Arnolds Field Air Quality Report | August 2023

This is a report about fires and air quality in August 2023 at Arnolds Field (shown on the top left). $PM_{2.5}$ and NO_2 data is collected by Breathe London nodes (an example node is shown in the image on the bottom left).

The Havering Council Department for Public Health would be grateful to receive feedback from residents about the updated content and information shared in these reports. It is important that these reports contain public health and environmental information that is relevant and of interest to Havering residents.

Please visit the following link to share your feedback .

Report Contents | August 2023

Contents

Overview of Air Quality around Arnolds Field in August 2023

Arnolds Field has been the site of frequent fires over the last five years.

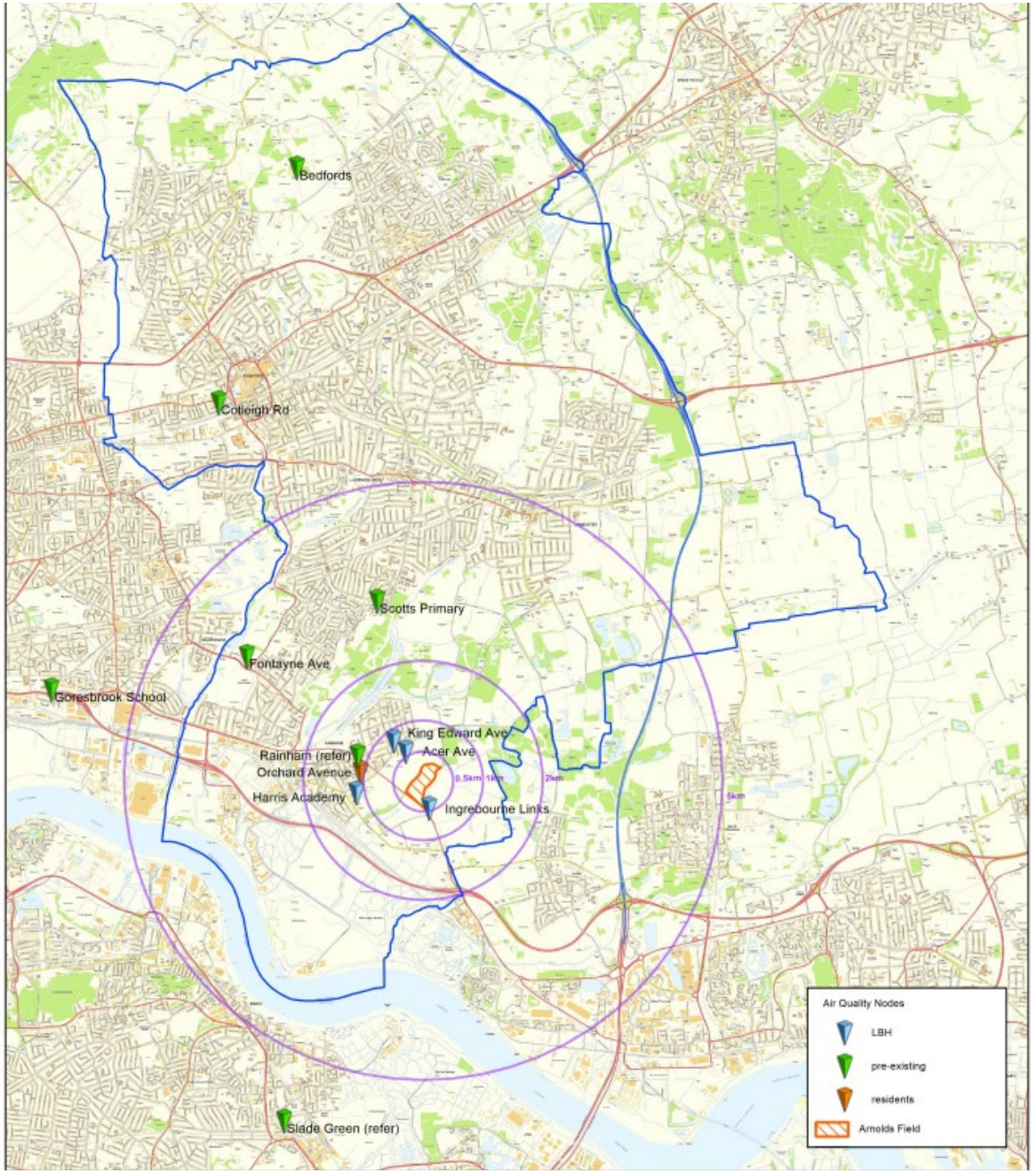
This report describes levels of two types of air pollution – fine particulate matter ($PM_{2.5}$) and Nitrogen Dioxide (NO_2) in residential areas adjacent to Arnolds Field. In summary:

- Levels of NO_2 pollution (Table 1, page 9) were consistently 'low' throughout August when compared to the UK Government's 'Daily Air Quality Index' (DAQI).
- Levels of $PM_{2.5}$ pollution (Table 2, page 10) were consistently 'low' when compared to the DAQI except on the 30th August when levels were 'very high' at Ingrebourne Golf Course.
- There were a number of fires at Arnolds Field in August (see Figure 2, Page 6), the largest and most prolonged of which occurred on the 30th.
- The fires coincided with repeated, short-term increases in $PM_{2.5}$ levels at many of the monitoring sites around Arnolds Field (Table 3, page 11). With the exception of the 30th, these increases were not sufficiently prolonged to affect the DAQI score, which is based on the average concentration for the day as a whole.
- Some of these short peaks in air pollution did exceed the daily limit on $PM_{2.5}$ set by the World Health Organisation (see pages 13-19). The UK Government has not set a limit of short-term exposure to $PM_{2.5}$.
- The UK limit for annual average $PM_{2.5}$ concentrations has not been exceeded at any of the three sites around Arnolds Field that have now been monitored for 12 months or longer. Pollution was well above the corresponding WHO limit, which is much lower than the UK equivalent.

Measuring Air Quality around Arnolds Field

- Havering Council has commissioned enhanced air quality monitoring in response to concerns about possible health impacts of recurrent fires at Arnolds Field, off Launders Lane, in Rainham.
- The report currently presents data about levels of particulate matter ($PM_{2.5}$) and Nitrogen Dioxide (NO_2). Information about levels of specific pollutants will be available shortly.
- Comparisons are made with:
    - levels of pollution recorded at sites elsewhere in Havering and in adjacent boroughs (see map to the right) to show whether the trends seen are local to Rainham or due to conditions affecting London as a whole.
    - relevant UK and WHO air quality limits
- Details of fires that required a response by the London Fire Brigade (LFB) are presented to show whether periods of high air pollution in Rainham coincided with visible fires at Arnolds Field.

