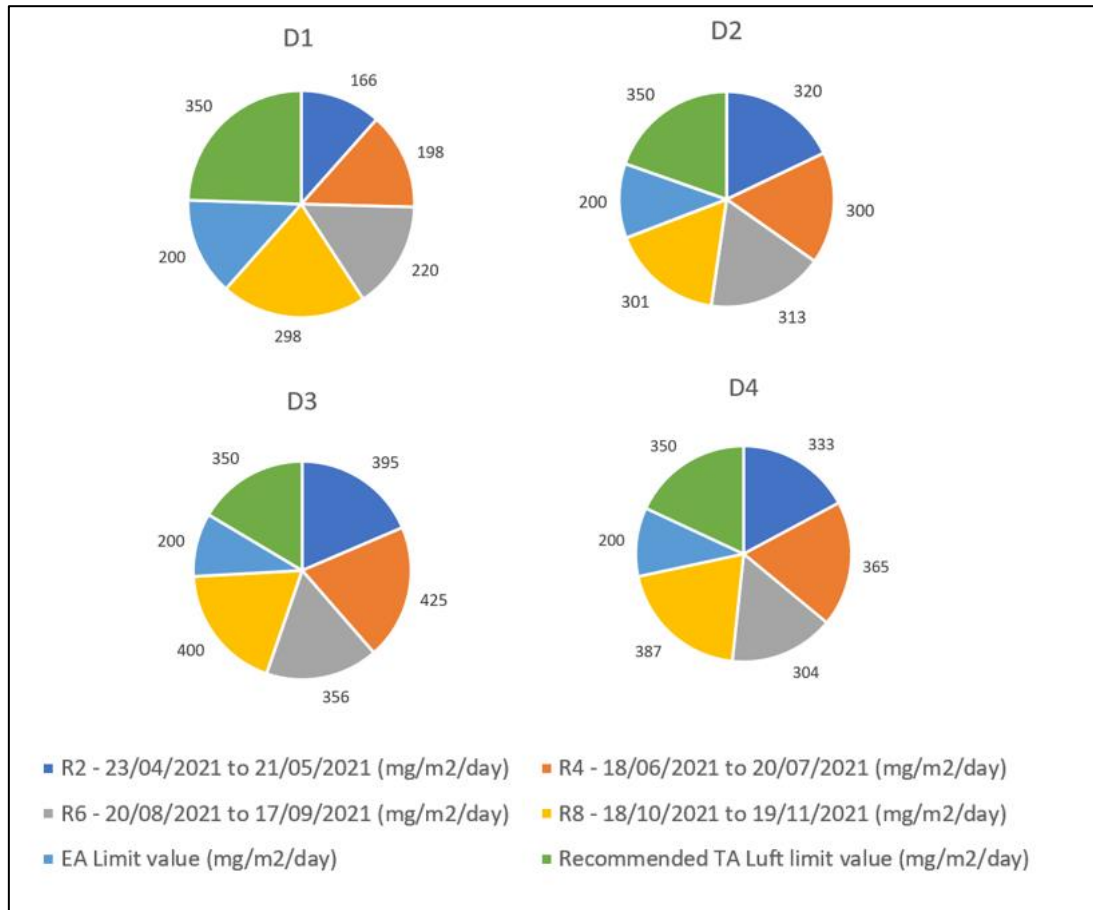
Figure 10.52: Comparison Between Average SO<sub>2</sub> Concentration Values For Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019, Event 6 Year 2020 and Event 7 Year 2021



## Total Depositional Dust

The Total depositional dust monitoring stations were deployed for a period of 4 x 1 month periods between April 2021 and November 2021. Monitoring was carried out at 4 monitoring stations located in close proximity to locations / activities know to give rise to fugitive dust emissions. The results of the monitoring are graphically shown in Figure 10.53.

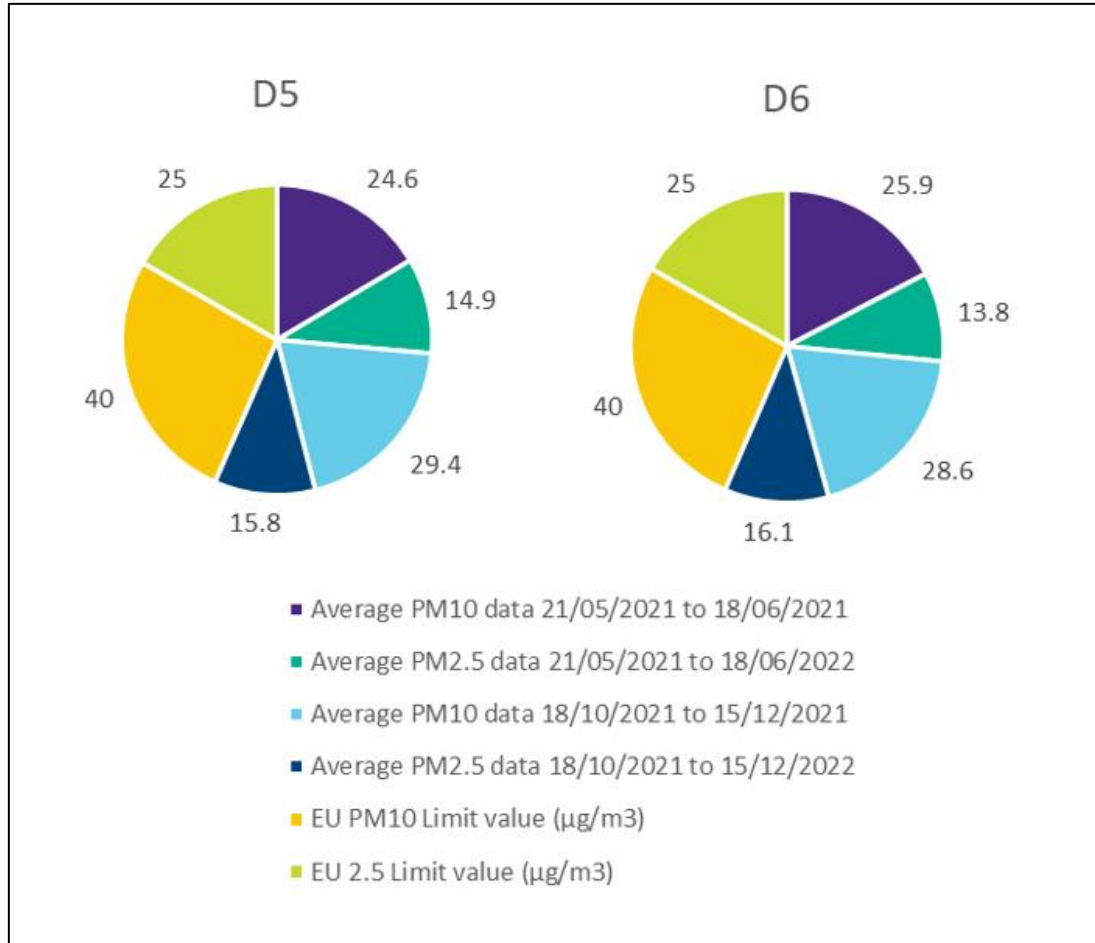
Figure 10.53: Total Depositional Dust Monitoring Results for the Dublin Port Estate and Environs



### Particulate Matter (PM<sub>10/2.5</sub>)

Particulate matter 10 and 2.5 µm monitoring stations were deployed for a period of approximately 2 off 4/6 week periods 23/03/2021 to 18/06/2021 and 17/09/2021 to 15/11/2021. Monitoring was carried out at 2 monitoring stations. The results of the monitoring are graphically shown in Figure 10.54.

Figure 10.54: Particulate Matter 10 and 2.5 µm Monitoring Results for Dublin Port Estate Monitoring Stations

