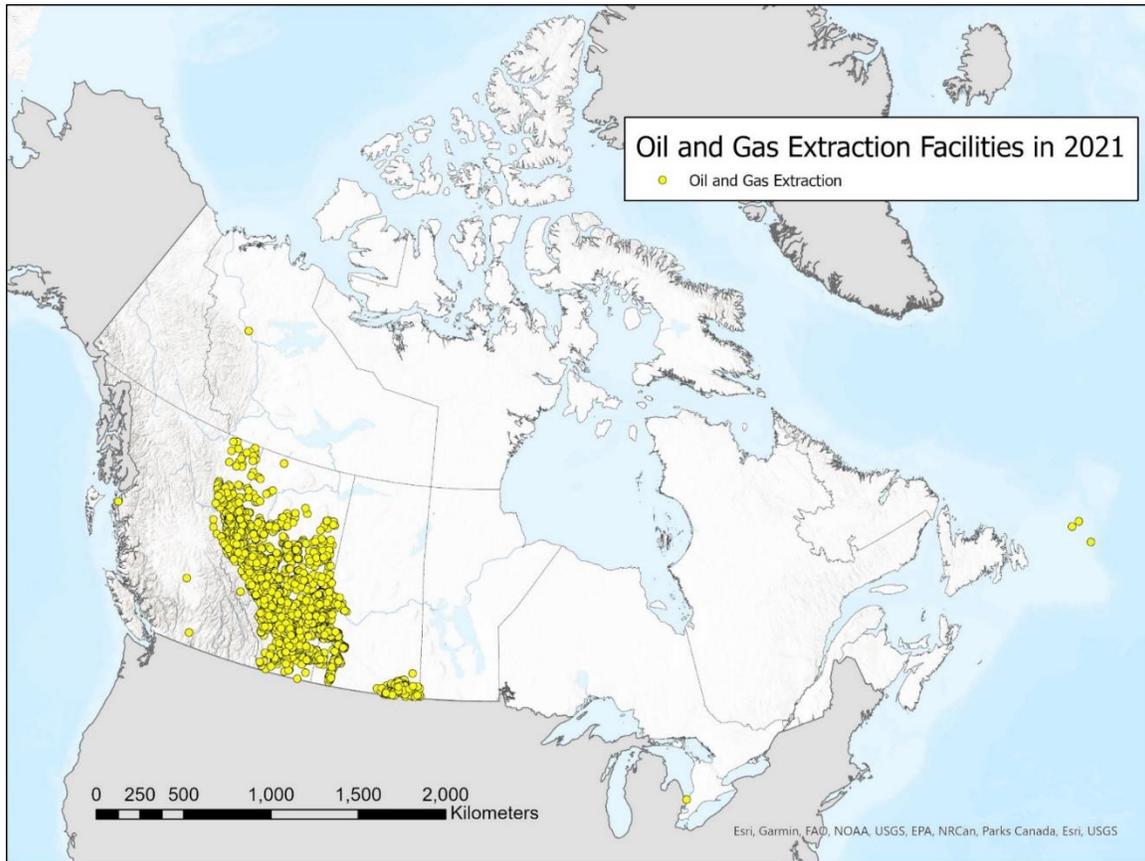


## Conventional Oil and Gas facilities - Reporting to the NPRI

### Map of Conventional Oil and Gas Extraction Facilities - 2021



#### A. Review of Oil and Gas Facilities - 2014, 2017 and 2021

For these years, the only requirement explicitly linked to oil and gas extraction is that in 2018, NAICS code 211110 (Oil and Gas extraction, except oil sands) excluding compressor stations, must report all Criteria Air Contaminants (CACs) and benzene if the criteria are met for at least one CAC.

While this would result in an increase of the amount emissions reported for those substances, the total amount of facilities wouldn't change since they would have been reporting that one substance that met the NPRI threshold.