Figure 1. Breathe London nodes around Arnolds field

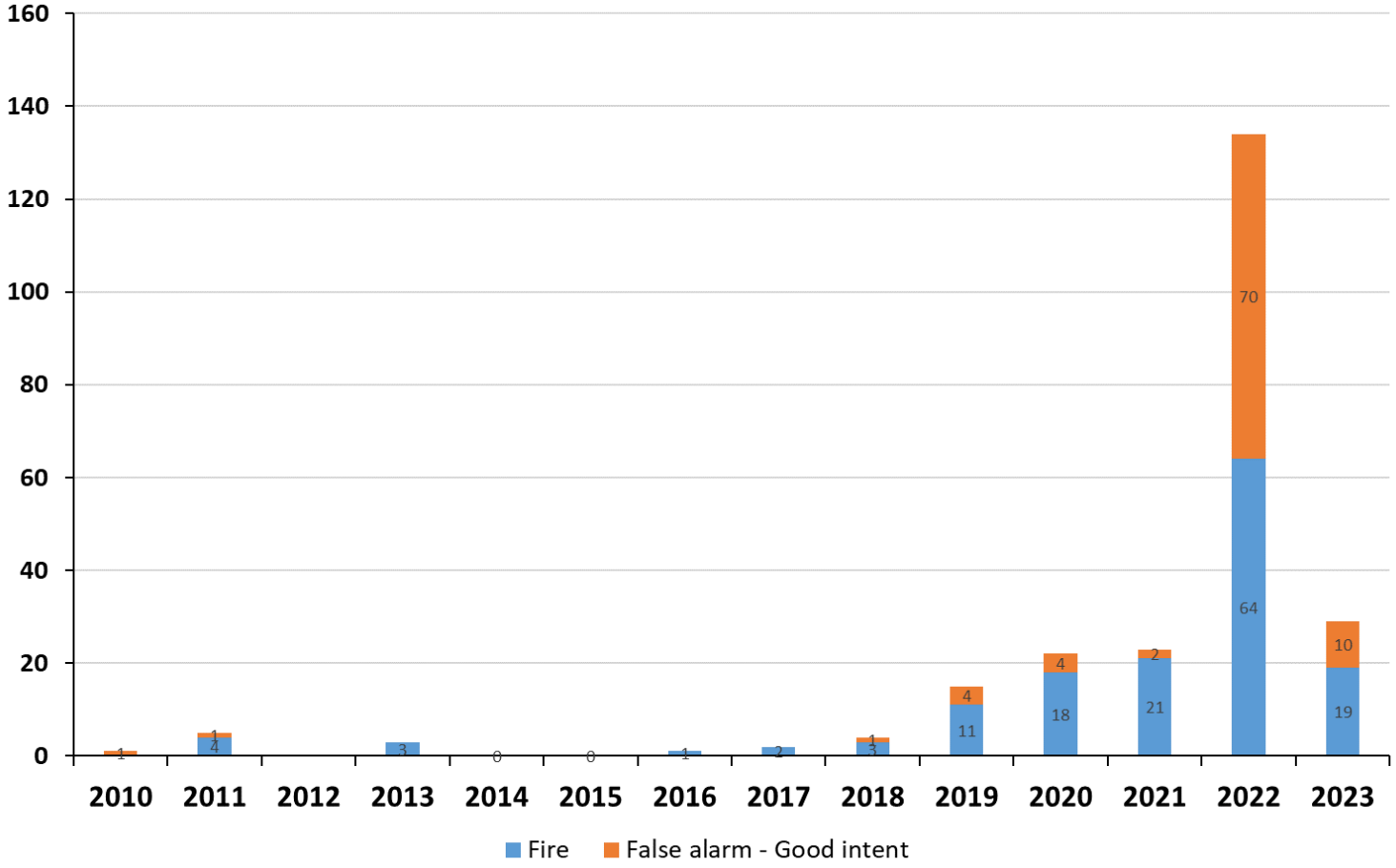


General Information About Air Pollution

- **Who is measuring & what is being measured?**
  - Havering Council is working with the Environmental Research Group at Imperial College London to monitor $PM_{2.5}$ and NO_2 using Breathe London sensor nodes.
  - Residents have independently sourced their own node (Orchard avenue), which forms part of the ring of sensors now surrounding Arnolds Field.
- **What is NO_2 how does it affect health?**
  - NO_2 (nitrogen dioxide) is a harmful, gaseous air pollutant primarily emitted from vehicles and industrial processes.
  - Inhalation of NO_2 can irritate the respiratory system, leading to increased respiratory symptoms in the general population and putting people with pre-existing conditions like asthma and COPD at risk of severe crises.
  - Children, older residents and individuals with pre-existing health conditions are particularly vulnerable
  - However $PM_{2.5}$ is more likely be impacted by fires at Arnolds field as previous monthly reports of air quality at Arnolds field have shown
- **What is $PM_{2.5}$ and how does it affect health?**
  - $PM_{2.5}$ (particulate matter with a diameter of 2.5 micrometres or smaller) consists of tiny particles that can penetrate deep into the lungs produced by road traffic, industrial activities, domestic wood burners and wild fires.
  - Short-term exposure to high levels of $PM_{2.5}$ increases respiratory symptoms and exacerbates pre-existing respiratory and cardiovascular problems increasing the risk of heart attacks, strokes, and respiratory crises. Exposure over the long term increases the risk of developing respiratory and cardiovascular disease, lung cancer and dementia and reduces overall life expectancy.
- **Air pollution and inequalities.**
  - The harm caused by air pollution is not equally distributed. Air quality is generally worse in urban areas and the poorer, more ethnically diverse communities that tend to live in these areas are hardest hit. These communities tend to contribute less to air pollution than more affluent counterparts do e.g. they are less likely to drive their own car and more likely to use public transport.
- **How is air quality regulated in the UK?**
  - The Department for Environment, Food and Rural Affairs (DEFRA) sets limits for levels of air pollution in the UK that must be achieved now by law and targets to be achieved in the future. The World Health Organization (WHO) publishes recommended limits that if achieved would minimise harm to health. The WHO limits are consistent with the most up-to-date evidence about the health effects of air pollution and are much lower than the corresponding UK limit where this exists.
- **Action to control air pollution**
  - Initiatives such as low-emission zones and improvements to the public transport network aim to improve air quality in urban areas.
  - Individual residents can also help by leaving the car at home whenever possible; not having bonfires and minimising use of wood burners.
  - For more information about actions to control air pollution read a report by the Chief Medical officer here .

Fires at Arnolds Field

Figure 2. LFB callouts to Arnolds Field (including fires and false alarms)



History of fires

The LFB responded to 64 fires at Arnolds Field in 2022.

Prior to August 2023, there had been 2 fires in 2023, both in July.

Fires in August 2023

The London Fire Brigade (LFB) responded to a further 17 fire incidences at Arnolds Field in August 2023.

This brought the total number of fires in 2023 to 19 (see blue bar for 2023).

The response ranged in size from 1 pump attending for 22 minutes, to multiple pumps with support vehicles and tactical level officers on site for 3059 minutes around the 30th August.

Average annual concentrations of $PM_{2.5}$ and NO_2 : Nov'22 – Oct'23

Three of the Breathe London nodes around Arnolds Field (Acer Avenue, King Edwards Avenue, and the Rainham Reference site highlighted in grey in Figures 3 & 4) have been in place for at least 12 months allowing calculation of average concentrations of air pollution over a full year. This allows comparisons to be made against the relevant annual UK limit (for $PM_{2.5}$ this is 20 micrograms/m^3 and 40 micrograms/m^3 for NO_2), which is described in terms of the maximum allowable annual average concentration. The annual concentrations for sites close to Arnolds field (grey bars) are also compared to sites further away (blue bars) which have also been in place for 12 months or more.

Concentrations of both $PM_{2.5}$ and NO_2 at the three sites in Rainham have been similar to levels recorded by nodes elsewhere in Havering and in adjacent boroughs. Suggesting that fires at Arnolds Field have not significantly changed background levels of NO_2 and $PM_{2.5}$ over the long term.

Those background levels are also well below the relevant UK limit. However, and in common with sites across London, they are also well above the levels recommended by the WHO and above which harm to health is likely.

Further action is necessary to reduce levels of air pollution closer to the relevant WHO recommendation. Stopping recurrent fires at Arnolds Field would help achieve this.

Figure 3. Annual $PM_{2.5}$ against UK and WHO annual limits for sites closer to and further away from Arnolds field

