

Emissions from the Mossmorran Complex in 2019

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We call this **One Planet Prosperity**

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Emissions from the Mossmorran Complex in 2019

SEPA has published [Scottish Pollutant Release Inventory](#) (SPRI) 2019 data – which this year are experimental official statistics – detailing the annual mass emissions from SEPA-regulated industrial sites.

Mossmorran Complex emissions

While the overall trend in Scotland for carbon dioxide and methane are down, the emissions for individual sites are impacted by their activities. Due to the period that ExxonMobil's Fife Ethylene Plant was offline in 2019, overall emissions have reduced – though emissions of some pollutants increased at the Mossmorran Complex as a whole due to flaring.

Information on these changes is available on our Mossmorran hub at sepa.org.uk/Mossmorran.

A comparison of air quality monitoring results gathered during January to April 2019 and August 2019 to March 2020 shows no noteworthy increase in the measured ambient air concentrations of PM10, PM2.5, sulphur dioxide, carbon monoxide or non-methane volatile organic compounds (NMVOCs).

SEPA's monitoring results show no breaches of any of the air quality objectives during 2019 due to emissions from the Mossmorran Complex and all measurements were in the low band of Defra's daily air quality index (DAQI) for all applicable pollutants.

Monitoring periods

A summary of SEPA's results from monitoring air quality in the vicinity of the Mossmorran complex is provided in Tables 1 and 2 below. Two significant periods of monitoring are presented:

- **January to April 2019**

During this monitoring period there were three unplanned elevated flaring events (reported by ExxonMobil Chemical Limited):

- 26 Jan 2019 – resulting in 1 hr 37 minutes ground flaring with two concurrent periods of elevated flaring of 10 minutes and 17 minutes respectively.

- 19 Mar 2019 – resulting in 42 minutes ground flaring with a concurrent period of 16 minutes elevated flaring
- 20 Mar 2019 –resulting in 51 minutes ground flaring with two concurrent periods of elevated flaring each of 10 minutes.

Full results are reported in SEPA report 'Air Quality Monitoring Mossmorran January – April 2019' which can be found at www.sepa.org.uk/media/475334/air-quality-monitoring-mossmorran-january-april-2019.pdf.

- **August 2019 to March 2020**

During this monitoring period, from 15 August 2019 ExxonMobil Chemical's Fife Ethylene Plant (FEP) was not in operation.

In late January 2020 the FEP then entered the start-up process with ground flaring and intermittent elevated flaring taking place until 21 February 2020, at which point ExxonMobil Chemical Limited announced that the start-up was complete and the plant had returned to normal production.

Throughout the period that the FEP was not in operation Shell U.K. Limited's Natural Gas Liquids (NGL) Plant utilised ground flaring of excess gas.

The full results, included the data shown in the tables on pages 7 - 10 will be available in the full report which is due to be published shortly.

Particulate Matter

Particulate matter is made up of a number of components, including chemical substances, and soil and dust particles and comes from both human-made and natural sources. It consists of substances, which are released directly from the source into the atmosphere, and secondary components, which are formed in the atmosphere by chemical reactions.

Particulate matter is not made up of one type of substance; it is a classification of particles by size. It is measured in micrometres (μm). A human hair is approximately 100 μm wide.

Larger particles are generally filtered in the nose and throat, but particulate matter smaller than about 10 micrometres (μm) can be inhaled, which is why these are the ones measured for air quality monitoring.

- PM10 means the particles are 10 μm or smaller. The measurement of this figure includes PM2.5.
- PM2.5 means the particles are 2.5 μm or smaller.

Particulate levels can vary for a variety of reasons, such as rush hour traffic, building work, elevated pollen levels and emissions from industrial activities. Changes in wind direction can also have an impact on the measurements at a monitoring site.

The following information is taken from the Air Quality in Scotland website at <http://www.scottishairquality.scot/air-quality/daqj>.

In the UK most air pollution information services use the index and banding system approved by the Committee on Medical Effects of Air Pollution Episodes (COMEAP). The overall Daily Air Quality Index (DAQI) looks at five substances, not just PM10 and PM2.5. These tables are included to help put the levels detected by SEPA into context.

PM10 Particles - Based on the daily mean concentration for historical data, latest 24 hour running mean (24 hour average) for the current day.

Index	1	2	3	4	5	6	7	8	9	10
Band	Low			Moderate			High			Very High
$\mu\text{g m}^{-3}$	0-16	17-33	34-50	51-58	59-66	67-75	76-83	84-91	91-100	101 or more

PM2.5 Particles - Based on the daily mean concentration for historical data, latest 24 hour running mean (24 hour average) for the current day.

Index	1	2	3	4	5	6	7	8	9	10
Band	Low			Moderate			High			Very High
$\mu\text{g m}^{-3}$	0-11	12-23	24-35	36-41	42-47	48-53	54-58	59-64	65-70	71 or more

Other pollutants

Equipment focussed on the measurement of combustion-related air pollutants and a range of volatile organic compounds (VOCs) – such as benzene.

Several of these compounds have associated health-related air quality standards and objectives against which the monitoring results have been compared.

Similarly, the results, where appropriate, have been compared against the UK's Department for Environment, Food and Rural Affairs (Defra) Daily Air Quality Index (DAQI).

