





Cat. No.: En81-14E-PDF English ISSN: 2369-7733

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Nomenclature

| APEI | Air Pollutant Emission Inventory |
|-------------------|---|
| BTEX | Benzene/toluene/ethylene/xylene |
| CAC | Criteria air contaminant |
| CEPA | Canadian Environmental Protection Act, 1999 |
| СО | Carbon monoxide |
| ECCC | Environment and Climate Change Canada |
| g | Gram |
| kg | Kilogram |
| MPO | Manufactured, processed or otherwise used |
| NAICS | Statistics Canada's North American Industry Classification System |
| NOx | Nitrogen oxides (expressed as NO2) |
| NPRI | National Pollutant Release Inventory |
| P2 | Pollution prevention |
| PAH | Polycyclic aromatic hydrocarbons |
| PM | Particulate matter |
| PM10 | Particulate matter ≤ 10 microns |
| PM _{2.5} | Particulate matter ≤ 2.5 microns |
| SO ₂ | Sulphur dioxide |
| TEQ | Toxic equivalent |
| TEF | Toxic equivalency factor |
| TPM | Total particulate matter |
| TRS | Total reduced sulphur |
| VOC | Volatile organic compounds |

Highlights

The purpose of this report is to provide a national level summary analysis of data on pollutant releases, disposals and transfers reported in 2016 by facilities that meet the National Pollutant Release Inventory (NPRI)'s reporting requirements.

The current report was prepared using data submitted by facilities as of September 14, 2017, for the 2016 reporting year. This data also contains updates and new reports submitted by facilities for 2015 or previous reporting years.

For the 2016 reporting year, 7 087 industrial, commercial and institutional facilities submitted standard substance reports to the NPRI, compared with 7 284 at the time of publication of the 2015 data release. The NPRI program accepts late reports from facilities, and the current count for 2015 facilities reporting releases, disposals and/or transfers is 7 338.¹ For the 2016 reporting period, 944 facilities reported that they do not meet reporting requirements and would not be submitting a standard report. Over half of these facilities were in the oil and gas extraction sector. For 2016, 322 substances were reportable to the NPRI according to various thresholds.

In 2016, the total quantities of pollutant releases, disposals and transfers reported to the NPRI (4 763 017 tonnes²) broke down as follows:

- Direct releases represented 67% (3 187 308 tonnes).
 - Direct releases to air accounted for 64% (3 037 564 tonnes). Direct releases to air include the following categories:
 - Emissions of criteria air contaminants (CACs) accounted for 62% (2 955 060 tonnes); and,
 - Other NPRI substances directly released to air accounted for nearly 2% (82 504 tonnes).
 - Direct releases to surface waters accounted for 3% (131 518 tonnes).
 - Direct releases to land accounted for 0.4% (17 835 tonnes).
 - Direct releases to unspecified media (less than one tonne) accounted for less than 0.1% (392 tonnes).
- Disposals (i.e., on-site and off-site) and transfers represented 33% (1 575 709 tonnes).

Between 2015 and 2016, total direct releases to air, water and land decreased overall by 1% (29 700 tonnes). Reported releases of CACs decreased by 1% (40 847 tonnes), while reported releases of all other substances to air, water, and land increased by 5% (11 147 tonnes):

- The decrease in CACs comes primarily from the upstream oil and gas extraction sector. In 2016, conventional oil and gas facilities reported 23 289 tonnes of nitrogen oxide releases than in the previous year, a decrease of 4%. Also, several oil sands facilities in the Fort McMurray area suspended operations in 2016 because of the Horse River Wildfire, which resulted in these facilities reporting 15 667 less tonnes of volatile organic compounds (a decrease of 8%) between 2015 and 2016 and 10 989 less tonnes of sulphur dioxide (a decrease of 1%) compared to 2015.
- Direct releases to air for all substances other than CACs increased by 2 273 tonnes (an increase of 3%) between 2015 and 2016. The two substances with the largest increases were ammonia, with an increase of 732 tonnes (4%), and sulphuric acid, with an increase of 539 tonnes (15%). The increases in releases to air of both of these substances is due to

¹ This value includes facilities reporting to the NPRI after the release of the 2015 Summary Report. Therefore, the number of facilities in 2015 went from 7 284 to 7 338.

² Totals reflected in the text, charts and tables may not add up due to rounding.

increased production – at a chemical fertilizer manufacturing facility in Saskatchewan for ammonia, and at a power plant in New Brunswick for sulphuric acid.

- Direct releases to water of all substances increased by 4 113 tonnes (3%) between 2015 and 2016. This increase is primarily driven by increases in releases of nitrate ion reported by three wastewater treatment plants in Ontario, each increasing their reported releases of this substance by over 1 000 tonnes.
- Direct releases to land of all substances increased by 4 760 tonnes (36%) between 2015 and 2016. This increase is mainly due to increases in land releases of ethylene glycol from airport facilities. Ethylene glycol is used as an aircraft de-icing fluid.

Between 2015 and 2016, total disposals and transfers increased by 39 531 tonnes (3%). This increase is led by higher quantities reported of tailings and waste rock from the mining and quarrying sector, which increased by 90 796 tonnes (11%). The five facilities with the largest increases in tailings and waste rock (with increases of 8 000 tonnes or more each) reported increased production levels, resuming operations after a halt in production, and starting operations for the first time among the reasons for their respective increases.

In 2016, of the 7 087 facilities that reported to the NPRI, 1 049 facilities stated they had implemented a pollution prevention plan, and 1 130 facilities specified that they had implemented at least one pollution prevention activity, for a total of 3 251 reported activities. Pollution prevention activities can include:

- materials or feedstock substitution;
- product design or reformulation;
- equipment or process modification;
- spill and leak prevention;
- on-site reuse, recycling or recovery;
- inventory management or purchasing techniques;
- good operating practices or training; and,
- any other activities that minimize the creation of pollutant and waste.

1 Introduction

The National Pollutant Release Inventory (NPRI) collects information from Canadian industrial, commercial, and institutional facilities on their releases (to air, water, and land), disposals, and transfers of pollutants and other substances of concern. The program began in 1993.

It is also a requirement under the Canadian Environmental Protection Act, 1999 (CEPA): owners or operators of facilities that meet the reporting requirements published in the Canada Gazette, Part I must report to the NPRI on an annual basis.

The NPRI is Canada's legally mandated, publicly accessible inventory of annual facility-level pollutant releases to air, water and land, as well as disposals, and transfers for recycling.

The NPRI is a key resource for identifying and monitoring sources of pollution in Canada. It exists to support priority setting and monitoring of environmental performance measures, to contribute to the compilation of pollution patterns and trends, to provide environmental information in the public interest, and to fulfill international reporting obligations.

NPRI data are used by governments (i.e., federal, provincial, territorial, municipal), academia, industry, non-governmental organizations, international organizations, financial institutions, the media, and the public.

This summary report presents an analysis of the information submitted by facilities to the NPRI for the 2016 reporting year.

2 General Considerations When Using the National Pollutant Release Inventory Data

The current report was prepared using data submitted by facilities as of September 14, 2017, for the 2016 reporting year. Following quality control checks of facility-reported data, a number of potential reporting errors by facilities were identified and prioritized for follow-up. A number of facilities proceeded to update their reports as a result. This data also contains updates and new reports submitted by facilities for 2015 and previous reporting years.³

The National Pollutant Release Inventory (NPRI) facility data are available in multiple formats, including an online data search application, map layers for use with Google Earth™ and downloadable datasets. For access to the data in electronic format and other information about the NPRI, please visit the NPRI website and the Government of Canada Open Data Portal.

The NPRI makes a significant amount of data available to data users, and this data can be analyzed in a number of ways (e.g., by substance, by facility, by media [air, water, land], by geographic region, by industrial classification code and/or by type of release to the environment [direct releases, disposals, transfers]). The Appendix of this report provides a breakdown of the 2016 facility reported data by substance and by substance category.

NPRI data can also be combined with other data sources, such as monitoring data collected under other environmental reporting programs, to provide a more comprehensive picture of pollution in various areas of the Canadian environment.

There are considerations to be taken into account by readers of this report and data users to ensure NPRI data are analyzed and interpreted properly:

- Not all sources of pollution in Canada are reported through the NPRI. The NPRI is designed to track the largest sources of pollution from industrial, commercial, and institutional facilities.
- Not all facilities in Canada have to report to NPRI. The NPRI requires that facilities that meet certain reporting criteria report their releases, as applicable, of more than 300 substances (which are indicated on a regularly updated list). Exemptions may apply to small facilities (e.g., where employees have worked less than 20 000 hours in a year, pits and quarries with production smaller than 500 000 tonnes), facilities undertaking certain activities (e.g., education and training of students, research or testing, dentistry), and facilities operating in certain sectors (e.g., oil and gas exploration, drilling of oil or gas wells).
- Data users should also note that NPRI substances do not all pose the same potential risk to the environment and to human health. This variation in the properties of different substances should be taken into account when analyzing NPRI data concerning different substances. The purpose of providing totals in this report is to offer a general perspective on pollutant releases, and not to characterize the impacts of this pollution.
- Data users should also be aware of the possibility of double counting when adding NPRI substances from different facilities or from different parts of the NPRI reporting requirements. For example, certain substances (e.g., certain sulphur compounds, certain particulate matter fractions, certain aromatic hydrocarbons) must be reported under more than one NPRI reporting requirement. Consequently, these quantities are reported several times, and should not be added.

³ The NPRI reporting system is available year-round and facilities can submit reports or corrected data at any time, regardless of the reporting year. More than 300 facilities submitted an update or a report in the months following publication of the NPRI summary report for 2015.

 It is also necessary to take into account changes made to NPRI reporting requirements over time. Figure 2-1 illustrates how some of the changes made to the reporting requirements have had an impact on the number of facilities reporting to the NPRI over the years, as well as on the list of reported substances. Other factors that impact the number of facilities reporting to the NPRI include the closure of facilities, or facilities no longer meeting reporting thresholds due to changes in production levels or production processes.



Figure 2-1 Changes to NPRI reporting requirements, 1993-2016

- When conducting analyses over time or comparing facilities, possible changes involving the facility must be taken into consideration. Important factors can include changes in production levels, changes in the calculation methods used to quantify releases, implementation of pollution prevention activities, or subsequent updates of the data submitted to the NPRI for previous years.
- Finally, despite all the efforts made by NPRI reporting facilities, errors sometimes occur when submitting information to the NPRI. Environment and Climate Change Canada implements a number of measures to ensure the relevance, accuracy, reliability, completeness, understandability, accessibility, and timeliness of NPRI data in order to continue to meet the needs of data users. For more information, please consult the Data Quality page of the NPRI website.

For more information about the factors to consider when using and interpreting NPRI data, please refer to the Guide for Using and Interpreting NPRI Data.

For more information on the assumptions and specific considerations used in preparing the 2016 NPRI Summary Report, please refer to the Technical Notes in section 9.

3 Changes to the National Pollutant Release Inventory Requirements for 2016

This section provides a summary of each change to the National Pollutant Release Inventory (NPRI) reporting requirements for 2016. The NPRI reporting requirements are updated every two years. Changes to reporting requirements over time may have an impact on reported values from year to year, and should be taken into account when analyzing NPRI data. More details and rationale for these changes can be found in the consultations section of the NPRI website.

3.1 Threshold Change for Cobalt (and its compounds)

Cobalt (and its compounds) was moved from Part 1A to Part 1B of the NPRI Reporting Guide with a reduced reporting threshold of 50 kg (from 10 tonnes) and a concentration threshold of 0.1% (reduced from 1%).

As shown in Figure 3-1, 265 facilities reported releases, disposals, or recycling of cobalt (and its compounds) compared to 102 in 2015. Despite the increase in reporting facilities, there was an overall decrease in total reported releases of cobalt. Releases to unspecified media as a total are only permitted when reporting substances listed in Part 1A, so there was no reporting in 2016 for this category. For more information about unspecified media, refer to section 9 of this report.

There was a small increase in reported releases to air and land, but a large decrease in releases to water for 2016. The decrease in 2016 releases to water can be attributed to a chemical manufacturing plant that implemented measures to reduce the amount of cobalt transferred to a wastewater treatment plant in 2015. When releases to water are examined excluding this facility, there was an overall increase in reporting of releases to water for 2016.



Figure 3-1 Changes in releases of cobalt (and its compounds) reported to the NPRI between 2015 and 2016

There was an overall increase reported quantities of cobalt for on-site and off-site disposals and transfers for recycling in 2016. Tailing and waste rock disposal values likely increased due to a combination of factors, including increased reporting from the mining sector, increased production at a number of mines, and the fact that there is no minimum concentration threshold for waste rock when reporting substances listed on Part 1B of the NPRI substance list.

3.2 Substances Deleted from the National Pollutant Release Inventory Substance List

In an effort to keep the NPRI substance list current and relevant, twenty-one substances were removed in 2016 as they no longer meet the NPRI decision factors for listing a substance. More specifically, they are no longer manufactured, processed or otherwise used (MPO) by facilities in Canada, are not of health or environmental concern, or have not been reported to the NPRI in the past.

The substances that were deleted for 2016 are listed below:

- C.I. Acid Green 3 (CAS RN 4680-78-8)
- C.I. Basic Red 1 (CAS RN 989-38-8)
- C.I. Direct Blue 218 (CAS RN 28407-37-6)
- C.I. Food Red 15 (CAS RN 81-88-9)
- Calcium cyanamide (CAS RN 156-62-7)
- Chlorendic acid (CAS RN 115-28-6)
- Dimethyl phenol (CAS RN 1300-71-6)
- 2,6-Dinitrotoluene (CAS RN 606-20-2)
- Dinitrotoluene (mixed isomers) (CAS RN 25321-14-6)
- Hexachloroethane (CAS RN 67-72-1)
- Isosafrole (CAS RN 120-58-1)
- p-Nitrophenol (and its salts) (CAS RN 100-02-7)
- Paraldehyde (CAS RN 123-63-7)
- Pentachloroethane (CAS RN 76-01-7)
- o-Phenylphenol (and its salts) (CAS RN 90-43-7)
- Propargyl alcohol (CAS RN 107-19-7)
- p-Quinone (CAS RN 106-51-4)
- Safrole (CAS RN 94-59-7)
- Styrene oxide (CAS RN 96-09-3)
- Tetracycline hydrochloride (CAS RN 64-75-5)
- Vinylidene chloride (CAS RN 75-35-4)

3.3 Contextual Information on Direct Discharges to Water

For 2016 reporting, facilities that reported a direct discharge to water were required to provide the average annual concentration (ppm) of the substance. Information on the method detection limit used to estimate releases was also collected. These data are used to provide context to quantities reported as releases to water and help explain variations.

For example, a refinery reported a discharge to water of 630 kg of lead in 2016. However, the average annual concentration was reported to be 0.004 ppm and the majority of samples were below the detection limit. The facility also provided the following comment in its report: "Most of the analyses were under detection limit. When the numbers were under the detection limit, half of the value of the detection limit was used for calculation."

Although this facility reported a large release of lead to water, the reported value is based on an estimation using half of the detection limit, and is not a measured value. This information is useful for putting context around reported releases to water and may reduce assumption making when only the release value is reported.

Since this is the first year collecting this information, continued efforts will be made to improve the quality of the data for subsequent years.