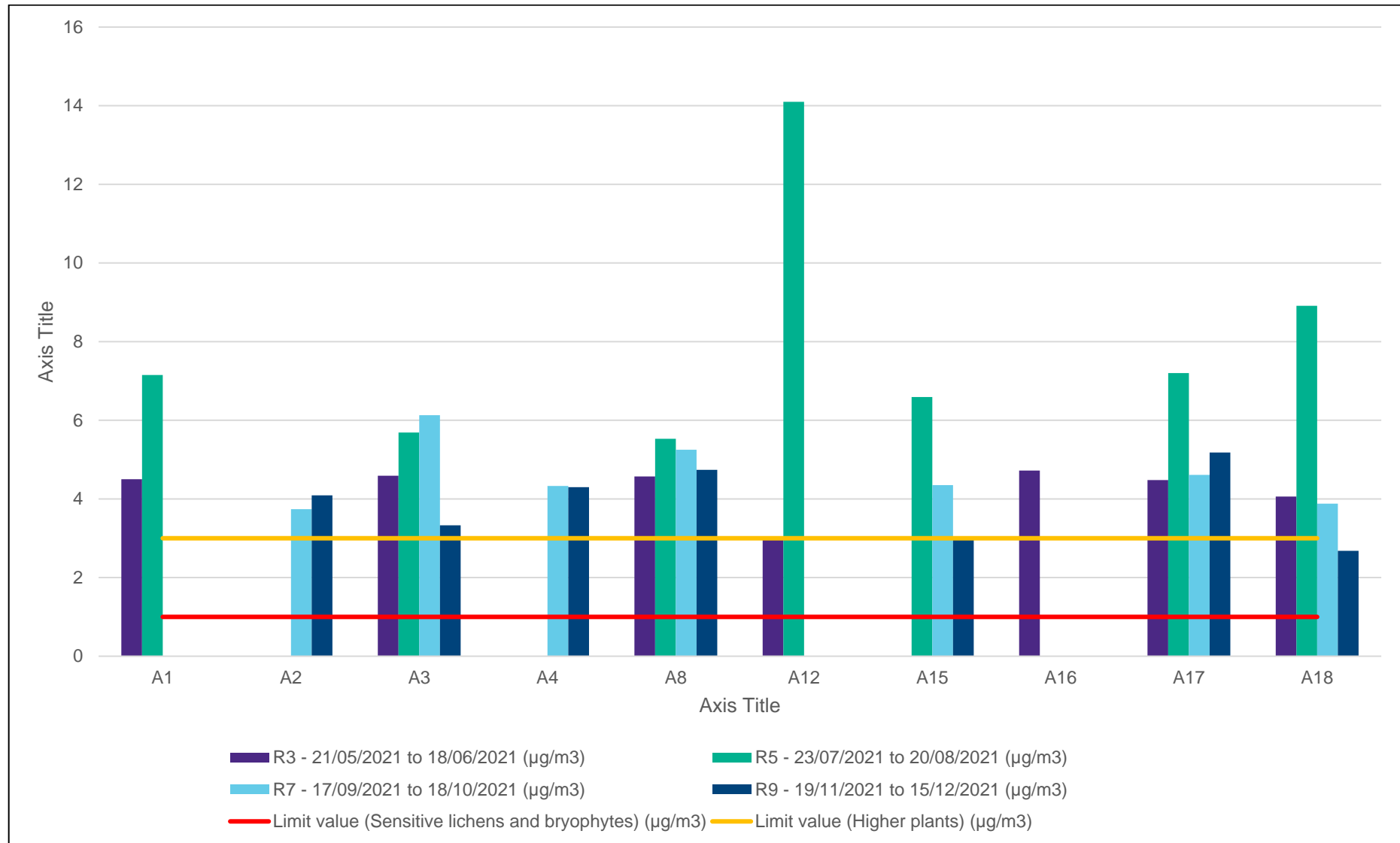




## **Ammonia**

The NH<sub>3</sub> diffusion tubes were deployed for a period of 4 x circa 1 month periods between May and December 2021. Monitoring was carried out at 7 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.55.

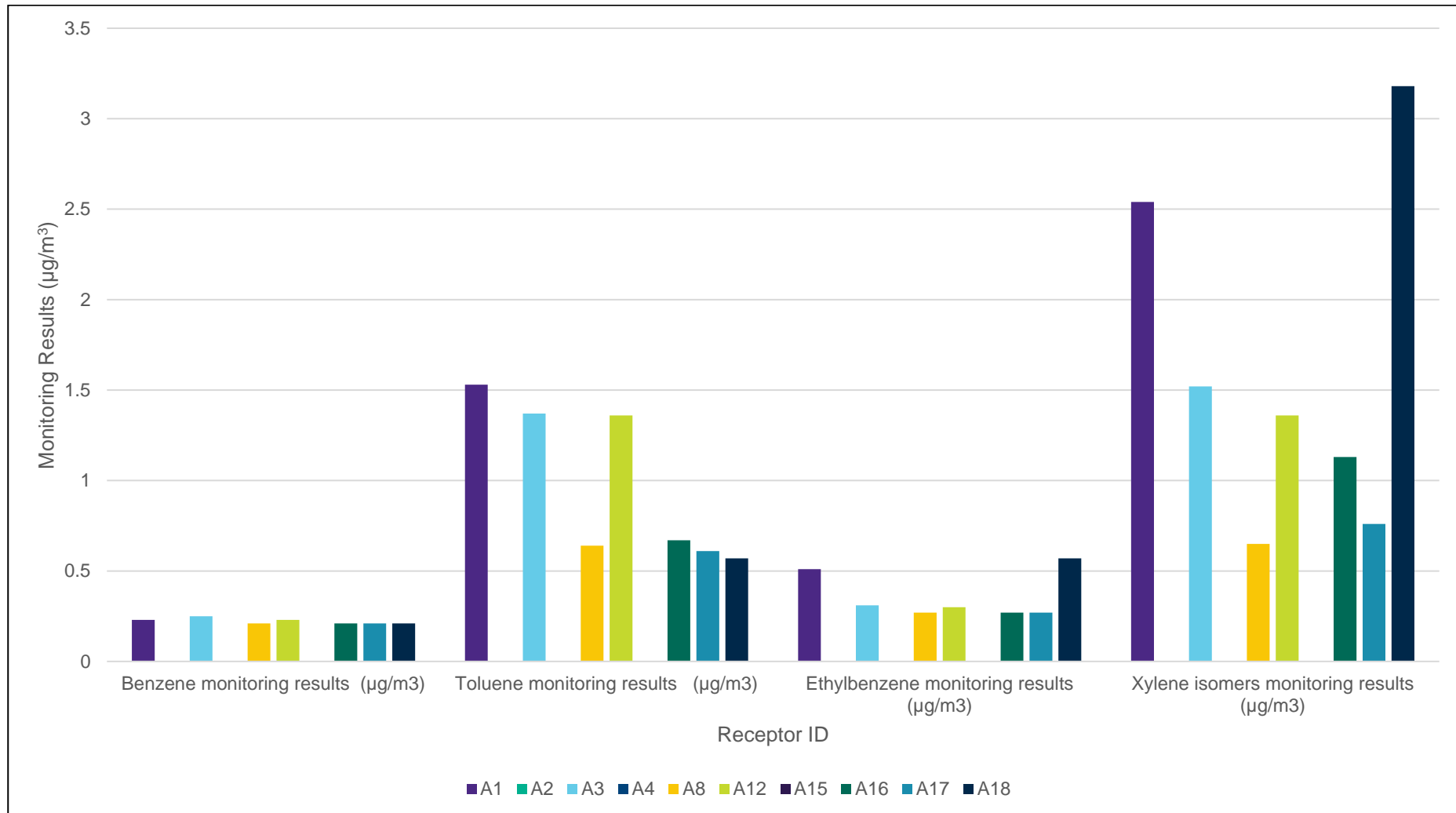
Figure 10.55: NH<sub>3</sub> Monitoring Results at Each of the 7 Monitoring Stations Over 3 Monitoring Events



## **BTEX**

The BTEX diffusion tubes were deployed for a period of 4 x circa 1 month periods between May and December 2021. Monitoring was carried out at 7 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.56 - Figure 10.59 .

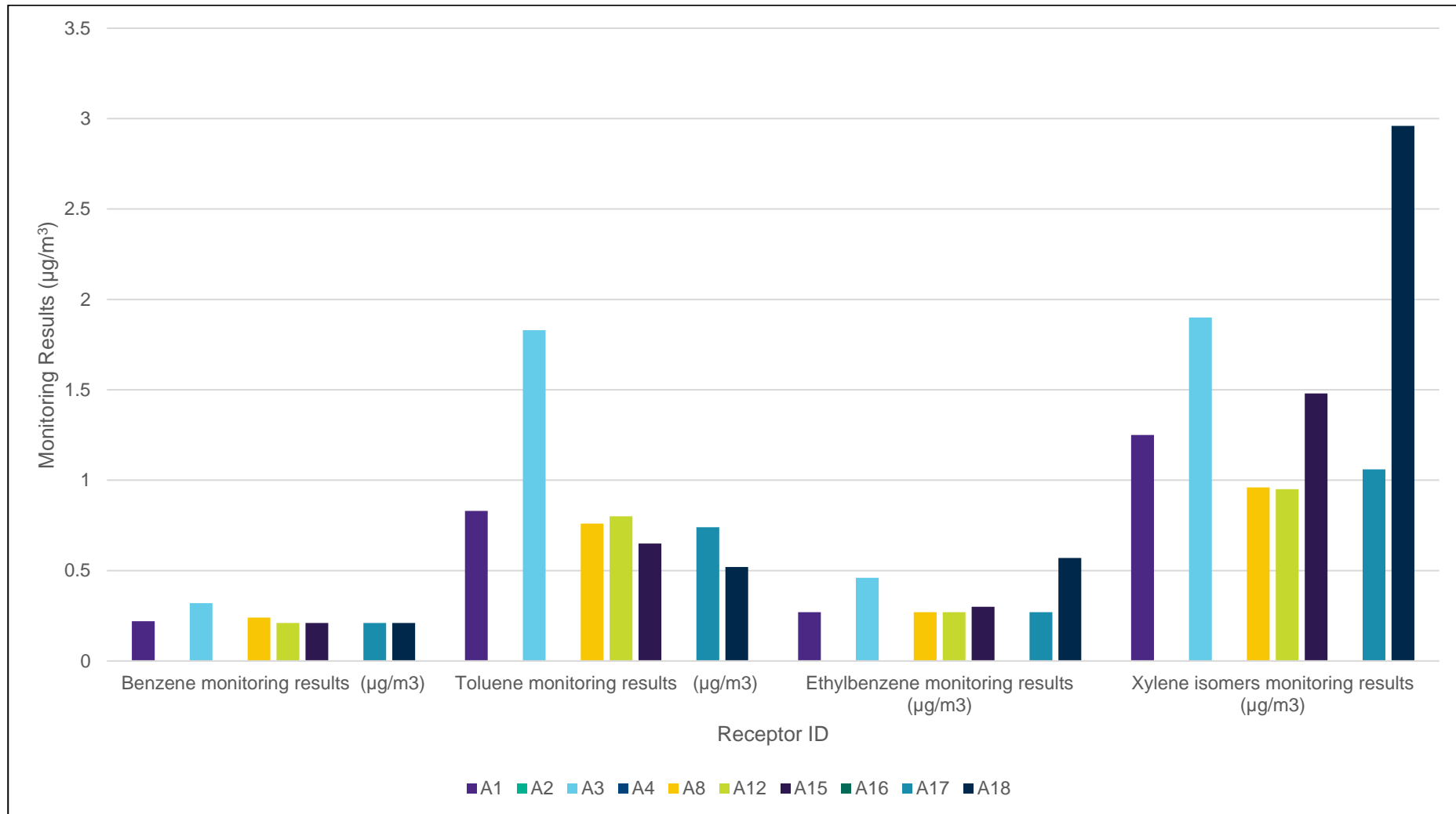
Figure 10.56: BTEX monitoring results at each of the 7 monitoring stations over R3 - 21/05/2021 to 18/06/2021