#### Number of Facilities reporting to the NPRI:

Year	AB	BC	MB	NL	NS	NT	ON	SK	Grand Total
2014	2657	365	5	4	8	3	8	566	3616
2017	2034	289	4	4	8	2	3	497	2841
2021	2332	217	1	3		1	1	550	3105

## Conventional Oil and Gas - NPRI Substances 2017-2021 – VOCs

CAS number	Substance	Units	2017	2018	2019	2020	2021	VOCs
100-41-4	Ethylbenzene	tonnes	3	1.52	7.78	1.96	1.16	√
106-99-0	1,3-Butadiene	tonnes	0.03	0.03	0.03	0		√
107-21-1	Ethylene glycol	tonnes	542.47	354.93	388.31	199.25	297.73	√
108-88-3	Toluene	tonnes	155.13	228.44	149.16	270.38	270.67	√
110-54-3	n-Hexane	tonnes	231.75	570.97	286.13	320.11	245.68	√
110-82-7	Cyclohexane	tonnes	21.41	18.49	20.88	24.17	13.8	√
11104-93-1	Nitrogen oxides (expressed as nitrogen dioxide)	tonnes	195597.1	199174.6	188650.8	184187.1	178958.2	
111-42-2	Diethanolamine (and its salts)	tonnes	0	0	0	1.09	0	√
111-76-2	2-Butoxyethanol	tonnes				3.03	6.8	√
115-07-1	Propylene	tonnes	41.04	41.26	41.89	41.19	14.22	√
120-12-7	Anthracene	kg			17.63	15.06	0.02	√
120-82-1	1,2,4-Trichlorobenzene	tonnes	0					
129-00-0	Pyrene	kg		1.39	0	0	0	√
1313-27-5	Molybdenum trioxide	tonnes	0	0	0			
1319-77-3	Cresol (all isomers, and their salts)	tonnes	24.69	17.26	10.56	0		√
1330-20-7	Xylene (all isomers)	tonnes	41.1	137.48	87.18	179.38	216.65	
1332-21-4	Asbestos (friable form only)	tonnes	0	0	0	0	0	
1344-28-1	Aluminum oxide (fibrous forms only)	tonnes	0	0	0	0	0	
191-24-2	Benzo[ghi]perylene	kg	8.46			0	0	
193-39-5	Indeno[1,2,3-cd]pyrene	kg	8.46					
198-55-0	Perylene	kg	8.43					
205-82-3	Benzo[j]fluoranthene	kg				0	0	
205-99-2	Benzo[b]fluoranthene	kg	8.46			0	0	
206-44-0	Fluoranthene	kg				0	0	
207-08-9	Benzo[k]fluoranthene	kg	8.46			0	0	
208-96-8	Acenaphthylene	kg	17.13	13.25	6.48	9.56	13.06	
463-58-1	Carbonyl sulphide	tonnes	794.17	703.31	389.92	480.7	474.93	√
50-00-0	Formaldehyde	tonnes	259.67	398.31	367.26	339.9	442.45	√
50-32-8	Benzo[a]pyrene	kg	8.46			0	0	
53-70-3	Dibenz[a,h]anthracene	kg	8.46			0	0	
56-55-3	Benz[a]anthracene	kg	8.47					