4 Overall Picture for 2016

For the 2016 reporting year, 7 087 industrial, commercial and institutional facilities reported to the National Pollutant Release Inventory (NPRI) on substances released into the environment (i.e., air, water, land), disposed of, and/or transferred to other facilities for treatment or recycling. The number of facilities has decreased compared to 2015, which was 7 284 at the time of the publication of the previous version of this report. The NPRI program accepts late reports from facilities, and the current count for 2015 facilities reporting releases, disposals and/or transfers is 7 338.⁴

There are several reasons to explain this decrease:

- In 2016, 944 facilities reported that they did not meet the reporting criteria to the NPRI program this number has decreased compared to the 2015 value of 1 340 facilities. Most of these facilities were from the oil and gas extraction sector⁵;
- In 2016, 44 facilities submitted a closure report. 17 of these reports were from facilities that closed during the 2016 reporting period while the rest were from facilities that closed in previous years, but only submitted a closure report in 2016; and,
- In 2016, 322 substances were reportable to the NPRI according to various thresholds. A facility is required to report the quantities of these substances released or managed if it meets the NPRI reporting requirements.

Figure 4-1 below provides an overall breakdown of the quantities reported to the NPRI in 2016. The total of reported quantities for all categories is 4 763 017 tonnes. The percentages in the chart are rounded.



Figure 4-1 Breakdown of the total quantities reported in 2016, by reporting category

Total quantities reported to the NPRI: 4 763 017 tonnes

⁴ For the 2015 summary report, 7 284 facilities had submitted reports at the time of drafting the report, using data as of September 29, 2016. Over 54 facilities subsequently submitted an update or a report for 2015.

⁵ As per the Statistics Canada North American Industry Classification System (NAICS), the oil and gas extraction sector is comprised of two subsectors: conventional oil and gas extraction and non-conventional oil extraction. Additional information can be found at

www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=118464&CVD=118468&CPV=21111&CST=01012012&CLV=1& MLV=5&D=1

Direct releases represented 67% (3 187 308 tonnes) of total reported quantities. All percentages below are based on total reported quantities.

- Direct releases to air accounted for 64% (3 037 564 tonnes). Direct releases to air include the following categories:
 - Emissions of criteria air contaminants accounted for 62% (2 955 060 tonnes); and,
 - Other NPRI substances directly released to air accounted for 2% (82 504 tonnes).
- Direct releases to surface waters accounted for 3% (131 518 tonnes).
- Direct releases to land accounted for 0.4% (17 835 tonnes).
- Direct releases to unspecified media (less than one tonne) accounted for less than 0.1% (392 tonnes).

Disposals and transfers represented 33% (1 575 709 tonnes) of total reported quantities. All percentages below are also based on total reported quantities.

- On-site disposals accounted for 5% (228 336 tonnes).
- Off-site disposals accounted for 2% (90 706 tonnes).
- Treatment prior to disposal accounted for close to 1% (40 067 tonnes).
- Tailings accounted for 16% (779 865 tonnes).
- Waste rock accounted for nearly 3% (128 689 tonnes).
- Transfers for off-site recycling accounted for 6% (308 044 tonnes).

More detailed information is provided in sections 6 and 7 of this summary report.

5 Location of Facilities Reporting to the National Pollutant Release Inventory

The 7 087 facilities that reported on direct releases, disposals and transfers to the National Pollutant Release Inventory (NPRI) in 2016 are distributed across all provinces and territories of Canada, as shown in Figure 5-1 and in Table 5-1.





Note: This map shows NPRI reporting facilities for 2016 (7 087 facilities), excluding those that did not meet the reporting criteria (944 facilities).

| Provinces/Territories | Number of facilities | Percentage |
|---------------------------|----------------------|------------|
| Alberta | 2 683 | 38% |
| Ontario | 1 667 | 24% |
| Québec | 811 | 11% |
| Saskatchewan | 727 | 10% |
| British Columbia | 716 | 10% |
| Manitoba | 173 | 2% |
| Nova Scotia | 98 | 1% |
| New Brunswick | 65 | 1% |
| Newfoundland and Labrador | 63 | 1% |
| Northwest Territories | 36 | 1% |
| Nunavut | 34 | <1% |
| Prince Edward Island | 11 | <1% |
| Yukon | 3 | <1% |
| Total | 7 087 | 100% |

Table 5-1 Location of facilities reporting to the NPRI for 2016, by province and territory

Alberta has the largest number of facilities that reported to the NPRI for 2016 (i.e., 2 683 or 38% of the total). The oil and gas extraction sector, with 2 109 facilities, accounts for 79% of Alberta's facilities reporting to the NPRI. The number of reporting facilities in the province decreased by 193 between 2015 and 2016, mostly attributed to oil and gas extraction facilities who indicated they did not meet the NPRI reporting requirements in 2016.

Ontario has the second highest number of facilities that reported for 2016 (i.e., 1 667, or 24% of the total). Most of these facilities are from the manufacturing sector, concentrated in southern Ontario. The number of reporting facilities in the province slightly increased (i.e., three additional facilities) between 2015 and 2016.

Québec, Saskatchewan and British Columbia are each home to approximately 10% of the facilities of the total number of facilities reporting for 2016 (i.e., 811 in Québec, 727 in Saskatchewan, and 716 in British Columbia).

In Québec, most of the facilities are from the manufacturing sector, particularly chemical and wood products manufacturers. All of Canada's aluminum smelters are located in Québec, except for one in British Columbia. Most manufacturing facilities lie along the Québec City–Windsor Corridor, which follows the St. Lawrence River. In 2016, the number of facilities that reported to the NPRI compared to 2015 decreased slightly (i.e., two facilities less).

In Saskatchewan, 69% (500 facilities) of the province reporters are from the oil and gas extraction sector. Other reporting facilities include natural gas and oil pipelines, uranium and potash mining, and grain handling and storage facilities. The number of reporting facilities increased by 22 between 2015 and 2016; this is mostly attributed to the oil and gas extraction sector.

In British Columbia, 40% (288 facilities) of the province reporters are from the oil and gas extraction sector and 34% (242 facilities) are from the manufacturing sector, particularly wood products. The number of reporting facilities decreased by 17 between 2015 and 2016; this is mostly attributed to reduction of reporting facilities from the oil and gas extraction sector.

In Manitoba, sectors that report to the NPRI include, but are not limited to, animal feed and chemical manufacturers, mines and grain handling facilities. In 2016, three more facilities reported to the NPRI compared to 2015.

In Atlantic Canada, facilities that submitted a report in Prince Edward Island, New Brunswick and Nova Scotia are spread across numerous sectors, including electric power generation, manufacturing (i.e., food manufacturing, wood products), and others (i.e., defence services, wastewater treatment). Newfoundland and Labrador has primarily electric power generation facilities—located along its coasts—as well as mines. Nova Scotia and Newfoundland and Labrador are also home to all of Canada's off-shore oil and gas production facilities. Overall, in 2016, 10 fewer facilities reported to the NPRI from Atlantic Canada compared to 2015, all from various sectors.

Most of the facilities in Northern Canada (i.e., Yukon, Northwest Territories and Nunavut) are diesel electric generating stations serving off-grid communities, mining operations, and oil and gas extraction activities. Overall, in 2016, three fewer facilities reported to the NPRI from Northern Canada compared to 2015, all from the electric power generation sector, which did not meet the NPRI reporting criteria.

For more information on reported direct releases, disposals and transfers reported by province or territory, please refer to section 10.7 (i.e., Provincial and territorial breakdown of reported data).

6 Data on Direct Releases to Air, Water and Land

This section presents the breakdown of total reported direct releases for the 2016 reporting year, the changes compared to 2015, the substances and main sectors associated with these releases, as well as changes over time of total releases since 2007.

Direct releases of National Pollutant Release Inventory (NPRI) substances are divided in four categories:

- Releases to air: this category includes substances released from many sources, such as discharges through a stack, vent or other points of release; losses from storage and handling of materials; fugitive emissions (i.e., releases that cannot be captured and unintentional releases); spills and accidental releases; and road dust, generated by vehicles operating on-site at a facility. This category is divided in two:
 - Releases to air of criteria air contaminants (CACs): this category includes emissions of carbon monoxide (CO), sulphur dioxide (SO₂), nitrogen oxides (NO_x), volatile organic compounds (VOCs), total particulate matter (TPM), particulate matter with a diameter of less than 10 microns (PM₁₀) and particulate matter (PM) with a diameter of less than 2.5 microns (PM_{2.5}).
 - Releases to air of other substances: this category includes all other substances listed on the NPRI released to air and excludes CACs, which are discussed in the previous category.
- Releases to surface waters: this category includes releases from direct discharges, spills and leaks to oceans, lakes, wetlands, rivers, and streams.
- Releases to land: this category includes surface and underground releases from spills, leaks and other releases that are not disposals (e.g., application of aircraft de-icing products).
- Releases to unspecified media: this category includes releases of substances as an aggregated total for all media, where the total release quantity is less than one tonne. The NPRI allows this approach only for Part 1A substances.

As indicated in Figure 6-1, most of the direct releases reported to the NPRI in 2016 were releases to air of CACs. In order to provide a better understanding of releases of PM across the country, the maximum PM value (i.e., largest value from TPM, PM₁₀ or PM_{2.5}) for each facility was chosen. For more information on the relationship between PM size fractions, please refer to section 9 (i.e., Technical Notes).

Figure 6-1 Breakdown of total direct releases reported to the NPRI for 2016



Total reported releases: 3 187 308 tonnes

As illustrated in Figure 6-2, between 2015 and 2016, total direct releases reported to the NPRI fell by 1% (38 574 tonnes); coincidentally, the number of reporting facilities decreased by 3% (250 facilities). This decrease is a combination of increases and decreases in emissions from various facilities. As CACs encompass the largest portion of releases reported to the NPRI, they are generally the main drivers for large variations of the national trend. Specific events can have an impact on production levels, pollution prevention activities, and pollutant release trends. For example, the 2016 Horse River Wildfire affected operations located in the area of Fort McMurray, Alberta, and contributed to reported decreases of PM, SO₂ and VOCs from industries.

It should be noted that releases from diffuse sources are not tracked by the NPRI. Their impacts on air quality also have to be taken into account when doing analysis. For example, wildfires could contribute to air emissions of CACs and other substances. For more information on factors to consider when using and interpreting NPRI data, please refer to the Guide for Using and Interpreting NPRI Data.



Figure 6-2 Changes over time of total direct releases by medium since 2007 relative to the number of facilities

Between 2007 and 2016, total direct releases to air, surface waters and land reported to the NPRI decreased by 28% (1 247 584 tonnes), with a notable reduction in direct releases reported from 2007 to 2009 from manufacturing plants (e.g., base metals smelting, wood products, pulp and paper), coal-fired electricity generating stations, and conventional oil and gas extraction facilities. Reductions continued in the following years at a lower and more stable rate.

6.1 Direct Releases to Air of Criteria Air Contaminants

In 2016, direct releases of CACs to air accounted for 62% of the total quantities reported to the NPRI (Figure 4-1) and 93% of direct releases reported to the NPRI (Figure 6-1) (2 955 060 tonnes). Table 6-1 provides the breakdown of the types of direct releases of CACs to air for 2016.

| Type of release | Reported quantities (tonnes) | Percentage | |
|----------------------|------------------------------|------------|--|
| Stack/Point | 2 567 791 | 87% | |
| Storage and handling | 52 219 | 2% | |
| Spills | 372 | <1% | |
| Fugitive emissions | 161 453 | 5% | |
| Road dust | 156 798 | 5% | |
| Other CAC releases | 16 427 | <1% | |
| Total | 2 955 060 | 100% | |

Table 6-1 Breakdown of the types of direct releases of CACs to air in 2016

It should be noted that there are other major sources of pollutants which are not reported to the NPRI, such as motor vehicles, residential heating, forest fires and agriculture. For more information concerning these other sources, see the Air Pollutant Emission Inventory (APEI) Report.

Similar to 2015, sectors with the largest reported direct releases of CACs for 2015 were manufacturing (1 338 135 tonnes), oil and gas extraction (714 228 tonnes), and electric power generation (460 126 tonnes). The proportion of CACs varies from a sector to another. As such, the manufacturing sector is the main emitter of CO and SO₂, whereas the mining and quarrying sector reports large quantities of PM (Figure 6-3).



Figure 6-3 Sectoral breakdown of direct releases of CACs in 2016

Between 2015 and 2016, total direct releases of CACs reported to the NPRI decreased by 1% (40.847 tonnes). This decrease is a net amalgam of increases and decreases from various facilities:

- Emissions of CO increased by 3% (39 611 tonnes) with increased production levels of aluminium smelters in British Columbia and Québec.
- NO_x emissions decreased by 4% (23 289 tonnes), the conventional oil and gas extraction being the main driver of this decline.
- The 2016 Horse River Wildfire in Fort McMurray, Alberta, halted operations at several nonconventional oil extraction facilities (including oil sands and heavy oil). This contributed to the drop in reported releases of VOCs (8%, 15 667 tonnes) and SO₂ (1%, 10 989 tonnes).
- Releases of SO₂ from a nickel-copper ore mine in Manitoba and conventional oil and gas extraction facilities also contributed to its decrease at the national level. SO₂ is a by-product of metal processing and fossil fuel combustion.
- PM emissions decreased by 4% (13 265 tonnes). PM releases vary with the weather (e.g., dry seasons, frequency of precipitation) and with the improvement of technologies removing PM.

Figure 6-4 displays the location of NPRI facilities reporting CACs across Canada and highlights facilities reporting large quantities of CACs emissions:

- Aluminum smelters from the manufacturing sector in Québec and in British Columbia reported significant releases of CO from aluminum electrolysis. Two nickel smelters in Northern Ontario are also high emitter of SO₂.
- Coal-fired electricity generating stations in Alberta, Saskatchewan and Nova Scotia reported large quantities of SO₂ and NO_x.
- Highlighted metal mining facilities on the map had different release profiles. The nickelcopper mine in Manitoba mainly reported SO₂ emissions. Two mines in Newfoundland and Labrador and Québec that are part of the iron ore mining industry reported all CACs in different proportions as they undertake different activities.
- Oil sands extraction facilities in Alberta reported over 20 000 tonnes of various CACs.



Figure 6-4 Map of facilities reporting direct releases to air of CACs in 2016, by sector and reported total quantities

6.2 Direct Releases to Air of Other Substances

Direct releases to air of substances other than CACs are discussed in this section. For the sake of simplicity, all chemicals listed on the NPRI, but CACs, will be referred to as "other substances" in this section.

In 2016, direct releases to air of other substances accounted for 2% of the total quantities reported to the NPRI (Figure 4-1) and 3% of direct releases reported to the NPRI (Figure 6-1) (82 504 tonnes). Table 6-2 provides the breakdown of the various types of direct releases to air reported to the NPRI in 2016.

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|---|------------------------------|------------|--|--|--|
| Type of release | Reported quantities (tonnes) | Percentage | | | |
| Stack/Point | 63 707 | 77% | | | |
| Storage and handling | 2 872 | 3% | | | |
| Spills | 58 | <1% | | | |
| Fugitive emissions | 13 632 | 17% | | | |
| Other air releases | 2 235 | 3% | | | |
| Total | 82 504 | 100% | | | |

| Table 6-2 Breakdown of the types | of direct releases | to air in 2016 |
|----------------------------------|--------------------|----------------|
|----------------------------------|--------------------|----------------|

Between 2015 and 2016, direct releases to air of substances other than CACs reported to the NPRI increased by 3% (2273 tonnes) (Figure 6-5). The aggregated trend has remained relatively stable since 2012, with certain substances increases cancelling others' decreases. Ammonia,

methanol and hydrochloric acid are the substances with the largest reported direct releases to air in 2016, excluding CACs (Figure 6-5). The substance-level trends discussed below identify the main drivers of the changes between 2015 and 2016, which generally match the production levels changes:

- National levels of ammonia released to air increased by 4% (732 tonnes), mainly attributed to a chemical fertilizer manufacturer production levels in Saskatchewan.
- A non-conventional oil extraction facility in Alberta also had increased levels of ammonia released to air. It also affected releases of benzene, toluene, ethylbenzene and xylene (BTEX) to air. National levels of BTEX increased by 9% for the whole country (644 tonnes). The contents of tailings ponds and the increased exposure of a mine's surface heavily influence the amount of fugitive releases of these substances.
- Sulphuric acid releases to air increased by 15% (539 tonnes), varying accordingly to production levels of a coal-fired power plant in New Brunswick, and to results of engineering estimates of a base metals smelter in Ontario.
- Production levels of an oilseed processing facility drove the 9% decrease of n-hexane released to air (418 tonnes). This substance serves as a solvent to extract the oilseed from grains.