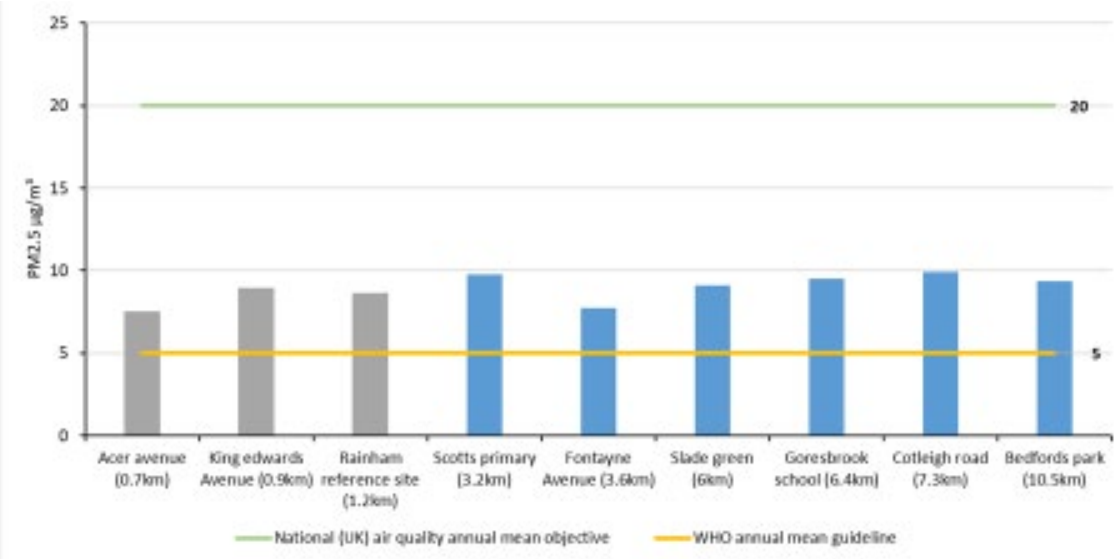
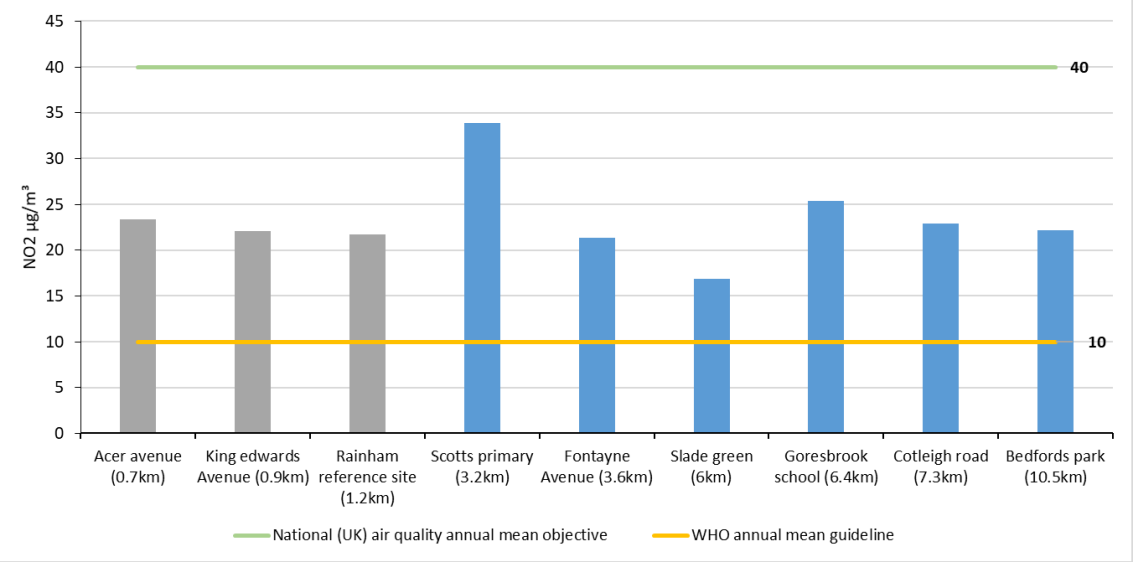


Figure 4. Annual NO_2 against UK and WHO annual limits for sites closer to and further away from Arnolds field



Levels of pollution presented as DAQI scores : August ’23

The Daily Air Quality Index (DAQI) was designed by DEFRA to act as the air pollution equivalent of the pollen or UV index. It is used in the presentation of the air pollution forecast – alerting UK residents to predicted periods of high air pollution so that we can take steps to reduce the potential for harm.

As shown in the table to the right, DAQI scores are based on the average daily concentration of $PM_{2.5}$ and the average hourly concentration of NO_2.

Scores vary from 1 to 10.

1-3 indicates low air pollution when no one needs to make any changes to their behaviour to reduce the risk of harm from air pollution

10 is very high air pollution when everyone is advised to reduce physical exertion, particularly outdoors, especially if they experience symptoms such as cough or sore throat; and adults and children with health problems that make them more vulnerable and older people, are advised to avoid strenuous physical activity and may need to adjust their medication.

Figure 5. Daily Air Quality Index

Band	Index	PM2.5 (24 hour mean µg/m3)	Nitrogen dioxide (1 hour mean µg/m3)
Low	1	0-11	0-66
	2	12-23	67-133
	3	24-35	134-200
Moderate	4	36-41	201-267
	5	42-46	268-334
	6	47-53	335-400
High	7	54-58	401-467
	8	59-64	468-534
	9	65-70	535-600
Very High	10	>71	>601

The DAQI score is used in this report to describe how pollution in Rainham varied over the past month and help residents make comparisons with levels of pollution observed at nodes further away from Arnolds Field. Changes that happened across all nodes at the same time are probably due to a regional issue e.g. weather that traps air pollution within urban areas. Poor air quality in Rainham alone is more likely to be due to a local issue – such as a fire at Launders Lane.

Dates this month where the LFB attended a fire at Launders Lane (if there were any) are highlighted in red in **Tables 1-3** that follow.

Table 1: August 2023 - NO_2 level (DAQI score) by node site (hourly) - Based on the hourly mean concentration

Approx. distance from Arnolds Field	Site Name	01-Aug	02-Aug	03-Aug	04-Aug	05-Aug	06-Aug	07-Aug	08-Aug	09-Aug	10-Aug	11-Aug	12-Aug	13-Aug	14-Aug	15-Aug	16-Aug	17-Aug	18-Aug	19-Aug	20-Aug	21-Aug	22-Aug	23-Aug	24-Aug	25-Aug	26-Aug	27-Aug	28-Aug	29-Aug	30-Aug	31-Aug
0.5 km N	Acer Avenue																															
1 km N	King Edwards Ave																															
1.1km W	Orchard Avenue																															
1.2 km NW	Rainham (refer																															
1.2 km	Spring Farm Park																															
1.3km W	Harris Academy																															
1.8 km	Ingrebourne Golf																															
3 km N	Scotts Primary																															
3 km	Slade Green																															
3.6 km	Fontain Avenue																															
6.5km W	Goresbrook School																															
7 km N	Cotleigh Road																															
10 km N	Bedfords Park																															

Based on the hourly mean concentration

Levels of NO_2 air pollution were low throughout August at all sites. DEFRA would not have recommended any change to the behaviour of residents to reduce the risk of immediate harm given this level of air pollution. Levels of NO_2 detected by nodes around Arnolds Field did not display a distinctly different pattern from that seen elsewhere. As such, these data do not suggest a significant source of air pollution unique to Rainham this month.

Table 2: August 2023 - $PM_{2.5}$ Particles Level (Index) by Node Site (Daily) - Based on the daily mean concentration for historical data, latest 24 hour running mean of current day

Approx. distance from Arnolds Field	Site Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0.4km S	Ingrebourne Links Golf & Country Club	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1	1	1	3	2	10	1
0.7km NW	Acer Avenue, Rainham	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	2
0.7km NW	Spring Farm Park	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	3	1	2
0.9 km NW	King Edwards Ave	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1
1.1km W	Orchard Avenue									1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1
1.1km W	Harris Academy, Rainham	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1
1.2 km NW	Rainham (refer)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1
3.2 km N	Scotts Primary	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1
3.6 km NW	Fontayne Avenue	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6.0km SW	Slade Green	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1
6.4 km W	Goresbrook School	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1
7.3 km NW	Cotleigh Road	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1
10.5km N	Bedfords Park	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1

N.B. dates highlighted in red in Table 2 are when there was a fire at Arnolds Field.

In the analysis of the $PM_{2.5}$ daily values (Table 2), looking at the values which are not Index 1:

- The 18th was a regional rise and was not related to the fires as can be seen since Bedfords Park was impacted (10km away from Arnolds Field)
- All other site/days which are not 1, the increase in $PM_{2.5}$ taking it out of index 1 is down to the fires at Arnolds Field.
- $PM_{2.5}$ increases for short periods were seen on other days but were not prolonged enough to elevate the daily index

Short term fluctuation in Air Quality : August ’23

Table 3. August 2023 - $PM_{2.5}$ Particles Level (Index) by Node Site (Hourly) - Based on the hourly mean concentration

Legend	PM2.5 - 1 hour mean (µg/m3)																													
0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300

August 2023 - PM2.5 Particles Level by Node Site (Hourly)

Approx. distance from Arnolds Field	Site Name	01-Aug	02-Aug	03-Aug	04-Aug	05-Aug	06-Aug	07-Aug	08-Aug	09-Aug	10-Aug	11-Aug	12-Aug	13-Aug	14-Aug	15-Aug	16-Aug	17-Aug	18-Aug	19-Aug	20-Aug	21-Aug	22-Aug	23-Aug	24-Aug	25-Aug	26-Aug	27-Aug	28-Aug	29-Aug	30-Aug	31-Aug
0.5 km N	Acer Avenue																															
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10 km N	Bedfords Park																															

Based on the hourly mean concentration

Table 3 shows $PM_{2.5}$ levels as an hourly average. These data cannot be directly compared with the DAQI which is based on a daily average so an alternative index has been produced by the Arnolds Field Technical Group. However, they can provide further confirmation that a fire at Arnolds Field is the cause of an increase in air pollution levels e.g. if the table shows an increase in air pollution at the same time as a fire at Arnolds Field i.e. darker colours on the legend; and sensors downwind of the fire at that time show the greatest increase. $PM_{2.5}$ hourly levels were at times elevated, these peaks aligned with when there were fires at Arnolds Field except for the 18th which was a regional rise and was not related to the fires as can be seen since Bedfords Park was impacted (10km away from Arnolds Field).

