



Sussex Air Pollution Monitoring Network Annual Report, 2019



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Table of Contents

EXECUTIVE SUMMARY	5
INTRODUCTION	6
CHAPTER 1: Results of Continuous Monitoring, 2019.....	7
Network performance.....	7
A statistical overview of 2019.....	9
Significant episodes during 2019.....	14
2019 in Comparison with the Air Quality Strategy (AQS) Objectives	17
Indicators of Sustainable Development	20
CHAPTER 2: Trends in Pollution Levels, 2001 – 2019.....	24
How the Charts Work.....	24
PM ₁₀ Particulates	24
PM _{2.5} Particulates.....	28
Nitrogen Dioxide (NO ₂)	31
Ozone (O ₃)	35
APPENDIX	38

EXECUTIVE SUMMARY

The Sussex Air Quality Monitoring Network provides a central source of information on air pollution issues of a defined and robust quality and can be used with confidence by members of the public, researchers and local authority officers.

Overall the data capture was good across the network during 2019 with all of the analysers that were in operation for the whole year meeting the minimum requirement of 75% data capture. The reasons for lower capture rate at certain sites are described in Chapter 1.

As seen there were many days of 'Moderate' ozone (O_3) - recorded at all network sites monitoring for this pollutant. The first widespread incident resulting in 'moderate' O_3 occurred in April, and the last in August. 'High' levels were reached on two separate days on 25th July and 27th August at Rother – Rye Harbour.

'Moderate' PM_{10} levels were measured at all sites (apart from Chichester – A27 Bypass) on twelve days from January through to April and three separate days in August, November and December.

$PM_{2.5}$ was measured at two network sites during 2019, Eastbourne – Holly Place and Worthing – Grove Lodge. 'Moderate' levels of $PM_{2.5}$ pollution were recorded on ten days from February to May.

There were no occurrences of 'Moderate' sulphur dioxide or 'Moderate' nitrogen dioxide recorded during the year.

All network sites, that achieved the necessary data capture, met the PM_{10} and $PM_{2.5}$, NO_2 and SO_2 Air Quality Strategy (AQS) objectives. Carbon monoxide (CO) is no longer measured at any network site.

All network sites monitoring O_3 exceeded the AQS objective apart from Chichester Lodsworth which only just met the standard with ten exceedance days.

The running annual mean concentration for PM_{10} showed a general downward trend when compared with the previous year.

For $PM_{2.5}$ the general increase during 2018 continued through for the first half of 2019, and thereafter decreased for the rest of the year.

NO_2 at most sites remained relatively stable during 2019.

O_3 concentrations across the network showed a general decrease during 2019.

The air quality sustainability indicator for both roadside and background PM_{10} in Sussex has decreased in 2019 when compared to the previous year.

The air quality sustainability indicators for the Sussex urban and rural O_3 showed an increase in 2019.

INTRODUCTION

The Sussex Air Pollution Monitoring Network was formed in 1995 and has developed into a comprehensive regional monitoring network with nineteen continuous monitoring sites in operation in January 2019.

Network sites are placed in a range of locations according to local monitoring requirements and resources. As a network, these individual sites allow an overall view of pollution levels in rural, industrial, urban and roadside parts of Sussex. As all sites are operated to defined network quality standards, each district or borough can augment their own monitoring results with comparable data from other network sites.

This report aims to make the data more accessible by describing the air pollution trends, episodes and standards across Sussex, and providing a freely available source of information for the public, local authorities and those in education.

The network's Internet site contains peak daily readings from each site, updated each day, as well as historical data from the continuous monitoring carried out across the region. There are many other features and data tools to aid interpretation as well as more detailed information about the network and the individual monitoring sites.

A general information section on the health effects of air pollution can also be found:

Network Home page: <http://www.sussex-air.net>

CHAPTER 1: Results of Continuous Monitoring, 2019

This chapter describes the results of continuous monitoring which are presented in comparison to national and international standards and guidelines.

The extent and frequency of pollution episodes recorded during 2019 are also reported with some background information as to the cause of each.

Statistics from three London Air Quality Network sites are included at the base of each table for comparison purposes.

'Marylebone Road' is a kerbside site located on a busy six-lane road in central London. 'Kensington & Chelsea' is a background site in central London and 'Greenwich' is a background site in outer London.

Further information on these sites can be found at:

<http://www.londonair.org.uk>

Network performance

Table 1.1 shows data capture rates for each network analyser during 2019. Low capture rates may be caused by repeated or prolonged analyser or logging system breakdown, on-site communications problems or interruptions in power supply to the monitoring stations.

All of the analysers that were in operation for the whole year met the minimum requirement of 75% data capture. However, the following sites failed to meet the stricter network target of 90% valid data capture:

Chichester – Lodsworth, O₃: The analyser suffered a flow fault for several days during April and May. There were further problems in July and August due to water ingress.

Wealden – Isfield, O₃: There was a UV lamp failure for over a month during August and September.

Eastbourne – Devonshire Park, PM₁₀; there were several periods where tape faults were not attended for over ten days resulting in data loss.

Wealden – Lullington Heath, SO₂; a national monitoring network site ratified by a third party. The reasons for the low data capture are not known at this time.

Lewes – West Street, PM₁₀; numerous flow faults throughout the year. The analyser was removed from site in January 2020 and currently there are no plans to replace it.

For the sites where analysers fell below the 75% threshold annual statistics are generally considered unrepresentative of the full year and results in the following tables are replaced with 'n.a.' where applicable.

Table 1.1 Analyser capture rates (%) for 2019

Capture Rate (%)	Nitrogen Dioxide	Ozone	PM ₁₀	PM ₂₅	Sulphur Dioxide
Adur - Shoreham-by-Sea	92	-	96	-	-
Chichester - Lodsworth	-	88	-	-	-
Wealden - Isfield	-	89	-	-	-
Brighton and Hove - Preston Park ¹	97 ¹	99 ¹	-	-	-
Crawley - Gatwick Airport ²	99	-	71 ²	-	-
Chichester - A27 Chichester Bypass	97	-	99	-	-
Chichester – Orchard Street	100	-	-	-	-
Chichester – Westhampnett Road ³	88 ³	-	-	-	-
Eastbourne - Devonshire Park	91	90	89	-	-
Eastbourne - Holly Place ¹	91 ¹	-	95 ¹	98 ¹	-
Horsham - Park Way	98	-	92	-	-
Horsham - Storrington ¹	96 ¹	-	-	-	-
Horsham - Cowfold	96	-	-	-	-
Hastings - Bulverhythe	100	-	96	-	-
Wealden - Lullington Heath ¹	98 ¹	98 ¹	-	-	81 ¹
Lewes - West Street	99	-	88	-	-
Rother – Rye Harbour	-	96	-	-	-
Rother - De La Warr Road	100	-	98	-	-
Worthing 2 - Grove Lodge ¹	97 ¹	-	-	97 ¹	-

¹ AURN

² Crawley Gatwick Airport PM₁₀ joined network in April 2019

³ Chichester Westhampnett Road commissioned February 2019

A statistical overview of 2019

Annual mean concentrations are shown in Table 1.2. These statistics are calculated from hourly mean concentrations.

Chapter 2 describes trends in running annual mean concentrations in more detail.

Tables 1.3 and 1.4 show the number of days in which 'Moderate' and 'High' pollution were measured at each site. 'Very high' air pollution was not measured at any of the network sites during 2019.

The air quality banding system has been set by the Government to help describe pollution levels and their associated health effects.

More information on the Air Quality Banding System can be found at:

<http://londonair.org.uk/london/asp/airpollutionindex.asp?IndexDate=2012>

Air pollution banding	Value	Accompanying health messages for at-risk groups and the general population	
		At-risk individuals *	General population
Low	1-3	<i>Enjoy</i> your usual outdoor activities.	<i>Enjoy</i> your usual outdoor activities.
Moderate	4-6	Adults and children with lung problems, and adults with heart problems, who experience symptoms , should consider reducing strenuous physical activity, particularly outdoors.	<i>Enjoy</i> your usual outdoor activities.
High	7-9	Adults and children with lung problems, and adults with heart problems, should reduce strenuous physical exertion, particularly outdoors, and particularly if they experience symptoms. People with asthma may find they need to use their reliever inhaler more often. Older people should also reduce physical exertion.	Anyone experiencing discomfort such as sore eyes, cough or sore throat should consider reducing activity, particularly outdoors.
Very High	10	Adults and children with lung problems, adults with heart problems, and older people, should avoid strenuous physical activity. People with asthma may find they need to use their reliever inhaler more often.	Reduce physical exertion, particularly outdoors, especially if you experience symptoms such as cough or sore throat.

* Adults and children with heart or lung problems are at greater risk of symptoms. Follow your doctor's usual advice about exercising and managing your condition.