**\*\*Note – Limit Values Include:**

**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**

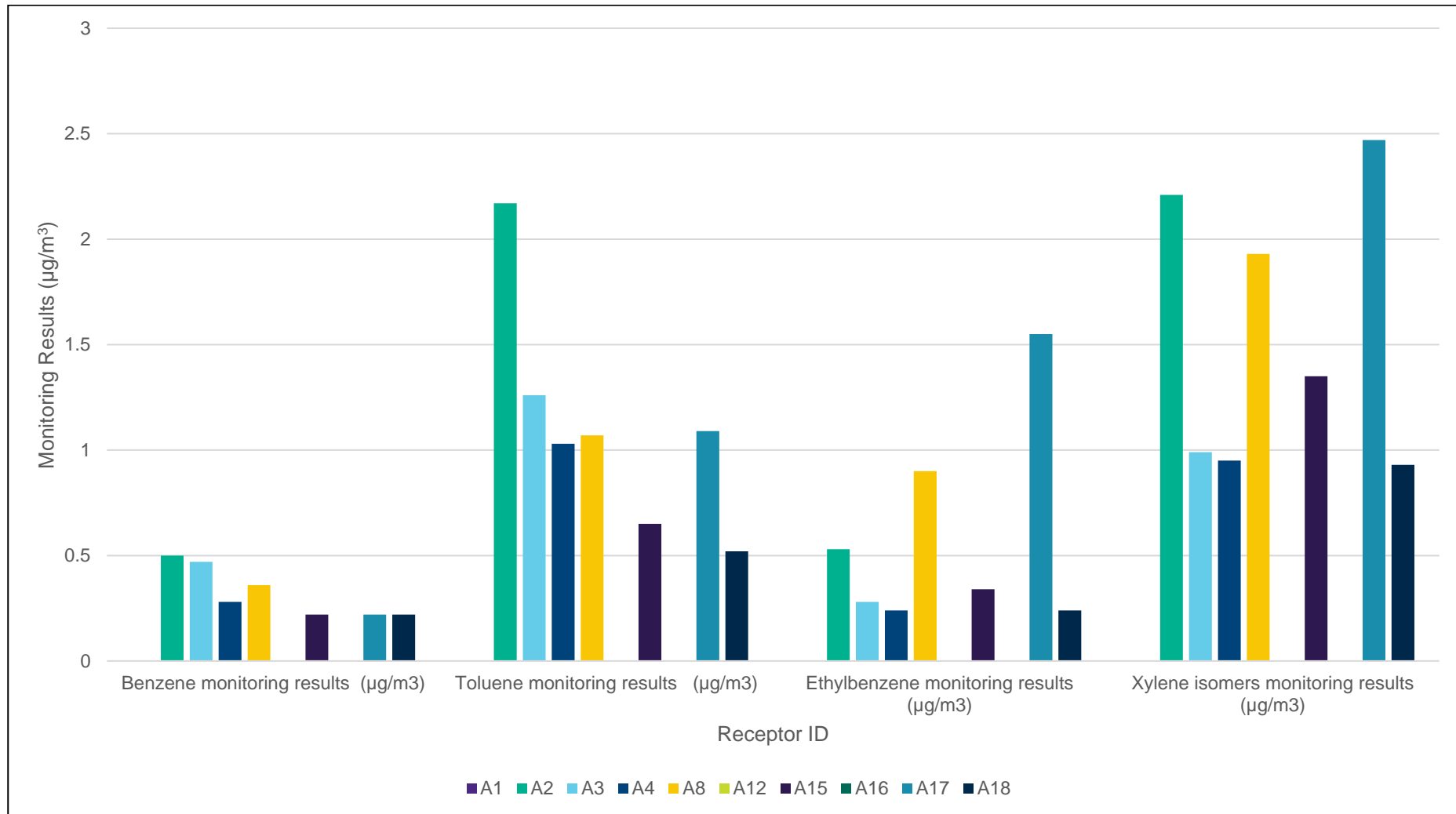
Figure 10.57: BTEX monitoring results at each of the 7 monitoring stations over R5 - 23/07/2021 to 20/08/2021



**\*\*Note – Limit Values Include:**

**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**

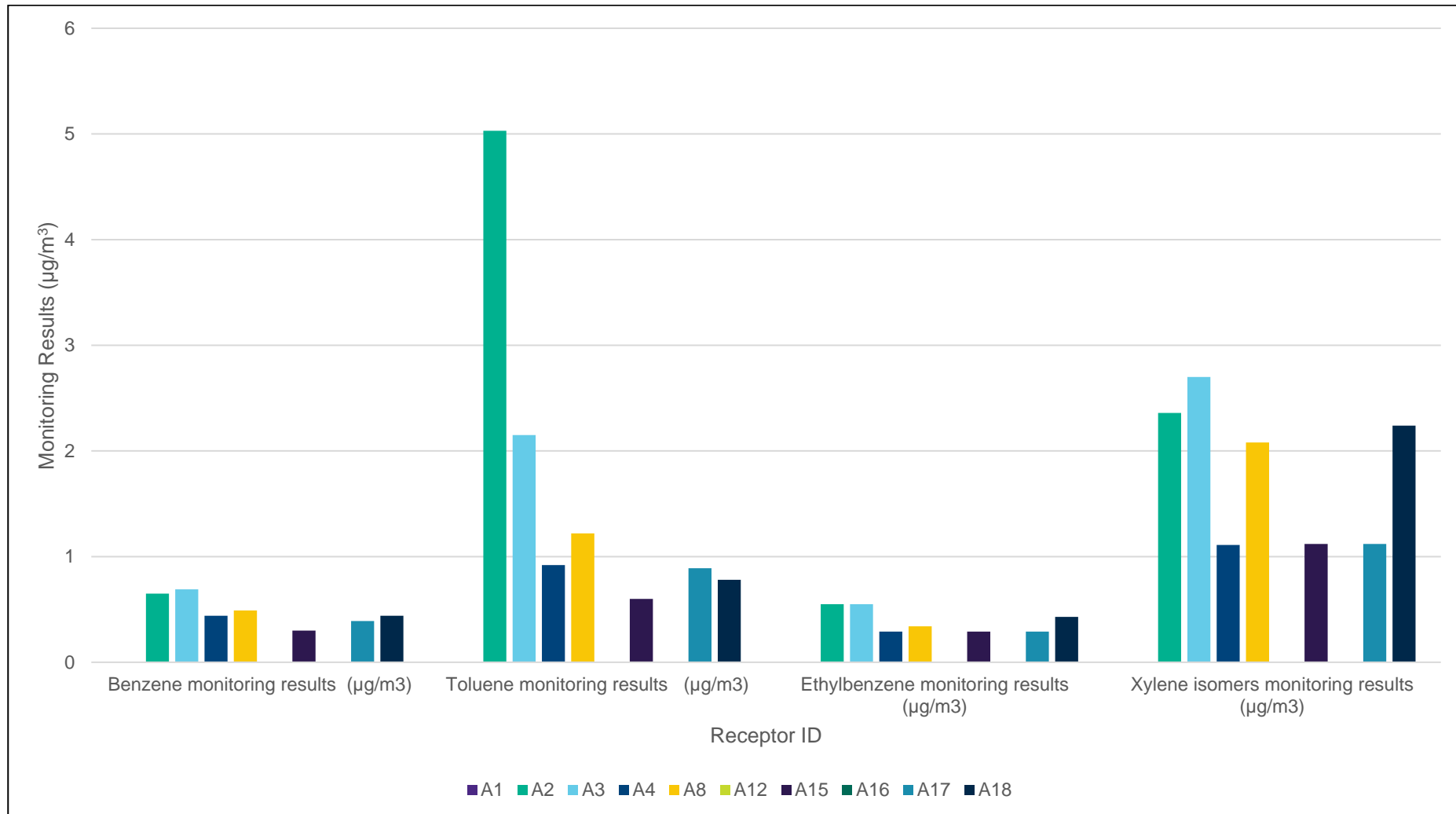
Figure 10.58: BTEX monitoring results at each of the 7 monitoring stations over R7 - 17/09/2021 to 18/10/2021



**\*\*Note – Limit Values Include:**

**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**

Figure 10.59: BTEX monitoring results at each of the 7 monitoring stations over R9 - 19/11/2021 to 15/12/2021



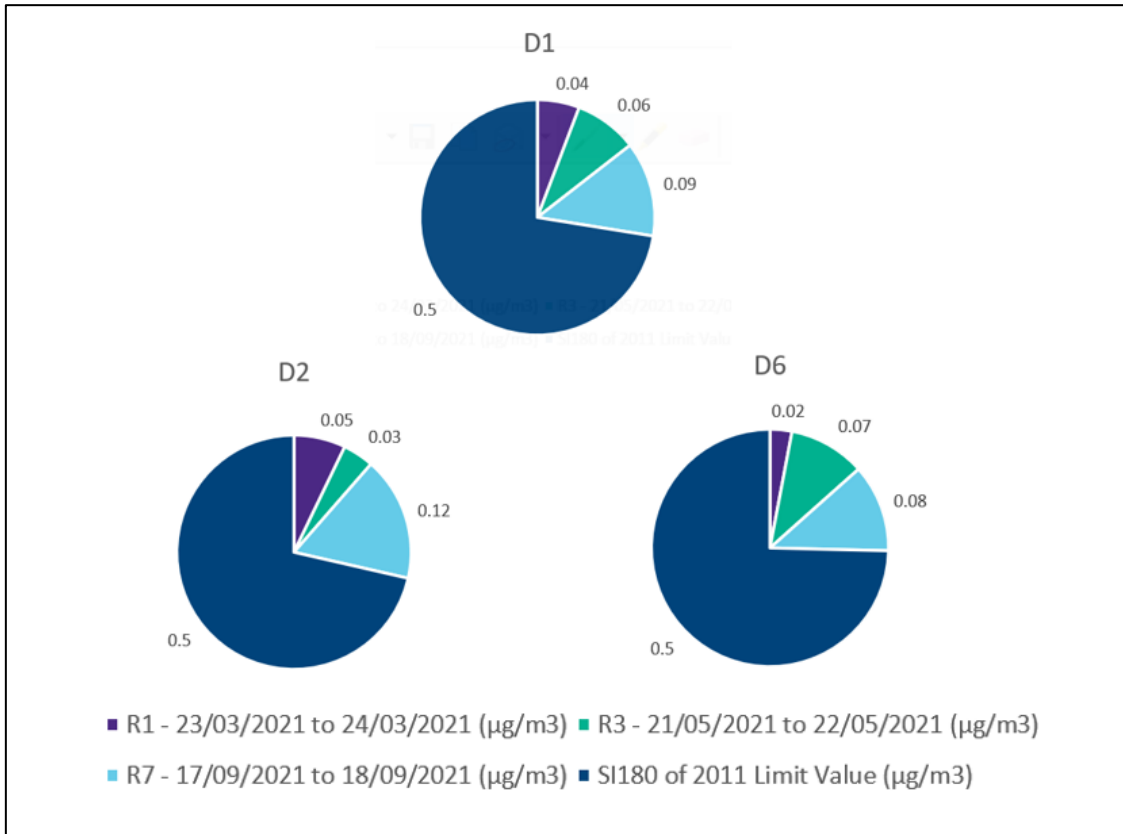
**\*\*Note – Limit Values Include:**

**Benzene <5.0 ( $\mu\text{g}/\text{m}^3$ ), Toluene 1,920 ( $\mu\text{g}/\text{m}^3$ ), Ethylbenzene 2,210 ( $\mu\text{g}/\text{m}^3$ ), Xylene 4,420 ( $\mu\text{g}/\text{m}^3$ )**

## Lead

The Lead samplers were deployed for a period of 3 times between January and July 2020. Monitoring was carried out at 3 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.60.