630-08-0	Carbon monoxide	tonnes	138240.2	159061.6	138048	144252.8	135440.4	
67-56-1	Methanol	tonnes	1528.57	1628.27	1871.46	587.81	754.98	
67-63-0	Isopropyl alcohol	tonnes	0	0	5.07	0.01	0.02	√
71-36-3	n-Butyl alcohol	tonnes				0	84.33	
71-43-2	Benzene	tonnes	203.09	258.4	149.46	179.81	189.98	√
7440-62-2	Vanadium (except when in an alloy) and its compounds	tonnes	0					
7446-09-05	Sulphur dioxide	tonnes	86166.38	89848.82	85961.7	81541.72	80475.68	
74-85-1	Ethylene	tonnes	15.3	15.38	15.62	15.35	1.42	√
75-15-0	Carbon disulphide	tonnes	208	208.62	126.24	76.84	64.03	
7632-00-0	Sodium nitrite	tonnes	0					
7647-01-0	Hydrochloric acid	tonnes	0	0	0	0	0	
7664-93-9	Sulphuric acid	tonnes	4.68	4.39	1.69	3.8	3.69	
7782-50-5	Chlorine	tonnes	20.99	63.39	80.35	69.52	70.67	
7783-06-04	Hydrogen sulphide	tonnes	315.96	450.2	462.55	378.32	265.68	
78-93-3	Methyl ethyl ketone	tonnes	0	0	0	0	0	
1980-05-07	Bisphenol A	kg	0	0	0			
83-32-9	Acenaphthene	kg	34.13	29.52	13.06	35.12	42.9	
1985-01-08	Phenanthrene	kg	223.06	303.34	314.42	264.37	239.04	
86-73-7	Fluorene	kg	179.25	160.13	107.86	201.84	198.86	√
91-20-3	Naphthalene	tonnes			12.17	12.14	24.6	√
95-63-6	1,2,4-Trimethylbenzene	tonnes	1.55	1.06	1.08	0.83	0.69	
NA - 02	Arsenic (and its compounds)	kg	0.39	58.77	1.33	0.37	0.34	
NA - 03	Cadmium (and its compounds)	kg	1.43	4.24	3.83	2.87	1.98	
NA - 05	Cobalt (and its compounds)	kg			0	0		
NA - 08	Lead (and its compounds)	kg	15.63	23.1	1.9	0.73	0.65	
NA - 11	Nickel (and its compounds)	tonnes	0	0	0			
NA - 12	Selenium (and its compounds)	kg	0.34	6.78	4.25	66.7	0	
NA - 16	Ammonia (total)	tonnes	218.49	213.4	230.25	255.13	405.42	
NA - 20	Nonylphenol and its ethoxylates	kg	0	0				
NA - 22	Phosphorus (total)	tonnes	44.49	15.76	16.91	16.77	0	
NA - 40	Vanadium (and its compounds)	tonnes		0	0			
NA - M08	Total particulate matter	tonnes	2150.55	14158.71	4470.05	4467.07	4351.7	

NA - M09	PM10 - Particulate Matter <= 10 Micrometers	tonnes	3693.43	6984.76	3921.06	3851.45	4068.45
NA - M10	PM2.5 - Particulate Matter <= 2.5 Micrometers	tonnes	3710.43	4172.96	3727.06	3670.01	3866.1
NA - M14	Total reduced sulphur (hydrogen sulphide)	tonnes	968.76	1064.49	844.5	730.01	616.49
NA - M16	Volatile Organic Compounds (VOCs)	tonnes	25276.81	55895.28	111862.7	72865.79	64059.26
NA - P/H	PAHs, total unspciated	kg	0.43	0.21	71.63	61.61	0.09

<https://pollution-waste.canada.ca/national-release-inventory/PredefinedQueries/2>

While production levels are not known, some of the changes in the number of reporting facilities, and in turn, the emissions reported to the NPRI, may be due to the fluctuation in the price of oil and gas over time. For example, while prices were high in 2014 and in years prior to that, production had dropped dramatically afterwards, but may have picked up by 2021. However, this is speculative on my part.

During the period 2017-2021, the only requirements explicitly linked to oil and gas extraction that have changed from previous years is that, in 2018, NAICS code 211110 (Oil and gas extraction, except oil sands) excluding compressor stations, must report all CAC and benzene emissions if the criteria are met for at least one CAC.

While this change could increase the amount of reported for those substances, the total number of facilities reporting shouldn't change since they would have been reporting that one substance that met the threshold.

## B. Particulate Matter

Of special note regarding reporting specific substances, is the reporting of Particulate Matter to the NPRI, as shown in the table below: (Note that Total PM includes both PM2.5 and PM10.)

### Reporting of Particulate Matter to the NPRI: (in tonnes, 2017-2021)

Year	2017	2018	2019	2020	2021
<b>Total PM</b>	<b>2150.55</b>	<b>14158.72</b>	<b>4470.05</b>	<b>4351.7</b>	<b>4351.7</b>
<b>PM10</b>	<b>3693.43</b>	<b>6984.76</b>	<b>3921.06</b>	<b>3851.45</b>	<b>4068.45</b>
<b>PM2.5</b>	<b>3710.43</b>	<b>4172.96</b>	<b>3727.06</b>	<b>3670.01</b>	<b>3866.1</b>

Based on the results in this table, there are clearly some issues in which or how PM is reported and the ensuing results.