Figure 6-5 Changes over time of direct releases to air (excluding CACs)

Between 2007 and 2016, direct releases to air of other substances decreased by 20% (20 878 tonnes), with a significant decrease between 2008 and 2011 (Figure 6-5). In 2009, the overall reduction of these releases was mainly from multiple facility closures in the manufacturing sector.

- Between 2007 and 2010, direct releases to air of total reduced sulphur (TRS) increased by 50% (5119 tonnes) due to the growth in the oil and gas sector. They then decreased by 42% in 2011 (6442 tonnes) following changes in the measurement methodology and in the emission factors used by several oil and gas extraction facilities.
- Between 2011 and 2016, direct releases to air of hydrochloric and sulphuric acids have increased by 65% (6551 tonnes), attributable to the use of new emission factors to calculate emissions by the electricity sector.

Table 6-3 below shows the manufacturing sector as the highest contributor of releases to air of other substances at 66% (54 128 tonnes), with 64% of facilities reporting (991 facilities). Major subsectors reporting releases to air include paper and paperboard mills, chemical manufacturers, and wood product manufacturers.

| Sector | Reported quantities (tonnes) | Percentage of reported quantities | Number of facilities | Percentage of facilities |
|------------------------|------------------------------------|---|-------------------------|-----------------------------|
| Electricity | 12 266 | 15% | 46 | 3% |
| Manufacturing | 54 128 | 66% | 991 | 64% |
| Mining and quarrying | 1 146 | 1% | 74 | 5% |
| Oil and gas extraction | 9 250 | 11% | 132 | 9% |
| Other sectors | 5 715 | 7% | 295 | 19% |
| Total | 82 504 | 100% | 1 538 | 100% |

Table 6-3 Sectoral breakdown of releases of substances to air other than CACs in 2016

Figure 6-6 displays the location of NPRI facilities reporting direct releases to air of other substances across Canada and highlights facilities reporting large quantities:

- The manufacturing sector encompasses multiple subsectors reporting large amounts of substances released to air across the country. This includes chemicals manufacturers (i.e., fertilizers, resins, rubber), metal smelting, and pulp and paper mills.
- Electric power generation plants using coal stand out on the map as well: the presence of chloride in coal burned by the power plants leads to the release of hydrochloric acid.
- Oil sands extraction facilities in Alberta reported high releases to air of other substances: fugitive emissions occur from the exposure of the tailings ponds and the exposure of the mine's face.



Figure 6-6 Map of facilities reporting direct releases to air of other substances in 2016, by sector and reported total quantities

6.3 Direct Releases to Surface Waters

In 2016, direct releases to surface waters accounted for 3% of the total quantities reported to the NPRI (Figure 4-1) and 4% of total direct releases reported to the NPRI () (131 518 tonnes).

Table 6-4 provides the breakdown of the types of direct releases to water for 2016.

| Type of release | Reported quantities (tonnes) | Percentage |
|-------------------|------------------------------|------------|
| Direct discharges | 130 502 | 99% |
| Accidental spills | 1 016 | 1% |
| Leaks | < 0.001 | < 1% |
| Total | 131 518 | 100% |

Between 2015 and 2016, direct releases to surface waters reported to the NPRI increased by 3% (4113 tonnes) (Figure 6-7). Nitrate ions in solution at a pH \ge 6.0, ammonia, and phosphorus are the main substances released to surface waters in large quantities in 2016 (Figure 6-7). All three substances are part of a substance grouping called nutrients to water: nutrients find their way into aquatic ecosystems at levels that can cause eutrophication – impairment due to the over – production of algae. These three substances mainly come from municipal wastewater treatment facilities, where throughput and effluent concentrations influence on the estimation of quantities of substances discharged in water upstream. Several wastewater treatment plants in the

Greater Toronto Area reported large increases of nitrate ion in solution at $pH \ge 6.0$ discharged to water (1000 tonnes more each compared to last year). Results of their source testing indicated increased effluent concentrations; in addition, one facility reported an increased throughput.



Figure 6-7 Changes over time of direct releases to surface waters

In 2014, the breaching of a tailings pond of a mining facility in British Columbia led to the releases of multiple substances to surface waters including phosphorus, manganese, copper, vanadium, lead, arsenic, and many more. Prior to this spill, these substances were disposed of as tailings. However, once the tailings retention pond dam was breached, these substances were consequently released to surface waters. Since there were no releases of this magnitude reported in 2015, total releases to water decreased by 37% (74 596 tonnes) compared to 2014. Direct releases to surface waters remained stable between 2006 and 2013 and between 2015 and 2016.

Table 6-5 below shows the other sectors as the highest contributor of releases to surface waters at 89% (116 792 tonnes), with 40% of facilities reporting (173 facilities). Major subsectors reporting releases to surface waters include wastewater treatment plants, and in a smaller proportion, pulp and paper mills, conventional oil and gas extraction facilities, and metal ore mines.

| Sector | Reported quantities (tonnes) | Percentage of reported quantities | | Percentage of facilities |
|------------------------|------------------------------------|---|-----|-----------------------------|
| Electricity | 31 | <1% | 16 | 4% |
| Manufacturing | 8 763 | 7% | 165 | 38% |
| Mining and quarrying | 2 991 | 2% | 78 | 18% |
| Oil and gas extraction | 2 942 | 2% | 7 | 2% |
| Other sectors | 116 792 | 89% | 174 | 40% |
| Total | 131 518 | 100% | 440 | 100% |

| Table | 6-5 | Sectoral | breakdown | of releases | to surface | waters in 2016 |
|-------|-----|----------|------------|--------------|------------|----------------|
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Figure 6-8 displays the location of NPRI facilities reporting direct releases to surface waters across Canada and highlights facilities reporting large quantities:

- The map shows the importance of other sectors' facilities. They are located close to major city centres where wastewater treatment plants handle the most wastewater.
- Offshore oil and gas production facilities from Newfoundland and Labrador and from Nova Scotia release mainly ammonia (from wastewater discharges), ethylene glycol (used as a de-icing agent) and methanol (used to prevent the formation of hydrates, which can plug equipment and interrupt flowlines).

Figure 6-8 Map of facilities reporting direct releases to surface waters for 2016, by sector and reported total quantities



6.4 Direct Releases to Land

In 2016, direct releases to land represented 0.4% of the total quantities reported to the NPRI (Figure 4-1) and 0.6% of reported direct releases reported to the NPRI (Figure 6-1) (17 835 tonnes). Table 6-6 provides the breakdown of direct releases to land reported in 2016.

| Type of release | Reported quantities (tonnes) | Percentage |
|---------------------|------------------------------|------------|
| Accidental spills | 28 | <1% |
| Leaks | 0.510 | <1% |
| Other land releases | 17 806 | ~100% |
| Total | 17 835 | 100% |

| Table 6-6 Breakdown of types of direct releases to land in 2016 | ole 6-6 Breakdown of ty | pes of direct rele | ases to land in 2016 |
|---|-------------------------|--------------------|----------------------|
|---|-------------------------|--------------------|----------------------|

Between 2015 and 2016, direct releases to land increased by 36% (4760 tonnes) (Figure 6-9). Ethylene glycol accounted for 78% (13 833 tonnes) of direct releases to land in 2015. Ethylene glycol is used as a de-icing agent in airports according to weather conditions. An Ontario airport reported an increase of 8425 tonnes compared to 2015 and was the main driver of the increase.



Figure 6-9 Changes over time of direct releases to land

Table 6-7 below shows the other sectors as the highest contributor of releases to land at 85% (15 092 tonnes), with 59% of facilities reporting (111 facilities). Major subsectors reporting releases to land include the sectors of scheduled air transportation and supporting activities for air transportation.

| Table 6-7 Sectoral breakdown of releases to land |
|--|
|--|

| Sector | Reported | Percentage of | Number of | Percentage of |
|--------|------------|---------------|------------|---------------|
| | quantities | reported | facilities | facilities |
| | (tonnes) | quantities | | |

| Sector | Reported quantities (tonnes) | Percentage of reported quantities | Number of facilities | Percentage of facilities |
|------------------------|------------------------------------|---|-------------------------|-----------------------------|
| Electricity | 13 | <1% | 1 | <1% |
| Manufacturing | 2 024 | 11% | 57 | 30% |
| Mining and quarrying | 667 | 4% | 8 | 4% |
| Oil and gas extraction | 38 | <1% | 10 | 5% |
| Other sectors | 15 092 | 85% | 111 | 59% |
| Total | 17 835 | 100% | 187 | 100% |

Figure 6-10 displays the location of NPRI facilities reporting direct releases to land across Canada and highlights facilities reporting large quantities:

- The map showcases the importance of other sectors' facilities. They are located close to several city centres where airports are located and use ethylene glycol as a de-icing agent.
- A hardware manufacturer in Southern Ontario released metal chips to land.
- A mine in Newfoundland and Labrador indicated the releases to land of methanol and ammonia from crushing, drilling and blasting activities.

Figure 6-10 Map of facilities reporting direct releases to land for 2016, by sector and reported total quantities of these releases



6.5 Direct Releases of Toxic Substances Reported to the National Pollutant Release Inventory

The NPRI substance list contains approximately 100 substances that are toxic under the Canadian Environmental Protection Act, 1999 (CEPA). An asterisk identifies these substances in section 10 of this report (Appendix – Breakdown of 2016 National Pollutant Release Inventory Facility Reported Data by Substance, and by Substance Category). For the sake of simplicity, they will be referred to as "toxic substances" in this section.

This section only examines releases of toxic substances using reported quantities. Other factors need to be considered to characterize their risks to the environment and human health. Those include, among others:

- a substance's inherent toxicity;
- the physical and chemical properties (e.g., persistence, bioaccumulation);
- the medium to which it is released (e.g., to air, land or water);
- the transport and transformation pathways (i.e., if and to what extent it is broken down or transported in the environment); and,
- the resulting amount, timing, nature and level of exposure.

In 2016, toxic substances account for 63% of total direct releases reported to the NPRI (1991 509 tonnes) (Figure 6-11). CACs make up the vast majority of the toxic substances category, accounting for 95% of reported direct releases of toxic substances (1 887 152 tonnes). Between 2015 and 2016, releases of toxic substances decreased 1% (29 319 tonnes).





Toxic CACs listed in the NPRI are NO_x, SO₂ and VOCs. Various forms of PM are also toxic under CEPA, such as respirable PM₁₀ (which includes PM_{2.5}), PM containing metals that is released in emissions from copper smelters or refineries, or from both, and from zinc plants. The NPRI does not distinguish metals and metal compounds found in PM from copper smelters, refineries and

zinc plants. For the sake of simplicity, PM₁₀ and PM_{2.5} were categorized as toxic, while the rest of PM is presumed larger than 10 microns.

Other toxic substances on the NPRI list can have significant environmental and human health impacts at very low levels. Some have lower reporting thresholds than CACs. For example, metals and metals compounds of lead, arsenic, cadmium, hexavalent chromium, and mercury have reporting thresholds ranging from 5 to 50 kg.

Figure 6-11 and Figure 6-12 describes the distribution of toxic substances released to the environment across industrial sectors, excluding SO_2 , NO_x and VOCs (which are already examined in section 6.1).



Figure 6-12 Breakdown by sector of direct releases in 2016 of certain groups of toxic substances





In the case of PM₁₀, its release profile differs from the PM release profile shown in section 6.1. The manufacturing represents 31% (42 168 tonnes) of PM₁₀ releases reported (Figure 6-12), as opposed to 22% (75 142 tonnes) of TPM releases reported (Figure 6-3). The main contributors are facilities from the pulp and paper, wood products, and metals sectors. Consequently, the mining and quarrying sector, and the oil and gas extraction sector have lower percentages in the PM₁₀ profile compared to the TPM profile.

The manufacturing sector is also a large emitter of other toxic substances. It represents 37% (733 416 tonnes) of toxic substances released. It is a vast and varied sector that encompasses a large range of different industries with their respective pollution profile, such as wood products, iron and steel, and chemicals. This sector reported the greatest amount of releases for these categories:

- Aldehydes (i.e., wood products, pulp and paper);
- BTEX (i.e., transportation equipment manufacturing, petroleum refineries);
- Toxic metals (i.e., metals [except aluminum, iron and steel], petroleum refineries);
- Dioxins and furans (i.e., iron and steel, pulp and paper);
- Diisocyanates (i.e., textiles, pulp and paper, wood products);
- Hexachlorobenzene (i.e., iron and steel, metals);
- Ozone depleting substances (i.e., chemicals, petroleum refineries);
- Polycyclic aromatic hydrocarbons, also known as PAH (i.e., pulp and paper, petroleum refineries, aluminum, chemicals); and,
- Phthalates (i.e., chemicals, transportation equipment manufacturing).

The oil and gas extraction sector follows as a high emitter of toxic substances to the NPRI at 25% (493 442 tonnes). It reported significant quantities of aldehydes, BTEX, PM₁₀ and PAH.

The electricity generation sector is third in reporting releases of toxic substances to the NPRI at 21% (415 882 tonnes). Releases of inorganic fluorides come from the burning of fluoridecontaining coal and oil.

The mining and quarrying sector accounted for 12% (246 327 tonnes) of toxic substances releases reported to the NPRI. Emissions of PM₁₀ mainly stem from drying, crushing and compacting activities and the use of vehicles on unpaved roads. Minerals extracted by mines contain various metals, including toxic metals such as arsenic, mercury, lead, and many others.

The other sectors accounted for 5% (102 442 tonnes) of toxic substances releases. Wastewater treatment plants reported for discharges to surface waters of phenols (mainly nonylphenol and its ethoxylates) and nutrients (mainly nitrate ion in solution at $pH \ge 6.0$ and ammonia). Sources of nonylphenol and its ethoxylates include industrial and household use of soap, detergents and degreasing agents, textile processing, pulp and paper, and pest control products.

Figure 6-13 displays the location of NPRI facilities reporting direct releases of toxic substances across Canada and highlights facilities reporting large quantities. While the map is very similar to Figure 6-4 due to the high levels of CACs reported to the NPRI, some facilities stand out more in the map below:

- A non-ferrous foundry in Québec reported large quantities of SO₂ and PM₁₀.
- The map highlights two petroleum refineries located in Newfoundland and Labrador and in Ontario, with releases of various CACs, PAH, heavy metals, and solvents.
- In Newfoundland and Labrador, an electric power generation plant burning fuel oil reported releases of SO₂, NO_x, heavy metals, hexachlorobenzene, dioxins and furans.



Figure 6-13 Map of facilities reporting toxic substances for 2016, by sector and reported total quantities of these releases

7 Data on Disposals and Transfers

This section provides a breakdown of the quantities of substances disposed of or transferred, as reported to the National Pollutant Release Inventory (NPRI), the main substances reported in these categories, the sector breakdown, and the changes over time since 2007.