Figure 10.60: Lead Monitoring Results at each of 3 Monitoring Stations Over 3 Monitoring Events





## Dublin Port Air Quality Monitoring Results 2022

Air monitoring data from 22 monitoring stations located in the Dublin Port area over a period of 12 monitoring events were assessed against legislative limits and target values for the protection of human health and vegetation. Monitoring was carried out for NO<sub>2</sub> and SO<sub>2</sub> at 22 locations over 12 monitoring events in Year 2022. Monitoring for PM<sub>10</sub> and PM<sub>2.5</sub> was carried out at 2 locations over 2 monitoring events while monitoring for Benzene, Toluene, Ethyl Benzene, Xylene isomers (BTEX) and Ammonia was carried out at 7 locations over 4 monitoring events in Year 2022. Total depositional dust was carried out at 4 locations over 2 monitoring events while Lead monitoring was carried out at 3 locations over 3 monitoring events in Year 2022.

A total of 22 individual monitoring locations (i.e. A1 to A22) were selected across the port estate area in order to monitor ambient air concentrations of Nitrogen dioxide and Sulphur dioxide. These locations were established during the 2014/2015 monitoring program and data collected in 2022 will facilitate comparison between the data sets in terms of improvement / dis-improvements in ambient air quality within the port environs.

A total of 7 individual monitoring locations (i.e. as taken from 10 locations A1, A2, A3, A4, A8, A12, A15, A16, A17 and A18) were chosen from the stated location for the monitoring of BTEX and Ammonia.

A total of 4 locations were chosen for Bergerhoff total dust deposition monitoring (i.e. D1 to D4) while a further two locations were chosen for PM<sub>10</sub> and PM<sub>2.5</sub> monitoring (i.e. D5 and D6). A total of three monitoring locations were chosen for Lead (i.e. D1, D2 and D6).X presents an overview of each monitoring locations located with the Dublin Port and its environs.

Figure 10.61: Overview of Ambient Air Monitoring Locations Located Within Dublin Port and Surrounding Environs for Nitrogen Dioxide, Sulphur Dioxide, BTEX, Ammonia, Total Depositional Dust, PM<sub>10/2.5</sub> and Lead

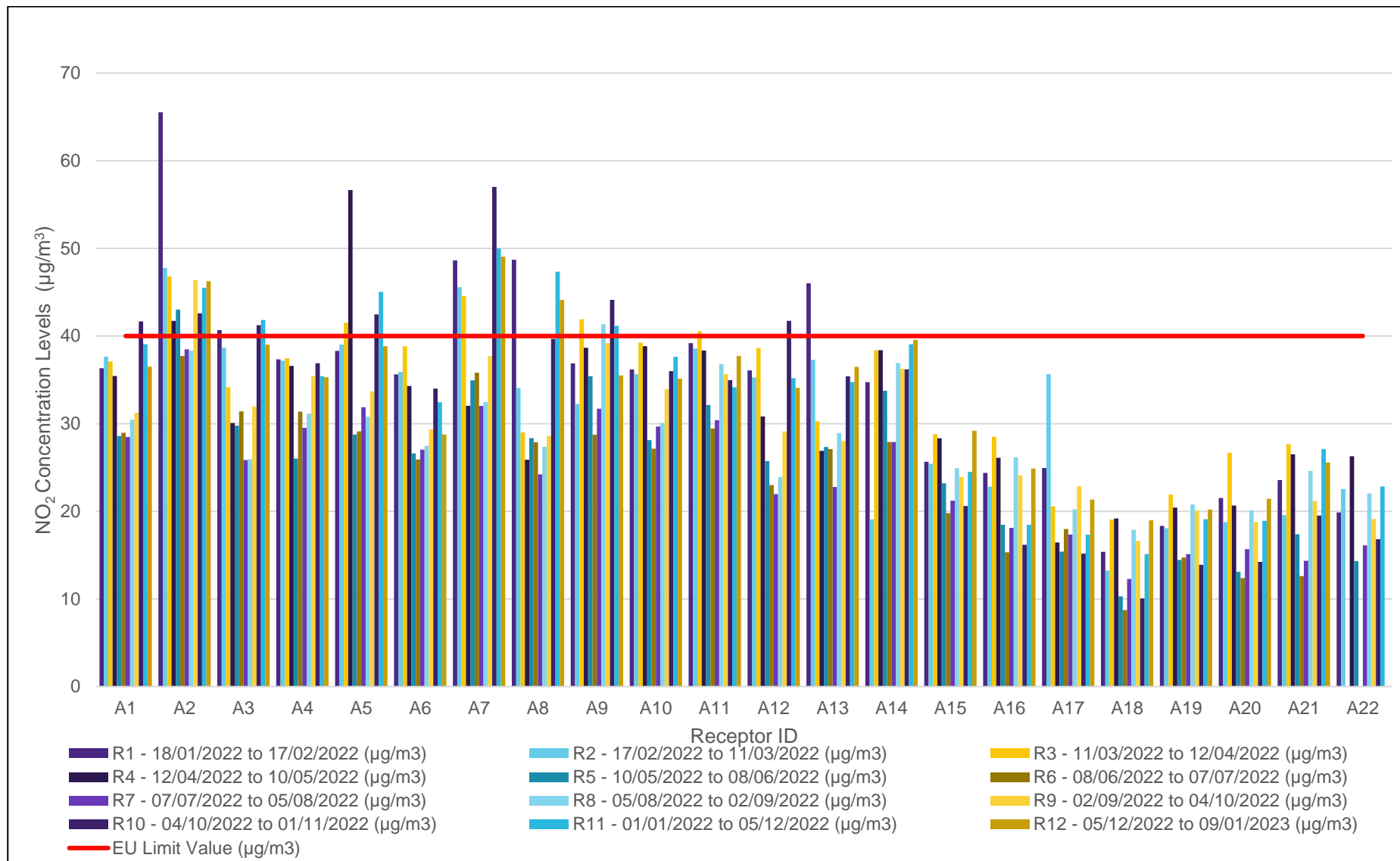


## Results

### Nitrogen Dioxide

The NO<sub>2</sub> diffusion tubes were deployed for a period of 12 x circa 1 month periods between January and Dec 2022. Monitoring was carried out at 22 monitoring stations spatially distributed across the port estate. The results of the monitoring are and graphically represented in Figure 10.62.

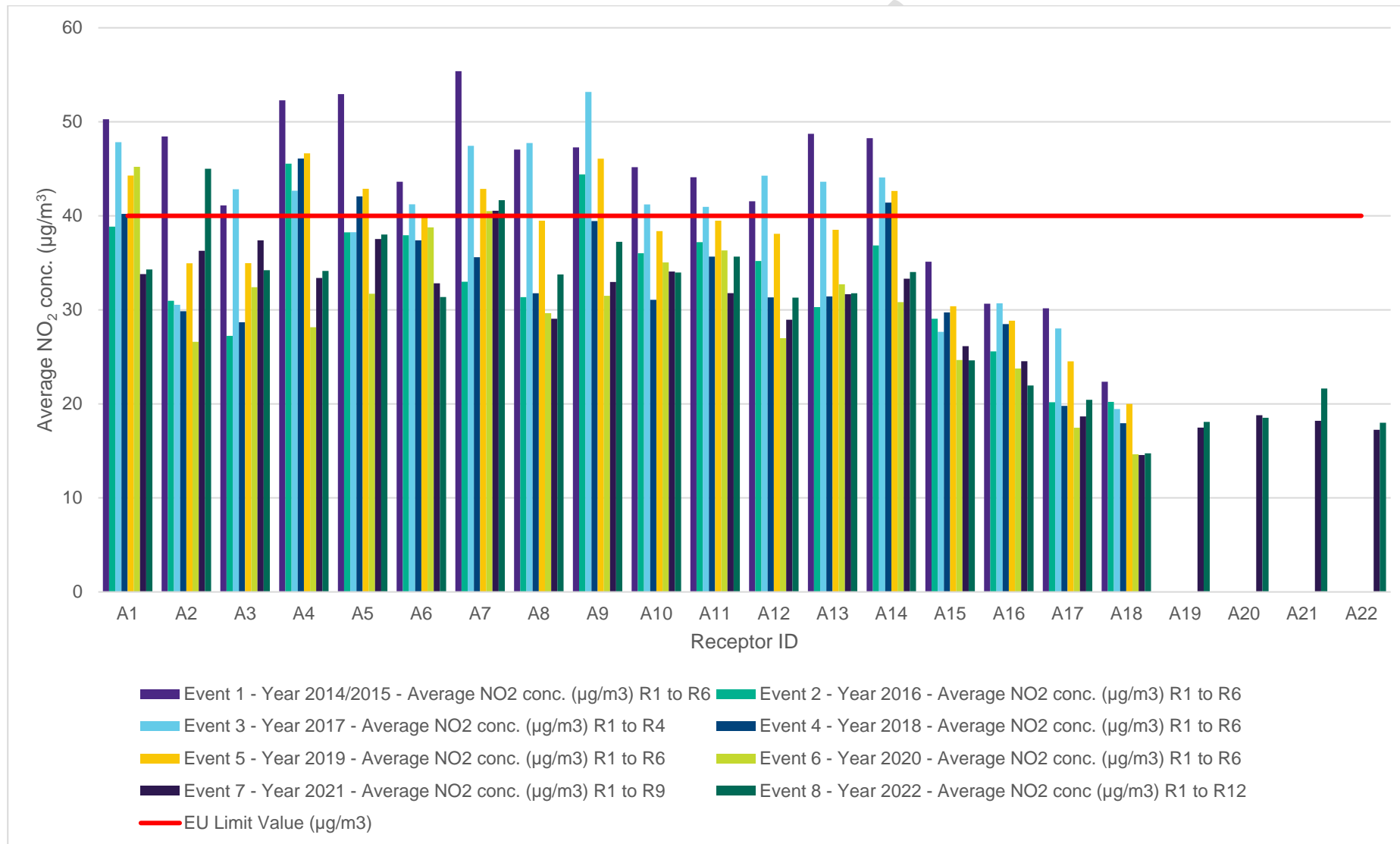
Figure 10.62: Plot of NO<sub>2</sub> Concentrations For Each Monitoring Event R1 to R12 at Each Monitoring Station A1 to A22