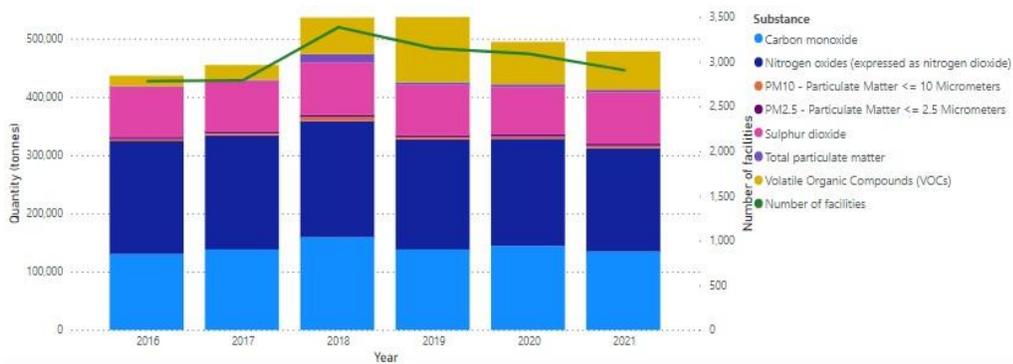
1) The spike in emissions for total PM in 2018: What is or is there an explanation for such an anomaly? Is it in fact “real”, or could it be a reporting error from a particular company? This clearly needs investigation by Environment Canada, rather than speculation as to the reported level of PM. It is important that this matter be looked into, to ensure the integrity of the NPRI.

2) Total PM includes both PM10 and PM2.5. This confusing could be considered “double counting”. It is important to know the specific amount of PM > 10 mm that is emitted as this was a point of discussion in the Oil and Gas Review conducted by ECCC in 2017.

The following table illustrates the trend analysis for specific substances, including Particulate Matter. If any reported number is incorrect, it would certainly affect the “predicted trend”.<sup>1</sup> the concern regarding data relates to Particulate Matter.

### C. Conventional Oil and Gas Emissions 2016-2021

## TREND ANALYSIS



Substance	Units	2016	2017	2018	2019	2020	2021
Carbon monoxide	tonnes	130263	138211	159143	138240	144198	134613
Nitrogen oxides (expressed as nitrogen dioxide)	tonnes	194078	195579	199263	188739	184012	177605
PM10- Particulate Matter <= 10 Micrometers	tonnes	3157	3693	6985	3922	3845	3897
PM2.5- Particulate Matter <= 2.5 Micrometers	tonnes	3251	3710	4173	3728	3664	3695
Sulphur dioxide	tonnes	86706	86166	89841	86024	81424	88551
Total particulate matter	tonnes	1341	2151	14159	4471	4461	4169
Volatile Organic Compounds (VOCs)	tonnes	17756	25267	62683	111911	72845	65625

There is little evidence of changes to the level of emissions over this 5-year period. Whether another 5 years may show a change is difficult to predict, given uncertainties in production levels and experience to date.

<sup>1</sup> Table presented at the NPRI Work Group meeting October 25, 2022

## **D. Review of Past Consultations of the Oil and Gas Sector (April 2016-March 2017)**

During the period 2016-2017, ECCC conducted a multi-stakeholder review of the NPRI reporting requirements for the Oil and Gas sector to consider changes to achieve greater rates of reporting coverage for pollutants of concern. ECCC's proposal for modifying the NPRI reporting requirements for the upstream oil and gas sector to improve reporting coverage took a multi-stage approach.

In considering the lengthy history of multistakeholder consultations regarding this industry, it is all the more important to review the past and examine how and if progress has been made in terms of what is being reported to the NPRI since that period. For the first stage, if one Part 4 substance (Criteria Air Contaminants (CACs) - NO<sub>x</sub>, SO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub> and VOCs) is triggered from stationary combustion, the industry would be required to report all CACs and benzene from all sources, regardless of threshold.

In addition, oil batteries meeting specific production and oil type thresholds would need to report VOC and benzene releases from their storage tanks. Other stages reviewed demonstrated increases in reporting coverage and whether additional requirements to increase VOC and benzene coverage would be needed. The years covered by this proposal are 2018-2027. Other issues included the 20,000 employee-hour threshold for reporting.

