Guide for Reporting to the National Pollutant Release Inventory

2025-2027

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Should any inconsistencies be found between this guide and the official Canada Gazette, Part I Notice with respect to substances in the National Pollutant Release Inventory for 2025, 2026 and 2027, published on March 8, 2025, the Notice will prevail.

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1.0 Introduction

The National Pollutant Release Inventory (NPRI) is Canada's legislated, publicly accessible inventory of pollutant releases, disposals and recycling. Sections 46–53 of the *Canadian Environmental Protection Act, 1999* (CEPA) contain information-gathering provisions that allow the Minister of Environment and Climate Change Canada to require reporting of information on substances. The provisions also require the Minister to establish and publish a national inventory of releases and transfers of pollutants. These provisions under CEPA form the primary legislative basis for the NPRI.

NPRI information is a major starting point for identifying and monitoring sources of pollution in Canada, and in developing indicators for the quality of our air, land and water. The NPRI helps determine if regulatory or other action is necessary to ensure reductions, and if so, the form that action should take. The NPRI provides Canadians with annual information on releases and transfers from industrial, institutional, commercial and other types of facilities in their communities.

The NPRI reporting requirements for the 2025-2027 reporting years were published in the *Notice with respect to substances in the National Pollutant Release Inventory for 2025, 2026 and 2027* in the Canada Gazette, Part I, on March 8, 2025. This guide is designed to assist facility owners and operators in understanding the NPRI reporting requirements, and in determining if they are required to report to the NPRI. It provides a general overview of the reporting requirements for all NPRI substances, and provides information on additional guidance materials that address specific sectors, activities and substances.

The requirements described in this guide apply to the 2025, 2026 and 2027 calendar years. Note that facility owners or operators must consider each year individually when determining if thresholds are met and if reporting is required. Quantities of substances that are released, disposed of, and recycled should be reported by the specified deadline for each year.

2.0 Reporting deadlines and changes to reporting requirements

2.1 Reporting deadlines

Reporting is mandatory for facilities that meet the requirements of the NPRI Notice published in the *Canada Gazette, Part I*.

The deadline for reporting to the NPRI for the 2025 calendar year is June 1, 2026.

The deadline for reporting to the NPRI for the 2026 calendar year is June 1, 2027.

The deadline for reporting to the NPRI for the 2027 calendar year is June 1, 2028.

2.2 Changes to reporting requirements for 2025-2027

2.2.1 New requirements for reporting triarylmethane dyes

The following substances were added to Part 1, Group B, with a 100 kg manufactured, processed, or otherwise used (MPO) threshold and 1% concentration threshold for each substance:

- Basic Violet 3, Chemical abstract service registry number (CAS RN) 548-62-9
- Basic Violet 4, CAS RN 2390-59-2
- Basic Blue 7, CAS RN 2390-60-5
- MAPBAP Acetate, CAS RN 72102-55-7

C.I. Basic Green 4 (CAS RN 569-64-2) was deleted from Part 1, Group A, and added to Part 1, Group B, with an MPO threshold of 100 kg and 1% concentration threshold. C.I. Basic Green 4 was renamed Malachite Green.

2.2.2 New requirements for reporting benzothiazoles that can form 2-mercaptobenzothiazole

2-Mercaptobenzothiazole (CAS RN 149-30-4) was deleted from Part 1, Group A, of the substance list. A group of 20 benzothiazoles that can form 2-mercaptobenzothiazole (MBT) (see Appendix F for the full list of substance names and CAS RNs), including MBT, was added to Part 1, Group B, of the substance list with a 100 kg MPO threshold and a 0.1% concentration by weight threshold. The thresholds apply to the total of the 20 substances.

2.2.3 New requirements for reporting long-chain aliphatic amines

Ninety-two long-chain aliphatic amines (see Appendix F for full list of names and CAS RNs) were added to Part 1, Group B, of the substance list with an MPO threshold of 5 000 kg and a concentration threshold of 0.1% by weight. The thresholds apply to the total of the 92 substances.

2.2.4 New requirements for reporting hydrogen cyanide, free cyanide, cyanide salts and cyanide complexes

Free cyanide, cyanide salts and cyanide complexes were added to Part 1, Group B, of the NPRI substance list with a 1 000 kg MPO threshold and a 0.1% concentration by weight threshold. The thresholds apply to the total of the group of substances. Hydrogen cyanide (CAS RN 74-90-8) was deleted from Part 1, Group A, and added to Part 1, Group B, of the substance list with an MPO threshold of 1 000 kg and 0.1% concentration. See Appendix F for the full list of names and CAS RNs included in this substance grouping.