Reported data discussed in this section is divided into two categories:

- Disposals:
 - On-site disposals: a substance can be permanently disposed of by various methods, including landfilling, underground injection or land application. This is termed on-site disposal if it takes place on the site of the reporting facility.
 - Off-site disposals: when the disposal takes place outside the site, this is termed offsite disposal. These transfers can take place within Canada or outside the country. The methods used are the same as for on-site disposals.
 - Tailings are waste materials that remain after the processing of ore, ore concentrate or other mined materials (e.g., oil sands) to extract marketable components such as metals, minerals, or bitumen. Depending on the type of process used and the material being recovered, tailings could include finely ground rock material, sand, clay, water, chemicals used in the process, and residual metals, minerals, and bitumen.
 - Waste rock is rock removed during mining operations to provide access to the ore and that is not further processed at that time. Waste rock generally consists of fragmented pieces of rock of various sizes.
- Transfers:
 - Off-site transfers for treatment prior to disposal (also called "treatment prior to disposal" or "treatment"): a substance may have been altered physically, chemically, biologically, by incineration, or by treatment in a treatment plant before being disposed of off-site.
 - Off-site transfers for recycling (also called "off-site recycling" or "recycling") are associated with activities that keep a material or component of the material from becoming a waste destined for final disposal. Facilities that meet the NPRI reporting thresholds submit information on the quantities of substances that they transfer off-site for recycling. On-site recycling activities do not have to be reported.

The quantities of substances disposed of or transferred reported to the NPRI accounted for 33% of the quantities reported to the NPRI in 2016, or 1 575 709 tonnes (Figure 4-1). The breakdown of this total by category is shown in Figure 7-1.



Figure 7-1 Breakdown of total disposals and total transfers reported to the NPRI in 2016

As shown in Figure 7-1, the majority of the quantities reported to the NPRI as disposed of or transferred in 2016 come from the management of tailings, which make up 49% (779 865 tonnes) of total disposals and transfers.

Figure 7-2 shows how this breakdown has changed over the last ten years since 2007.





Between 2015 and 2016, total reported disposals and transfers increased by 3% (39 061 tonnes). Tailings and waste rock from the mining and quarrying sector contributed the most to this

increase. This variation is slightly offset by on-site disposals and off-site disposals, which decreased by 15% (41 768 tonnes) and 9% (8 553 tonnes), respectively.

Between 2007 and 2016, total disposals and transfers decreased by 7% (122 945 tonnes). Reported quantities for several disposal and transfer categories have decreased, particularly from off-site disposals (78% [404 742 tonnes]), on-site disposals (38% [138 275 tonnes]), and off-site transfers for recycling (23% [93 961 tonnes]). On the other hand, since 2007, tailings and waste rock quantities have increased by 60% (293 130 tonnes) and 27% (124 091 tonnes), respectively.

In Table 7-1, reported disposals and transfers and the number of reporting facilities for these categories are broken down by sectors. The sectors contributing the most to the quantities of NPRI substances disposed of or transferred were the mining and quarrying, manufacturing, and oil and gas extraction sectors.

| Sector | Reported quantities (tonnes) | Percentage of reported quantities | Number of facilities | Percentage of facilities |
|------------------------|------------------------------------|---|-------------------------|-----------------------------|
| Electricity | 5 593 | <1% | 39 | 2% |
| Manufacturing | 379 383 | 24% | 1 077 | 63% |
| Mining and quarrying | 853 197 | 54% | 83 | 5% |
| Oil and gas extraction | 217 102 | 14% | 130 | 8% |
| Other sectors | 120 434 | 8% | 389 | 23% |
| Total | 1 575 709 | 100% | 1 718 | 100% |

Table 7-1 Sectoral breakdown of disposals and transfers in 2016

Figure 7-3 shows the location of NPRI facilities that reported disposals and transfers across Canada.

- Most of the largest reporters of disposals are mines. The five largest facilities are all metal mining facilities. Mostly reporting tailings, they include one iron ore mine in Newfoundland and Labrador, one gold and silver ore mine in Ontario, two copper and zinc ore mines in British Columbia, and one metal ore mine in Québec.
- Four manufacturing facilities also reported large amounts of disposals, from various subsectors. Two petroleum refineries (one in New Brunswick and one in southern Ontario) reported large amounts of sulfuric acid transferred for recycling. A spent pot lining treatment facility in Québec reported on-site landfill of calcium fluoride. Finally, one nonferrous metal producer and processing facility in British Columbia reported large amounts of recovered inorganic compounds.
- A few oil and gas extraction facilities located in British Columbia and Alberta reported underground injection of large quantities of hydrogen sulphide.



Figure 7-3 Map of facilities that reported disposals and transfers for 2016, by sector and total quantities reported

7.1 On-Site and Off-Site Disposals, and Treatment prior to Disposal

This section discusses off-site transfers for treatment prior to disposal, as well as on-site and off-site disposals reported in 2016. Tailings and waste rock are not included in section 7.1 and will be discussed in section 7.2.

On-site disposals, off-site disposals, and off-site transfers for treatment prior to disposal accounted for 26% (406 293 tonnes) of the total disposals and transfers reported to the NPRI in 2016.

Figure 7-4 shows that the majority of disposals are on-site disposals, mostly underground injection with 35% (125 306 tonnes) and landfilling with 27% (96 446 tonnes) of total reported disposals, excluding tailings and waste rock. The main disposal methods for off-site disposals are similar, with underground injection at 11% (41 200 tonnes) and landfill at 10% (37 059 tonnes) of total reported disposals in this section. In the case of off-site transfers for treatment prior to final disposal, municipal sewage treatment plants are the most commonly used treatment method with 4% (13 861 tonnes), followed by treatment by an incineration or thermal process, with 3% of total disposals (11 339 tonnes), excluding tailings and waste rock.



Figure 7-4 Breakdown of types of disposals reported to the NPRI in 2016, excluding tailings and waste rock management

In 2016, the following sectors reported over 60 000 tonnes of disposals (excluding tailings and waste rock):

- Conventional oil and gas extraction (i.e., oil and gas extraction);
- Waste treatment and disposal (i.e., others); and,
- All other non-metallic mineral product manufacturing (i.e., manufacturing).



Figure 7-5 Changes over time of disposals excluding tailings and waste rock reported to the NPRI between 2007 and 2016

As shown in Figure 7-5, the substances disposed of on-site and off-site and treated in larger quantities in 2016 (excluding tailings and waste rock) were lower to those reported in 2015. Hydrogen sulphide is reported primarily by the oil and gas extraction sector since it occurs in natural gas extraction.

Between 2015 and 2016, total disposals (excluding tailings and waste rock) decreased by 12% (46 725 tonnes). This is due to a decrease in hydrogen sulphide of 17% (28 864 tonnes) reported for oil and gas extraction facilities as well as a decrease in methanol of 38% (14 280 tonnes) reported for the landfilling by waste treatment and disposal facilities. Between 2006 and 2009, an oil facility in British Columbia contributed to a slow but steady increase in disposals reported to the NPRI, due primarily to off-site transfers. From 2010 until it closed in late 2012, it contributed significantly to a decrease in underground injection of hydrogen sulphide. From 2015 to 2016, the decrease in hydrogen sulphide disposals could be explained by a decrease in acid gas injection.

In 2015, six facilities in Alberta undertaking services for oil and gas extraction indicated changes in production levels and in on-site treatment to explain the increase in methanol disposals. In 2016, the same six facilities reported data that was much more consistent with their reported quantities from previous years, indicating that 2015 was most likely an anomaly.

7.2 Disposal of Tailings and Waste Rock

Disposal of tailings and waste rock accounted for 58% (908 554 tonnes) of total disposals and transfers reported to the NPRI in 2016, with approximately 779 865 tonnes of tailings and 128 689 tonnes of waste rock. Close to 94% of these reported quantities originate from the mining sector.

NPRI substances contained in tailings and waste rock occur naturally, typically at low concentrations, in rock or bitumen deposits extracted during mining operations. However, the overall quantities can be high due to the volume of material extracted or processed. Although

tailings and waste rock in Canada are managed with a view to reducing the risk of environmental contamination, acid drainage, potential leaks from tailings ponds, and the possibility of wildlife coming in contact with tailings are sources of concern.





As shown in Figure 7-6, phosphorus along with many metals and metal compounds, such as manganese, copper, nickel and zinc, were among the substances reported in larger quantities in tailings and waste rock in 2016. These substances have traditionally made up the tailings and waste rock category in the NPRI since they started being reported for the 2006 reporting year.

Between 2015 and 2016, tailings and waste rock have increased 11% (90 796 tonnes). Five mining facilities reported increases of over 8000 tonnes for tailings and waste rock in 2016 compared to 2015. There were various reasons to explain these increases:

- One facility in British Columbia resumed normal operations in June 2016 following a facility breach in 2014;
- One facility in British Columbia completed a relocation project giving it access to additional reserves;
- One facility in New Brunswick restarted operations in 2016;
- One facility in Ontario opened in 2012 and has been gradually increasing its production levels; and,
- One facility in Québec reopened in 2010 and has been gradually increasing its production levels.

The increase was offset by large decreases of reported quantities for tailings and waste rock from three mining facilities:

- One facility in Québec reduced production in order to conduct operations to expand reserves;
- One facility in British Columbia completed an updated mine plan featuring a decrease in strip ratio (ratio of waste rock to ore); and,
- One facility in British Columbia ceased operations in August 2016 and is on care and maintenance pending the improvement of the price of copper.

Between 2007 and 2016, reported amounts of tailings and waste rock reporting increased by 85% (417 221 tonnes). This change can be attributed to various factors:

- A facility in Newfoundland and Labrador has driven most of the trend with reported quantities of 98 832 tonnes or more since 2006;
- There were new large reporters of tailings and waste rock, such as a gold and silver ore mining facility in Ontario in 2013, and a copper-zinc ore mining facility in British Columbia in 2014; and,
- The year 2016 saw the opening of four mining facilities with a significant level of production.

7.3 Off-Site Transfers for Recycling

Off-site transfers for recycling accounted for 20% (308 044 tonnes) of total disposals and transfers reported to the NPRI in 2016. Figure 7-7 shows the types of off-site recycling, and the quantities reported by the facilities in 2016.



Figure 7-7 Breakdown of recycling categories reported to the NPRI in 2016

The most commonly used recycling category for off-site transfers in 2016 was the recovery of acids and bases and the recovery of metals and metal compounds. In 2016, the following sectors reported over 8000 tonnes of substances for off-site transfers for recycling:

- Manufacturing: petroleum refineries; non-ferrous metal (except copper and aluminum) rolling, drawing, extruding and alloying; iron and steel mills and ferro-alloy manufacturing, non-ferrous metal (except aluminum) smelting and refining;
- Oil and gas extraction: non-conventional oil extraction (oil that does not flow or cannot be pumped without being heated or diluted); and,
- Other: petroleum and petroleum products merchant wholesalers; waste treatment and disposal.



Figure 7-8 Changes over time of transfers for off-site recycling reported to the NPRI between 2007 and 2016

Sulphuric acid is the most commonly recovered acid, while lead, zinc, manganese and copper (and their compounds) are among the most recycled metals. Over the past decade, these were the substances most reported as being transferred off-site for recycling.

Between 2015 and 2016, off-site transfers for recycling decreased by 2% (4 824 tonnes). Sulphuric acid had the largest decrease of all substances reported for off-site recycling. This decrease was primarily due to a petroleum refinery in Québec that reported 15 855 tonnes of sulphuric acid transferred off-site for recycling in 2106, which is 10 414 tonnes less then what was reported by this facility in 2015. The facility reported that a decrease in overall production as the primary reason for the decrease in transfers for recycling.

The quantities reported to the NPRI for off-site transfers for recycling decreased 23% (93 961 tonnes) between 2007 and 2016. Most of the decrease is attributed to the transportation equipment manufacturing sector, which reported lower quantities of zinc and its compounds between 2007 and 2016. Reduction in production levels due to a reduced demand in manufactured products, a reduced amount of generated scrap metal, a change in steel reformulation, and several cases where facilities did not meet the reporting requirements for zinc and its compounds, led to the decrease in reported quantities of this metal. In 2010 and 2011, a mining/metal smelter and refinery in Ontario, reported large quantities of zinc transferred off-site for recycling, following the closure of its operations in May 2010.

7.4 Disposals and Transfers of Toxic Substances Reported to the National Pollutant Release Inventory

The list of reportable NPRI substances contains approximately 100 substances that are toxic under the Canadian Environmental Protection Act, 1999 (CEPA). These substances are indicated by an asterisk in the table in section 10 (Appendix – Breakdown of 2016 National Pollutant Release Inventory Facility Reported Data by Substance, and by Substance Category). For the sake of simplicity, they will be referred to as "toxic substances" in this section.

Figure 7-9 shows that toxic substances accounted for 23% (362 350 tonnes) of disposals and transfers reported to the NPRI in 2016. Compared to 2015, reported quantities of toxic substances

decreased by 1% (2 964 tonnes). Compared to 2007, reported quantities of toxic substances increased by 28% (80 364 tonnes). A large portion of the increase is attributed to on-site disposals of calcium fluoride from a spent pot lining treatment facility which started operations in 2008: calcium fluoride is a compound of spent pot lining, a waste material generated in the aluminum manufacturing sector.







Non-toxic substances - Tailings and waste rock

Non-toxic substances - On-site and off-site disposals, and transfers for treatment

Toxic substances [Under CEPA (1999)] - Transfers for off-site recycling

Toxic substances [Under CEPA (1999)] - Tailings and waste rock

Toxic substances [Under CEPA (1999)] - On-site and off-site disposals, and transfers for treatment

Unlike direct releases to the environment, where most of the reported quantities were toxic substances, disposals and transfers reported to the NPRI consist primarily of non-toxic substances. It should be noted that criteria air contaminants (CACs), which make up a large portion of direct releases of toxic substances, cannot be reported in the disposals and transfers category.

The types of toxic substances reported in larger quantities depend on the category. For disposals and transfers for treatment (excluding tailings and waste rock), large quantities of calcium fluoride (inorganic fluorides), methanol (volatile organic compounds [VOCs]) and asbestos were reported. Tailings and waste rock are primarily composed of toxic metals like nickel, vanadium, arsenic, lead, and their compounds. Substances transferred for off-site recycling include lead, toluene and xylene (benzene/toluene/ethylene/xylene [BTEX] grouping), and methanol (VOCs).

For the 2016 reporting year, most disposals and transfers of toxic substances were reported to the NPRI by the manufacturing sector, as shown in Figure 7-10. This sector had the largest reported disposals and transfers of dioxins and furans, hexachlorobenzene, inorganic fluorides, ammonia (nutrient), phenols, and phthalates. The manufacturing sector is large and covers different industries, which report for different substances according to their activities. Pulp and paper producers reported the most disposals and transfers for dioxins and furans; chemical manufacturers reported the most for hexachlorobenzene; a spent pot lining treatment facility reported the most for inorganic fluorides; plastics and rubber manufacturers reported the most

for phthalates; and oil and gas pipeline and storage facilities reported the most polycyclic aromatic hydrocarbons (PAHs).

The "Other" sector category, which is mostly made up of facilities in the waste treatment and disposal sector, reported large quantities of aldehydes, BTEX, diisocyanates, and ozone-depleting substances. Recycling of BTEX was also largely reported by petroleum and petroleum products merchant wholesalers.

Toxic metals were mostly reported by the mining and quarrying sector under the tailings and waste rock category. Toxic metals include arsenic, cadmium, hexavalent chromium, mercury, nickel, vanadium (except when in an alloy) and their compounds.