Table 1.2 Annual means 2019					
Mean concentration	Nitrogen Dioxide	Ozone	PM ₁₀	PM ₂₅	Sulphur Dioxide
Adur - Shoreham-by-Sea	26	-	24	-	-
Chichester - Lodsworth	-	56	-	-	-
Wealden - Isfield	-	51	-	-	-
Brighton and Hove - Preston Park ¹	15 ¹	47 ¹	-	-	-
Crawley - Gatwick Airport ²	25	-	(17 ²)	-	-
Chichester - A27 Chichester Bypass	28	-	19	-	-
Chichester – Orchard Street	21	-	-	-	-
Chichester – Westhampnett Road ³	27 ³	-	-	-	-
Eastbourne - Devonshire Park	16	57	17	-	-
Eastbourne - Holly Place ¹	11 ¹	-	16 ¹	10 ¹	-
Horsham - Park Way	24	-	19	-	-
Horsham - Storrington ¹	22 ¹	-	-	-	-
Horsham - Cowfold	24	-	-	-	-
Hastings - Bulverhythe	15	-	22	-	-
Wealden - Lullington Heath ¹	7 ¹	61 ¹	-	-	1.1 ¹
Lewes - West Street	19	-	18	-	-
Rother – Rye Harbour	-	55	-	-	-
Rother - De La Warr Road	20	-	20	-	-
Worthing 2 - Grove Lodge ¹	33 ¹	-	-	10 ¹	-
Greenwich 4	17	44	14	11	(3)
Kens and Chelsea 1	27	47	-	10	1.6
Marylebone Road	63	22	(26)	-	4
Values shown in brackets have less than 75% data capture rate					

¹ AURN

² Crawley Gatwick Airport PM₁₀ joined network in April 2019

³ Chichester Westhampnett Road commissioned February 2019

Table 1.3 Number of days 'moderate' air pollution during 2019 (Air Quality Index 4-6)					
	Nitrogen Dioxide	Ozone	PM ₁₀	PM ₂₅	Sulphur Dioxide
Adur - Shoreham-by-Sea	0	-	8	-	-
Chichester - Lodsworth	-	10	-	-	-
Wealden - Isfield	-	24	-	-	-
Brighton and Hove - Preston Park ¹	0 ¹	14 ¹	-	-	-
Crawley - Gatwick Airport ²	0	-	(4 ²)	-	-
Chichester - A27 Chichester Bypass	0	-	0	-	-
Chichester – Orchard Street	0	-	-	-	-
Chichester – Westhampnett Road ³	0 ³	-	-	-	-
Eastbourne - Devonshire Park	0	13	1	-	-
Eastbourne - Holly Place ¹	0 ¹	-	3 ¹	10 ¹	-
Horsham - Park Way	0	-	5	-	-
Horsham - Storrington ¹	0 ¹	-	-	-	-
Horsham - Cowfold	0	-	-	-	-
Hastings - Bulverhythe	0	-	4	-	-
Wealden - Lullington Heath ¹	0 ¹	20 ¹	-	-	0 ¹
Lewes - West Street	0	-	1	-	-
Rother – Rye Harbour	-	17	-	-	-
Rother - De La Warr Road	0	-	5	-	-
Worthing 2 - Grove Lodge ¹	0 ¹	-	-	5 ¹	-
Greenwich 4	0	17	2	10	(0)
Kens and Chelsea 1	0	18	-	8	0
Marylebone Road	0	0	(2)	-	0
Values shown in brackets have less than 75% data capture rate					

¹ AURN

² Crawley Gatwick Airport PM₁₀ joined network in April 2019

³ Chichester Westhampnett Road commissioned February 2019

Table 1.4 Number of days 'high' air pollution during 2019 (Air Quality Index 7-9)					
	Nitrogen Dioxide	Ozone	PM ₁₀	PM ₂₅	Sulphur Dioxide
Adur - Shoreham-by-Sea	0	-	0	-	-
Chichester - Lodsworth	-	0	-	-	-
Wealden - Isfield	-	0	-	-	-
Brighton and Hove - Preston Park ¹	0 ¹	0 ¹	-	-	-
Crawley - Gatwick Airport ²	0	-	(0 ²)	-	-
Chichester - A27 Chichester Bypass	0	-	0	-	-
Chichester – Orchard Street	0	-	-	-	-
Chichester – Westhampnett Road ³	0 ³	-	-	-	-
Eastbourne - Devonshire Park	0	0	0	-	-
Eastbourne - Holly Place ¹	0 ¹	-	-	0 ¹	-
Horsham - Park Way	0	-	0	-	-
Horsham - Storrington ¹	0 ¹	-	-	-	-
Horsham - Cowfold	0	-	-	-	-
Hastings - Bulverhythe	0	-	0	-	-
Wealden - Lullington Heath ¹	0 ¹	0 ¹	-	-	0 ¹
Lewes - West Street	0	-	0	-	-
Rother – Rye Harbour	-	2	-	-	-
Rother - De La Warr Road	0	-	0	-	-
Worthing 2 - Grove Lodge ¹	0 ¹	-	-	-	-
Greenwich 4	0	0	0	0	(0)
Kens and Chelsea 1	0	0	0	0	0
Marylebone Road	0	0	(0)	0	0
Values shown in brackets have less than 75% data capture rate					

¹AURN

²Crawley Gatwick Airport PM₁₀ joined network in April 2019

³Chichester Westhampnett Road commissioned February 2019

Nitrogen Dioxide (NO₂) and Sulphur Dioxide (SO₂)

There were no occurrences of 'Moderate' or above NO₂ or SO₂ pollution during 2019 at network sites.

Ozone (O₃)

Widespread 'Moderate' O₃ was recorded on a number of days at all the network sites monitoring for this pollutant. These episodes occur during the warmer sunnier months due to the photochemical reaction of nitrogen oxides with hydrocarbons.

It is also known that a proportion of the O₃ experienced in Sussex is transported from continental Europe under certain meteorological conditions.

The first widespread incident resulting in 'Moderate' O₃ occurred in April, and the last in August.

'High' levels were reached on two separate days on 25th July and 27th August at Rother – Rye Harbour.

PM₁₀ Particulates

Defra's Air Pollution Index applies to PM₁₀ measured by a reference equivalent method such as the Filter Dynamic Measurement System (FDMS). The TEOM PM₁₀ data has been converted to reference equivalent PM₁₀ using the Volatile Correction Model (VCM) method developed by King's College London. All TEOM PM₁₀ data reported on the Sussex-air website prior to the 1st January 2004 has been corrected using a gravimetric conversion factor of 1.3. All data reported after the 1st January 2004 has been corrected using the Volatile Correction Model (VCM).

Further details about the VCM can be found at:

<http://www.volatile-correction-model.info/>

'Moderate' PM₁₀ levels, were measured at all sites apart from Chichester – A27 Bypass on twelve days from January through to April and three separate days in August, November and December.

PM_{2.5} Particulates

PM_{2.5} was measured at two network sites during 2019, Eastbourne – Holly Place and Worthing – Grove Lodge. 'Moderate' pollution was recorded on ten days from February to May.

Significant episodes during 2019

Particulate Episodes

'Moderate' PM₁₀ and PM_{2.5} episodes occurred from January to May 2019 and also during August, November and December 2019 at all but one (Chichester – A27 Bypass) of the network sites that monitor these pollutants.

The first widespread incident occurring at four of the sites (Adur – Shoreham-by-Sea, Horsham – Park Way, Lewes – West Street and Eastbourne – Holly Place) was on the 27th February and thereafter there were a further eleven days during the proceeding months to May where episodes occurred at several sites. Analysis of the episodes indicate the cause to be a combination of poor dispersion of locally emitted air pollution and the import air particle pollution from Europe.

A further three episodes of 'moderate' PM₁₀ were recorded in August, November and December. The first two of these on 10th August and 2nd November were recorded at only Adur – Shoreham-By-Sea and the remaining one, on 19th December was recorded at Hastings – Bulverhythe.

The daily mean PM₁₀ levels for 2019 are illustrated in Figure 1.

Figure 1 Daily mean PM₁₀ levels across the network during 2019

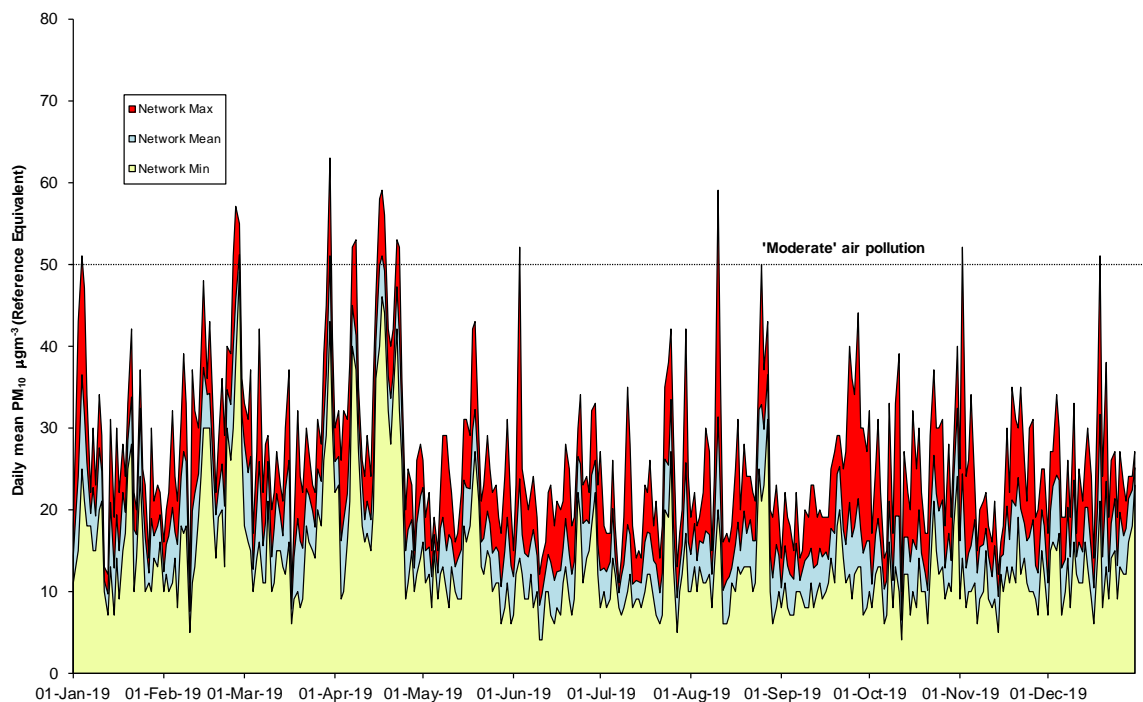
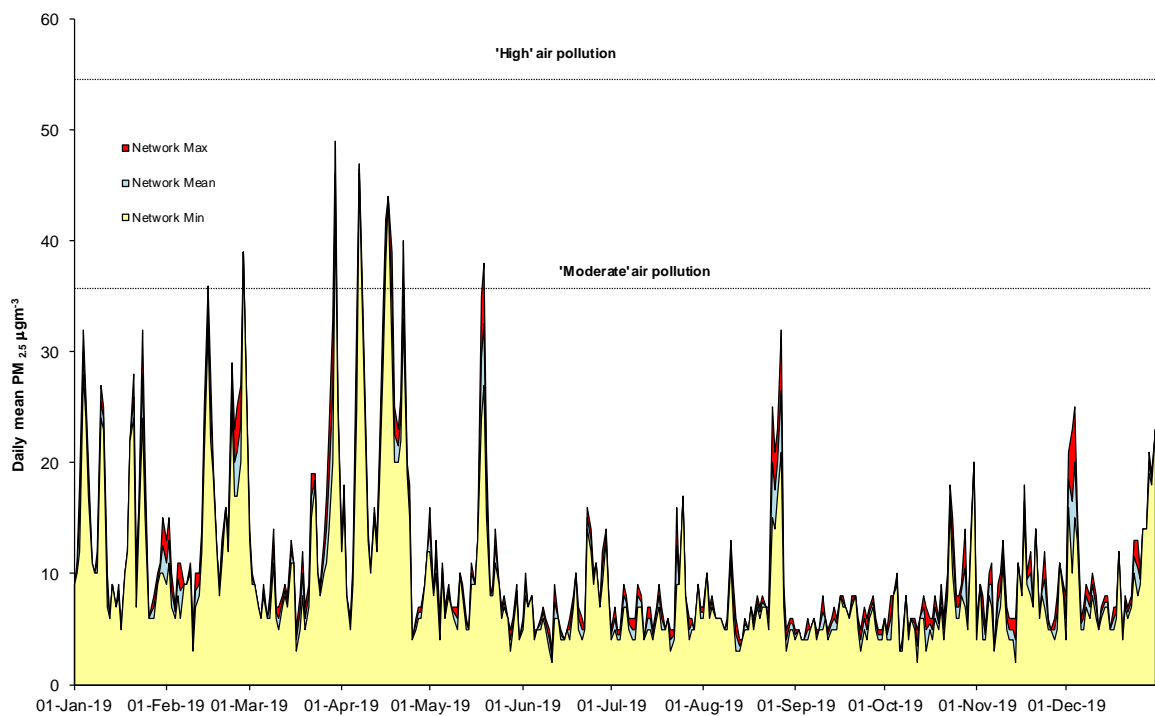