## **E. Comments on Process and Outcomes of the Review:**

- The Oil and Gas industry had been reporting to the NPRI since 2003. At the time of this review, less than 5% of VOC emissions and 1.4% of benzene emissions were being captured by the NPRI. ECCC's proposal was designed to significant increases in VOC and benzene reporting, but at the same time, minimize the reporting "burden" to industry. However, VOC and benzene reporting under Stage 1 of this proposal would still be inadequate.
- The lengthy period of time (≈10 years) for this review for the proposed step process to reach "completion" was excessive. There was no assurance as to the degree of improvements in emissions reporting that would or could be made and no specification as to what modifications would be made to reporting requirements in order to secure increased reporting deemed necessary.
- It was questionable as to whether the first stage of this proposal would result in improved changes in reporting, especially given uncertainties in the potential "overlap" between facilities that currently report to the NPRI and additional facilities (i.e., oil batteries) that would be required to report. Thus, there was no assurance that the degree of improvement would adequately reflect the actual emissions (in particular, VOCs and benzene) from the operations of this industry as a whole.
- The industry has not been required to report the full extent of its emissions of CACs and benzene to the NPRI because of limitations to the NPRI reporting requirements.

- Emissions from wells were not and are still not included. This is an important longstanding issue, given the vast number of wells (over 300,000), including orphaned and abandoned wells, and the aggregate impact of emissions from the dense clusters of wells.
- With respect to uncertainty and accuracy of numbers, there is no indication as to the level of uncertainty of what is currently being reported. Emissions estimates are given to six digits in some cases, implying a level of accuracy that is totally unwarranted.<sup>2</sup>

At the time of these consultations and currently, it is questionable as to when and whether ECCC's proposed strategy would provide the level of coverage of these pollutants representative of this industry in a timely fashion.

NGO participants indicated an overriding goal for this industry of 80% coverage of emissions of CACs and benzene and that this goal would be achieved within two years after reviewing the results of the first step in ECCC's proposal.<sup>3</sup>

## Thresholds for Reporting to the NPRI

### VOC Thresholds:

The mass threshold is typically 10 tonnes MPO and the concentration threshold is 1% (also in tonnes) for all substances reported. For a sector such as Conventional Oil and Gas, considering the vast number of VOCs released, it would be inappropriate to apply such thresholds, especially considering the potential adverse effects of the substances themselves and the cumulative emissions of these substances.

### Final Comments:

Some changes on reporting requirements have been made (as of 2018 onward) with respect to this sector, for example, on reporting requirements with respect to the number of employees (e.g., less than 10 employees), the benzene threshold and other specific VOCs, should reflect on the quantities reported to the NPRI.<sup>4</sup>

However, it is not evident as to what degree that would be or whether the changes are even adequate to reflect the degree of toxicity of exposure to a particular substance or a host of substances, that is cumulative effects on health and the environment. Given uncertainties in reporting to the NPRI, ECCC should carry out an assessment and verification of some the values reported.

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<sup>2</sup> Note: The industry should be required to correct its previously reported emissions. (There is a precedent for this - the mining sector was required to back-report emissions of waste rock and to tailings ponds to the NPRI following a court case.)

<sup>3</sup> Reference to Final Report – Consultation Document March 29, 2017 - NPRI Oil and Gas Review (Phase 2) is not on line.

<sup>4</sup> Oil and Gas sector data: Results of 2018 changes October 28, 2022 ([Npri reporting updates \(gccollab.ca\) https://pollution-waste.canada.ca/national-release-inventory/](https://pollution-waste.canada.ca/national-release-inventory/))

## References:

1) **Conventional Oil and Gas Sector:** NPRI Substances reported for the years 2017-2021, with indication of which substances are VOCs.

<https://pollution-waste.canada.ca/national-release-inventory/PredefinedQueries/2>

2) **NPRI Substance List 2022- Thresholds for VOCs**

<https://www.canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/substances-list.html>

3) **NPRI Substance List 2022 – Thresholds for all NPRI substances**

<https://www.canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/substances-list/threshold.html>

4) NPRI Oil and Gas Review Phase 2 – NGO Perspectives on Reporting Issues and Recommendations (January 13, 2017)