Figure 7-10 Sectoral and substance group breakdown of toxic substances disposals and transfers for 2016



Figure 7-10 Sectoral and substance group breakdown of toxic substances disposals and transfers for 2016 (continued)



Figure 7-11 indicates the location of facilities reporting disposals and transfers of toxic substances across Canada. The three largest facilities with over 16 000 tonnes of disposals and transfers of toxic substances were from the manufacturing and the mining sectors:

- two manufacturing facilities are a spent pot lining facility in Québec and a non-ferrous metal processor in British Columbia; and,
- one from the mining sector is a nickel-copper ore mine in Ontario.



Figure 7-11 Map of facilities that reported disposals and transfers of toxic substances for 2016, by sector and total quantities reported

8 Pollution Prevention Information Reported to the National Pollutant Release Inventory

This section presents the breakdown of the information reported to the National Pollutant Release Inventory (NPRI) related to pollution prevention (P2)⁶.

P2 is defined by the Canadian Environmental Protection Act, 1999 (CEPA) as: "the use of processes, practices, materials, products, substances or energy that avoid or minimize the creation of pollutants and waste, and reduce the overall risk to the environment or human health." Facilities reporting to the NPRI may have applied P2 practices and techniques to various parts of their operations in order to reduce pollutants and waste at the source. For more information on pollution prevention, please visit Environment and Climate Change Canada (ECCC)'s Pollution prevention web page.

8.1 P2 Reporting

Facilities are asked to declare in their report to the NPRI if they have prepared or updated a P2 plan over the course of the 2016 reporting year. If applicable, facilities are asked additional questions with regards to their plan, including the reason for which the plan was prepared and the main environmental issue that was addressed in the plan. Facilities are also asked if they implemented any of the seven common types of P2 activities during the reporting year, regardless of whether or not a plan was implemented. These types of activities are listed below:

- Substituting materials or products;
- Redesigning or reformulating products;
- Changing equipment or processes;
- Preventing spills and leaks;
- Recovering, reusing, and repairing;
- Changing inventory and buying practices; and,
- Changing behaviour, and training.

In 2016, a total of 7 087 facilities submitted a report to the NPRI. Of these total reporting facilities, 1 049 declared having prepared a P2 plan and 1 130 declared having implemented P2 activities during the reporting year. The number of facilities reporting to the NPRI, as well as the number of facilities that declared having implemented P2 activities, has shown a decreasing trend since 2014, as shown in Figure 8-1. The number of facilities with a P2 plan decreased in comparison to the 2014 and 2015 reporting years.

⁶ This section of the report focuses on a three-year trend (2014, 2015 and 2016) rather than a ten-year trend.



Figure 8-1 Number of facilities reporting to the NPRI, reporting having P2 plans or P2 activities in 2014, 2015 and 2016

8.2 P2 Plans

Of the 1 049 facilities that declared having prepared a P2 plan, 693 reported preparing a plan on a voluntary basis, 230 in response to a requirement of another government jurisdiction (such as another federal government department, or a provincial or municipal government), 83 in response to a requirement of a P2 planning notice published under CEPA, and 43 for more than one reason. The reasons for implementing a plan in 2016 show a similar distribution to those of the past two reporting years (2014 and 2015), as shown in Figure 8-2.





Facilities also specified whether their plan addressed energy conservation, water conservation or the use or release of a toxic or harmful substance. The proportion of issues addressed is illustrated in Figure 8-3, and shows a similar distribution throughout the three most recent reporting years (i.e., 2014, 2015 and 2016), with the majority of plans addressing substances or more than one of the listed issues. In 2016, 442 of the facilities' plans addressed substances, 56 addressed energy conservation, 19 addressed water conservation, and 393 addressed more than one of the issues.



Figure 8-3 Percentage of total P2 plans addressing each issue in 2014, 2015 and 2016

The distribution of Canadian facilities with a P2 plan in 2016 is presented in Table 8-1.

- The Northwest Territories with 83%, (i.e., 30 of the 36 total reporting facilities in the territory), Newfoundland and Labrador with 56% (i.e., 35 of the 63 total reporting facilities in the province), and Prince Edward Island with 36% (i.e., 4 of the 11 total reporting facilities in the province) had the highest proportion of facilities that reported having a P2 plan in 2016, respectively.
- Saskatchewan had the lowest proportion of facilities with a P2 plan with 4% (i.e., 29 of the 727 total reporting facilities in the province), followed by Alberta with 5% (i.e., 127 of the 2683 total reporting facilities in the province).
- Ontario, followed by Québec, had the highest absolute numbers of facilities with a P2 plan (375 and 225 facilities, respectively).

 Table 8-1 Absolute numbers and percent share of facilities reporting having prepared a P2 plan in 2014, 2015 and 2016 out of the total reporting facilities in each province and territory

 Vert
 2014

| Year | 2014 | | | | 2015 | | 2016 | | | |
|------------------------------|---|-------------------------------------|------------------|---|-------------------------------------|------------------|---|-------------------------------------|------------------|--|
| Province / Territory | Number of facilities with a P2 plan | Total of reporting facilities | Percent share | Number of facilities with a P2 plan | Total of reporting facilities | Percent share | Number of facilities with a P2 plan | Total of reporting facilities | Percent share | |
| Ontario | 391 | 1 693 | 23% | 382 | 1 685 | 23% | 375 | 1 667 | 22% | |
| Québec | 223 | 832 | 27% | 219 | 817 | 27% | 225 | 811 | 28% | |
| British Columbia | 150 | 781 | 19% | 165 | 734 | 22% | 152 | 716 | 21% | |
| Alberta | 131 | 3 256 | 4% | 141 | 2 900 | 5% | 127 | 2 683 | 5% | |
| Newfoundland and Labrador | 38 | 69 | 55% | 38 | 65 | 58% | 35 | 63 | 56% | |
| Northwest Territories | 31 | 40 | 78% | 32 | 39 | 82% | 30 | 36 | 83% | |
| Saskatchewan | 36 | 787 | 5% | 37 | 706 | 5% | 29 | 727 | 4% | |
| Manitoba | 33 | 175 | 19% | 31 | 171 | 18% | 28 | 173 | 16% | |
| Nova Scotia | 21 | 107 | 20% | 18 | 102 | 18% | 20 | 98 | 20% | |
| New Brunswick | 20 | 71 | 28% | 17 | 69 | 25% | 18 | 65 | 28% | |
| Nunavut | 10 | 38 | 26% | 5 | 33 | 15% | 5 | 34 | 15% | |
| Prince Edward Island | 4 | 12 | 33% | 4 | 13 | 31% | 4 | 11 | 36% | |
| Yukon | 1 | 2 | 50% | 1 | 4 | 25% | 1 | 3 | 33% | |
| National Total | 1 089 | 7 863 | 14% | 1 090 | 7 338 | 15% | 1 049 | 7 087 | 15% | |

8.3 P2 Activities

In 2016, 1130 facilities declared having completed one of the seven common types of P2 activities over the course of the reporting year. A total of 3 251 activities were implemented by the facilities, as a single facility may implement multiple activities. Furthermore, 1 026 facilities implemented "Good operating practice or training" activities. As illustrated in Figure 8-4, this type of activity was implemented by the largest number of facilities during the three most recent reporting years (i.e., 2014, 2015 and 2016), followed by "Spill and leak prevention", and "Equipment or process modification".





■2014 ■2015 ■2016

As shown in Figure 8-5:

- The electricity sector presented the highest proportion of facilities having implemented P2 activities in 2016 (24%, i.e., 63 of the sector's 260 total reporting facilities), followed by the manufacturing (22%, i.e., 536 of the sector's 2437 total reporting facilities) and the mining and quarrying sectors (22%, i.e., 56 of the sector's 249 total reporting facilities), and, lastly, the oil and gas extraction sector (7%, i.e., 191 of the sector's 2 920 total reporting facilities).
- In both 2014 and 2015, the mining and quarrying sector had the highest proportion of facilities having implemented P2 activities among all sectors (27% both years, i.e., 67 of the sector's 248 total reporting facilities in 2014, and 67 of the sector's 250 total reporting facilities in 2015), and the oil and gas extraction sector had the lowest proportion (6%, i.e., 203 of the sector's 3630 total reporting facilities in 2014 and 5%, i.e., 169 of the sector's 3137 total reporting facilities in 2015).



Figure 8-5 Percentage of facilities having implemented P2 activities in 2014, 2015 and 2016, by sector

The distribution of facilities having implemented P2 activities across Canada is illustrated in Table 8-2:

- The provinces and territories with the highest proportion of facilities that reported having implemented P2 activities were Prince Edward Island (55%, i.e., 6 of the 11 total reporting facilities in the province), Québec (34%, i.e., 273 of the 811 total reporting facilities in the province) and Yukon (33%, i.e., one of the three total reporting facilities in the territory), respectively.
- Nunavut had the lowest percentage of facilities having implemented P2 activities (3%, i.e., one of the 34 total reporting facilities in the territory), followed by Alberta (9%, i.e., 245 of the 2 683 total reporting facilities in the province).
- Québec, followed by Ontario, had the highest absolute numbers of facilities having implemented P2 activities (273 and 269 facilities, respectively).

Table 8-2 Absolute numbers and percent share of facilities reporting having implemented at least one P2 activity in 2014, 2015 and 2016 out of the total reporting facilities in each province and territory

| Year | | 2014 | | | 2015 | | 2016 | | | |
|------------------------------|---|-------------------------------------|------------------|---|-------------------------------------|------------------|---|-------------------------------------|------------------|--|
| Provinces and Territories | Number of facilities with P2 activities | Total of reporting facilities | Percent share | Number of facilities with P2 activities | Total of reporting facilities | Percent share | Number of facilities with P2 activities | Total of reporting facilities | Percent share | |
| Québec | 274 | 832 | 33% | 274 | 817 | 34% | 273 | 811 | 34% | |
| Ontario | 301 | 1 693 | 18% | 291 | 1 685 | 17% | 269 | 1 667 | 16% | |
| Alberta | 279 | 3 256 | 9% | 246 | 2 900 | 8% | 245 | 2 683 | 9% | |
| British Columbia | 155 | 781 | 20% | 150 | 734 | 20% | 154 | 716 | 22% | |
| Saskatchewan | 69 | 787 | 9% | 74 | 706 | 10% | 92 | 727 | 13% | |
| Manitoba | 38 | 175 | 22% | 39 | 171 | 23% | 33 | 173 | 19% | |
| New Brunswick | 22 | 71 | 31% | 20 | 69 | 29% | 19 | 65 | 29% | |
| Nova Scotia | 18 | 107 | 17% | 20 | 102 | 20% | 18 | 98 | 18% | |
| Newfoundland and Labrador | 12 | 69 | 17% | 11 | 65 | 17% | 11 | 63 | 17% | |
| Northwest Territories | 8 | 40 | 20% | 9 | 39 | 23% | 8 | 36 | 22% | |
| Prince Edward Island | 6 | 12 | 50% | 6 | 13 | 46% | 6 | 11 | 55% | |
| Yukon | 1 | 38 | 3% | 1 | 33 | 3% | 1 | 34 | 3% | |
| Nunavut | 1 | 2 | 50% | 1 | 4 | 25% | 1 | 3 | 33% | |
| National Total | 1 184 | 7 863 | 15% | 1 142 | 7 338 | 16% | 1 130 | 7 087 | 16% | |

For a more detailed analysis of P2 information reported to the NPRI, and for further details regarding the implementation of P2 activities among Canadian facilities, please consult ECCC's Pollution prevention in practice information sheets.

9 Technical Notes

The following are the specific assumptions and considerations taken into account by Environment and Climate Change Canada (ECCC) for analysis purposes in this report.

This National Pollutant Release Inventory (NPRI) Summary Report is based on data reported by facilities as of September 14, 2017. In cases where facilities submitted or updated their data after this date, these will not be reflected in this summary report. ECCC has conducted data quality control checks on the data submitted by facilities, to examine completeness, data integrity, and compliance with mandatory reporting requirements. This process is ongoing, and additional reported information may be flagged for follow-up with reporting facilities.

It should be noted that the data provided in this summary report are for information purposes only. Any interpretation of the data must consider the possible presence of estimation, calculation, or input errors made by facilities.

Totals reflected in the text, charts and tables may not add due to rounding.

While the NPRI was created in 1993, this summary report solely covers data collected and analyzed over the past decade.

Information on the geographic location of facilities includes adjustments for facilities that reported mailing addresses and/or latitude and longitude coordinates that differ from their actual physical location.

In total, 7 087 facilities reported one or more substances to the NPRI for the 2016 reporting year. This number does not include facilities that reported only that they closed or did not meet the NPRI requirements. Facilities that reported manufacturing, processing or using one or more substances for the previous year are required to notify ECCC if they no longer meet the reporting requirements the following year. Changes in ownership or the closure of a facility must also be reported to the NPRI. These types of reports are not included in this summary report; however, they are available to the public through the NPRI downloadable databases.

The following five air pollutants are included in the analysis for criteria air contaminants (CACs):

- total particulate matter (TPM);
- carbon monoxide (CO);
- nitrogen oxides (NOx);
- sulphur dioxide (SO2); and,
- volatile organic compounds (VOCs).

These CACs are listed under Part 4 of the NPRI substance list and were added starting with the 2002 reporting year. Ammonia released to air can also be considered a CAC, but it is included under the category of "Direct Releases to Air, Water and Land (Excluding CACs)", given that it is also released to water in large quantities.

When calculating total direct air releases for particulate matter (PM), road dust emissions were included. To avoid double or triple counting of PM, only the largest reported value between TPM, Particulate matter ≤ 10 microns (PM₁₀), and Particulate matter ≤ 2.5 microns (PM_{2.5}) for each facility was used. PM₁₀ and PM_{2.5} have lower reporting thresholds (0.5 tonnes for PM₁₀ and 0.3 tonnes for PM_{2.5}) compared to the 20-tonne threshold for TPM: in certain cases, a facility may have reported only PM₁₀ and/or PM_{2.5} and not have met the reporting criteria for TPM.



Total reduced sulphur (TRS) was added to the NPRI substance list for the 2007 reporting year due to concerns about its impact on air quality. TRS consists of six individual substances, three of which (hydrogen sulphide [H₂S], carbon disulphide [CS₂] and carbonyl sulphide [COS]) are also listed individually in the NPRI substance list. Therefore, there is a potential for "double counting" if data on TRS and the individual substances are combined. To avoid double counting, the three individual substances were excluded for the analysis of releases to air, whereas TRS was excluded for the analysis of releases to other media and of quantities disposed of or transferred. In 2014, changes were made to the reporting criteria for TRS: only releases to air of this substance are now reportable to the NPRI. However, the possibility of double counting still exists: the individual substances comprising the above-mentioned TRS are excluded from the analysis of releases to air.

Facilities may report negative values for substances contained in waste rock or tailings. Reporting of a negative value for waste rock or tailings indicates that the quantity of a substance removed from the management area exceeded the quantity of the substance deposited in that area for a given year. Total amounts for disposals may vary depending on whether the negative values are considered.

For more detailed information on the potential for double counting, negative values for tailings and other points concerning data analysis, please consult the Guide for Using and Interpreting National Pollutant Release Inventory (NPRI) Data web page.

Facilities reporting releases of less than one tonne of a Part 1A substance are not required to report the specific media of the release (i.e., to air, water or land). In these cases, they have the option to report only a value for total releases: they are described in this report as "releases to unspecified media". For a given Part 1A substance, therefore, total releases reported to the NPRI may be larger than the sum of reported releases to air, water and land.