Please note that hydrogen cyanide (HCN) may be incidentally produced in significant quantities during high-temperature industrial processes, such as carbon black production, petroleum refining, and coke processing. These incidental by-products are required to be included in the ‘manufacture, process or otherwise use’ (MPO) threshold calculation and must be reported to NPRI if the 1,000 kg threshold is met. Concentration thresholds do not apply to by-products.

2.2.5 New requirements for reporting per- and polyfluoroalkyl substances

One hundred sixty-three per- and polyfluoroalkyl substances (PFAS) were added to a new Part 1, Group C, of the substance list. Facilities that meet the employee threshold and that MPO of 1 kg or more of a listed PFAS at a concentration of 0.1% by weight or more will be required to report quantities of that PFAS that are released, disposed of and recycled. The mass and concentration thresholds apply to each listed PFAS individually. More information for reporting these substances can be found in section 5.4 of this Guide.

2.2.6 New requirements for reporting ethylene oxide

Ethylene oxide (CAS RN 75-21-8) was deleted from Part 1A and added to Part 1B of the NPRI substance list, with an MPO threshold of 1 kg and a 0.1% concentration. In addition, the reporting requirements for ethylene oxide now apply to activities related to the education and training of students.

2.2.7 Clarification of the definition for Naphthenic Acid Fraction Compounds (and their salts)

Changes were made to clarify the definition for naphthenic acid fraction compounds (and their salts). No changes were made to the reporting requirements for this substance. The definition found in the Canada Gazette is as follows:

> Carboxylic acids that include chain compounds and compounds with one or more alicyclic ring structures with the general formula $C_nH_{2n+Z}O_xN_\alpha S_\beta$, where “n” indicates the carbon number; “Z” is referred to as the “hydrogen deficiency” (the number of hydrogen atoms that are lost as the structures become more compact) and is zero or a negative, even integer (from -2 to -12); “x” refers to the oxygen number; “α” refers to the nitrogen number; and “β” refers to the sulphur number. Includes diverse polar organic compounds present in bitumen and oil sands process-affected water. This includes several compound classes, including aromatic, adamantine, or diamondoid structures, sulphur- and nitrogen-containing compounds, and oxygenated acids.