Figure 2 Daily mean PM_{2.5} levels across the network during 2019



The daily mean PM_{2.5} levels for 2019 are illustrated in Figure 2.

Spring & Summer Photochemical Episodes

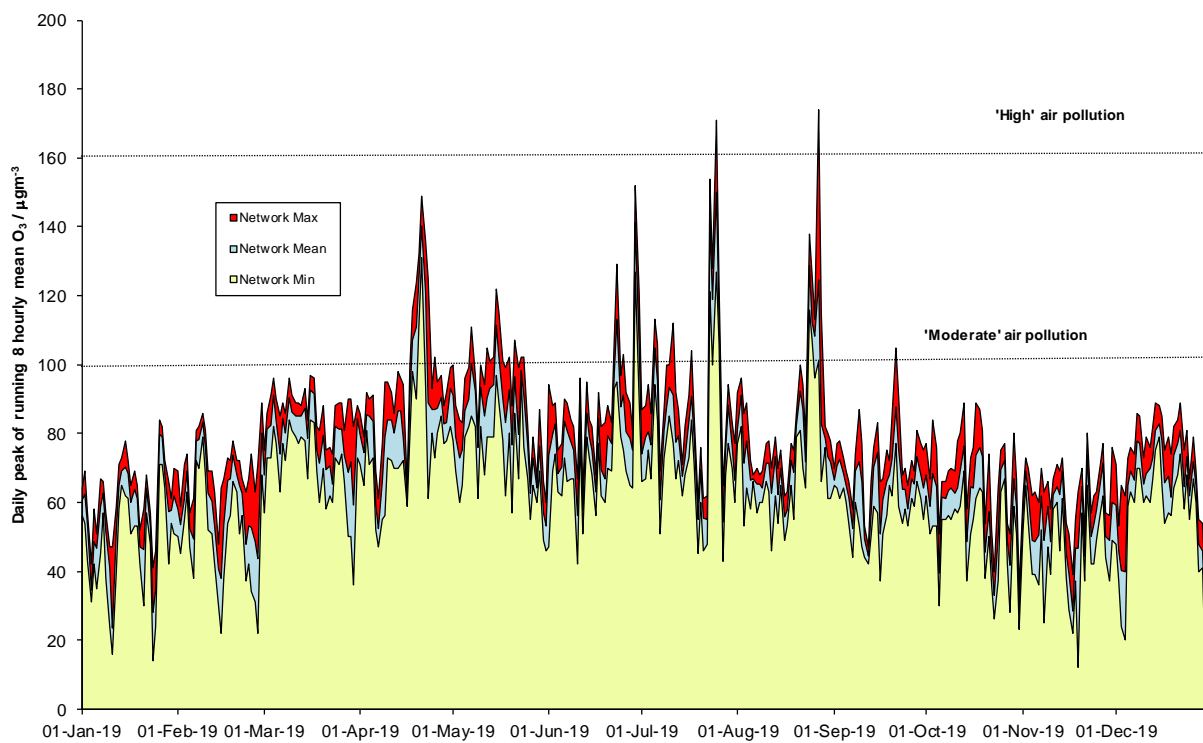
Figure 3 illustrates the distribution of photochemical episodes of O₃ during 2019.

Photochemical episodes occur annually in Sussex. Their development is due to a complex set of reactions involving NO_x and hydrocarbons in the presence of sunlight.

A proportion of the O₃ experienced in Sussex is also transported from continental Europe.

The first widespread O₃ episode of the year occurred in April and the last in August with 'High' levels recorded on two separate days on 25th July and 27th August at the Rother – Rye Harbour site.

Figure 3 Daily peak of running 8 hourly mean ozone levels across the network during 2019



2019 in Comparison with the Air Quality Strategy (AQS) Objectives

Tables 1.5a and 1.5b compare results of monitoring in 2019 to the Government's AQS objectives. There is often more than one objective per pollutant reflecting the differing health effects of short and long-term exposure. Each objective had an achievement date between 2004 and 2010 depending on the pollutant. The PM_{2.5} objective has an achievement date of 2020.

Where a site did not achieve a minimum of 75% data capture for the year, the measurements cannot be accurately compared to the AQS objectives and are entered as 'not applicable'.

No network sites exceeded either PM₁₀ or PM_{2.5} objectives. The distribution of exceedances of the 50 µg^m⁻³ daily mean value of PM₁₀ (equating to the EU Health Threshold) across the network during 2019 is shown in Figure 1.

The distribution of exceedances of the 36 µg^m⁻³ daily mean value of PM_{2.5} during 2019 is shown in figure2.

All sites also met the NO₂ and SO₂ objectives (SO₂ measured at only one site).

All network sites monitoring O₃ exceeded the AQS objective apart from Chichester Lodsworth which only just met the standard with ten exceedance days.

The daily peak of running eight hourly mean O₃ levels across the network during 2019 are shown in Figure 3.

CO is no longer monitored at any of the Sussex stations.

Table 1.5a Comparison with Air Quality Strategy Objectives – Achieved ('yes') or Exceeded ('no')						
	PM ₁₀		PM _{2.5}		SO ₂	
	A	B	C	D	E	F
Adur - Shoreham-by-Sea	Yes (8)	Yes (24)	-	-	-	-
Chichester - Lodsworth	-	-	-	-	-	-
Wealden - Isfield	-	-	-	-	-	-
Brighton and Hove - Preston Park ¹	-	-	-	-	-	-
Crawley - Gatwick Airport ²	n.a	n.a	-	-	-	-
Chichester - A27 Chichester Bypass	Yes (0)	Yes (19)	-	-	-	-
Chichester – Orchard Street	-	-	-	-	-	-
Chichester – Westhampnett Road ³	-	-	-	-	-	-
Eastbourne - Devonshire Park	Yes (1)	Yes (17)	-	-	-	-
Eastbourne - Holly Place ¹	Yes (3) ¹	Yes (16) ¹	Yes (10) ¹	-	-	-
Horsham - Park Way	Yes (5)	Yes (19)	-	-	-	-
Horsham - Storrington ¹	-	-	-	-	-	-
Horsham - Cowfold	-	-	-	-	-	-
Hastings - Bulverhythe	Yes (4)	Yes (22)	-	-	-	-
Wealden - Lullington Heath ¹	-	-	-	Yes (0) ¹	Yes(0) ¹	Yes (0) ¹
Lewes - West Street	Yes (1)	Yes (18)	-	-	-	-
Rother – Rye Harbour	-	-	-	-	-	-
Rother - De La Warr Road	Yes (5)	Yes (20)	-	-	-	-
Worthing 2 - Grove Lodge ¹	-	-	Yes (10) ¹	-	-	-
Greenwich 4	Yes (2)	Yes (14)	Yes (11)	n.a	n.a	n.a
Kens and Chelsea 1	-	-	Yes (10)	Yes (0)	Yes (0)	Yes (0)
Marylebone Road	n.a	n.a	-	Yes (0)	Yes (0)	Yes (0)

¹AURN

²Crawley Gatwick Airport PM₁₀ joined network in April 2019

³Chichester Westhampnett Road commissioned February 2019

A: 50 µg m⁻³ not to be exceeded more than 35 times a year measured as 24 hr mean. Data is reference equivalent

B: 40 µg m⁻³ measured as annual mean. All data is reference equivalent

C: 25 µg m⁻³ measured as annual mean. All data is reference equivalent

D: 350 µg m⁻³ not to be exceeded more than 24 times a year measured as 1 hour mean.

E: 125 µg m⁻³ not to be exceeded more than 3 times a year measured as 24 hour mean.

F: 266 µg m⁻³ not to be exceeded more than 35 times a year measured as 15 min.