**Comparison between average monitoring data collected in Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019, Event 6 Year 2020 and Event 7 Year 2021 for NO<sub>2</sub>**

Figure 10.63 present the comparison between the average monitoring data collected over the 6 monitoring events in Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019, Event 6 Year 2020 and Event 7 Year 2021 for NO<sub>2</sub>.

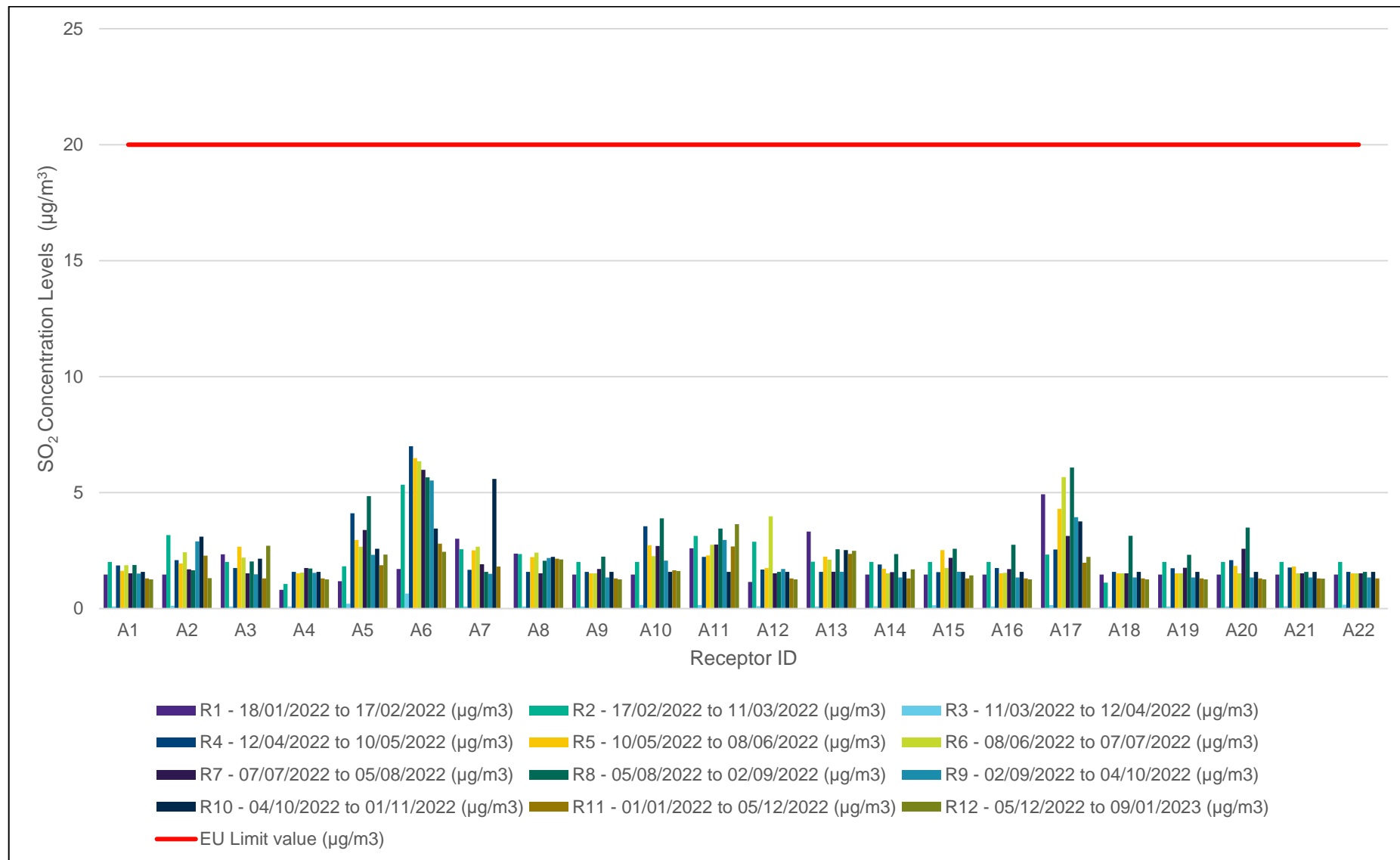
Figure 10.63: Graphical Comparison Between Average NO<sub>2</sub> Concentration Values for Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019, Event 6 Year 2020 and Event 7 Year 2021



## **Sulphur Dioxide**

The SO<sub>2</sub> diffusion tubes were deployed for a period of 12 x circa 1 month periods between January and Dec 2022. Monitoring was carried out at 22 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically represented in Figure 10.64.

Figure 10.64: Plot of SO<sub>2</sub> Concentrations For Each Monitoring Event R1 to R12 at Each Monitoring Station A1 to A22

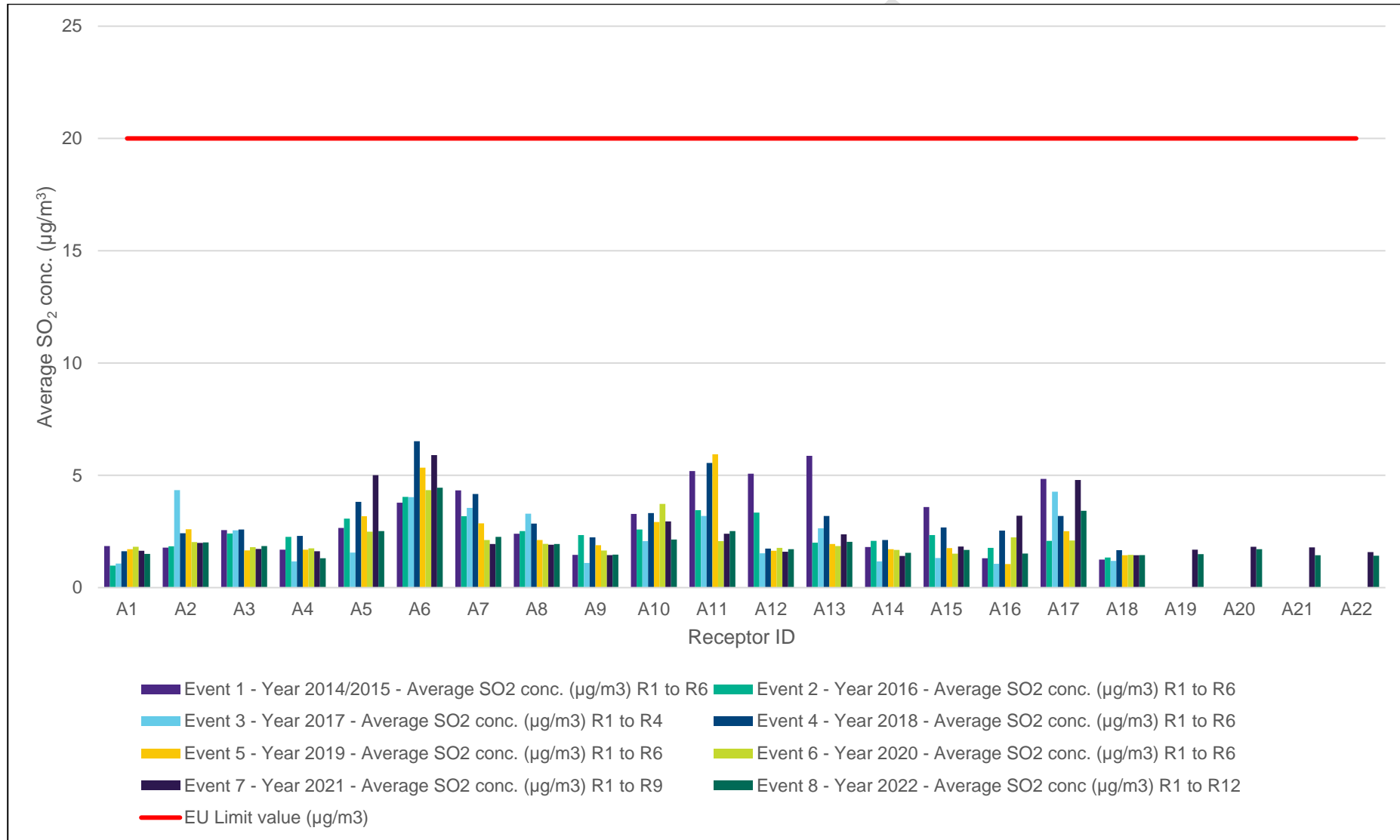




**Comparison between average monitoring data collected in Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019, Event 6 Year 2020 and Event 7 Year 2021 for SO<sub>2</sub>**

Figure 10.65 present the comparison between the average monitoring data collected over the 6 monitoring events in Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019, Event 6 Year 2020 and Event 7 Year 2021 for SO<sub>2</sub>.