In this report, industrial sectors are based on Statistics Canada's North American Industry Classification System (NAICS). They are broken down in Table 9-1.

| Sector | NAICS code | NAICS description | | | | | | | | | |
|---------------------------|--|---|--|--|--|--|--|--|--|--|--|
| Flootricity | 2211 | Electric power generation, transmission | | | | | | | | | |
| Electricity | 2211 | and distribution | | | | | | | | | |
| Manufacturing | 31, 32 and 33 | Manufacturing | | | | | | | | | |
| Mining and quarrying | 212 | Mining and quarrying (except oil and gas) | | | | | | | | | |
| Oil and gas extraction | 211 | Oil and gas extraction | | | | | | | | | |
| Other sectors | All other codes not discussed above | Not applicable | | | | | | | | | |

Table 9-1 NAICS codes used extensively in this report

Sectors at the 4-digit or the 6-digit NAICS code level may be used to provide additional context.

10 Appendix – Breakdown of 2016 National Pollutant Release Inventory Facility Reported Data by Substance, and by Substance Category

All substances marked with an asterisk are listed in Schedule 1 of the CEPA (Toxic Substances List).

10.1 Part 1A – Substances listed at the original NPRI threshold (10 tonnes, 1%)

Reporting threshold: the substance is manufactured, processed or otherwise used (MPO) in a quantity of 10 tonnes or more, at a concentration $\geq 1\%$ by weight (except for by-products and mine tailings, which have no concentration threshold) and employees (including contractors) worked $\geq 20\,000$ hours at the facility (or an activity for which the employees threshold does not apply took place).

| CAS No. | Substance name | Releases to air (tonnes) | Releases to water (tonnes) | Releases to land (tonnes) | Releases to unspecified media ⁷ (tonnes) | Total releases (tonnes) | On-site disposals (tonnes) | Off-site disposals (tonnes) | Off-site transfers for treatment prior to final disposal (tonnes) | Off-site transfers for recycling (tonnes) |
|------------|--|--------------------------------|----------------------------------|---------------------------------|--|-------------------------------|----------------------------------|-----------------------------------|--|---|
| 100-41-4 | Ethylbenzene | 631 | 2.8 | 0.000 | 20 | 654 | 1 088 | 238 | 76 | 2 357 |
| 100-42-5 | Styrene* | 1 599 | - | - | 5.1 | 1 604 | 6.1 | 682 | 80 | 21 |
| 10049-04-4 | Chlorine dioxide | 293 | - | - | 1.1 | 294 | - | - | - | - |
| 101-14-4 | p,p'-Methylenebis(2- chloroaniline) | - | - | - | 0.003 | 0.003 | - | 0.026 | - | - |
| 101-68-8 | Methylenebis(phenylisocyan ate) | 2.1 | - | 2.1 | 1.8 | 6.1 | 2.1 | 8.0 | 33 | 0.295 |
| 101-77-9 | p,p'-Methylenedianiline | - | - | - | - | - | - | - | 0.060 | - |
| 103-23-1 | Bis(2-ethylhexyl) adipate | 1.1 | - | - | 0.269 | 1.4 | - | 1.2 | - | 0.304 |
| 106-46-7 | p-Dichlorobenzene* | - | - | - | 0.022 | 0.022 | - | - | - | - |
| 106-50-3 | p-Phenylenediamine (and its salts) | - | - | - | 0.447 | 0.447 | - | - | 0.447 | 0.104 |
| 106-99-0 | 1,3-Butadiene* | 21 | - | - | 0.308 | 21 | - | - | 0.061 | 0.000 |
| 107-02-8 | Acrolein* | 105 | 3.0 | - | 0.105 | 108 | - | - | - | - |
| 107-06-2 | 1,2-Dichloroethane* | 0.034 | - | - | 0.167 | 0.201 | 0.055 | - | - | - |
| 107-21-1 | Ethylene glycol | 163 | 984 | 13 833 | 6.3 | 14 986 | 2 478 | 1 527 | 4 824 | 5 090 |
| 108-05-4 | Vinyl acetate* | 184 | - | - | 0.628 | 184 | 3.3 | 16 | 177 | 8.9 |
| 108-10-1 | Methyl isobutyl ketone* | 221 | 0.026 | - | 4.5 | 226 | 13 | 42 | 105 | 268 |
| 108-31-6 | Maleic anhydride | 0.019 | - | - | 1.1 | 1.1 | - | - | 0.705 | - |
| 108-88-3 | Toluene* | 3 165 | 72 | 0.075 | 41 | 3 279 | 1 872 | 947 | 1 941 | 10 578 |
| 108-90-7 | Chlorobenzene* | - | - | - | 0.990 | 0.990 | - | - | - | - |
| 108-95-2 | Phenol (and its salts) | 162 | 4.4 | - | 1.6 | 168 | 296 | 48 | 84 | 281 |
| 109-86-4 | 2-Methoxyethanol* | - | - | - | 0.003 | 0.003 | 8.6 | 35 | 20 | - |
| 110-54-3 | n-Hexane* | 4 151 | 5.6 | 1.9 | 29 | 4 188 | 3 086 | 896 | 787 | 2 751 |
| 110-80-5 | 2-Ethoxyethanol | - | - | - | 0.002 | 0.002 | 5.7 | 20 | 9.1 | - |
| 110-82-7 | Cyclohexane | 750 | 0.081 | 0.000 | 17 | 767 | 85 | 517 | 98 | 267 |
| 110-86-1 | Pyridine (and its salts) | - | - | - | 0.002 | 0.002 | 5.2 | 19 | 8.4 | - |
| 111-42-2 | Diethanolamine (and its salts) | 5.7 | 0.341 | - | 0.875 | 6.9 | 244 | 0.416 | 43 | 0.801 |
| 111-76-2 | 2-Butoxyethanol* | 429 | - | - | 3.2 | 432 | 75 | 74 | 216 | 80 |
| 111-77-3 | 2-(2-Methoxyethoxy)ethanol* | 0.054 | - | - | 0.004 | 0.058 | - | - | 0.328 | 0.030 |
| 115-07-1 | Propylene* | 428 | - | - | 3.8 | 431 | - | 0.773 | 0.003 | - |
| 1163-19-5 | Decabromodiphenyl oxide* | - | - | - | 0.002 | 0.002 | - | - | - | - |
| 117-81-7 | Bis(2-ethylhexyl) phthalate* | 0.009 | - | - | 2.0 | 2.0 | - | 1.1 | 1.0 | 72 |

Table 10-1 Part 1A – Substances listed at the original NPRI threshold

⁷ Releases to unspecified media include releases of substances as an aggregated total for all media, where the total release quantity is less than one tonne. The NPRI allows this approach only for Part 1A substances.

| CAS No. | Substance name | Releases to air (tonnes) | Releases to water (tonnes) | Releases to land (tonnes) | Releases to unspecified media ⁷ (tonnes) | Total releases (tonnes) | On-site disposals (tonnes) | Off-site disposals (tonnes) | Off-site transfers for treatment prior to final disposal (tonnes) | Off-site transfers for recycling (tonnes) |
|------------|---|--------------------------------|----------------------------------|---------------------------------|--|-------------------------------|----------------------------------|-----------------------------------|--|---|
| 117-84-0 | Di-n-octyl phthalate | - | - | - | - | - | - | - | - | - |
| 120-12-7 | Anthracene* | 8.5 | - | - | 1.2 | 9.7 | 0.145 | 2.3 | 0.036 | 0.740 |
| 120-80-9 | Catechol* | - | - | - | 0.024 | 0.024 | 204 | - | - | - |
| 120-82-1 | 1,2,4-Trichlorobenzene | 1.2 | - | - | 0.006 | 1.2 | - | 0.009 | - | - |
| 121-14-2 | 2,4-Dinitrotoluene | - | - | - | - | - | - | - | - | - |
| 121-44-8 | Triethylamine | 0.090 | - | - | 0.173 | 0.263 | - | - | - | 5.4 |
| 122-39-4 | Diphenylamine | - | - | - | 0.017 | 0.017 | - | 0.767 | 28 | 3.1 |
| 123-31-9 | Hydroquinone (and its salts)* | - | - | - | 0.000 | 0.000 | - | - | - | - |
| 123-72-8 | Butyraldehyde | - | - | - | 0.589 | 0.589 | - | - | - | - |
| 123-91-1 | 1,4-Dioxane | 1.8 | 2.6 | - | 0.000 | 4.4 | - | - | - | - |
| 124-40-3 | Dimethylamine | 1.3 | - | - | - | 1.3 | - | - | - | - |
| 127-18-4 | Tetrachloroethylene* | 75 | - | - | 1.1 | 76 | - | 43 | 14 | 138 |
| 128-37-0 | 2,6-Di-t-butyl-4-methylphenol | - | - | - | 0.001 | 0.001 | - | - | - | - |
| 131-11-3 | Dimethyl phthalate | 2.4 | - | - | 0.600 | 3.0 | - | - | - | - |
| 1313-27-5 | Molybdenum trioxide | 1.1 | - | - | 0.284 | 1.4 | 12 | 74 | 17 | 544 |
| 1319-77-3 | Cresol (all isomers and their salts) | 28 | 0.074 | - | 1.6 | 30 | - | 0.133 | 33 | 63 |
| 1330-20-7 | Xylene (all isomers)* | 3 299 | 14 | 14 | 35 | 3 362 | 2 179 | 998 | 953 | 10 381 |
| 1332-21-4 | Asbestos (friable form)* | - | - | - | - | - | 19 998 | 678 | 0.115 | - |
| 1344-28-1 | Aluminum oxide (fibrous forms) | - | - | - | 1.3 | 1.3 | 3 027 | 199 | 5.4 | 1 940 |
| 13463-40-6 | Iron pentacarbonyl | - | - | - | - | - | - | - | - | - |
| 139-13-9 | Nitrilotriacetic acid (and its salts) | - | - | - | 0.360 | 0.360 | - | - | 0.093 | - |
| 140-88-5 | Ethyl acrylate | 0.070 | - | - | 0.002 | 0.072 | - | - | 0.002 | - |
| 141-32-2 | Butyl acrylate | 2.2 | - | - | 0.174 | 2.4 | - | 0.121 | 0.103 | 0.004 |
| 149-30-4 | 2-Mercaptobenzothiazole | - | - | - | - | - | - | 4.1 | 0.037 | 2.8 |
| 1634-04-4 | Methyl tert-butyl ether | 3.8 | - | - | 0.447 | 4.2 | - | - | 98 | 31 |
| 34077-87-7 | HCFC-123 and all isomers* | 1.7 | 3.7 | - | - | 5.4 | - | - | 0.060 | - |
| 4098-71-9 | Isophorone diisocyanate | - | - | - | 0.172 | 0.172 | - | - | - | - |
| 463-58-1 | Carbonyl sulphide | 3 692 | - | - | 0.884 | 3 693 | 2.1 | - | - | - |
| 50-00-0 | Formaldehyde* | 1 536 | 41 | 0.001 | 4.6 | 1 582 | 38 | 9.2 | 56 | 6.6 |
| 5124-30-1 | 1,1-Methylenebis(4- isocyanatocyclohexane) | - | - | - | 0.000 | 0.000 | - | - | - | - |
| 554-13-2 | Lithium carbonate | 0.000 | - | - | - | 0.000 | - | - | 0.344 | 0.013 |
| 55-63-0 | Nitroglycerin | - | - | - | 0.860 | 0.860 | - | - | 5.4 | - |
| 56-23-5 | Carbon tetrachloride* | - | - | - | - | - | - | - | - | - |
| 569-64-2 | C.I. Basic Green 4 | - | - | - | - | - | - | 0.045 | - | - |
| 62-53-3 | Aniline (and its salts)* | - | - | - | 0.002 | 0.002 | 3.0 | 13 | 37 | - |
| 62-56-6 | Thiourea* | - | - | - | - | - | - | - | - | - |
| 63938-10-3 | HCFC-124 and all isomers* | - | - | - | 0.176 | 0.176 | - | - | - | - |
| 64-18-6 | Formic acid | 33 | - | - | 1.1 | 35 | - | 0.025 | 6.0 | - |
| 67-56-1 | Methanol* | 11 793 | 1 929 | 250 | 17 | 13 988 | 11 366 | 8 804 | 3 181 | 6 595 |
| 67-63-0 | Isopropyl alcohol* | 808 | - | 2.4 | 11 | 821 | 19 | 94 | 2 385 | 942 |
| 67-66-3 | Chloroform | 139 | 0.409 | - | 0.807 | 141 | - | - | 5.3 | - |
| 68-12-2 | N,N-Dimethylformamide | 5.0 | - | - | 0.002 | 5.0 | - | - | 0.031 | 34 |
| 68920-70-7 | Alkanes, C6-18, chloro* | - | - | - | - | - | - | 3.1 | - | 16 |
| 71-36-3 | n-Butyl alcohol | 545 | - | - | 4./ | 550 | 11 | 33 | 82 | 430 |
| 71-43-2 | | /46 | 125 | 0.002 | 18 | 889 | 550 | 435 | 102 | 1 014 |
| 7440-62-2 | Vanadium (except when in | 56 | 1.7 | - 8.7 | 1./ | 68 | 31 653 | 729 | 49 | 3 387 |
| 74.00.0 | an alloy) and its compounds* | | | 0.7 | | | 2. 000 | / | | 0,02 |
| /4-83-9 | Bromomethane* | - | - | - | - | - | - | - | - | - |
| 74-85-1 | Emylene* | 1 4/2 | - | - | 1.3 | 4/4 | 0.300 | - | | 408 |
| 74-87-3 | | 99 | 0.101 | - | 0.002 | 99 | - | - | /.9 | - |
| 74-90-8 | nyarogen cyaniae | 161 | - | - | - | 161 | - | - | - | - |
| /5-00-3 | Chloroethane | 0.154 | - | - | - | 0.154 | - | - | - | - |