Index:	1	2	3	4	5	6	7	8	9	10
Band:	Low			Moderate			High			Very High
NO₂ µg m⁻³ (1 hour mean)	0 - 67	68 - 134	135 - 200	201 - 267	268 - 334	335 - 400	401 - 467	468 - 534	535 - 600	≥ 601
SO₂ µg m⁻³ (15 min mean)	0 - 88	89 - 177	178 - 266	267 - 354	355 - 443	444 - 532	533 - 710	711 - 887	888 - 1064	≥ 1065

Results

Depending on the pollutant measured concentrations are expressed as either ppb or µg m⁻³.

ppb (parts per billion) is the concentration of a pollutant in air in terms of volume ratio. A concentration of 1 ppb means that for every billion (10⁹) units of air, there is one unit of pollutant present.

µg m⁻³ (microgrammes per cubic meter) is a measure of concentration in terms of mass per unit volume. A concentration of 1 µg m⁻³ means that one cubic metre of air contains one microgramme (millionth of a gramme) of pollutant.

Definitions taken from the Air Quality in Scotland website: <http://www.scottishairquality.scot/>

Table 1: Measured Pollutant Concentrations for Volatile Organic Compounds at four locations around the Mossmorran Complex

Measured air pollutant concentrations						
Location	Period:				Air Quality Standard	
	10/01/19 – 18/04/19		23/10/19 – 20/02/20			
	Duration		Duration			
Measured by diffusion tubes; based on 2 week averages	Benzene ($\mu\text{g m}^{-3}$) - average over period					
	Little Raith Farm	0.7	98 days	0.7	86 days	Annual Mean (Scotland) 3.25 $\mu\text{g/m}^3$
	Donibristle	0.5	98 days	0.8	86 days	
	Cowdenbeath	0.8	98 days	0.9	86 days	
	Lochgelly	0.6	98 days	0.5	86 days	
	Toluene ($\mu\text{g m}^{-3}$) – average over period					
	Little Raith Farm	<1.2	98 days	1.4	86 days	N/A
	Donibristle	<1.2	98 days	1.3	86 days	
	Cowdenbeath	1.2	98 days	1.9	86 days	
	Lochgelly	<1.2	98 days	1.5	86 days	
	Ethylbenzene ($\mu\text{g m}^{-3}$) average over period					
	Little Raith Farm	<1.3	98 days	<1.3	86 days	N/A
	Donibristle	<1.3	98 days	<1.3	86 days	
Cowdenbeath	<1.3	98 days	<1.3	86 days		
Lochgelly	<1.3	98 days	<1.3	86 days		

Measured air pollutant concentrations					
Location	Period:				Air Quality Standard
	10/01/19 – 18/04/19		23/10/19 – 20/02/20		
	Duration		Duration		
Xylene ($\mu\text{g m}^{-3}$) average over period					
Little Raith Farm	1.4	98 days	1.6	86 days	N/A
Donibristle	1.4	98 days	2.0	86 days	
Cowdenbeath	1.4	98 days	1.6	86 days	
Lochgelly	0.6	98 days	<1.3	86 days	
1,3-Butadiene ($\mu\text{g m}^{-3}$) average over period					
Little Raith Farm	<0.2	98 days	<0.2	86 days	Annual Mean 2.25 $\mu\text{g}/\text{m}^3$
Donibristle	<0.2	98 days	<0.2	86 days	
Cowdenbeath	0.2	98 days	<0.2	86 days	
Lochgelly	0.2	98 days	<0.2	86 days	
Total Hydrocarbons (ppb) average over period					
Little Raith Farm	6.7	98 days	8.0	86 days	N/A
Donibristle	7.1	98 days	9.0	86 days	
Cowdenbeath	7.0	98 days	9.0	86 days	
Lochgelly	7.6	98 days	7.0	86 days	

Table 2: Measured pollutant concentrations for particulate matter and combustion gases at four locations around the Mossmorran Complex

Measured air pollutant concentrations						
Location	Period					
	10/01/19 -18/04/19		14/8/19 – 11/03/20 (LRF 4/12/19 – 11/03/20)			
Measured by continuous air analysers; based on 15 min averages and >90% data capture	PM 10 ($\mu\text{g m}^{-3}$) – average of daily mean values					
	Little Raith Farm	11.8	99 days	5.4	93 days	24 hour mean 50 $\mu\text{g/m}^3$
	Donibristle	n/m	-	6.6	211 days	
	Lochgelly	n/m	-	7.0	211 days	
	Auchtertool	n/m	-	6.5	211 days	
	PM 2.5 ($\mu\text{g m}^{-3}$) - average of daily mean values					
	Little Raith Farm	8.9	99 days	4.5	93 days	Annual mean (Scotland)
	Donibristle	n/m	-	5.1	211 days	10 $\mu\text{g/m}^3$
	Lochgelly	n/m	-	4.4	211 days	
	Auchtertool	n/m	-	4.8	211 days	24 hour mean (UK) 25 $\mu\text{g/m}^3$
	SO2 ($\mu\text{g m}^{-3}$) – average of 1 hour mean					
	Little Raith Farm	1.0	99 days	1.2	93 days	1 hour mean 350 $\mu\text{g/m}^3$

Measured air pollutant concentrations					
Location	Period				
	10/01/19 -18/04/19	14/8/19 – 11/03/20 (LRF 4/12/19 – 11/03/20)			
NO₂ (µg m⁻³) – average of 1 hour mean					
Little Raith Farm	9.5	99 days	10.9	93 days	1 hour Mean UK 200 µg/m ³
CO (mg m⁻³) – average of 8 hour running mean					
Little Raith Farm	0.0	99 days	0.0	93 days	8-hour running mean (Scotland) 10 mg/m ³

- Details of methodologies used can be found in Appendix A of the SEPA report '*Air Quality Monitoring Mossmorran January – April 2019*' which can be found at www.sepa.org.uk/media/475334/air-quality-monitoring-mossmorran-january-april-2019.pdf.