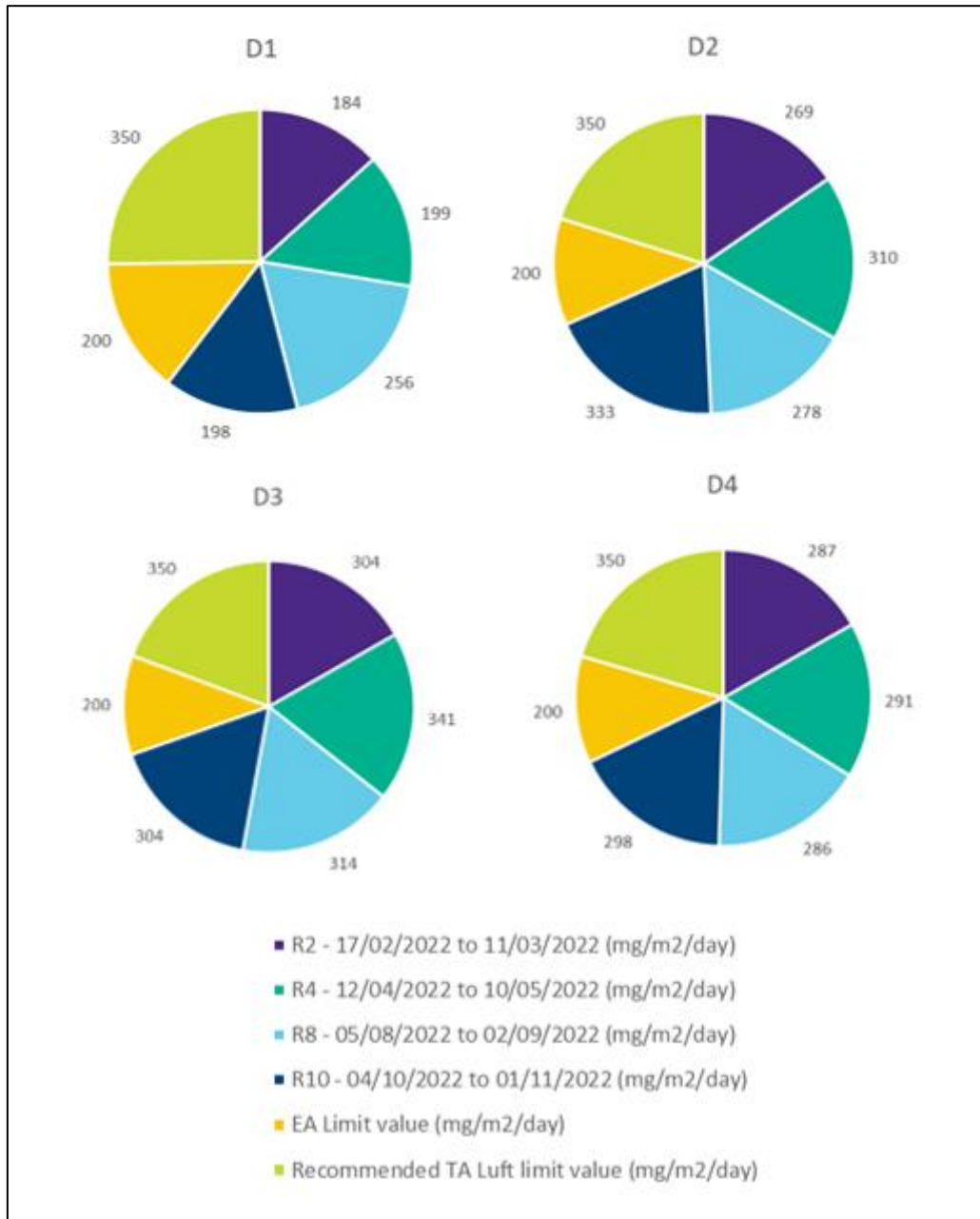
Figure 10.65: Comparison Between Average SO<sub>2</sub> Concentration Values For Event 1 Year 2014/2015, Event 2 Year 2016, Event 3 Year 2017, Event 4 Year 2018, Event 5 Year 2019, Event 6 Year 2020 and Event 7 Year 2021



### Total Depositional Dust

The Total depositional dust monitoring stations were deployed for a period of 4 x 1 month periods between February 2022 and November 2022. Monitoring was carried out at 4 monitoring stations located in close proximity to locations / activities know to give rise to fugitive dust emissions.. The results of the monitoring are graphically shown in Figure 10.66.

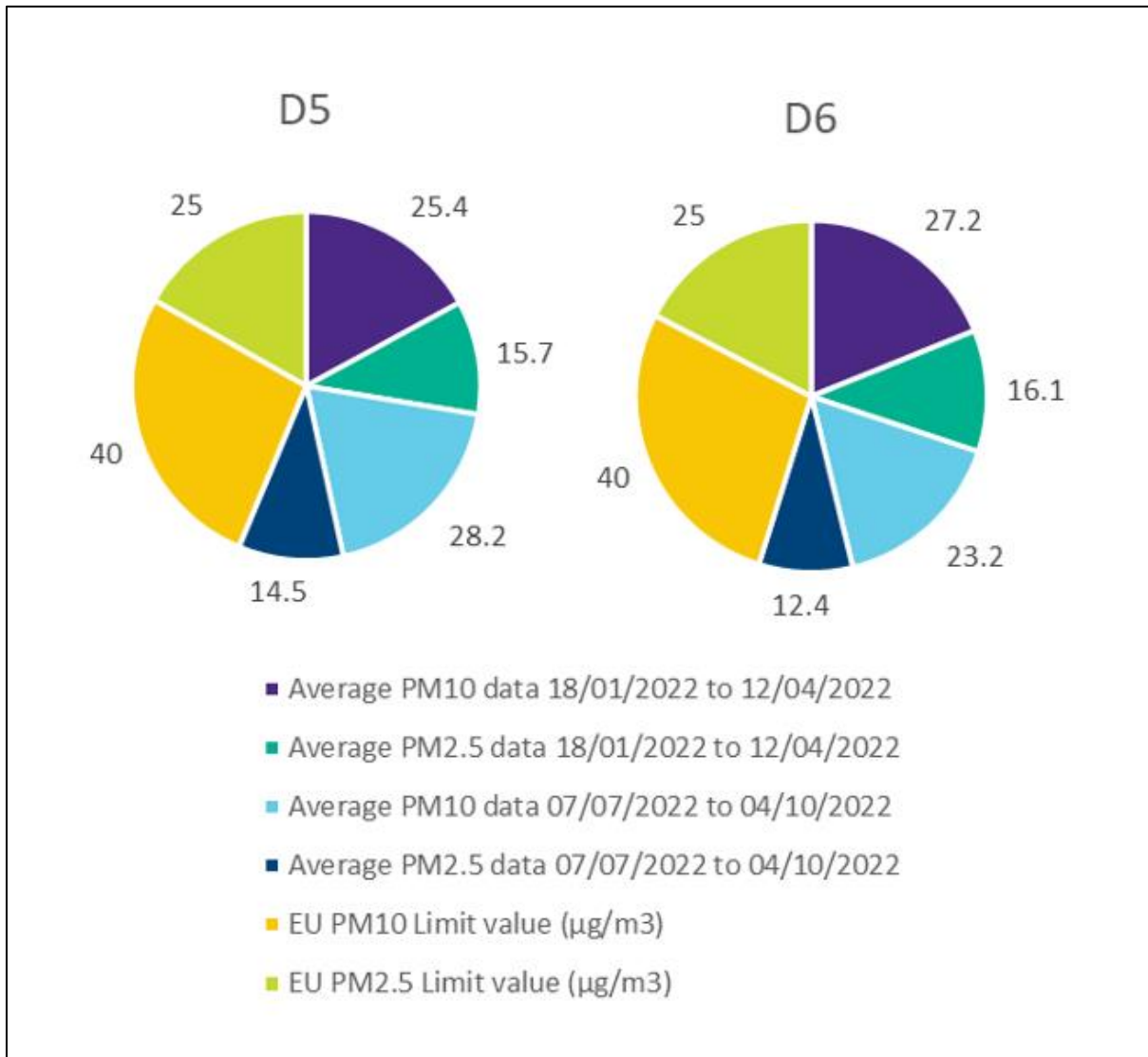
Figure 10.66: Total Depositional Dust Monitoring Results for the Dublin Port Estate and Environs



### Particulate Matter (PM<sub>10/2.5</sub>)

Particulate matter 10 and 2.5 µm monitoring stations were deployed for a period of approximately 2 off 3 month periods. Monitoring was carried out at 2 monitoring stations. The results of the monitoring are graphically shown in Figure 10.67.