Air Quality at individual Breathe London nodes surrounding Arnolds field: August ’23

What follows is a presentation of data collected by Breathe London nodes at the seven sites immediately around Arnolds Field.

Figure A shows the number of days that $PM_{2.5}$ and NO_2 levels exceeded the WHO recommendation for daily average concentration (see WHO recommendations in Table 4).

NB. The UK does not have a daily target for $PM_{2.5}$ and the UK daily limit for NO_2 is considerably higher than the WHO recommendation. However, the WHO recommended limits are consistent with research evidence regarding the level above which harm to health is likely.

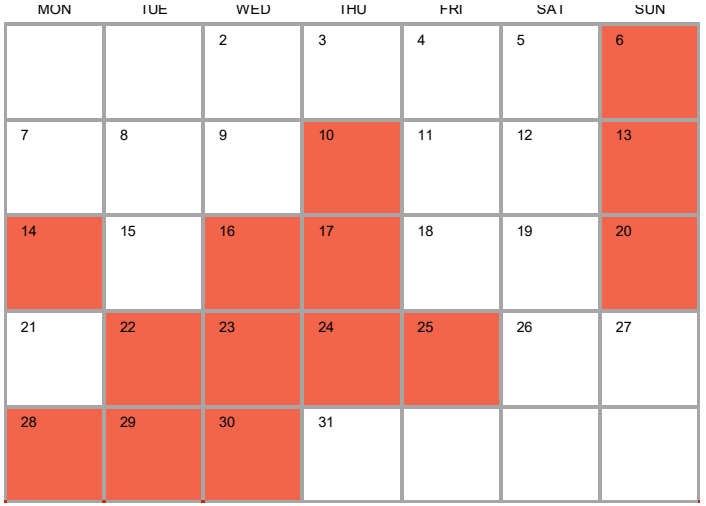
Figure B shows a trace of $PM_{2.5}$ and NO_2 levels recorded at 60 minute intervals. These data cannot be directly compared with recommended levels. However, they can provide further confirmation that a fire at Arnolds Field is the cause of an increase in air pollution levels e.g. if the trace shows an increase in air pollution at the same time as a fire at Arnolds Field; and sensors downwind of the fire at that time show the greatest increase.

Figure C shows the location of the specific node

Table 4. $PM_{2.5}$ and NO_2 UK air quality standards and WHO limits

Pollutant	Averaging time	WHO recommendations	UK Air quality limits
$PM_{2.5}$ µg/m3	Hourly		
	Daily	15	The UK does not have a daily target for $PM_{2.5}$
	Annual	5	20
NO_2 µg/m3	Hourly		200
	Daily	25	
	Annual	10	40

Figure 6. Calendar days where there were fires at Arnolds Field (highlighted red) during August 2023



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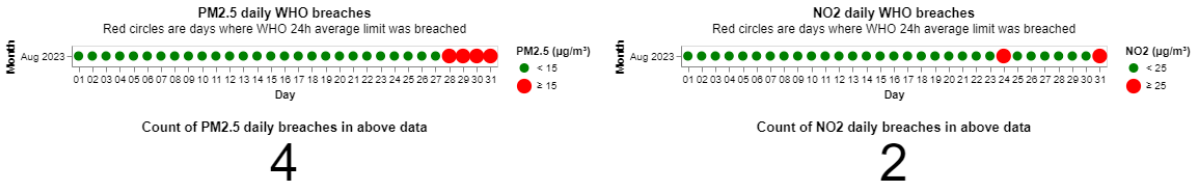


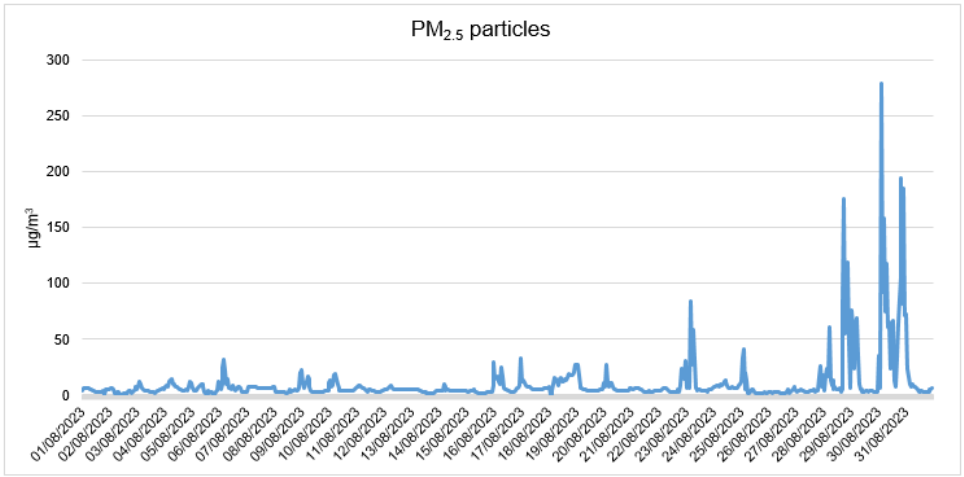
Count of PM2.5 daily breaches in above data

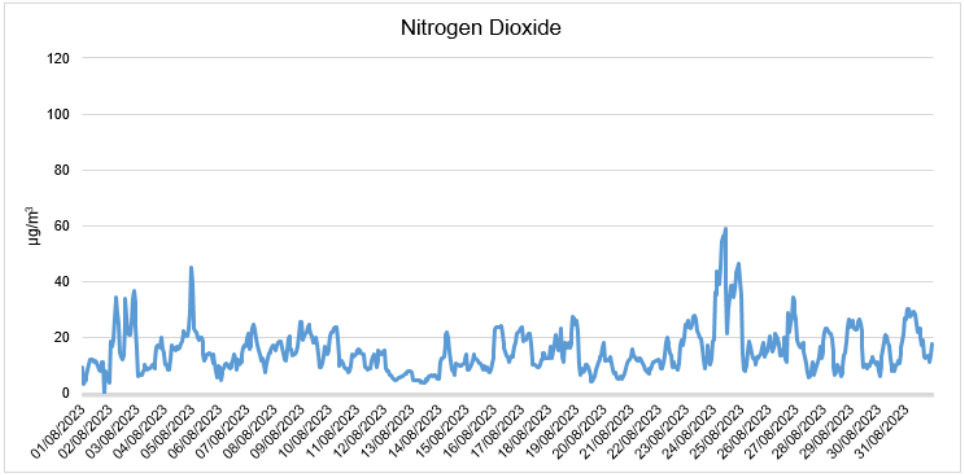
4

Count of NO2 daily breaches in above data

2

B





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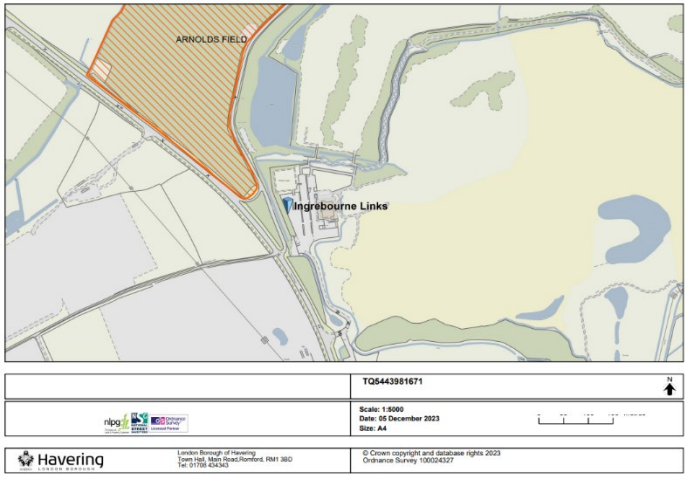