3.0 General information and overview of reporting requirements

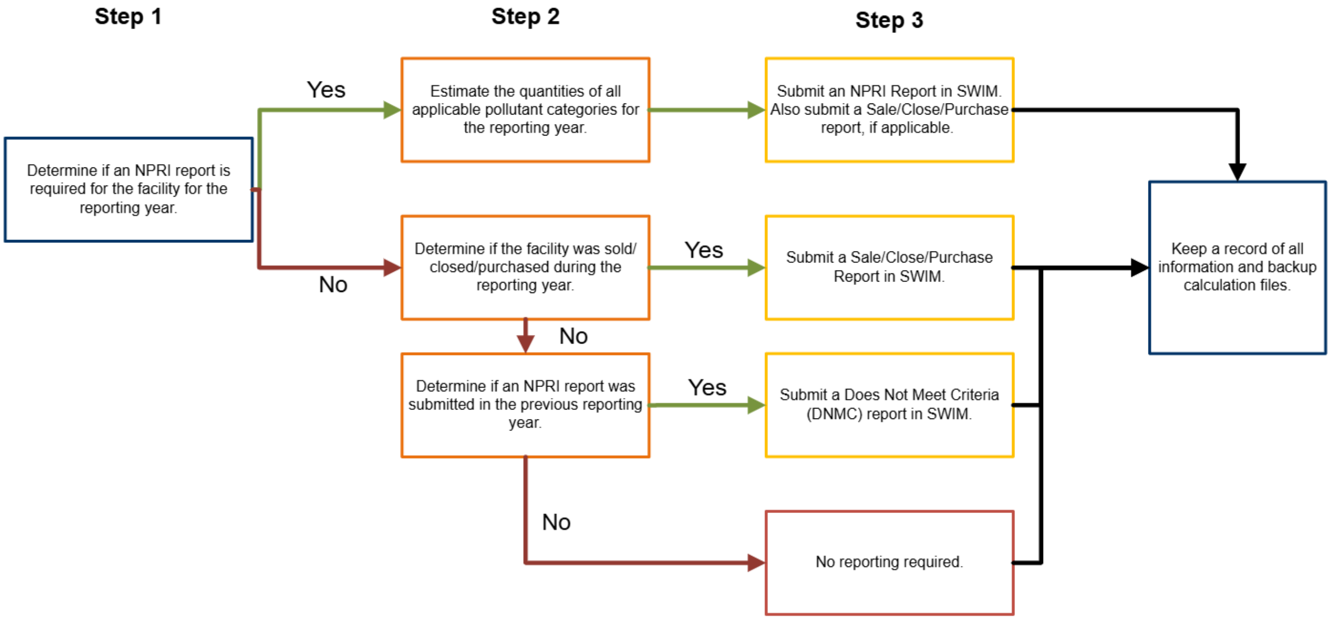
3.1 Introduction

This section summarizes the process for reporting to the NPRI, describes the legal basis for the NPRI, provides an overview of the NPRI reporting requirements, provides definitions of terms that are used throughout the guide, and describes the information to be reported that applies to more than one group of substances. This section also provides information on additional resources that are available to assist in determining if a report is required for a facility, and on the methods for estimating quantities of releases, disposals and transfers for recycling. Details on reporting requirements and information to be reported that are specific to substances from Parts 1 through 5 are presented in sections 4 through 9.

3.2 Process for reporting to the NPRI

The NPRI reporting process is outlined in Figure 1. An NPRI report can be created and submitted to Environment and Climate Change Canada using the online reporting system. Step-by-step instructions and video tutorials for creating and submitting a report are available in the online reporting system and on the NPRI website.

Figure 1. Process for reporting to the NPRI



The owner/operator of a facility must review the specific reporting requirements applicable to their facility to determine if they are required to report to the NPRI. If the requirements are met, then the total quantities of NPRI substances released, disposed of, and transferred for recycling must be reported to the NPRI using the online reporting system, even if the total quantity is zero.

A facility that submitted a report in the previous year, but no longer meets NPRI reporting criteria for the current year, is required to submit a “Does Not Meet Criteria” report using the online system by the reporting deadline.

3.3 The *Canada Gazette* Notice – The legal basis for the NPRI

The legal basis for the NPRI is the *Notice with respect to substances in the National Pollutant Release Inventory for 2025, 2026 and 2027* published in the *Canada Gazette, Part I* (hereafter referred to as “the Notice”). The Notice is published under the authority of subsection 46(1) CEPA. It specifies that any person who owned or operated a facility during the 2025, 2026 or 2027 calendar years, under the conditions prescribed in the Notice, must provide certain information to the Minister of the Environment and Climate Change by the reporting deadline for that calendar year.

Reporting to the NPRI is mandatory. Companies that meet reporting requirements but fail to report, fail to report on time, or knowingly submit false or misleading information, face penalties as listed under section 272 of CEPA. Facilities that did not meet the reporting criteria or were exempt from reporting in previous years should review their status to determine whether they are required to report each year.

The owner or operator of the facility as of December 31st of the given year is required to report to the NPRI, whether or not the ownership of the facility changes during the calendar year. If operations at a facility are terminated, the last owner or operator of the facility is required to report. An NPRI report may need to be submitted for a facility that is under decommissioning or in care or maintenance mode if the employee and/or substance-specific reporting criteria are met. Once reporting criteria are met for a substance, an NPRI report must be submitted for that substance regardless of the quantities released, disposed of, or transferred (even if the quantity is zero).

The Notice encompasses a wide range of substances and groups of substances (available on the NPRI website in HTML and MS Excel™ formats, and listed in Appendix A), reporting criteria and requirements. It is divided into four schedules with several parts in each, as described in Table 1.

Table 1. Overview of the NPRI Notice

Schedule	Part	Contents
1 – List of Substances	**1**	Lists 373 substances and groups of substances and is divided into groups A, B, and C, based on thresholds and information to be reported (referred to as Part 1A, Part 1B, and Part 1C substances)
	2	Lists 31 individual polycyclic aromatic hydrocarbons (PAHs)
	3	Lists 7 dioxins, 10 furans and hexachlorobenzene (HCB)
	4	Lists 7 criteria air contaminants (CACs)
	5	Lists 62 selected volatile organic compounds (VOCs) and groups of VOCs with additional reporting requirements (speciated VOCs)
2 – Definitions	**n/a**	Provides definitions of the terms used in the Notice
3 – Reporting Criteria	**General**	General reporting criteria, including the reporting deadline, the employee threshold, and exclusions and exemptions
	1	Criteria for substances listed in Schedule 1, Part 1
	2	Criteria for the PAHs listed in Schedule 1, Part 2
	3	Criteria for dioxins, furans and HCB listed in Schedule 1, Part 3
	4	Criteria for CACs listed in Schedule 1, Part 4
	5	Criteria for speciated VOCs listed in Schedule 1, Part 5

Schedule	Part	Contents
4 – Information to be Reported	**General**	General information required to be reported and manner of reporting
	Facility Information	Information to be reported on the facility, including name, identification codes, contacts and pollution prevention activities
	1	Information to be reported for substances listed in Schedule 1, Part 1
	2	Information to be reported for PAHs listed in Schedule 1, Part 2
	3	Information to be reported for dioxins, furans and HCB listed in Schedule 1, Part 3
	4	Information to be reported for CACs listed in Schedule 1, Part 4
	5	Information to be reported for speciated VOCs listed in Schedule 1, Part 5

3.4 Key concepts for understanding NPRI reporting requirements

This section is designed to help facility owners and operators understand the NPRI reporting requirements and determine if they are required to report to the NPRI. The following sections give a brief overview of the NPRI reporting requirements, the substance list, the employee threshold, and other key definitions. Additional definitions for terms used in this guide can be found in the Glossary.