Table 1.5b Comparison with Air Quality Strategy Objectives – Achieved ('yes') or Exceeded ('no')			
	O ₃		
	A	B	C
Adur - Shoreham-by-Sea	-	Yes (0)	Yes (26)
Chichester - Lodsworth	Yes (10)	-	-
Wealden - Isfield	No (24)	-	-
Brighton and Hove - Preston Park ¹	No (14) ¹	Yes (0) ¹	Yes(15) ¹
Crawley - Gatwick Airport	-	Yes (0)	Yes (25)
Chichester - A27 Chichester Bypass	-	Yes (0)	Yes (28)
Chichester – Orchard Street	-	Yes (0)	Yes (21)
Chichester – Westhampnett Road ³	-	Yes (0)	Yes (27)
Eastbourne - Devonshire Park	No (13)	Yes (0)	Yes (16)
Eastbourne - Holly Place ¹	-	Yes (0)	Yes (11)
Horsham - Park Way	-	Yes (0)	Yes (24)
Horsham - Storrington ¹	-	Yes (0) ¹	Yes (22) ¹
Horsham - Cowfold	-	Yes (0)	Yes (24)
Hastings - Bulverhythe	-	Yes (0)	Yes (15)
Wealden - Lullington Heath ¹	No (20) ¹	Yes (0) ¹	Yes (7) ¹
Lewes - West Street	-	Yes (0)	Yes (19)
Rother – Rye Harbour	No (19)	-	-
Rother - De La Warr Road	-	Yes (0)	Yes (20)
Worthing 2 - Grove Lodge ¹	-	Yes (0) ¹	Yes (33) ¹
Greenwich 4	No (17)	Yes (0)	Yes (17)
Kens and Chelsea 1	No (18)	Yes (0)	Yes (27)
Marylebone Road	Yes (0)	Yes (0)	No (63)

¹ AURN

² Crawley Gatwick Airport PM₁₀ joined network in April 2019

³ Chichester Westhampnett Road commissioned February 2019

A: 100 µg m⁻³ not to be exceeded more than 10 times a year measured as the daily max of running 8 hour mean.

B: 200 µg m⁻³ not to be exceeded more than 18 times a year measured as 1 hour mean.

C: 40 µg m⁻³ measured as an annual mean.

Indicators of Sustainable Development

The UK Government is required by European Union law to publish a number of indicators that can be used to assess whether its aims of sustainable development are being met. The UK Sustainable Development Strategy was released in 1999 and one of the Headline Indicators was air quality. The strategy was updated in 2005 and included new air quality indicators designed to better reflect the effects on health of long term exposure to lower levels of pollution.

The three indicators are:

- i. Annual average urban PM₁₀ concentrations (roadside and background),
- ii. Annual average O₃ concentrations (rural and urban background) measured as the daily maximum 8-hour running mean,
- iii. Total number of days in which one or more of the specified pollutants were recorded as 'Moderate' or worse air pollution (the old headline indicator) in urban and rural locations.

The third indicator is the most complex and has a number of site requirements to ensure that monitoring data are representative:

- Rural sites should be included if they at least monitor O₃ (ideally PM₁₀ should also be monitored but this criterion would exclude almost all sites from the Indicator),
- Urban Background and Roadside sites should be included if they monitor at least PM₁₀

Due to the small number of exceedances, it was decided that the absence of monitoring for NO₂ and CO would not result in a significant under-reporting of episodes.

Analysers must record an annual data capture rate of at least 75% to be included in any of the indicator calculations.

Sites demonstrated to be far outliers as a result of local factors in a particular year should be excluded from the analysis.

Air Quality Sustainability Indicator for Sussex

The following sites meet the criteria for inclusion in the Indicator calculation for 2019:

- **Rural: AQ Indicator:** Chichester - Lodsworth, Wealden – Isfield, Wealden – Lullington Heath, Rother – Rye Harbour.
- **Urban AQ Indicator (*background*):** Brighton and Hove – Preston Park, Eastbourne – Devonshire Park, Eastbourne – Holly Place
- **Urban AQ Indicator (*roadside*):** Adur – Shoreham-By-Sea, Hastings – Bulverhythe, Horsham – Park Way, Chichester - A27 Chichester Bypass, Lewes - West Street, Rother – De La Warr Road.

Figure 4 plots the first Sustainability Indicator for long-term monitoring sites in Sussex.

Figure 5 shows a similar plot for the second indicator. Table 1.6 shows the third indicator.

Figure 4 First Air Quality Indicator for Sussex 2001 to 2019 (annual mean PM₁₀)

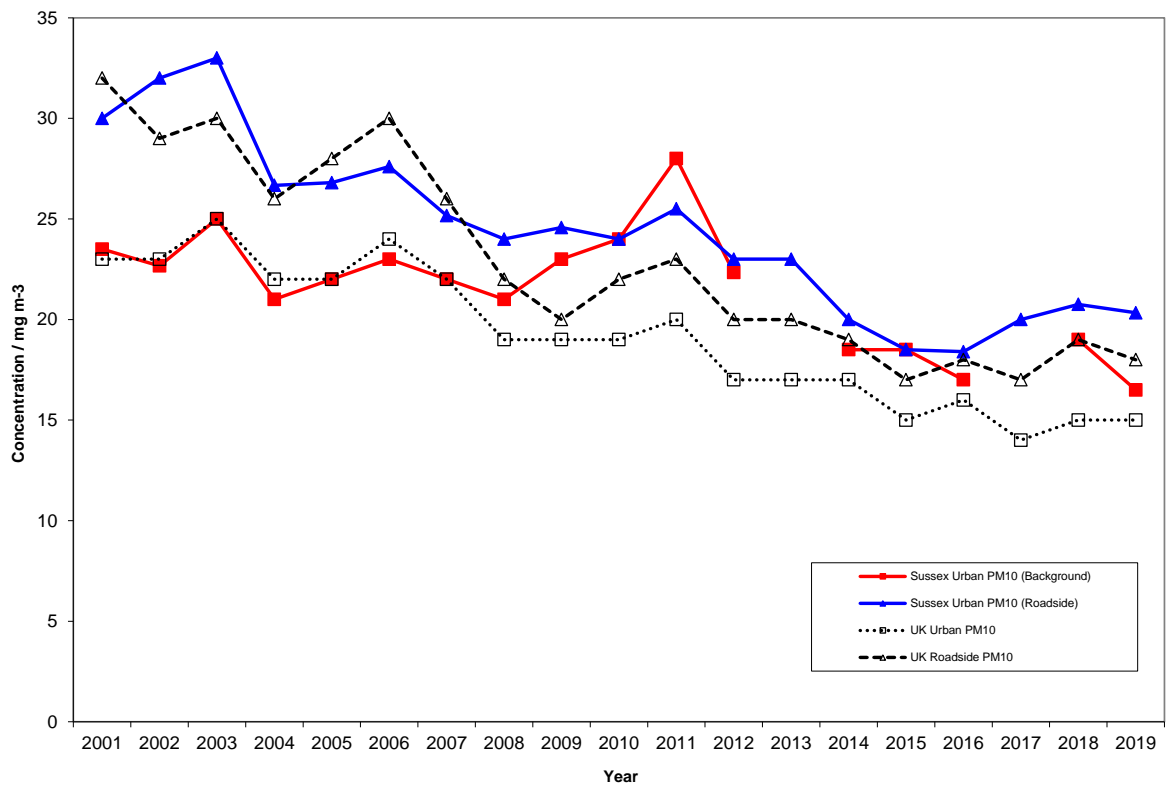


Figure 5 Second Air Quality Indicator for Sussex, 2001 to 2019 (mean daily max running 8hr ozone)