Ingrebourne Links Golf & Country Club

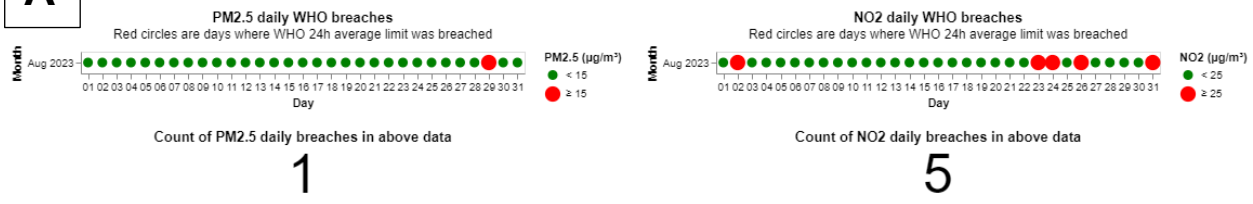
The last visible fires at Arnolds Field were in August 2023.

During August, at Ingrebourne Golf Club site, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 4 and 2 times

The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 280 and 59 micrograms/m^3, respectively.

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

A



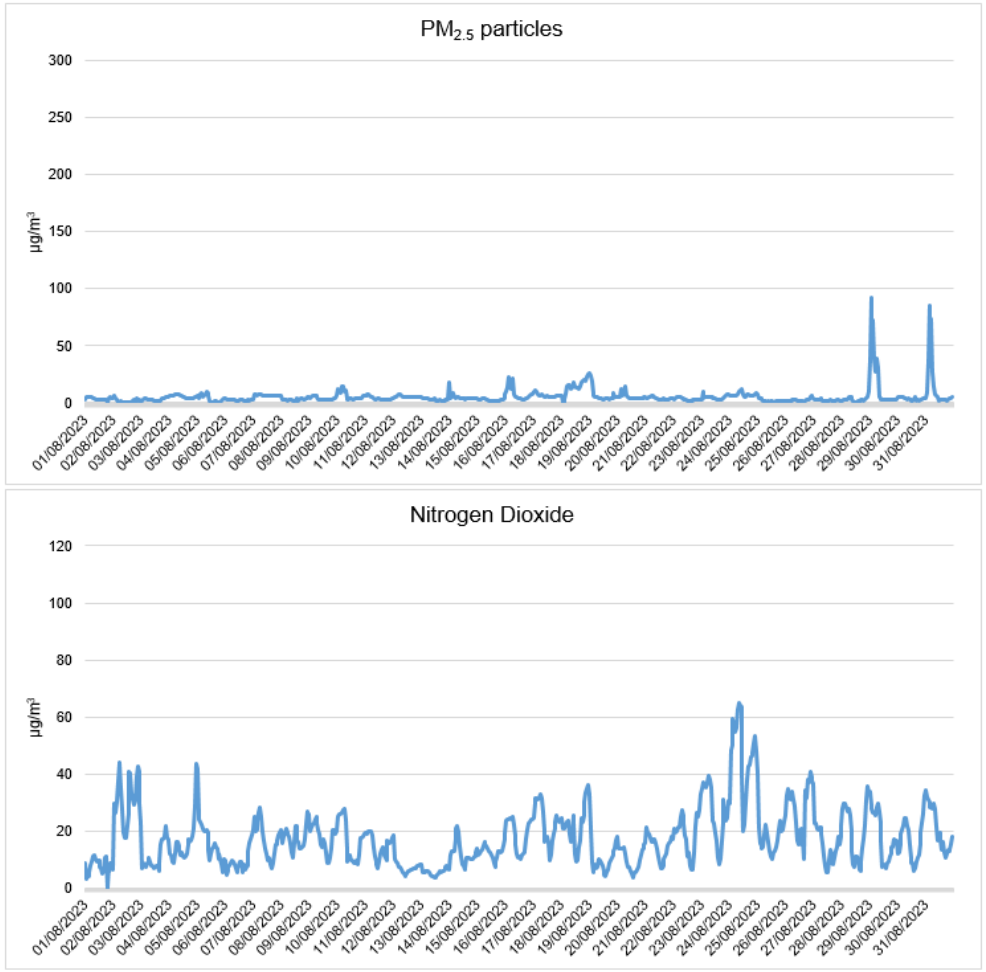
Count of PM2.5 daily breaches in above data

1

Count of NO2 daily breaches in above data

5

B



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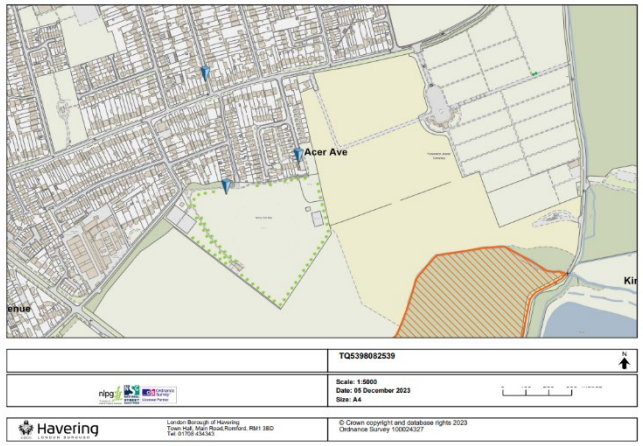


Acer Avenue

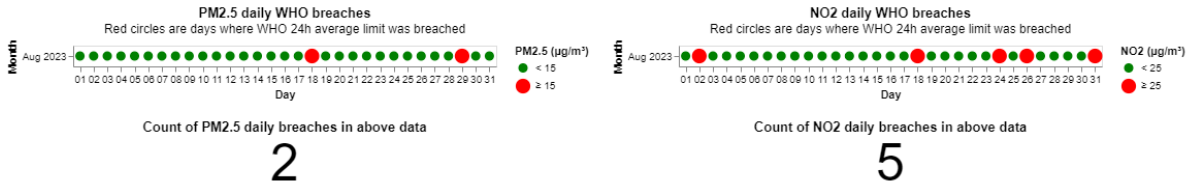
The last visible fires at Arnolds Field were in August 2023.

During August, at the Aver Avenue, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 1 and 5 times

The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 93 and 66 micrograms / m^3, respectively.

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

A



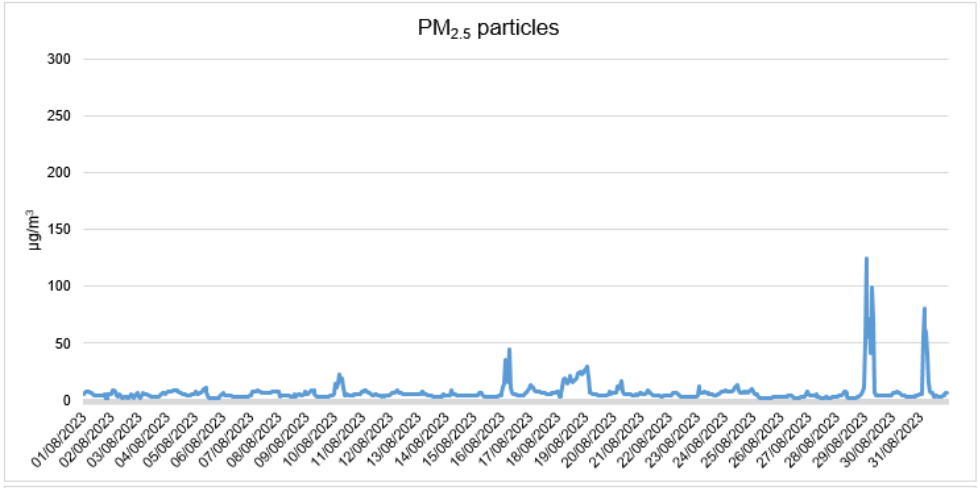
Count of PM2.5 daily breaches in above data