3.4.1 Facilities to which the NPRI reporting requirements apply

In general, an NPRI report is required for any facility:

- where employees work a total of ≥ 20 000 hours (the employee threshold) (see section 3.4.3);
- where specified activities to which the employee threshold does not apply take place (see section 3.4.3);
- where the reporting criteria for CACs are met, whether or not the employee threshold is met;
- that is a pipeline installation (defined in section 3.4.2); or
- that is subject to the *Chromium Electroplating, Chromium Anodizing and Reverse Etching Regulations*.

In addition, the facility must meet any of the other reporting criteria (e.g., mass, concentration or activity thresholds) for substances on the NPRI substance list.

3.4.2 Definition of facility

The term “facility” refers to a contiguous facility, a portable facility, a pipeline installation or an offshore installation, as defined below. The different types of facilities have to consider different subsets of the NPRI substance list: contiguous facilities and offshore installations need to consider the substances in all Parts of the substance list; portable facilities need to consider substances in Parts 2-5; and pipeline facilities need to consider only Part 4 and 5 substances. See section 3.4.4 for more information on the Parts of the NPRI Substance list.

Contiguous facility

A contiguous facility is defined as all buildings, equipment, structures and stationary items that are located on a single site, or on contiguous sites or adjacent sites, that are owned or operated by the same person and that function as a single integrated site, including wastewater collection systems that release treated or untreated wastewater into surface waters.

Portable facility

A portable facility is defined as portable polychlorinated biphenyl (PCB) destruction equipment, portable asphalt plants and portable concrete batching plants. The definition applies where the facility can be entirely relocated for operation. The owner or operator of a portable facility must submit a report for the location where the facility operated for the longest period of time in the calendar year, using the total quantity of releases, disposals, or transfers from all operating locations. For all other locations where the portable facility operated during the year, the dates, addresses and geographic coordinates are to be submitted in the facility comments section in the online reporting system.

Pipeline installation

A pipeline installation is defined as a collection of equipment, situated at a single site, used in the operation of a natural gas transmission or distribution pipeline. This definition includes pipeline compressor and storage stations along pipelines used to transport raw or processed natural gas.

Offshore installation

An offshore installation is defined as an offshore drilling unit, production platform or ship, or subsea installation that is related to the exploitation of oil or natural gas and that is attached or anchored to the continental shelf of Canada or within Canada’s exclusive economic zone.

3.4.3 The employee threshold

Facilities where the employees work a total of 20 000 hours or more during the calendar year (the employee threshold) are required to report to the NPRI, if the thresholds for at least one substance are met, or if an activity-based threshold is met. The employee threshold depends on the number of hours worked by all employees at the facility during the calendar year. This includes:

- all hours worked by individuals employed at the facility, regardless of function or location, including students, part-time and term employees;
- all hours worked by the owner(s) who performed work on-site at the facility;
- all hours worked by a person, such as a contractor, who performed work at the facility that is related to the operations of the facility; and
- all paid overtime, vacation and sick leave.

The employee threshold must be met by most facilities before they need to consider reporting for Parts 1 through 3 substances, unless activities to which the employee threshold does not apply take place at the facility.

Activities to which the employee threshold does not apply

If one or more of the following activities take place at the facility and other reporting criteria such as mass and concentration thresholds are met, the owner/operator of the facility must report to the NPRI regardless of the number of hours worked by employees:

- Non-hazardous solid waste incineration of ≥ 26 tonnes of waste, including, but not limited to, conical burners and beehive burners
- Biomedical or hospital waste incineration of ≥ 26 tonnes of waste
- Hazardous waste incineration
- Sewage sludge incineration
- Wood preservation (using heat or pressure treatment, or both)
- Terminal operations
- Discharge of treated or untreated wastewater from a wastewater collection system discharging an average of ≥ 10 000 m^3/day into surface waters
- Production of ≥ 500 000 tonnes at pits or quarries

The employee threshold does not apply to facilities where these activities occur because these activities release significant quantities of NPRI substances to the environment, while not necessarily employing enough people to meet the threshold. Detailed descriptions of these activities are provided in the glossary.