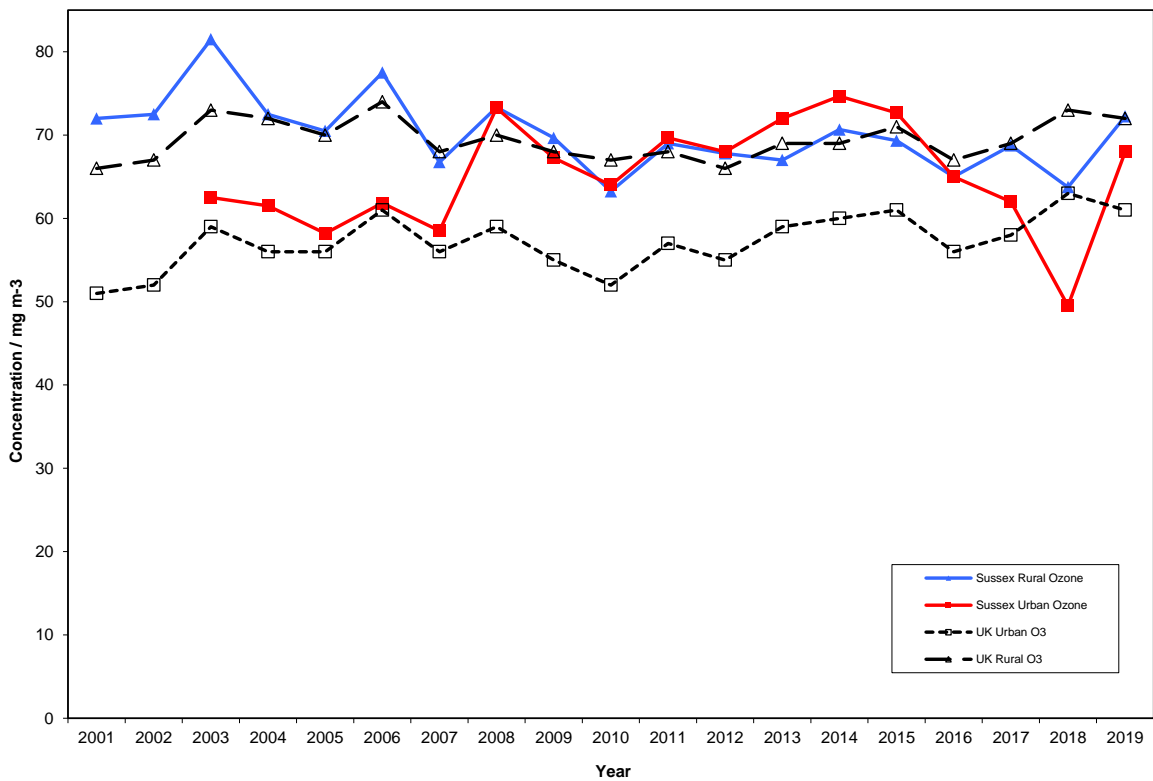


Table 1.6 Third (original) Air Quality Sustainability Indicator for Sussex																			
Indicator	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Adur Shoreham-By-Sea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Chichester Lodsworth	-	-	-	-	-	71	43	76	39	39	43	13	24	18	7	16	15	36	10
Wealden Isfield	-	-	-	-	-	78	24	-	-	36	76	16	31	12	16	14	20	55	27
Brighton and Hove Stanmer Park	-	-	-	-	-	-	-	-	-	-	38	19	21	-	-	8	-	-	-
Chichester A27 Chichester Bypass	-	1	14	1	-	11	9	5	3	1	5	5	1	3	1	2	1	0	0
Eastbourne Devonshire Park	0	4	10	12	14	27	21	52	18	9	31	28	-	-	-	-	-	36	13
Eastbourne Holly Place	-	-	-	-	-	-	-	-	-	-	-	11	-	3	3	2	-	-	-
Horsham Park Way	-	-	-	-	10	4	12	6	3	0	10	3	2	4	-	4	2	0	5
Horsham Storrington	-	-	-	-	-	-	-	-	-	0	10	7	16	-	1	3	-	-	-
Hastings Bulverthythe	-	19	41	3	11	12	8	4	6	0	0	1	-	-	3	0	4	1	4
Hastings Fresh Fields	-	-	-	-	-	-	-	-	17	7	-	-	-	-	-	-	-	-	-
Wealden Lullington Heath	50	40	94	56	64	64	27	51	36	10	25	12	12	6	12	16	10	32	20
Telscombe Cliffs Roadside	6	10	8	-	12	23	28	56	12	-	-	-	-	-	-	-	-	-	-
Lewes Commercial Square	-	-	-	-	20	13	15	5	4	1	0	-	-	-	-	-	-	-	-
Lewes Denton Community Centre	-	-	-	-	-	-	-	-	-	-	-	-	-	30	14	17	-	-	-
Lewes West Street	-	-	-	-	-	-	-	-	-	-	-	2	0	1	-	0	1	-	1
Rother Rye Harbour	-	47	107	37	26	59	24	44	39	10	37	24	-	-	-	-	12	24	19
Rother De La Warr Road	-	-	-	-	-	-	7	-	2	0	8	-	1	-	-	-	2	4	5
Sussex-Rural	50	44	101	47	45	68	30	57	38	24	44	17	22	12	12	14	14	37	19
Sussex-Urban-(Background)	-	4	10	12	14	27	21	52	18	9	31	19.5	-	16.5	8.5	9.5	-	36	13
Sussex-Urban-(Roadside)	6	10	21	2	13	13	13	15	7	1	6	4	4	3	2	2	2	1	3
UK-Rural-Indicator	34	32	64	45	40	55	30	45	32	22 (10)	30 (17)	14	17	9	11	12	9	25	20
UK-Urban-Indicator	23	19	48	22	21	38	23	26	10	8 (15)	15 (24)	18	14	12	10	8	7	8	11

The 2019 figures in Table 1.6 are based on the revised index. The 2010 and 2011 figures in brackets are also based on the new threshold levels. As can be seen the changes to the thresholds has had a significant effect on the third indicator.

Sussex:

A general improvement has been seen for both roadside and background PM₁₀ since 2001 and the air quality sustainability indicator for roadside and background PM₁₀ in Sussex has decreased in 2019 when compared to the previous year.

The air quality sustainability indicators for the Sussex urban and rural O₃ showed an increase in 2019, although the general trend since 2001 remains fairly stable.

The UK:

Urban and rural O₃ indicators showed a decrease in 2019. Roadside and background PM₁₀ both decreased slightly in 2019 when compared to 2018.

CHAPTER 2: Trends in Pollution Levels, 2001 – 2019

This chapter uses running annual mean calculations to illustrate trends in pollution levels as recorded by each continuous monitor in the network (see the 'How the charts work' section below for an explanation of running annual means).

Long-term pollution trends may be caused by changes in local emissions, i.e. fewer or cleaner vehicles or industrial processes, or changes in how these emissions are dispersed, i.e. weather patterns. For example, an unusually wet summer can lead to decreased levels of O₃, a cold settled winter can lead to increased levels of NO₂. These effects can obscure actual changes in emissions due to traffic management schemes or increased use of a particular road.

The longer a dataset is, i.e., the longer a site has been monitoring for, the more effective the trend analysis is. The effects of unusual weather conditions are smoothed out and sustained patterns due to changes in local emissions become clearer. Many years of monitoring data are required before firm conclusions can be made as to whether pollution levels are increasing or decreasing. For this reason, sites that have been in operation for less than three years are not included in this chapter but will become integrated into the analysis in the future.

How the Charts Work

The charts appearing in this chapter show running annual mean values (based on monthly mean concentrations and a minimum of 75% data capture) from a specified start date to January 2020. Running annual means are used so that gradual changes can be identified throughout the year, which are not apparent from a single annual figure.

For example, in Figure 6 the line for Hastings Bulverhythe is calculated in the following way;

- The first data we have for this site are from June 2001, so the first annual mean concentration can be calculated one year later on the 1st June 2002.
- The first mean is calculated from 1st June 2001 to 1st June 2002. The second is calculated from 1st July 2001 to 1st July 2002 and so on. This is what is meant by a running mean.

A chart showing percentage change is often more informative than simply showing changes in concentrations. In these charts, all sites start at zero, then concentrations are shown as the percentage change since the start date. As a common start date is required for this type of chart, they may show a shorter time period than the concentration charts.

Data from an inner London background site have been included in some charts to provide comparison with the Sussex network data.

PM₁₀ Particulates

Running annual mean PM₁₀ trends at all continuous monitoring sites since 2001 are shown in Figure 6.

Sites are shown one year after they joined the network, i.e., when the first annual mean calculation is possible. Sites that have not run for a complete year prior to January 2019 do not appear on the graph.

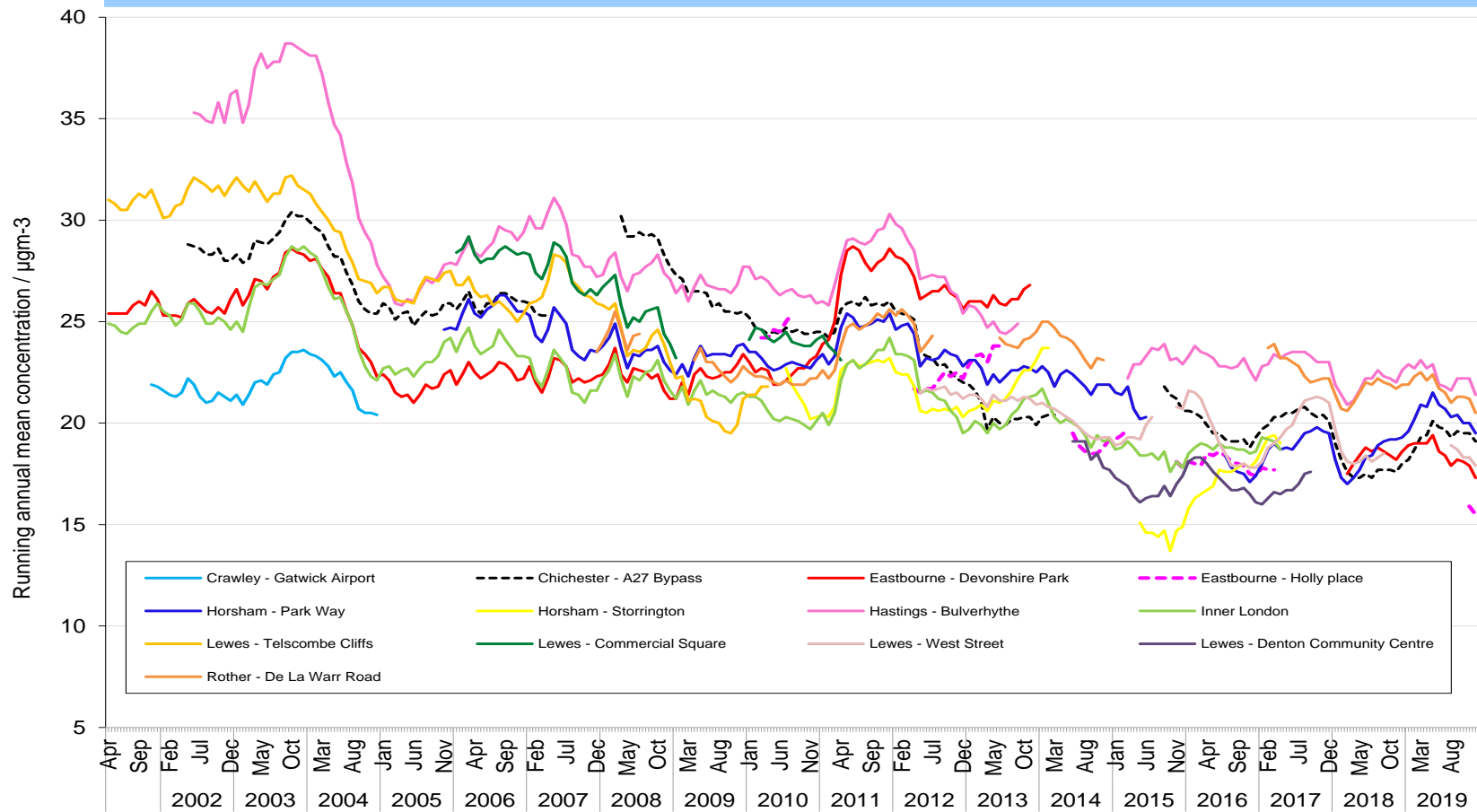
The running annual mean concentration for PM₁₀ showed a general downward trend when compared with the previous year.

The overall trend is highlighted further when the percentage change rather than actual change in concentration is traced, as shown in Figure 7.

There are a number of sites that are not included in the percentage change plot as it is necessary for all included sites to have a common start date, in this case January 2006, the analysers that have been introduced into the network after this start date are not included.