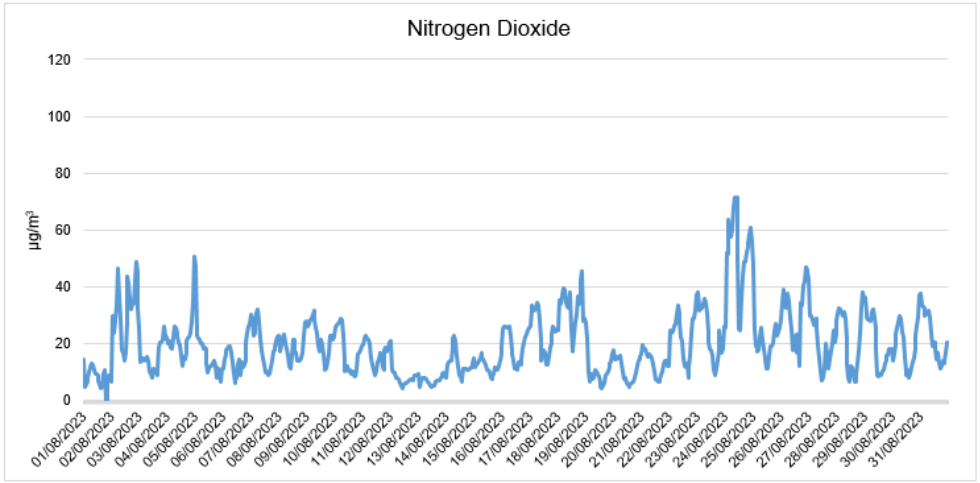
2

Count of NO2 daily breaches in above data

5

B





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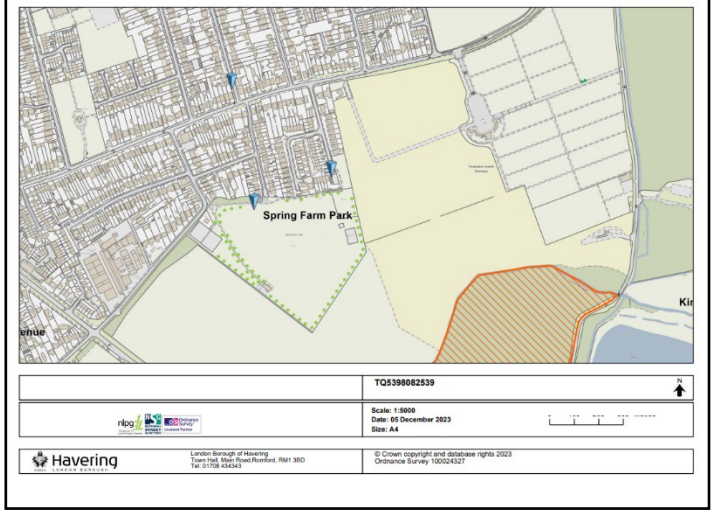


Spring Farm Park

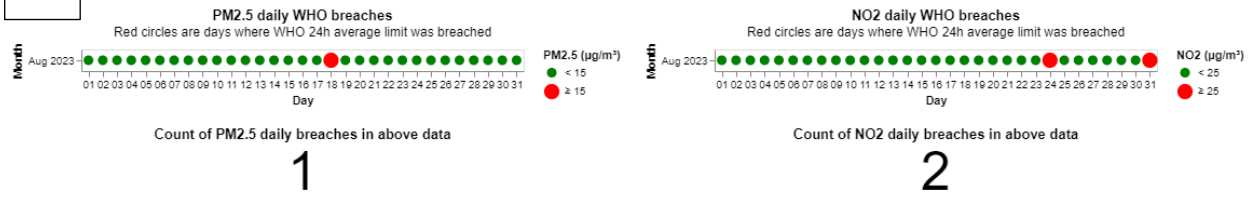
The last visible fires at Arnolds Field were in August 2023.

During August, at the Spring Farm Park site, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 2 and 5 times.

The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 125 and 72 micrograms / m^3, respectively.

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

A



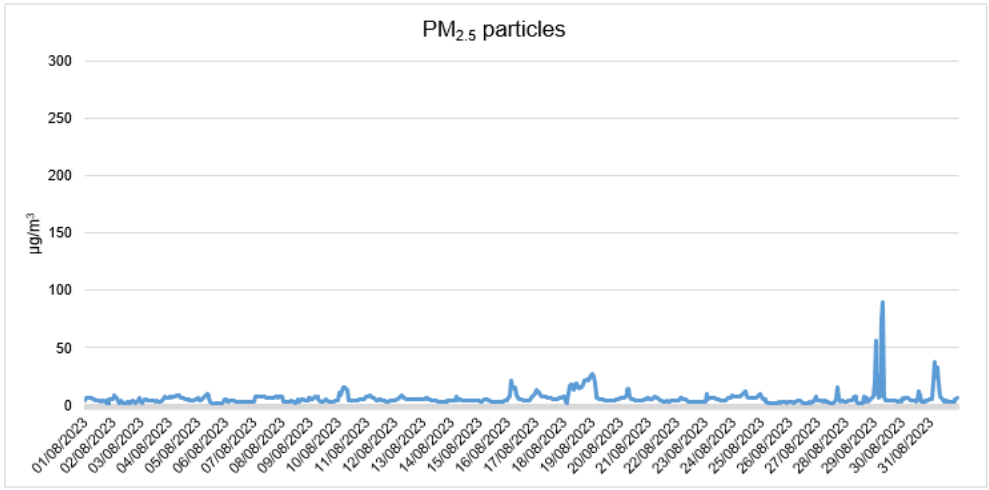
Count of PM2.5 daily breaches in above data

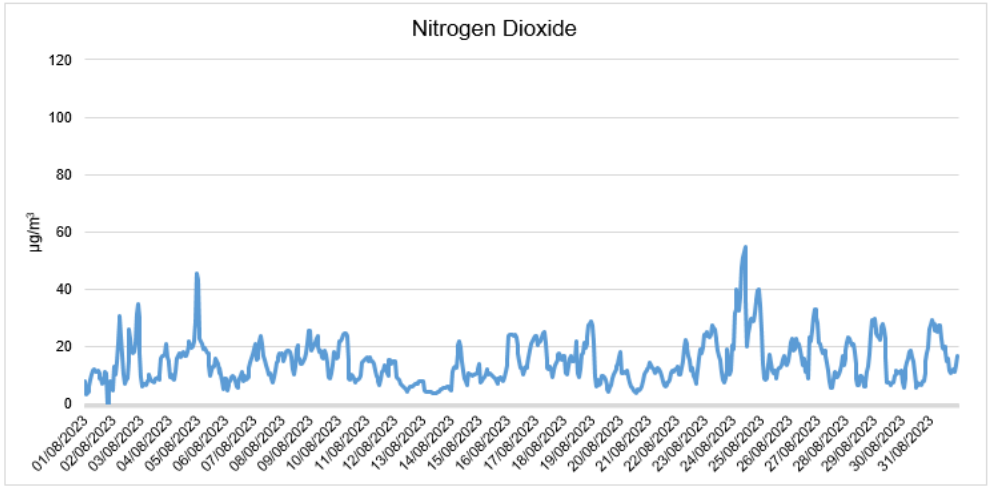
1

Count of NO2 daily breaches in above data

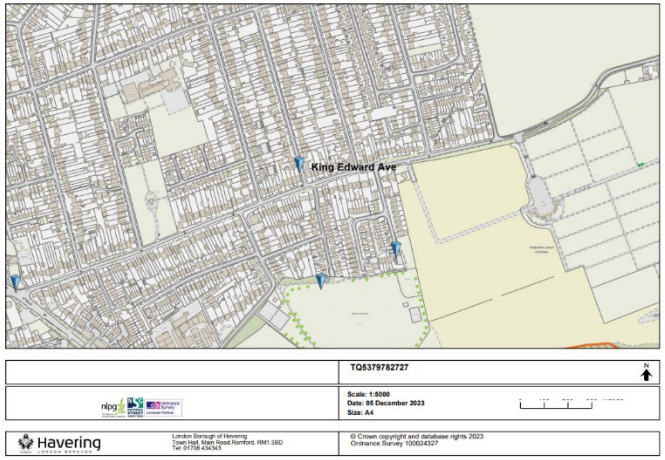
2

B





C



King Edward Avenue

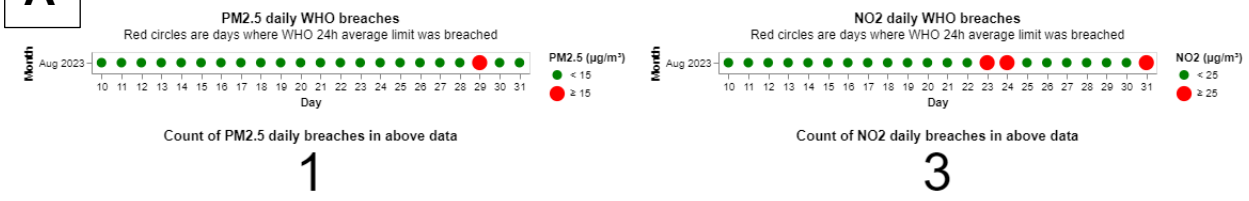
The last visible fires at Arnolds Field were in August 2023.