Facilities that are subject to the *Chromium Electroplating, Chromium Anodizing and Reverse Etching Regulations* are required to report releases, disposals, and transfers for recycling of hexavalent chromium (and its compounds), regardless of the number of employees and regardless of the 50 kg NPRI threshold.

3.4.4 The NPRI substance list: Parts 1-5

The NPRI substance list is divided into five parts, based on specific reporting criteria for each part. The reporting thresholds may be based on mass, concentration, or specific activities and are explained in detail in sections 5 through 9 of this guide. Table 2 provides an overview of the reporting requirements for each Part of the substance list.

Definitions for the manufacture, process, or otherwise use of a substance are found in the Glossary and are further explained in section 5 of this guide.

Table 2. Overview of NPRI reporting thresholds

Part	Substances	Mass Threshold	Reporting Thresholds
1A	▪ 177 substances and groups of substances	10 tonnes	**TOTAL** quantity of a substance: ▪ manufactured, processed or otherwise used at a concentration by weight of ≥ 1%, **plus** ▪ incidentally manufactured, processed or otherwise used as a by-product at any concentration, **plus** ▪ contained in tailings at any concentration, **plus**

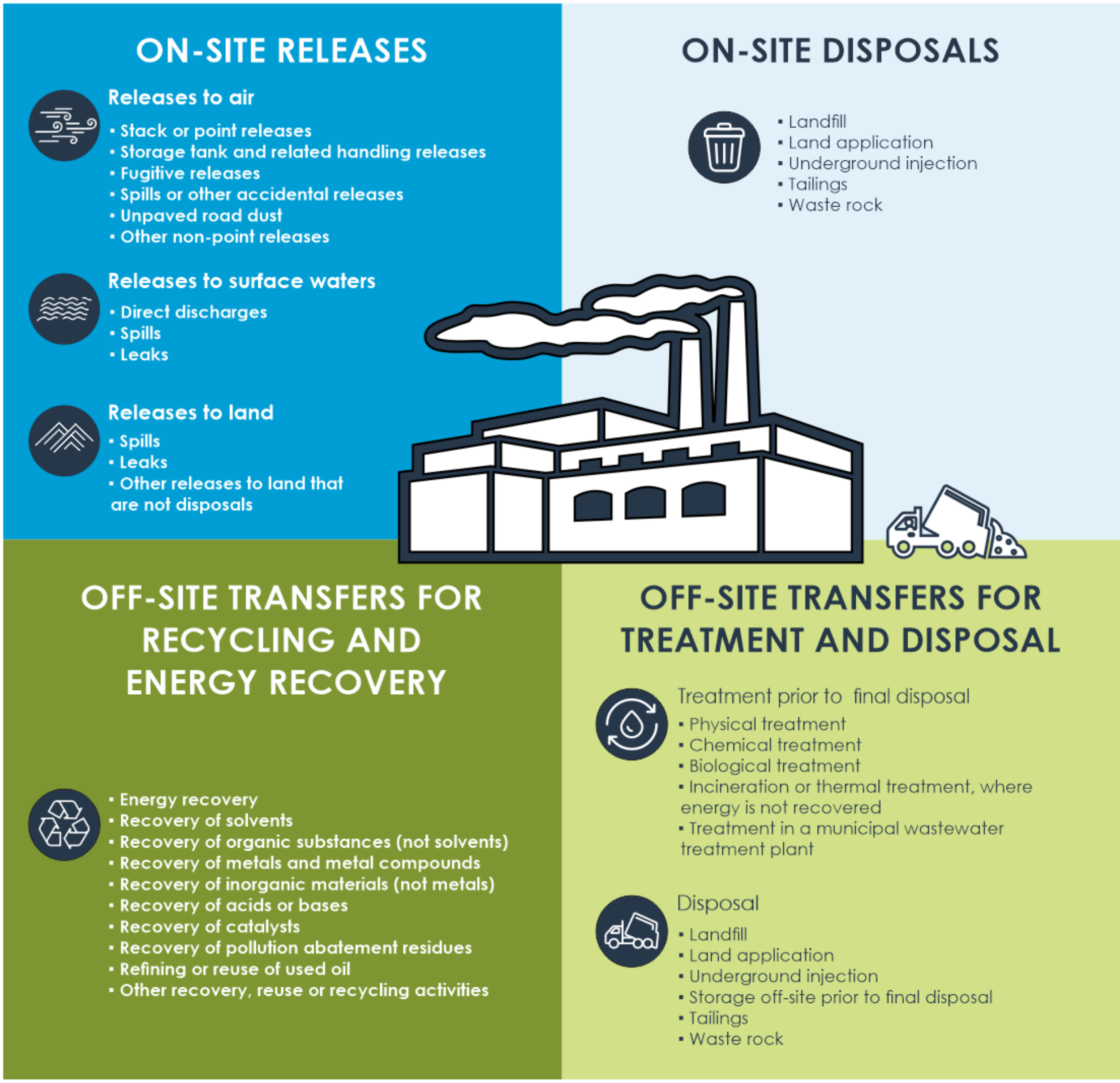
Part	Substances	Mass Threshold	Reporting Thresholds
			▪ contained in waste rock that is not clean or inert at a concentration by weight of ≥ 1%
1B	▪ 33 substances and groups of substances	1 to 1 000 kilograms, depending on the substance	**TOTAL** quantity of a substance: ▪ manufactured, processed or otherwise used at a concentration by weight greater than or equal to the concentration threshold (0.000005% to 1%, depending on the substance, or regardless of concentration for mercury), **plus** ▪ incidentally manufactured, processed or otherwise used as a by-product at any concentration, **plus** ▪ contained in tailings at any concentration, **plus** ▪ contained in waste rock that is not clean or inert at any concentration
1C	▪ 163 per- and polyfluoroalkyl substances (PFAS)	1 kg	**TOTAL** quantity of a substance: ▪ manufactured, processed or otherwise used at a concentration by weight greater than or equal to the concentration threshold (0.1%), plus ▪ incidentally manufactured, processed or otherwise used as a by-product at any concentration, plus ▪ contained in tailings at any concentration, plus ▪ contained in waste rock that is not clean or inert at any concentration
2	▪ 31 polycyclic aromatic hydrocarbons (PAHs)	50 kilograms	**TOTAL** of the quantities of PAHs at any concentration: ▪ incidentally manufactured and released, disposed of or transferred for recycling, plus ▪ contained in tailings disposed of during the calendar year
		Any quantity	Where wood preservation using creosote takes place, all releases, disposals and transfers for recycling must be reported, regardless of quantities or concentrations.
3	▪ 7 dioxins ▪ 10 furans ▪ hexachlorobenzene	Any quantity	Where specified activities take place, reporting is mandatory regardless of quantities or concentrations.
4	▪ carbon monoxide ▪ nitrogen oxides ▪ sulphur dioxide ▪ total particulate matter	20 tonnes	Quantity released to air (no concentration threshold applies)
	▪ volatile organic compounds (VOCs)	10 tonnes	
	▪ particulate matter ≤ 10 micrometres (PM_{10})	0.5 tonnes	
	▪ particulate matter ≤ 2.5 micrometres ($PM_{2.5}$)	0.3 tonnes	
5	▪ 62 speciated VOCs (individual VOCs, isomer groups and other groups and mixtures)	1 tonne	Quantity released to air (no concentration threshold applies)