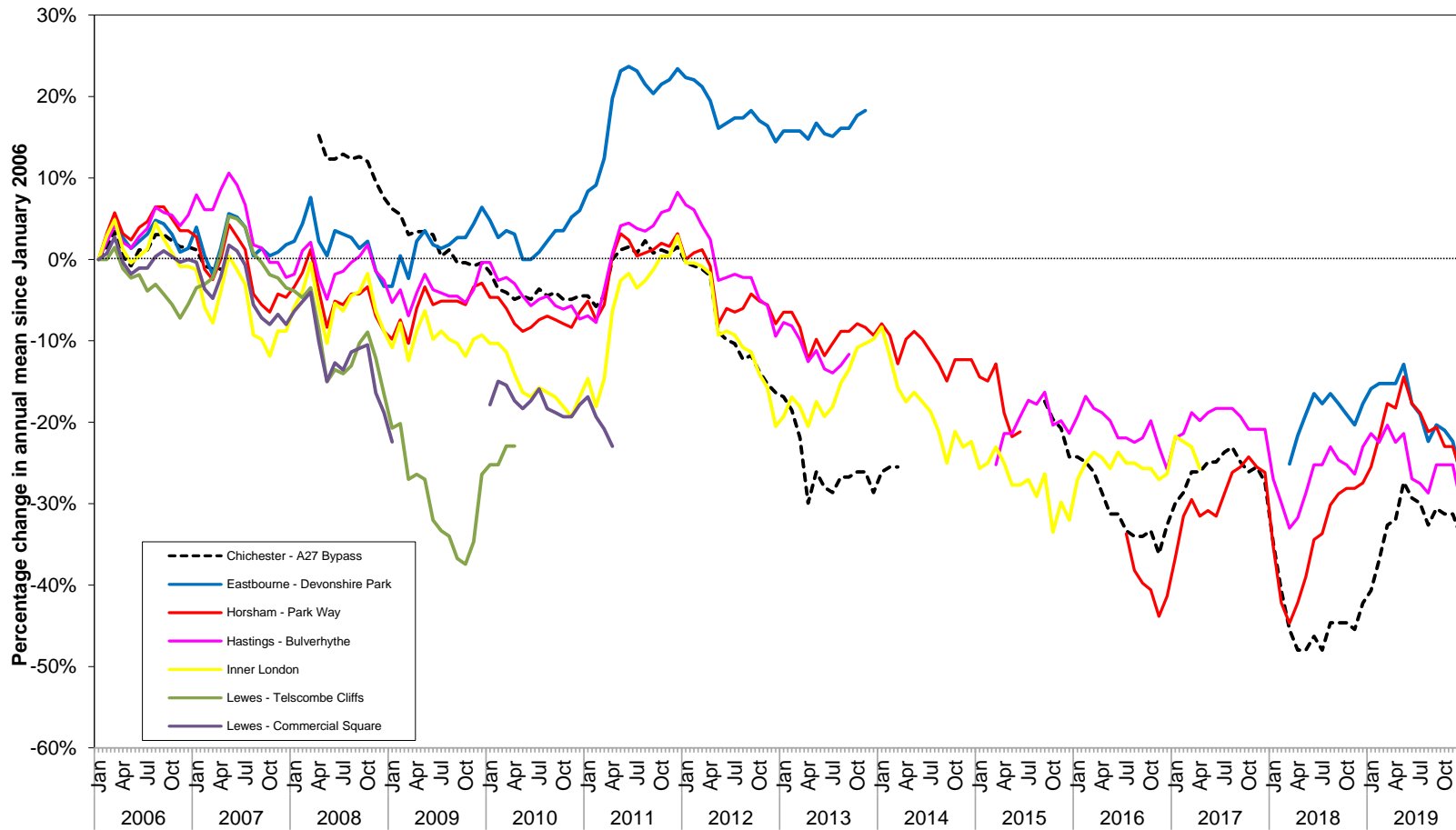
Roadside sites are generally expected to record higher levels than those monitoring at background locations due to their proximity to the local emission source that is mainly traffic related.

Figure 6 Trends in running annual mean PM₁₀ concentrations, 2001 to 2019



N.B. The reduction in PM10 concentrations in 2004 can be attributed to TEOM data being corrected using VCM since 1st January 2004

Figure 7 Percentage change in running annual mean PM₁₀ since January 2006



PM_{2.5} Particulates

During 2019 PM_{2.5} was measured at Eastbourne – Holly Place and Worthing – Grove Lodge, however the latter has not been in operation for long enough to be included in this part of the analysis.

The general increase during 2018 continued through for the first half of 2019, and thereafter decreased for the rest of the year.

The running annual mean concentrations are shown in Figure 8 and the percentage change plot in Figure 9.

Figure 8 Trends in running annual mean PM_{2.5} concentrations, 2010 to 2019

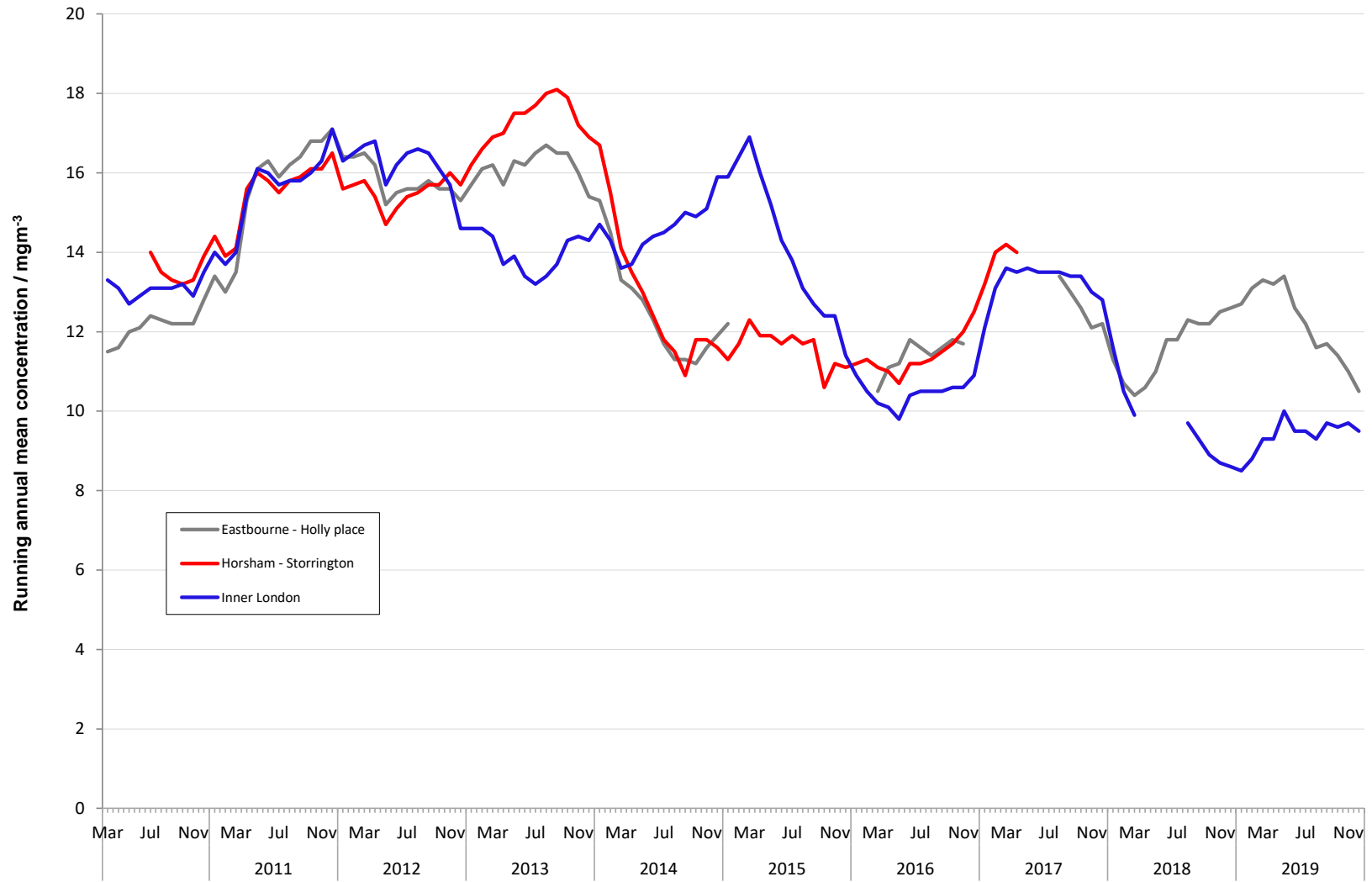
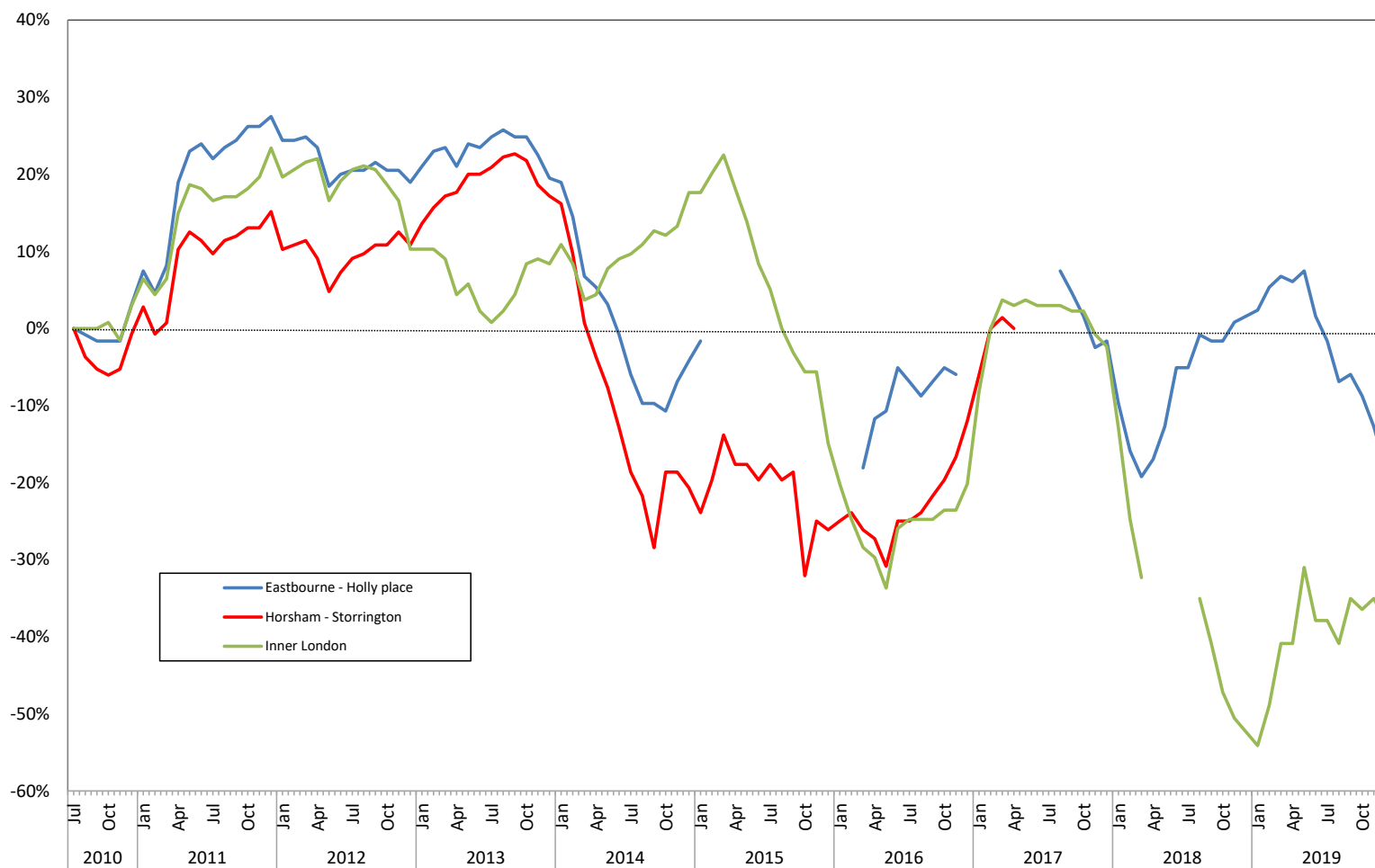