| CAS No. | Substance name | Releases to air (tonnes) | Releases to water (tonnes) | Releases to land (tonnes) | Releases to unspecified media ⁷ (tonnes) | Total releases (tonnes) | On-site disposals (tonnes) | Off-site disposals (tonnes) | Off-site transfers for treatment prior to final disposal (tonnes) | Off-site transfers for recycling (tonnes) |
|-----------|---|--------------------------------|----------------------------------|---------------------------------|--|-------------------------------|----------------------------------|-----------------------------------|--|---|
| 75-01-4 | Vinyl chloride* | 0.352 | 0.001 | - | - | 0.353 | - | - | - | - |
| 75-05-8 | Acetonitrile | 17 | - | - | 0.795 | 18 | - | 0.620 | 61 | 97 |
| 75-07-0 | Acetaldehyde* | 697 | 7.5 | - | 0.219 | 704 | 0.003 | 0.010 | - | - |
| 75-09-2 | Dichloromethane* | 24 | - | - | 3.9 | 28 | 4.3 | 17 | 308 | 773 |
| 75-15-0 | Carbon disulphide | 502 | - | - | 1.4 | 503 | 0.350 | - | 0.005 | - |
| 75-21-8 | Ethylene oxide* | 1.4 | - | - | 1.3 | 2.7 | 3.8 | 14 | 6.4 | - |
| 75-45-6 | HCFC-22* | 4.8 | - | - | 0.213 | 5.0 | - | - | 5.3 | 0.107 |
| 7550-45-0 | Titanium tetrachloride | - | - | - | 0.009 | 0.009 | - | 0.057 | 0.179 | - |
| 75-56-9 | Propylene oxide* | - | - | - | 0.003 | 0.003 | - | - | - | - |
| 75-65-0 | tert-Butyl alcohol | - | - | - | 0.034 | 0.034 | - | - | 1.4 | 2.4 |
| 75-68-3 | HCFC-142b* | - | - | - | 0.001 | 0.001 | - | - | - | - |
| 75-69-4 | CFC-11* | - | - | - | - | - | - | - | - | - |
| 75-71-8 | CFC-12* | - | - | - | - | - | - | - | - | - |
| 7632-00-0 | Sodium nitrite | 9.2 | 9.9 | - | 0.425 | 19 | - | 7.3 | 229 | 0.088 |
| 7647-01-0 | Hydrochloric acid | 12 452 | - | 3.0 | 6.0 | 12 461 | 44 | 33 | 445 | 1 570 |
| 7664-39-3 | Hydrogen fluoride* | 2 886 | - | - | 1.7 | 2 888 | - | - | 1.2 | - |
| 7664-93-9 | Sulphuric acid | 4 158 | 39 | 20 | 10 | 4 227 | 48 | 157 | 3 103 | 131 388 |
| 7681-49-4 | Sodium fluoride* | 13 | 13 | - | 0.001 | 26 | - | 2 737 | 29 | - |
| 7697-37-2 | Nitric acid | 8.3 | 20 | 0.000 | 2.4 | 30 | 3.0 | 15 | 577 | 81 |
| 7723-14-0 | Phosphorus (yellow or white) | 0.811 | - | 0.000 | 0.146 | 0.957 | 1 139 | 16 | 6.5 | - |
| 7726-95-6 | Bromine | 18 | - | - | 0.123 | 18 | - | - | - | - |
| 77-73-6 | Dicyclopentadiene | - | - | - | 1.0 | 1.0 | 54 | 0.020 | 23 | - |
| 7782-41-4 | Fluorine | 20 | 68 | - | - | 88 | - | - | - | - |
| 7782-50-5 | Chlorine | 338 | 147 | - | 3.4 | 488 | 1.4 | 25 | 1.8 | 15 |
| 7783-06-4 | Hydrogen sulphide | 1 849 | 100 | - | 9.1 | 1 958 | 108 297 | 27 842 | 1.9 | 14 |
| 7789-75-5 | Calcium fluoride* | 99 | 50 | - | 0.949 | 149 | 45 859 | 840 | 4.8 | 457 |
| 78-83-1 | i-Butyl alcohol | 231 | - | - | 2.3 | 233 | 5.4 | 21 | 35 | 71 |
| 78-87-5 | 1,2-Dichloropropane | - | - | - | - | - | - | - | - | - |
| 78-92-2 | sec-Butyl alcohol | 0.000 | - | - | 0.001 | 0.001 | - | - | - | - |
| 78-93-3 | Methyl ethyl ketone* | 1 182 | 20 | - | 11 | 1 213 | 31 | 236 | 867 | 2 116 |
| 79-00-5 | 1,1,2-Trichloroethane | 3.4 | - | - | - | 3.4 | - | - | - | - |
| 79-01-6 | Trichloroethylene* | 39 | - | - | 1.4 | 41 | - | - | - | 7.4 |
| 79-06-1 | Acrylamide* | - | - | - | 0.000 | 0.000 | - | 0.001 | 0.042 | - |
| 79-10-7 | Acrylic acid (and its salts) | 0.005 | - | - | 0.027 | 0.032 | - | 0.018 | 3.9 | - |
| 79-21-0 | Peracetic acid (and its salts) | 24 | - | - | 0.291 | 24 | - | - | 30 | - |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | - | - | - | 0.008 | 0.008 | 13 | - | - | - |
| 80-15-9 | Cumene hydroperoxide | - | - | - | 0.004 | 0.004 | - | - | - | 0.870 |
| 80-62-6 | Methyl methacrylate | 44 | - | - | 1.1 | 46 | - | 6.6 | 0.836 | - |
| 84-74-2 | Dibutyl phthalate | - | - | - | 0.816 | 0.816 | 18 | 85 | 29 | 0.013 |
| 85-44-9 | Phthalic anhydride | 0.092 | - | - | 0.034 | 0.126 | - | - | 1.1 | - |
| 85-68-7 | Butyl benzyl phthalate | 0.002 | - | - | 0.001 | 0.003 | - | 0.003 | 0.144 | 2.4 |
| 872-50-4 | N-Methyl-2-pyrrolidone | 44 | - | 1.1 | 0.475 | 45 | 6.2 | 9.1 | 54 | 117 |
| 9016-87-9 | Polymeric diphenylmethane diisocyanate | 0.192 | - | 1.1 | 1.9 | 3.1 | 1.1 | 39 | 21 | 4.7 |
| 91-20-3 | Naphthalene* | 81 | 0.030 | - | 4.8 | 86 | 20 | 54 | 111 | 557 |
| 924-42-5 | N-Methylolacrylamide | 0.004 | - | - | - | 0.004 | - | - | - | - |
| 92-52-4 | Biphenyl | 4.0 | 0.001 | - | 0.536 | 4.5 | 0.200 | 0.767 | 1.7 | 47 |
| 94-36-0 | Benzoyl peroxide | 0.004 | - | - | 0.053 | 0.057 | - | - | 0.020 | - |
| 95-50-1 | o-Dichlorobenzene | - | - | - | 0.068 | 0.068 | - | - | - | - |
| 95-63-6 | 1,2,4-Trimethylbenzene* | 721 | 0.038 | 0.258 | . 11 | 732 | 66 | 702 | 31 | 3 205 |
| 96-33-3 | Methyl acrylate | - | - | - | 0.002 | 0.002 | - | 0.011 | 0.025 | - |
| 98-82-8 | Cumene | 82 | - | - | 0.414 | 82 | - | 0.175 | 0.038 | 16 |
| 98-86-2 | Acetophenone | - | - | - | 0.134 | 0.134 | - | - | - | - |
| NA - 01 | Antimony (and its compounds) | 2.7 | 1.8 | 0.007 | 0.460 | 4.9 | 441 | 267 | 4.9 | 210 |
| NA - 04 | Chromium (and its compounds) | 28 | 1.8 | 3.0 | 5.8 | 39 | 31 714 | 1 172 | 203 | 5 131 |

| CAS No. | Substance name | Releases to air (tonnes) | Releases to water (tonnes) | Releases to land (tonnes) | Releases to unspecified media ⁷ (tonnes) | Total releases (tonnes) | On-site disposals (tonnes) | Off-site disposals (tonnes) | Off-site transfers for treatment prior to final disposal (tonnes) | Off-site transfers for recycling (tonnes) |
|----------|--------------------------------------|--------------------------------|----------------------------------|---------------------------------|--|-------------------------------|----------------------------------|-----------------------------------|--|---|
| NA - 06 | Copper (and its compounds) | 274 | 34 | 922 | 9.8 | 1 240 | 103 906 | 2 579 | 486 | 20 844 |
| NA - 07 | Cyanides (ionic) | 6.2 | 0.364 | 0.070 | 1.6 | 8.2 | 1 024 | 0.010 | 10 | - |
| NA - 09 | Manganese (and its compounds) | 82 | 994 | 204 | 14 | 1 295 | 377 565 | 8 310 | 467 | 17 079 |
| NA - 11 | Nickel (and its compounds)* | 147 | 26 | 2.7 | 6.3 | 181 | 54 714 | 509 | 128 | 5 041 |
| NA - 13 | Silver (and its compounds) | 0.109 | 0.003 | - | 0.444 | 0.555 | 106 | 7.5 | 28 | 124 |
| NA - 14 | Zinc (and its compounds) | 361 | 232 | 923 | 12 | 1 529 | 61 076 | 9 316 | 3 346 | 22 974 |
| NA - 16 | Ammonia (total) | 18 470 | 46 126 | 842 | 13 | 65 451 | 13 168 | 3 605 | 4 789 | 770 |
| NA - 17 | Nitrate ion in solution at pH >= 6.0 | 6.4 | 74 885 | 40 | 1.8 | 74 933 | 373 | 645 | 4 866 | 186 |
| NA - 21 | Octylphenol and its ethoxylates | - | - | 0.026 | 0.364 | 0.390 | - | 17 | 46 | 0.081 |
| NA - 22 | Phosphorus (total) | 163 | 5 465 | 642 | 11 | 6 280 | 203 432 | 11 145 | 2 853 | 2 682 |
| NA - M14 | Total Reduced Sulphur (TRS) | 6 243 | - | - | - | 6 243 | - | - | - | - |

10.2 Part 1B – Substances listed at an alternate threshold

Reporting threshold: the substance is MPO in quantities equal to or exceeding reporting thresholds listed below, and employees (including contractors) worked \geq 20 000 hours at the facility (or an activity for which the employees threshold does not apply took place).

| CAS No. | Substance name | Releases to air (kg) | Releases to water (kg) | Releases to land (kg) | Total releases (kg) | On-site disposals (kg) | Off-site disposals (kg) | Off-site transfers for treatment prior to final disposal (kg) | Off-site transfers for recycling (kg) |
|------------|--|----------------------------|------------------------------|-----------------------------|---------------------------|------------------------------|-------------------------------|---|--|
| 107-13-1 | Acrylonitrile* | 3 583 | - | 0.875 | 3 584 | - | 462 | 406 | - |
| 26471-62-5 | Toluenediisocyanate (mixed isomers)* | 151 | - | - | 151 | - | 0.290 | 23 104 | - |
| 302-01-2 | Hydrazine (and its salts)* | 58 | 1 539 | - | 1 596 | - | - | 2 536 | - |
| 584-84-9 | Toluene-2,4-diisocyanate* | 249 | - | - | 249 | - | - | - | - |
| 78-00-2 | Tetraethyl lead* | 0.020 | - | - | 0.020 | - | - | - | 900 |
| 78-79-5 | Isoprene* | 7 331 | - | - | 7 331 | 1 229 | - | 151 | - |
| 80-05-7 | Bisphenol A* | 30 | 58 | - | 88 | 91 | 2 418 | 1 071 | 33 |
| 91-08-7 | Toluene-2,6-diisocyanate* | 0.138 | - | - | 0.138 | - | - | - | - |
| NA - 02 | Arsenic (and its compounds)* | 42 998 | 9 657 | 4 710 | 57 365 | 21 805 913 | 650 820 | 40 544 | 518 779 |
| NA - 03 | Cadmium (and its compounds)* | 6 429 | 2 473 | 325 | 9 227 | 1 295 803 | 77 428 | 729 524 | 232 062 |
| NA - 05 | Cobalt (and its compounds) | 6 488 | 3 355 | 2 517 | 12 360 | 9 611 627 | 84 463 | 10 462 | 196 284 |
| NA - 08 | Lead (and its compounds)* | 130 642 | 9 208 | 109 155 | 249 004 | 19 197 010 | 2 588 023 | 303 227 | 39 537 914 |
| NA - 10 | Mercury (and its compounds)* | 2 286 | 142 | 6.6 | 2 435 | 110 085 | 12 953 | 30 624 | 17 294 |
| NA - 12 | Selenium (and its compounds) | 19 013 | 15 828 | 110 | 34 950 | 1 140 579 | 40 086 | 46 354 | 44 056 |
| NA - 19 | Hexavalent chromium (and its compounds)* | 1 121 | 822 | 604 | 2 547 | 22 574 | 35 906 | 70 006 | 60 411 |
| NA - 20 | Nonylphenol and its ethoxylates* | 2 455 | 41 429 | 0.030 | 43 884 | 6.0 | 1 080 | 4 971 | 22 861 |
| NA - 37 | Thallium (and its compounds)* | 441 | 3 115 | 13 | 3 569 | 99 082 | 74 617 | 0.000 | 55 |

Table 10-2 Part 1B – Substances listed at an alternate threshold

10.3 Part 2 – Polycyclic aromatic hydrocarbons

Reporting threshold: polycyclic aromatic hydrocarbons (PAHs) were incidentally manufactured or present in mine tailings, and were released, disposed of or transferred for recycling in a combined quantity of \geq 50 kilograms, and employees (including contractors) worked \geq 20 000 hours at the facility (or where an activity for which the employees threshold does not apply took place). Wood preservation facilities using creosote must report regardless of the mass threshold for PAHs and regardless of the number of hours worked by employees.

| CAS No. | Substance name | Releases to air (kg) | Releases to water (kg) | Releases to land (kg) | Total releases (kg) | On-site disposals (kg) | Off-site disposals (kg) | Off-site transfers for treatment prior to final disposal (kg) | Off-site transfers for recycling (kg) |
|-----------|--|-------------------------|------------------------------|-----------------------------|---------------------------|------------------------------|-------------------------------|---|--|
| 129-00-0 | Pyrene - PAH* | 2 444 | 18 | 1.4 | 2 464 | 25 471 | 16 448 | 1 242 | 14 916 |
| 189-55-9 | Dibenzo(a,i)pyrene - PAH* | 86 | 3.7 | - | 89 | - | 226 | 1.4 | 13 |
| 189-64-0 | Dibenzo(a,h)pyrene - PAH* | 0.896 | 0.243 | - | 1.1 | - | - | - | 5.9 |
| 191-24-2 | Benzo(g,h,i)perylene - PAH* | 107 | 12 | - | 119 | 3 577 | 1 890 | 21 | 1 148 |
| 191-30-0 | Dibenzo(a,I)pyrene - PAH* | 0.003 | - | - | 0.003 | - | - | - | 5.9 |
| 192-65-4 | Dibenzo(a,e)pyrene - PAH* | 0.343 | 0.243 | - | 0.586 | - | - | - | - |
| 192-97-2 | Benzo(e)pyrene - PAH* | 128 | 8.0 | - | 136 | 9 530 | 2 512 | 35 | 676 |
| 193-39-5 | Indeno(1,2,3-c,d)pyrene - PAH* | 101 | 12 | - | 113 | 2 169 | 2 380 | 18 | 791 |
| 194-59-2 | 7H-Dibenzo(c,g)carbazole - PAH* | 0.079 | - | - | 0.079 | - | 0.227 | 1.4 | 7.2 |
| 198-55-0 | Perylene - PAH* | 28 | 13 | - | 41 | 9 575 | 1 310 | 8.5 | 346 |
| 205-82-3 | Benzo(j)fluoranthene - PAH* | 63 | 0.295 | - | 63 | 3 097 | 77 | 61 | 410 |
| 205-99-2 | Benzo(b)fluoranthene - PAH* | 278 | 9.4 | - | 288 | 1 676 | 4 453 | 66 | 428 |
| 206-44-0 | Fluoranthene - PAH* | 3 673 | 17 | 1.4 | 3 691 | 7 379 | 7 625 | 638 | 6 117 |
| 207-08-9 | Benzo(k)fluoranthene - PAH* | 228 | 1.4 | - | 229 | 154 | 1 130 | 24 | 228 |
| 208-96-8 | Acenaphthylene - PAH* | 20 283 | 0.393 | 1.6 | 20 285 | 780 | 1 534 | 5 058 | 25 493 |
| 218-01-9 | Benzo(a)phenanthrene - PAH* | 650 | 2.8 | 0.170 | 652 | 5 051 | 3 539 | 110 | 1 618 |
| 224-42-0 | Dibenz(a,j)acridine - PAH* | 3.1 | 0.243 | - | 3.3 | - | 0.227 | 1.4 | 7.2 |
| 226-36-8 | Dibenz(a,h)acridine - PAH* | 1.3 | 0.218 | - | 1.6 | - | - | - | - |
| 3697-24-3 | 5-Methylchrysene - PAH* | 0.035 | 0.684 | - | 0.720 | - | - | - | - |
| 50-32-8 | Benzo(a)pyrene - PAH* | 190 | 6.8 | - | 196 | 4 558 | 8 853 | 86 | 776 |
| 53-70-3 | Dibenzo(a,h)anthracene - PAH* | 218 | 2.8 | - | 221 | 1 078 | 2 497 | 0.768 | 15 |
| 5385-75-1 | Dibenzo(a,e)fluoranthene - PAH* | 0.312 | - | - | 0.312 | - | - | - | - |
| 5522-43-0 | 1-Nitropyrene - PAH* | 0.298 | - | - | 0.298 | - | 9.0 | - | - |
| 56-49-5 | 3-Methylcholanthrene - PAH* | 0.911 | 0.243 | - | 1.2 | - | - | - | 5.9 |
| 56-55-3 | Benzo(a)anthracene - PAH* | 337 | 3.9 | - | 341 | 38 764 | 8 363 | 294 | 1 857 |
| 57-97-6 | 7,12-Dimethylbenz(a)anthracene - PAH* | 1.4 | 0.243 | - | 1.7 | - | - | - | 5.9 |
| 83-32-9 | Acenaphthene - PAH* | 3 535 | 22 | - | 3 557 | 14 005 | 3 123 | 1 198 | 7 606 |
| 85-01-8 | Phenanthrene - PAH* | 20 524 | 336 | 17 | 20 877 | 83 373 | 25 422 | 4 124 | 54 618 |
| 86-73-7 | Fluorene - PAH* | 7 660 | 126 | - | 7 787 | 10 065 | 3 299 | 2 509 | 13 554 |
| 91-22-5 | Quinoline (and its salts)* | 216 | 19 | - | 235 | 4 820 | 593 | 105 | 450 |
| NA - P/H | PAHs, total unspeciated* | 3 802 | 251 | 122 | 4 175 | 251 | 321 | 13 | 443 |

| - 10018 10-3 2011 2 = 2017070110 010110110 1701000100118 |
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10.4 Part 3 – Dioxins, furans and hexachlorobenzene

Activity-based reporting threshold: facilities must report if any of the following activities took place:

- Incineration;
- chlorinated solvent production;
- metal smelting;
- power generation;
- iron and steel manufacturing;
- pulp and paper manufacturing;
- titanium dioxide pigment production;
- cement manufacturing;
- magnesium production; and,
- wood preservation using pentachlorophenol.