3.4.5 Releases, disposals and transfers

Once it has been determined that a facility meets the specific thresholds for an NPRI substance, the total quantities released, disposed of, or transferred must be reported.

Figure 2 gives an overview of the categories reportable to the NPRI. Detailed definitions for each of the reportable categories can be found in the Glossary.

Figure 2. Categories reportable to the NPRI



ON-SITE RELEASES

Releases to air

- Stack or point releases
- Storage tank and related handling releases
- Fugitive releases
- Spills or other accidental releases
- Unpaved road dust
- Other non-point releases

Releases to surface waters

- Direct discharges
- Spills
- Leaks

Releases to land

- Spills
- Leaks
- Other releases to land that are not disposals

ON-SITE DISPOSALS

- Landfill
- Land application
- Underground injection
- Tailings
- Waste rock

OFF-SITE TRANSFERS FOR RECYCLING AND ENERGY RECOVERY

- Energy recovery
- Recovery of solvents
- Recovery of organic substances (not solvents)
- Recovery of metals and metal compounds
- Recovery of inorganic materials (not metals)
- Recovery of acids or bases
- Recovery of catalysts
- Recovery of pollution abatement residues
- Refining or reuse of used oil
- Other recovery, reuse or recycling activities

OFF-SITE TRANSFERS FOR TREATMENT AND DISPOSAL

Treatment prior to final disposal

- Physical treatment
- Chemical treatment
- Biological treatment
- Incineration or thermal treatment, where energy is not recovered
- Treatment in a municipal wastewater treatment plant

Disposal

- Landfill
- Land application
- Underground injection
- Storage off-site prior to final disposal
- Tailings
- Waste rock

3.5 Exemptions from and exclusions to NPRI reporting requirements

3.5.1 Facilities exempt from all reporting requirements

NPRI reporting requirements do not apply if the only activities that take place at a facility are:

- exploration for oil or gas, or the drilling of oil or gas wells;
- discharge of treated or untreated wastewater from a wastewater collection system with an average discharge of < 10 000 m^3 per day into surface waters; or
- production of < 500 000 tonnes at pits or quarries. Open-pit mines are not included in the definition of a pit or quarry (see the glossary) and are subject to NPRI reporting requirements.