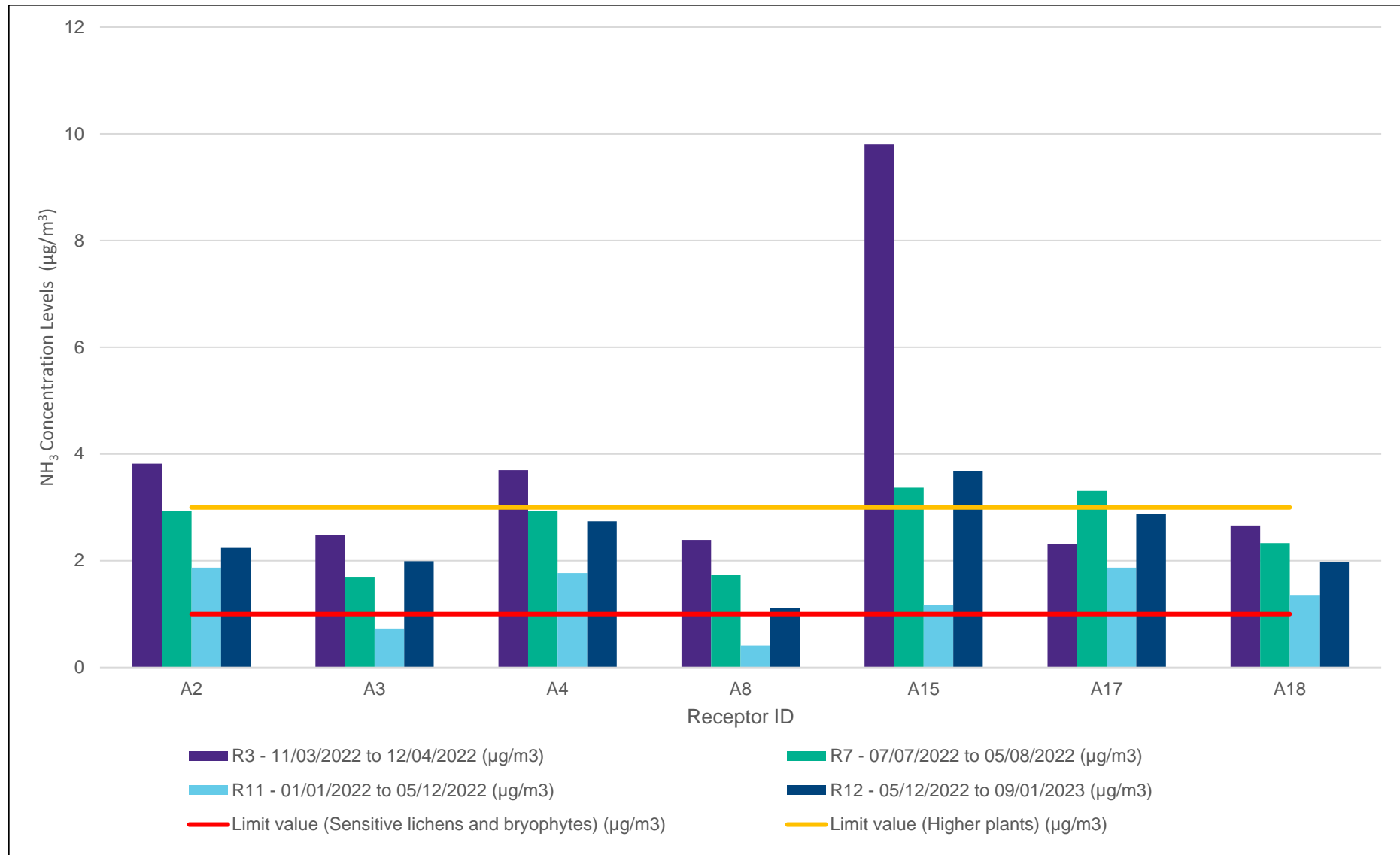
Figure 10.67: Particulate Matter 10 and 2.5 µm Monitoring Results for Dublin Port Estate Monitoring Stations



## **Ammonia**

The NH<sub>3</sub> diffusion tubes were deployed for a period of 4 x circa 1 month periods between March and December 2022. Monitoring was carried out at 7 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.68.

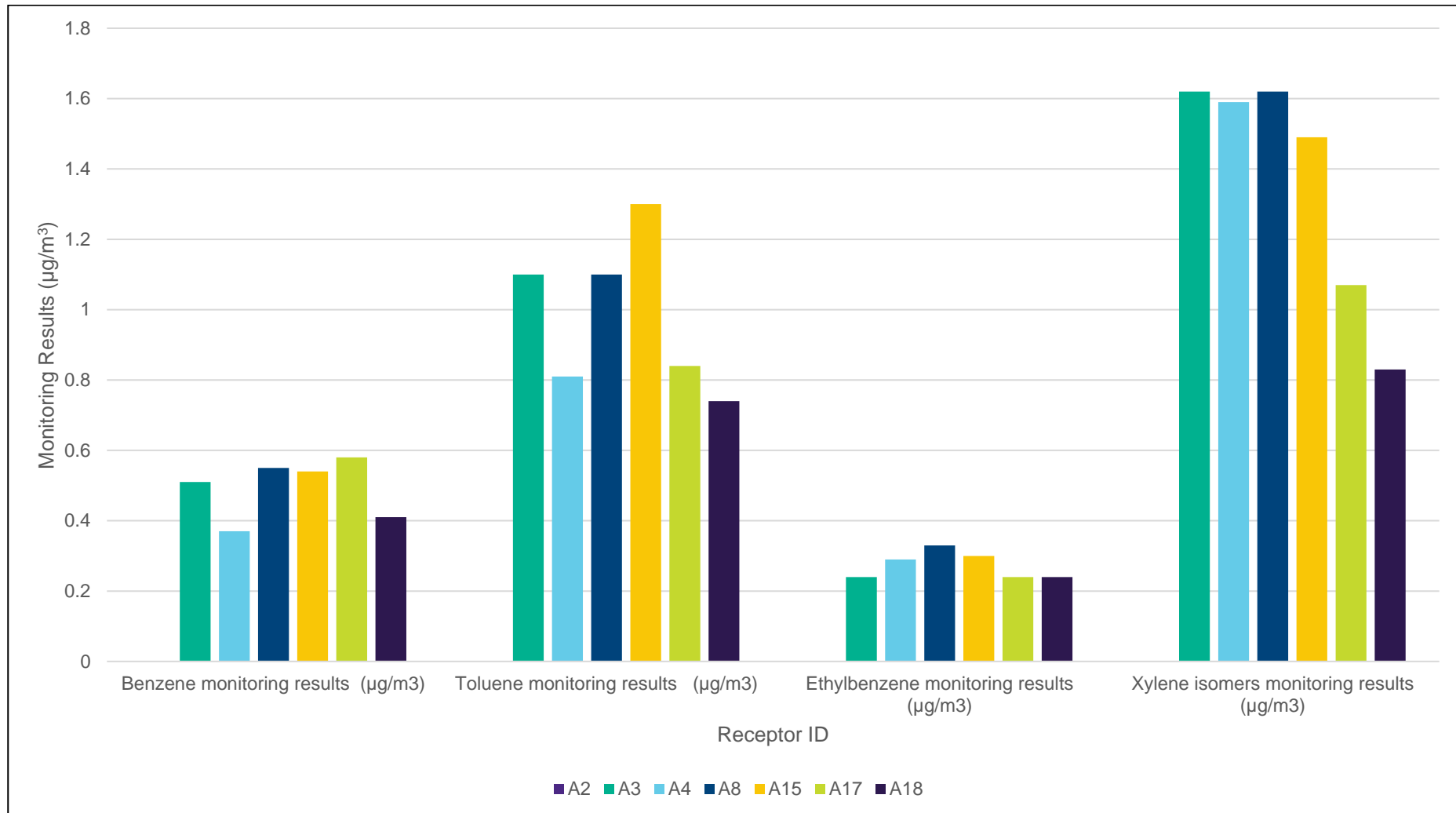
Figure 10.68: NH<sub>3</sub> Monitoring Results at Each of the 7 Monitoring Stations Over 4 Monitoring Events



## **BTEX**

The BTEX diffusion tubes were deployed for a period of 4 x circa 1 month periods between March and December 2022. Monitoring was carried out at 7 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.69 - Figure 10.72.

Figure 10.69: BTEX monitoring results at each of the 7 monitoring stations over R3 - 11/03/2022 to 12/04/2022