During August, at the King Edwards Avenue, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 1 and 2 times.

The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 90 and 55 micrograms / m^3, respectively.

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

A



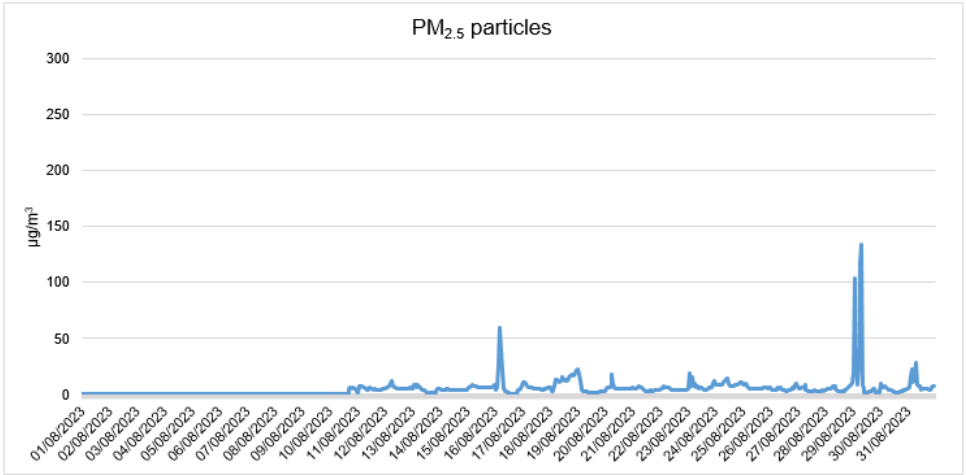
Count of PM2.5 daily breaches in above data

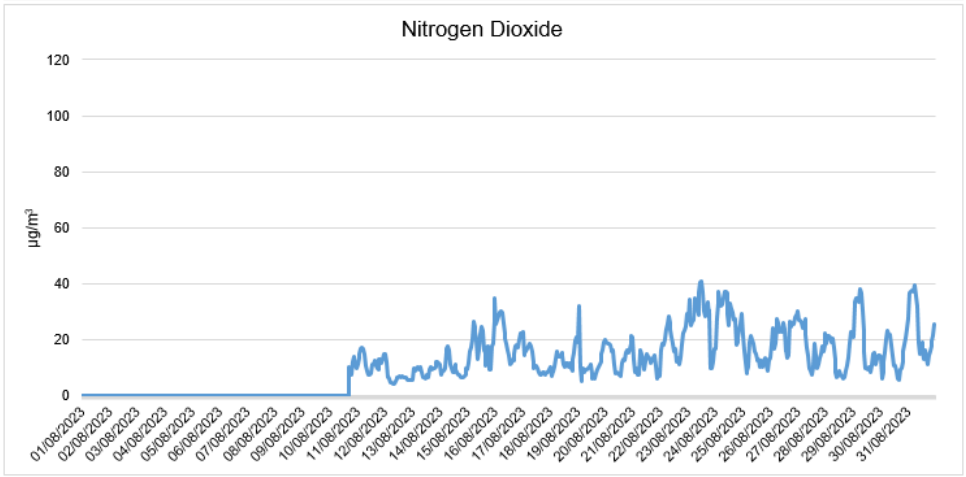
1

Count of NO2 daily breaches in above data

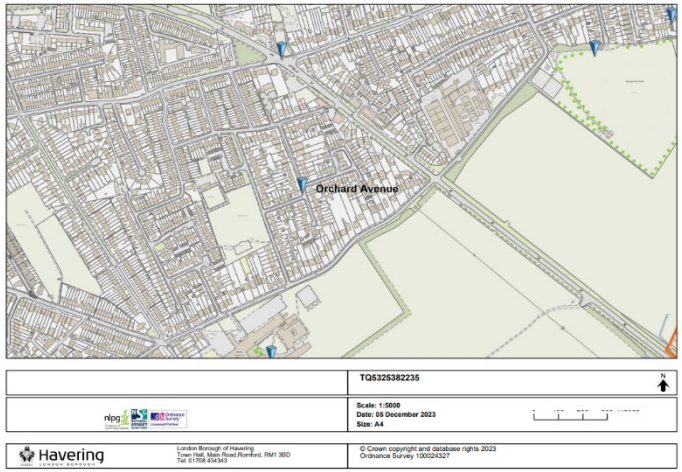
3

B





C



Orchard Avenue

The last visible fires at Arnolds Field were in August 2023.

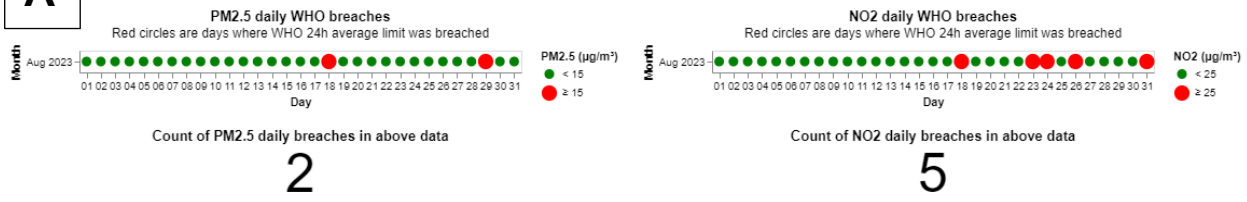
During August, at the Orchard Ave, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 1 and 3 times

The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 135 and 41 micrograms / m^3, respectively

This site launched on 10th August at 1700

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

A



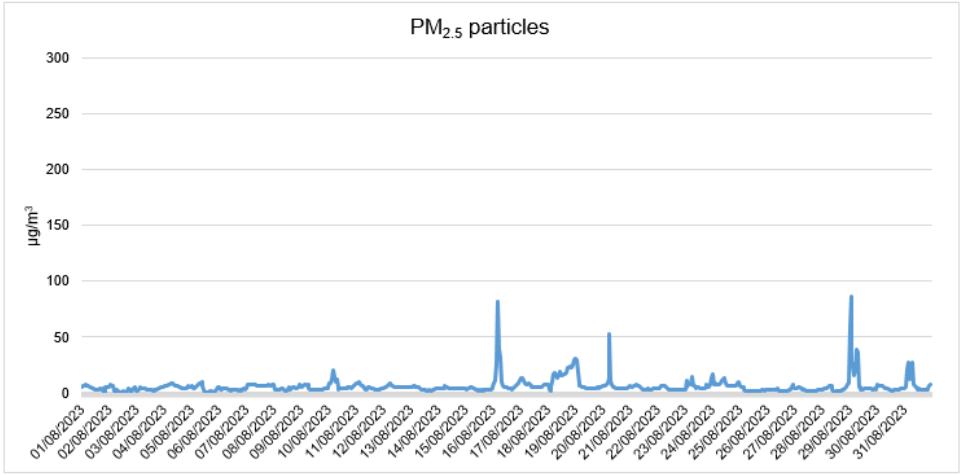
Count of PM2.5 daily breaches in above data