3.5.2 Exclusions for all substances

The quantity of a substance contained in any of the following items should not be included when calculating if the reporting threshold was met and when calculating and reporting releases, disposals or transfers for recycling:

- Articles that are processed or otherwise used. An article is defined as a manufactured item that does not release an NPRI substance when it undergoes processing or other use. See the glossary for examples of articles.
- Materials used as structural components of the facility (buildings and other fixed structures), but not process equipment.
- Materials used in janitorial or facility grounds maintenance. This includes NPRI substances contained in fertilizers and pesticides used for grounds maintenance, cleaning agents used for maintaining facility cleanliness, and paint used for building maintenance. The maintenance of process equipment (e.g., painting or cleaning manufacturing equipment with a solvent) is not excluded.
- Materials used for personal use by employees or other persons.
- Intake water or intake air, such as water used for process cooling or air used either as compressed air or for combustion.

The quantity of a substance that is manufactured, processed or otherwise used in the exploration for oil or gas or in the drilling of oil or gas wells should not be included when calculating if the reporting threshold was met and when calculating and reporting releases, disposals or transfers for recycling. This exclusion applies to all activities from initial exploration until the well is put into production.

In addition, vehicle emissions (not including unpaved road dust) should not be considered when calculating if the thresholds were met and when reporting releases, disposals or transfers for recycling. A vehicle is any mobile equipment that is capable of self-propulsion, including fleet vehicles and earth moving equipment (e.g., loaders, dump trucks, forklifts, excavators and bulldozers).

3.5.3 Activities exempt from reporting for Parts 1-3 substances

The threshold calculation for a substance must exclude the quantity of a substance that is manufactured, processed or otherwise used in the following activities:

- Education or training of students (for example, universities, colleges and schools), except when considering whether the threshold is met for reporting releases of ethylene oxide (CAS RN 75-21-8)
- Research or development.
- Maintenance and repair of vehicles (automobiles, trucks, locomotives, rail cars, ships or aircraft), except painting and stripping of vehicles or their components, or the rebuilding or remanufacturing of vehicle components. Substances used for routine, scheduled and preventative maintenance of vehicles are exempt (e.g., repair, cleaning, replacement of lubricants/fluids). However, substances used in the painting or stripping of vehicles or vehicle components are subject to reporting. There is no exemption for activities that involve the removal, breakdown and total reconstruction of vehicle components (e.g., engines, landing gear, traction motors) using recovered or new parts, such that the rebuilt component is reinstalled or sold as an as-new replacement.
- Distribution, storage or retail sale of fuels, except as part of terminal operations (defined in the glossary). The exemption for distribution, storage or sale of fuels does not include terminal operations.
- Wholesale or retail sale of the substance or articles or products that contain the substance. Materials or substances sent back to a manufacturer, supplier or recycler for reprocessing, repackaging, resale or for credit or payment are considered to be recycled, and the exemption for wholesale or retail sale does not apply.
- Growing, harvesting or management of renewable natural resources.
- The practice of dentistry.

A facility is exempt from reporting Parts 1 through 3 substances if the only source or use of that substance is from one or more of the activities listed above. Note, however, that these facilities are not exempt from reporting releases of Parts 4 and 5 substances from stationary combustion equipment.

In cases where a facility met the reporting criteria for a substance based on sources other than those listed above, the quantity of that specific substance from any exempt activities should also be excluded when reporting releases, disposals or transfers for recycling to the NPRI. As of the 2025 reporting year, the exemption for the quantity of a substance that is manufactured, processed, or otherwise used in the education or training of students no longer applies when reporting releases of ethylene oxide (CAS RN 75-21-8).

3.5.4 Exclusions for tailings and waste rock

The following sections describe the exclusions for unconsolidated overburden, inert waste rock and stable/inert constituents of tailings. Refer to the Glossary for definitions of tailings and waste rock. These exclusions apply only to substances contained in tailings and waste rock. If a substance is released to air or water from tailings or waste rock (e.g., in airborne dust or as effluent), the quantity of the substance released must be included in threshold calculations.