Table 10-4 Part 3 – Dioxins, furans and hexachlorobenzene

| CAS No. | Substance name | TEF ⁸ | Releases to air (grams) | Releases to water (grams) | Releases to land (grams) | Total release s (grams) | On-siłe disposals (grams) | Off-siłe disposals (grams) | Off-site transfers for treatment prior to final disposal (grams) | Off-site transfers for recycling (grams) |
|------------|--|------------------|-------------------------------|---------------------------------|--------------------------------|----------------------------------|---------------------------------|----------------------------------|---|---|
| 118-74-1 | Hexachlorobenzene* | N/A | 3 679 | 0.000 | 3.3 | 3 683 | 1 205 | 10 599 | 717 | - |
| 1746-01-6 | 2,3,7,8-Tetrachlorodibenzo- p-dioxin* | 1 | 0.877 | 0.388 | 0.013 | 1.3 | 3.6 | 1.9 | 0.016 | 0.423 |
| 19408-74-3 | 1,2,3,7,8,9- Hexachlorodibenzo-p- dioxin* | 0.1 | 0.229 | 0.190 | 0.007 | 0.427 | 1.1 | 0.651 | 0.010 | 1.1 |
| 3268-87-9 | Octachlorodibenzo-p- dioxin* | 0.001 | 0.239 | 0.015 | 0.003 | 0.257 | 0.059 | 1.6 | 0.035 | 0.009 |
| 35822-46-9 | 1,2,3,4,6,7,8- Heptachlorodibenzo-p- dioxin* | 0.01 | 0.137 | 0.111 | 0.007 | 0.255 | 0.541 | 0.157 | 0.047 | 0.216 |
| 39001-02-0 | Octachlorodibenzofuran* | 0.001 | 0.015 | 0.005 | 0.009 | 0.030 | 0.002 | 0.089 | 0.097 | 0.004 |
| 39227-28-6 | 1,2,3,4,7,8- Hexachlorodibenzo-p- dioxin* | 0.1 | 0.141 | 0.116 | 0.004 | 0.261 | 0.680 | 0.125 | 0.003 | 0.192 |
| 40321-76-4 | 1,2,3,7,8- Pentachlorodibenzo-p- dioxin* | 0.5 | 1.0 | 0.538 | 0.021 | 1.6 | 4.7 | 2.9 | 0.017 | 1.2 |
| 51207-31-9 | 2,3,7,8- Tetrachlorodibenzofuran* | 0.1 | 1.1 | 0.150 | 0.039 | 1.3 | 2.8 | 1.4 | 0.100 | 1.4 |
| 55673-89-7 | 1,2,3,4,7,8,9- Heptachlorodibenzofuran* | 0.01 | 0.017 | 0.002 | 0.001 | 0.019 | 0.021 | 0.033 | 0.005 | 0.022 |
| 57117-31-4 | 2,3,4,7,8- Pentachlorodibenzofuran* | 0.5 | 4.4 | 0.729 | 0.028 | 5.2 | 5.2 | 6.8 | 0.159 | 3.5 |
| 57117-41-6 | 1,2,3,7,8- Pentachlorodibenzofuran* | 0.05 | 0.376 | 0.058 | 0.003 | 0.437 | 0.399 | 1.0 | 0.011 | 0.207 |
| 57117-44-9 | 1,2,3,6,7,8- Hexachlorodibenzofuran* | 0.1 | 0.324 | 0.140 | 0.000 | 0.464 | 0.515 | 0.991 | 0.015 | 0.482 |
| 57653-85-7 | 1,2,3,6,7,8- Hexachlorodibenzo-p- dioxin* | 0.1 | 0.224 | 0.185 | 0.008 | 0.417 | 1.2 | 0.725 | 0.017 | 0.845 |
| 60851-34-5 | 2,3,4,6,7,8- Hexachlorodibenzofuran* | 0.1 | 0.276 | 0.036 | 0.007 | 0.320 | 0.441 | 0.908 | 0.023 | 0.554 |
| 67562-39-4 | 1,2,3,4,6,7,8- Heptachlorodibenzofuran* | 0.01 | 0.099 | 0.035 | 0.007 | 0.140 | 0.050 | 0.483 | 0.060 | 0.102 |
| 70648-26-9 | 1,2,3,4,7,8- Hexachlorodibenzofuran* | 0.1 | 0.613 | 0.124 | 0.005 | 0.743 | 0.432 | 1.8 | 0.039 | 0.955 |
| 72918-21-9 | 1,2,3,7,8,9- Hexachlorodibenzofuran* | 0.1 | 0.136 | 0.060 | 0.000 | 0.195 | 0.114 | 0.202 | 0.003 | 0.051 |
| NA - D/F | Dioxins and furans - total* | N/A | 12 | 2.9 | 0.181 | 16 | 27 | 23 | 0.701 | 11 |

⁸ TEF : toxic equivalency factor

10.5 Part 4 – Criteria air contaminants

Reporting threshold: the substance is released to the air from a facility in quantities equal to or exceeding the release thresholds listed below.

| CAS No. | Substance name | Reporting threshold (tonnes released) | Releases to air (tonnes) |
|------------|--|---------------------------------------|--------------------------|
| 11104-93-1 | Nitrogen oxides (expressed as NO ₂)* | 20 | 587 544 |
| 630-08-0 | Carbon monoxide | 20 | 869 344 |
| 7446-09-5 | Sulphur dioxide* | 20 | 975 538 |
| NA - M08 | PM - Total Particulate Matter | 20 | 329 515 |
| NA - M09 | PM10 - Particulate Matter <= 10 Microns* | 0.5 | 136 433 |
| NA - M10 | PM2.5 - Particulate Matter <= 2.5 Microns* | 0.3 | 48 326 |
| NA - M16 | Volatile Organic Compounds (VOCs)* | 10 | 187 453 |

Table 10-5 Part 4 – Criteria air contaminants

10.6 Part 5 – Speciated volatile organic compounds

Reporting threshold: the substance is released to air in a quantity of ≥ 1 tonne and the 10-tonne air release threshold for VOCs (under Part 4) was met.

| CAS No. | Substance name | Releases to air (tonnes) |
|------------|--|--------------------------|
| 100-42-5 | Styrene* | 1 344 |
| 103-71-9 | Phenyl isocyanate* | 0 |
| 106-46-7 | p-Dichlorobenzene* | 0.104 |
| 106-99-0 | 1,3-Butadiene* | 20 |
| 107-06-2 | 1,2-Dichloroethane* | 2.0 |
| 108-05-4 | Vinyl acetate* | 179 |
| 108-10-1 | Methyl isobutyl ketone* | 320 |
| 108-65-6 | Propylene glycol methyl ether acetate* | 410 |
| 108-88-3 | Toluene* | 4 653 |
| 108-90-7 | Chlorobenzene* | 1.8 |
| 109-99-9 | Tetrahydrofuran* | 19 |
| 110-54-3 | n-Hexane* | 4 123 |
| 111-76-2 | 2-Butoxyethanol* | 442 |
| 112-07-2 | Ethylene glycol butyl ether acetate* | 39 |
| 112-15-2 | Diethylene glycol ethyl ether acetate* | 19 |
| 112-25-4 | Ethylene glycol hexyl ether* | 1.5 |
| 112-34-5 | Diethylene glycol butyl ether* | 59 |
| 115-07-1 | Propylene* | 921 |
| 115-10-6 | Dimethylether* | 54 |
| 123-35-3 | Myrcene* | 108 |
| 123-86-4 | n-Butyl acetate* | 1 340 |
| 124-04-9 | Adipic acid* | 10 |
| 127-91-3 | beta-Pinene* | 1 400 |
| 1330-20-7 | Xylene (all isomers)* | 3 682 |
| 141-78-6 | Ethyl acetate* | 3 078 |
| 25167-67-3 | Butene (all isomers)* | 791 |
| 25264-93-1 | Hexene (all isomers)* | 610 |
| 25551-13-7 | Trimethylbenzene* | 341 |
| 27133-93-3 | Methylindan (all isomers)* | 0 |
| 420-56-4 | Trimethylfluorosilane* | 0 |
| 50-00-0 | Formaldehyde* | 2 905 |
| 5131-66-8 | Propylene glycol butyl ether* | 38 |
| 555-10-2 | beta-Phellandrene* | 1 251 |
| 5989-27-5 | D-Limonene* | 501 |
| 62-53-3 | Aniline (and its salts)* | 0.073 |
| 64-17-5 | Ethyl Alcohol* | 18 361 |
| 64475-85-0 | Mineral spirits* | 94 |

Table 10-6 Part 5 – Speciated volatile organic compounds

| CAS No. | Substance name | Releases to air (tonnes) |
|------------|-----------------------------------|--------------------------|
| 64741-65-7 | Heavy alkylate naphtha* | 27 |
| 64742-47-8 | Hydrotreated light distillate* | 833 |
| 64742-48-9 | Hydrotreated heavy naphtha* | 532 |
| 64742-88-7 | Solvent naphtha medium aliphatic* | 402 |
| 64742-89-8 | Solvent naphtha light aliphatic* | 409 |
| 64742-94-5 | Heavy aromatic solvent naphtha* | 233 |
| 64742-95-6 | Light aromatic solvent naphtha* | 751 |
| 67-56-1 | Methanol* | 9 968 |
| 67-63-0 | Isopropyl alcohol* | 1 516 |
| 68956-56-9 | Terpenes (all isomers)* | 11 |
| 71-43-2 | Benzene* | 994 |
| 7379-12-6 | 2-Methyl-3-hexanone* | 0 |
| 74-85-1 | Ethylene* | 1 772 |
| 74-86-2 | Acetylene* | 182 |
| 74-98-6 | Propane* | 6 507 |
| 78-93-3 | Methyl ethyl ketone* | 3 136 |
| 8001-58-9 | Creosote* | 0 |
| 8030-30-6 | Naphtha* | 21 |
| 8032-32-4 | VM & P naphtha* | 195 |
| 8042-47-5 | White mineral oil* | 63 |
| 8052-41-3 | Stoddard solvent* | 412 |
| 80-56-8 | alpha-Pinene* | 2 906 |
| 95-63-6 | 1,2,4-Trimethylbenzene* | 819 |
| 98-00-0 | Furfuryl alcohol* | 206 |
| NA - 23 | Anthraquinone (all isomers)* | 0 |
| NA - 24 | Butane (all isomers)* | 11 451 |
| NA - 25 | Cycloheptane* | 872 |
| NA - 26 | Cyclohexene* | 72 |
| NA - 27 | Cyclooctane* | 9.0 |
| NA - 28 | Decane (all isomers)* | 167 |
| NA - 29 | Dihydronapthalene (all isomers)* | 0.514 |
| NA - 30 | Dodecane (all isomers)* | 29 |
| NA - 31 | Heptane (all isomers)* | 4 531 |
| NA - 32 | Hexane* | 5 432 |
| NA - 33 | Nonane (all isomers)* | 544 |
| NA - 34 | Octane (all isomers)* | 3 645 |
| NA - 35 | Pentane (all isomers)* | 14 680 |
| NA - 36 | Pentene (all isomers)* | 659 |

10.7 Provincial and territorial breakdown of reported data

| Province/ Territory | Releases to air - Criteria air contaminants (tonnes) | Releases to air - Other substances (tonnes) | Releases to water (tonnes) | Releases to land (tonnes) | Releases to unspecified media (tonnes) | Total releases (tonnes) | On-site disposals (tonnes) | Off-site disposals (tonnes) | Off-site transfers for treatment prior to final disposal (tonnes) | Off-site transfers for recycling (tonnes) |
|------------------------------|--|--|----------------------------------|---------------------------------|---|-------------------------------|----------------------------------|-----------------------------------|--|---|
| Alberta | 922 877 | 32 315 | 19 080 | 1 817 | 101 | 976 189 | 139 362 | 49 726 | 5 128 | 15 391 |
| British Columbia | 290 093 | 9 443 | 18 008 | 640 | 29 | 318 213 | 273 595 | 3 294 | 2 433 | 61 105 |
| Manitoba | 163 509 | 3 801 | 3 741 | 1 090 | 15 | 172 156 | 20 866 | 1 524 | 1 088 | 2 649 |
| New Brunswick | 71 461 | 2 689 | 2 819 | 82 | 2.9 | 77 054 | 19 113 | 1 988 | 362 | 52 675 |
| Newfoundland and Labrador | 71 493 | 742 | 2 875 | 952 | 3.5 | 76 065 | 198 453 | 170 | 69 | 217 |
| Nova Scotia | 92 877 | 1 815 | 2 402 | 317 | 8.2 | 97 419 | 2 330 | 125 | 171 | 326 |
| Northwest Territories | 15 153 | 35 | 41 | 43 | 1.9 | 15 275 | 9 814 | 0.562 | 0.255 | 10 |
| Nunavut | 10 298 | 1.3 | 4.7 | - | 2.2 | 10 306 | 10 152 | - | - | - |
| Ontario | 449 610 | 17 515 | 60 234 | 11 422 | 135 | 538 916 | 232 894 | 18 038 | 20 780 | 122 356 |
| Prince Edward Island | 640 | 58 | 985 | - | - | 1 684 | 26 | 276 | 550 | - |
| Québec | 622 316 | 10 333 | 19 066 | 1 140 | 57 | 652 911 | 218 722 | 13 648 | 9 059 | 48 796 |
| Saskatchewan | 243 682 | 3 757 | 2 262 | 330 | 37 | 250 068 | 6 194 | 3 575 | 519 | 5 089 |
| Yukon | 1 052 | - | - | - | - | 1 052 | 3 713 | - | - | - |

Table 10-7 Provincial and territorial breakdown of reported data