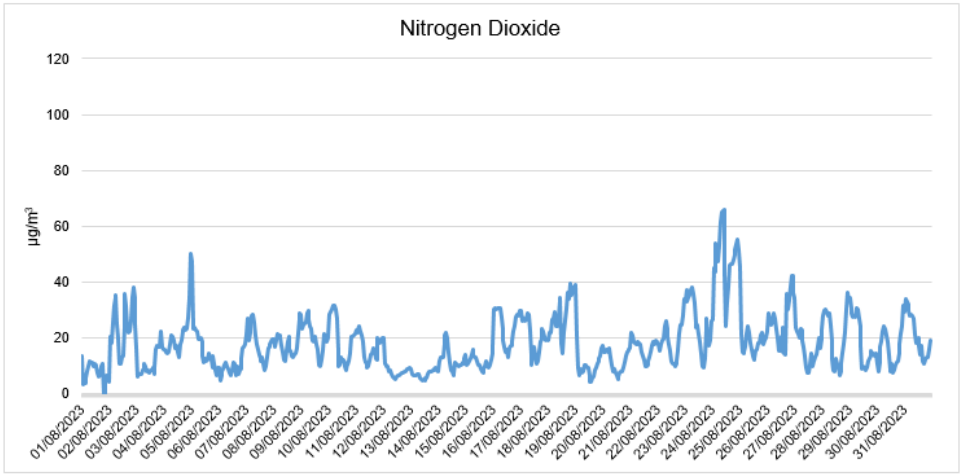
2

Count of NO2 daily breaches in above data

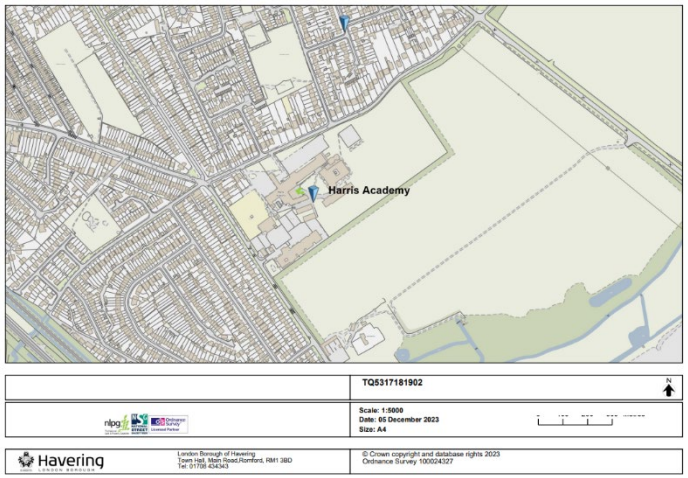
5

B





C



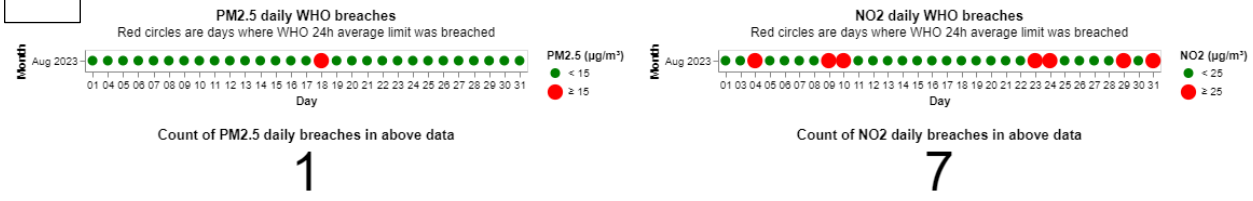
Harris Academy

The last visible fires at Arnolds Field were in August 2023. During August, at the Harris Academy site, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 2 and 5 times

The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 86 and 66 micrograms / m^3, respectively.

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

A



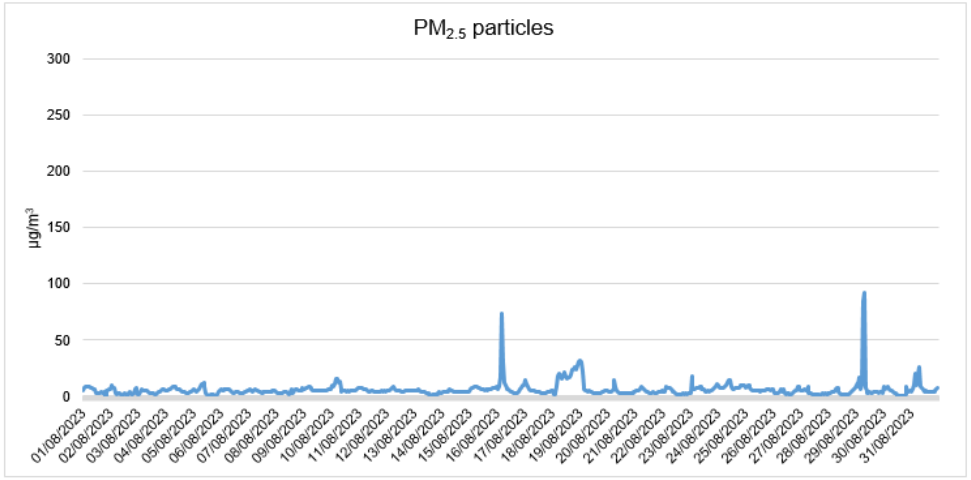
Count of PM2.5 daily breaches in above data

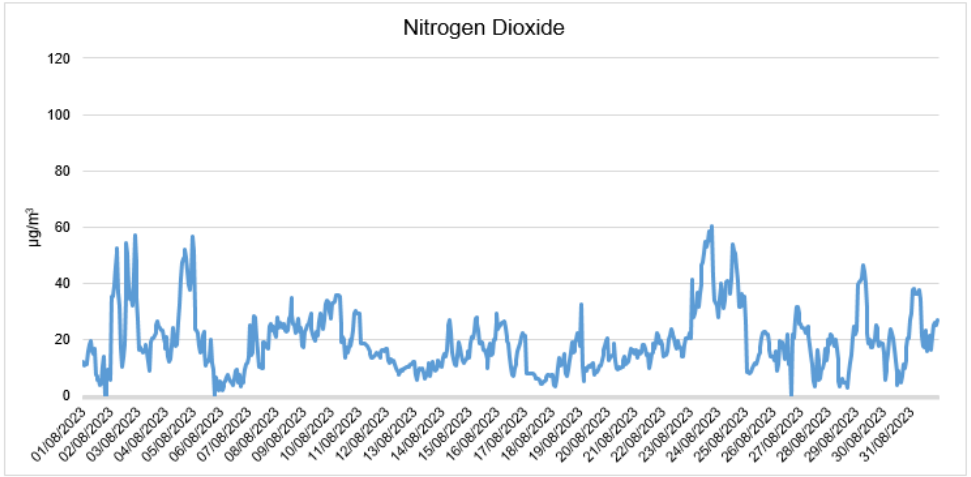
1

Count of NO2 daily breaches in above data

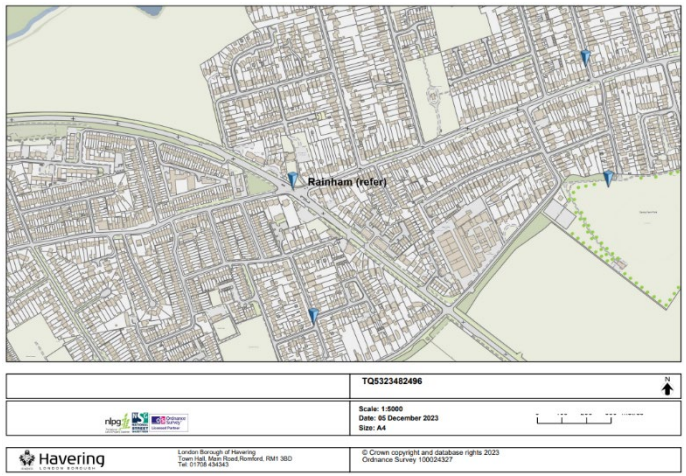
7

B





C



Rainham (reference co location)

The last visible fires at Arnolds Field were in August 2023.

During August, at the Rainham reference colocation site, the WHO daily limit for $PM_{2.5}$ and NO_2 was breached 1 and 7 times

The maximum hourly concentration recorded for $PM_{2.5}$ and NO_2 was 93 and 61 micrograms / m^3, respectively

In the absence of visible fires, the frequency and severity of air pollution peaks at this site was reduced.

Opportunity for Feedback

The Havering Council Department for Public Health would be grateful to receive feedback from residents about the updated content and information shared in these reports. It is important that these reports contain public health and environmental information that is relevant and of interest to Havering residents.

Please visit the following link to share your feedback