Figure 9 Percentage change in running annual mean PM_{2.5} since July 2010



Sulphur Dioxide (SO₂)

There has been a national downward trend in SO₂ concentrations for several years.

Currently only the Lullington Heath site monitors for SO₂.

Nitrogen Dioxide (NO₂)

NO₂ is the most commonly monitored pollutant in the network. Charts of running annual mean concentrations are shown in Figure 10. Percentage change over a shorter period at longer-running sites is shown in Figure 11. Trends from the inner London background site are included in each chart for comparison.

The Air Quality Standard for annual mean NO₂ is 40 µgm⁻³ (21 ppb).

Most sites remained relatively stable during 2019. Again, the trend is highlighted in Figure 12 showing the percentage change since February 2006.

The levels recorded at the roadside sites are generally higher than those seen at background sites due to their proximity to the traffic which is the primary source of nitrogen dioxide.

Figure 10 Running annual mean NO₂ concentrations, 1999 to 2019

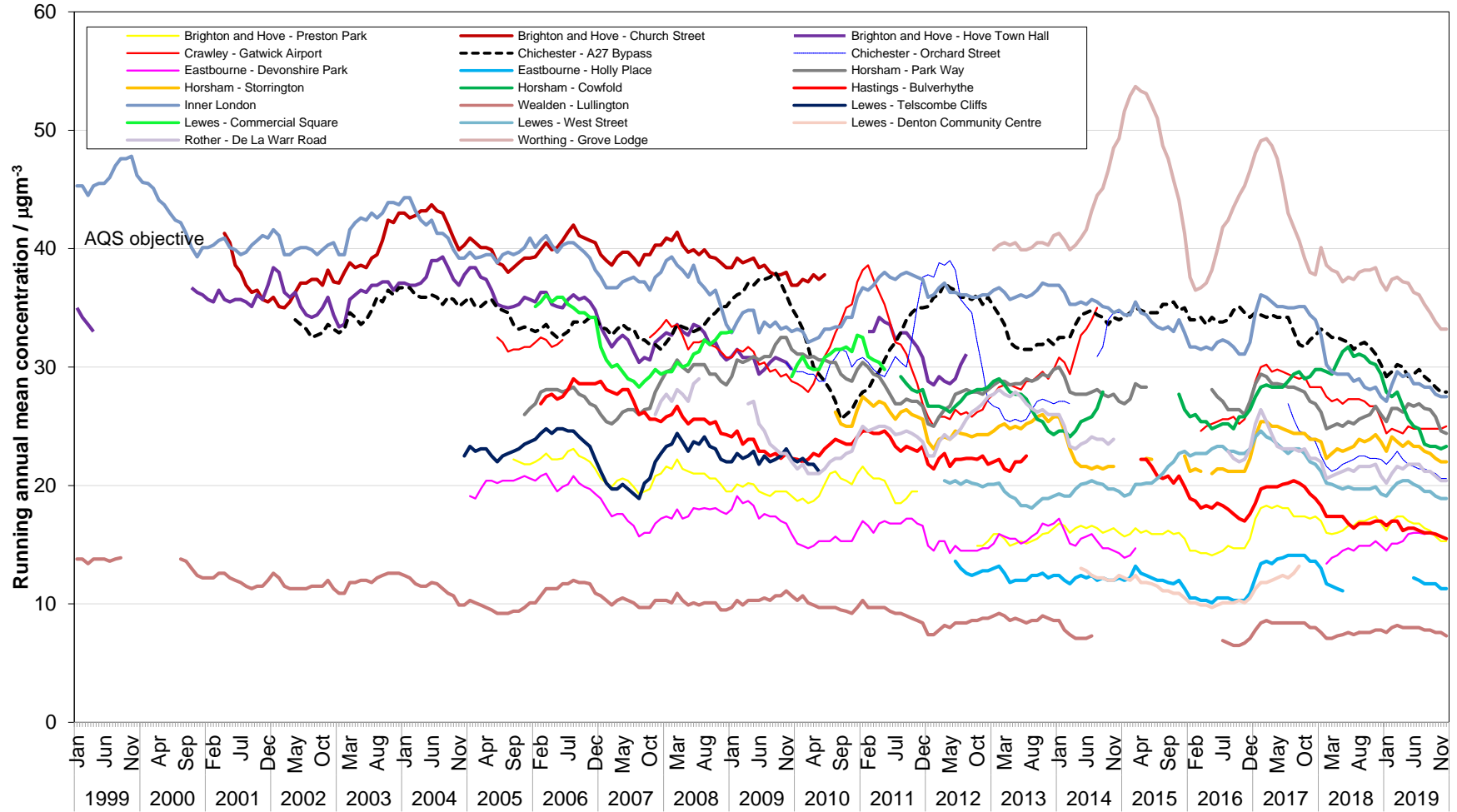


Figure 11 Percentage change in running annual mean NO₂ concentrations since February 2006