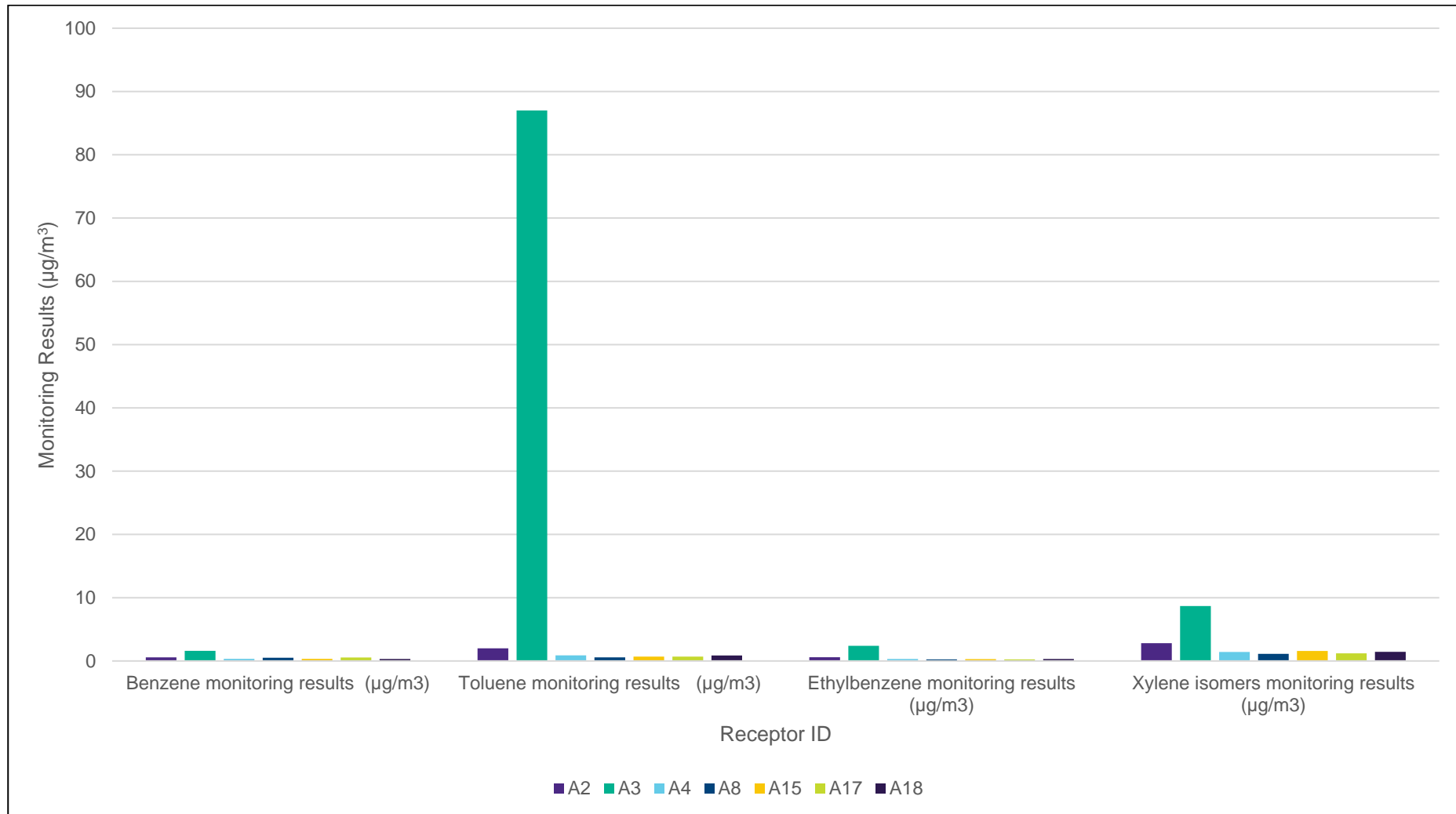


**\*\*Note – Limit Values Include:**

**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**



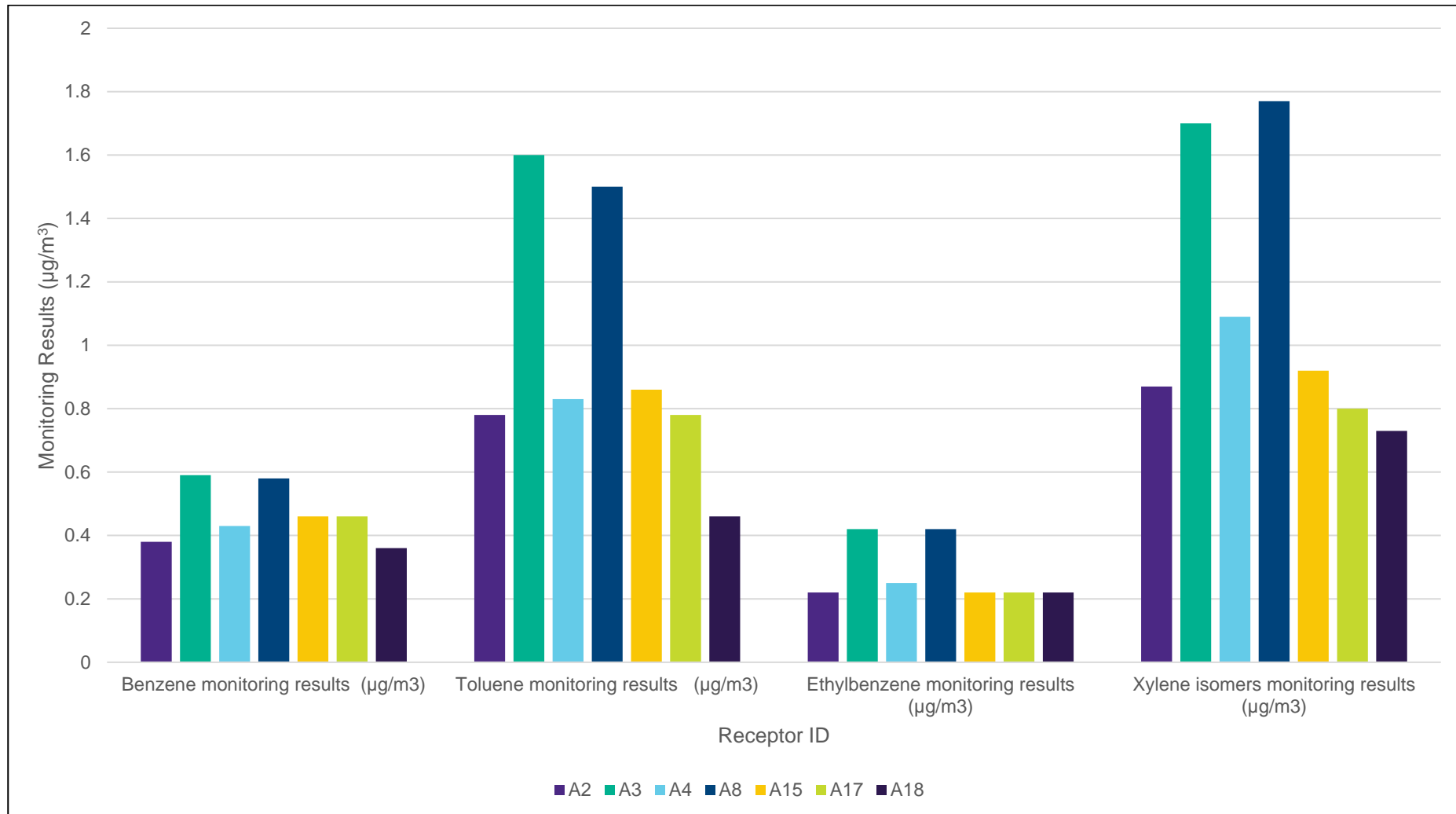
Figure 10.70: BTEX monitoring results at each of the 7 monitoring stations over R7 - 07/07/2022 to 05/08/2022



**\*\*Note – Limit Values Include:**

**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**

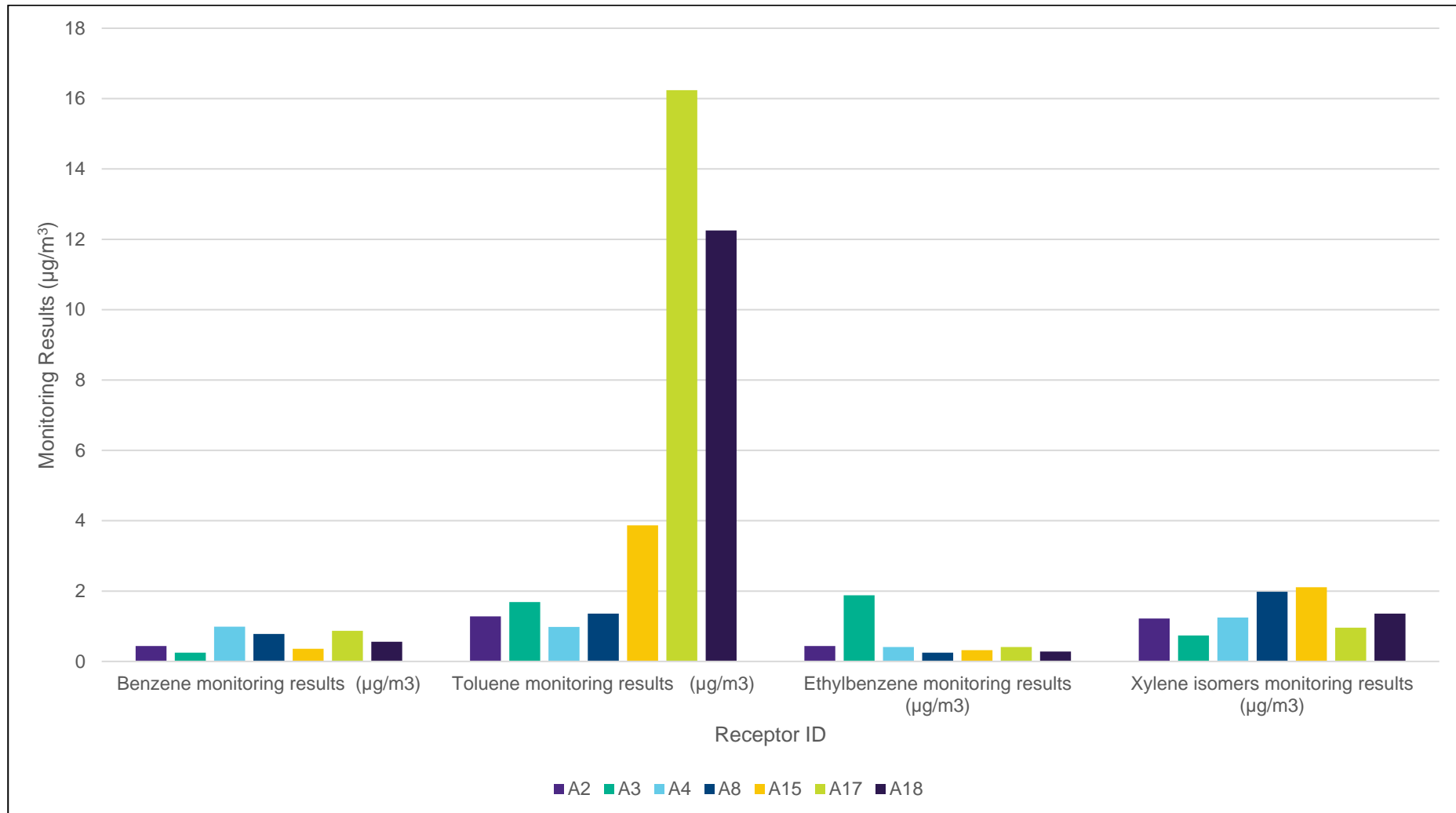
Figure 10.71: BTEX monitoring results at each of the 7 monitoring stations over R11 - 01/01/2022 to 05/12/2022



**\*\*Note – Limit Values Include:**

**Benzene <5.0 (µg/m³), Toluene 1,920 (µg/m³), Ethylbenzene 2,210 (µg/m³), Xylene 4,420 (µg/m³)**

Figure 10.72: BTEX monitoring results at each of the 7 monitoring stations over R12 - 05/12/2022 to 09/01/2023



**\*\*Note – Limit Values Include:**

**Benzene  $<5.0$  ( $\mu\text{g}/\text{m}^3$ ), Toluene  $1,920$  ( $\mu\text{g}/\text{m}^3$ ), Ethylbenzene  $2,210$  ( $\mu\text{g}/\text{m}^3$ ), Xylene  $4,420$  ( $\mu\text{g}/\text{m}^3$ )**

## Lead

The Lead samplers were deployed for a period of 3 times between March and October 2022. Monitoring was carried out at 3 monitoring stations spatially distributed across the port estate. The results of the monitoring are graphically shown in Figure 10.73.

Figure 10.73: Lead Monitoring Results at each of 3 Monitoring Stations Over 3 Monitoring Events