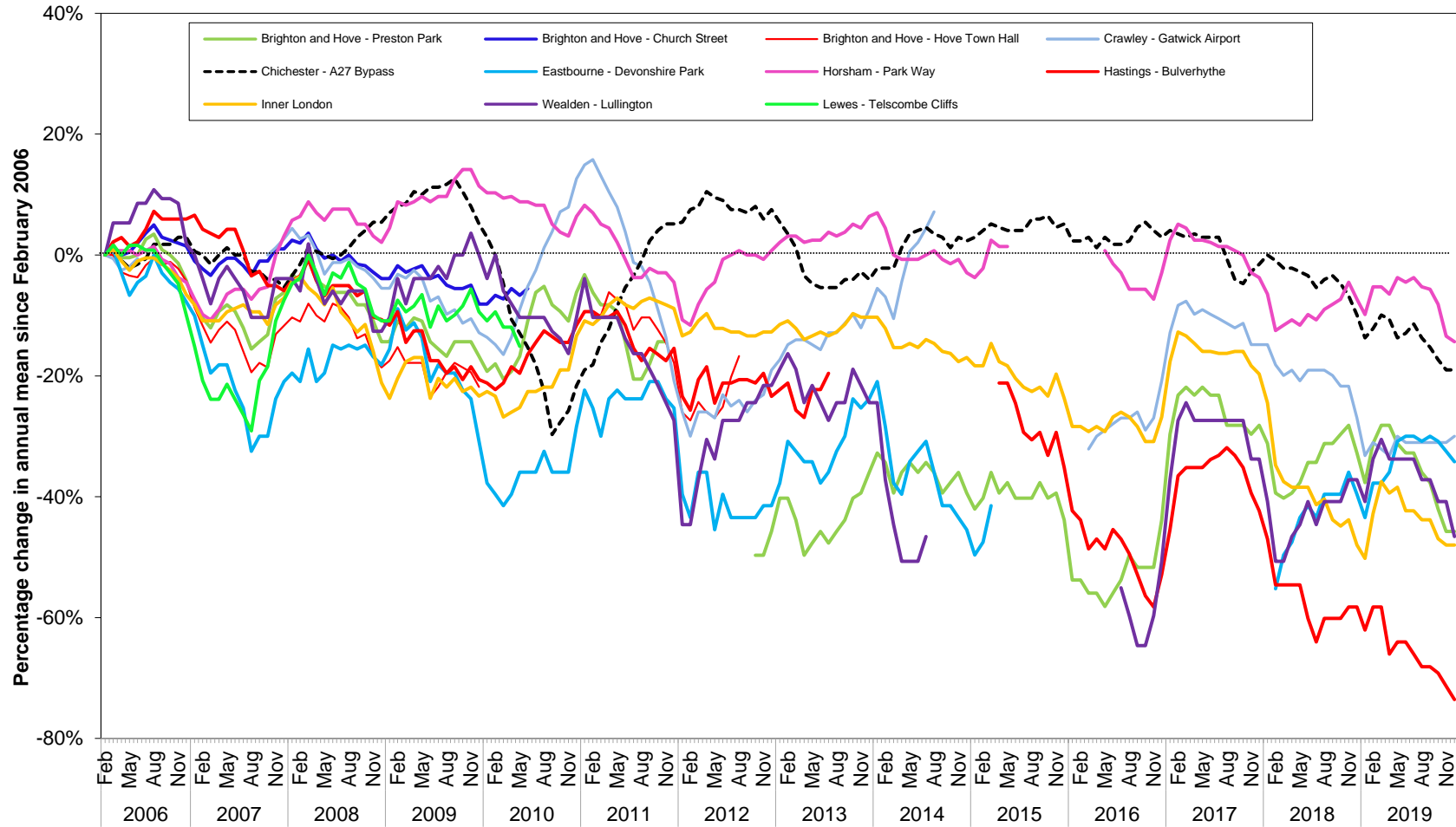
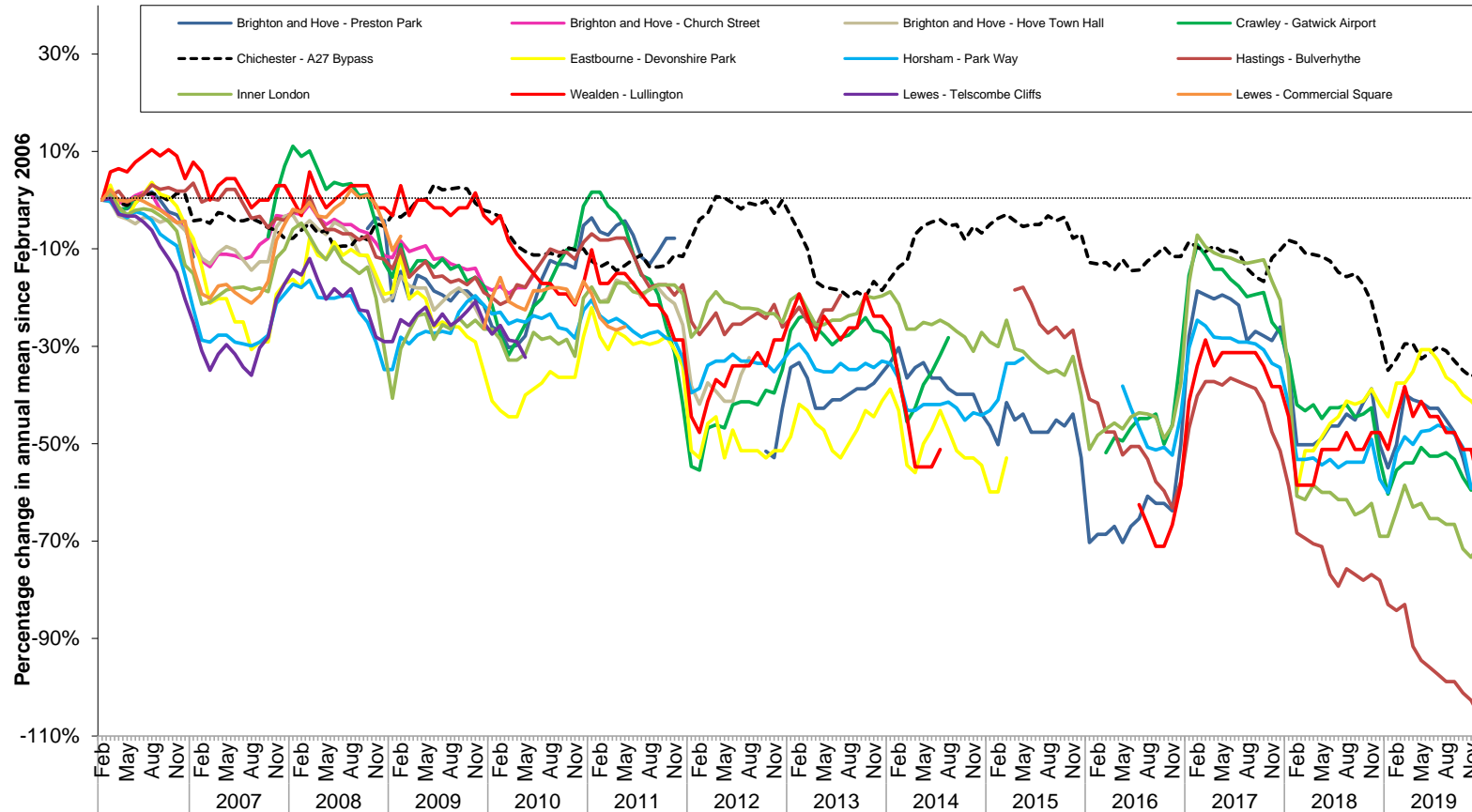


Figure 12 Percentage change in running annual mean NOx concentrations since February 2006



Ozone (O₃)

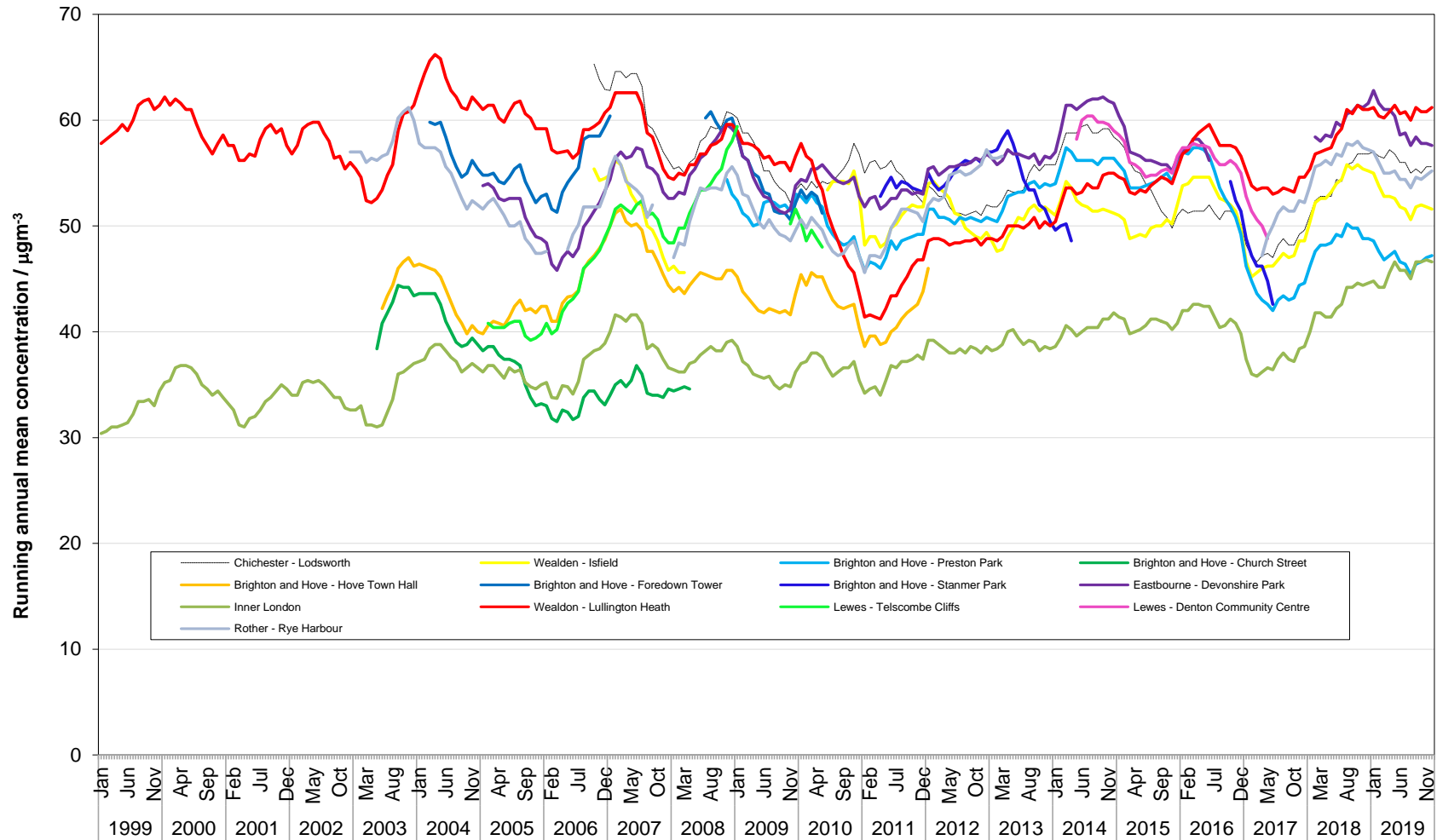
Figure 13 shows the running annual mean O₃ concentrations since 1999.

O₃ concentrations across the network showed a general decrease during 2019.

O₃ levels are highly dependent on the weather and the warm sunny summer periods can cause a sharp increase in mean levels. It is also known that a proportion of the O₃ experienced in Sussex is transported from continental Europe under certain meteorological conditions.

The slight changes in O₃ levels throughout the year are also seen in the percentage change plot (figure 14).

Figure 13 Running annual mean O₃ concentrations, 1999 to 2019



Appendix

Air Quality Review and Annual Status Updates

Since 2016 each council is required to produce an Annual Status Report on air quality and any developments that may affect it.

For information concerning the responsibilities of Local Authorities with regard to local air quality management contact the council direct or visit Defra's web site at:

<https://uk-air.defra.gov.uk/aqma/>

For information on air quality in Sussex and the review and assessment reports go to:

<http://www.adur-worthing.gov.uk/environmental-health/pollution/air-quality-and-pollution/local-air-quality-management/>

<http://www.arun.gov.uk/air-quality-including-bonfires>

<http://www.brighton-hove.gov.uk/content/environment/air-quality-and-pollution/air-quality-management-city>

<http://www.chichester.gov.uk/pollutioncontrolairquality>

<https://crawley.gov.uk/environment/environmental-health/air-pollution/air-quality>

<http://www.sussex-air.net/ImprovingAQ/AQManagement/Reports.aspx?LA=Eastbourne>

http://www.hastings.gov.uk/environment_planning/pollution_noise_drainage/air/air_management/

<http://www.horsham.gov.uk/environmentalhealth/environmental-health/air-quality/air-quality-assessment>

<http://www.sussex-air.net/ImprovingAQ/AQManagement/Reports.aspx?LA=Lewes>

<http://www.rother.gov.uk/article/193/Air-quality>

http://www.wealden.gov.uk/Wealden/Residents/Environment_and_Pollution/Pollution/Protectingandimprovingtheenvironment/Airquality/PHCS_Monitoring_Air_Quality.aspx