Unconsolidated overburden

Substances contained in unconsolidated overburden should be excluded from threshold calculations and reporting. Unconsolidated overburden is unconsolidated materials overlying the ore or bitumen deposit, including, but not limited to, soil, glacial deposits, sand and sediment.

Inert waste rock

Substances contained in inert or clean waste rock should be excluded from threshold calculations and reporting. Inert waste rock is defined as waste rock that:

- is inert or clean according to a federal or provincial operating permit; or
- has a sulphur concentration of ≤ 0.2%; or
- has a sulphur concentration of > 0.2%, and the ratio of neutralizing potential to acid generating potential is ≥ 3:1.

There is one exception to the exclusion for inert or clean waste rock: even if waste rock is inert or clean as defined above, the quantity of arsenic in waste rock cannot be excluded if the concentration of arsenic is > 12 milligrams per kilogram of waste rock.

Stable/inert constituents of tailings

Substances contained in certain materials in tailings should be excluded from threshold calculations and reporting (e.g., sand grains from bitumen mines or in-situ production of bitumen). In order to be excluded, these materials must:

- be inert
- be inorganic
- not have been crushed or otherwise physically or chemically altered.

The exclusion applies only to the components of tailings that meet the above three criteria (i.e., if part of the tailings stream met the criteria, only that portion of the tailings would be excluded, and the remainder of the tailings would be included).

3.6 Methods for estimating quantities of NPRI substances

3.6.1 Reasonable access to information

Information on releases, disposals and transfers for recycling needs to be reported if the owner/operator possesses the information or may reasonably be expected to have access to the information. The Notice specifies that if emissions are already monitored or measured under provincial or federal legislation or a municipal bylaw, those measurements must be used to report to the NPRI. However, all releases, disposals or transfers off site for recycling must be included in threshold calculations and reported, unless otherwise specified, not just those that are measured or monitored.

An NPRI report is mandatory for any substances that meet the reporting thresholds, regardless of whether the substance is being measured or monitored for other jurisdictions. If emissions are not monitored or measured under provincial or federal legislation or a municipal bylaw, reasonable efforts must still be undertaken to gather information on releases, disposals and transfers of a substance. What is “reasonable” depends on individual circumstances, but may include additional measures (e.g., additional monitoring, contacting suppliers, conducting source testing) for NPRI substances.

Other measures that may assist a facility in reporting to the NPRI include:

- Requesting detailed composition data from suppliers. While some manufacturers may cite proprietary restrictions, others may be able to provide the information when regulatory obligations are cited.
- Using publicly available data sources such as peer-reviewed literature, information from the United States Environmental Protection Agency, or industry-specific studies to make estimates.
- Applying surrogate or comparable data where appropriate. Reasonable estimates based on similar facilities, analogous processes, or comparable substances may be used when specific data is not accessible.
- Applying expert judgement in the absence of specific data, drawing on knowledge of the chemical and physical processes, the design and operation of the equipment or system, and relevant physical and chemical principles.

In deciding whether additional efforts should be undertaken to generate new information for the purposes of NPRI reporting, the following factors, among others, should be considered:

- the health and environmental risks posed by a substance, including whether the substance has been declared toxic under CEPA;
- the relative contribution of the industrial sector or the facility to releases, disposals and transfers for recycling of a substance in Canada;
- the cost of additional monitoring.

3.6.2 Bases of estimate that can be used to report to NPRI

Estimates of the quantity of a substance that is manufactured, processed or otherwise used, and of the quantity that is released, disposed of or transferred for recycling, may be based on one of the following methods:

- continuous emission monitoring systems (reporting system code M1)
- predictive emission monitoring (M2)
- source testing (M3)
- remote quantification (RQ)
- mass balance (C)
- site-specific emission factor (E1)
- published emission factor (E2)
- speciation profile (SP)
- engineering estimates (O)

The reporting system only allows one basis of estimate for each individual type of release, disposal and transfer. If more than one basis of estimate is used to arrive at a single quantity to be reported, select the basis of estimate that was used to calculate the majority of the value. Further explanation on the basis of estimate used can be provided in the comment fields found on the main pages for reporting releases, disposals and recycling in the online reporting system.

A description of these methods is provided in the following sections. Examples using these estimation methods can be found in Appendix B.

Note that facilities can choose the most appropriate basis of estimate to report to the NPRI based on their particular circumstances. However, if the facility is required by federal or provincial legislation or a municipal by-law to measure or monitor releases, disposals or transfers for recycling, the facility must use those data to report to the NPRI.

Continuous emission monitoring systems

Continuous emission monitoring systems (CEMS) record emissions over an extended and uninterrupted period. Once the concentration of a substance and the total flow rate of the stream being measured have been determined, emission rates can be calculated by multiplying the concentration by the discharge flow rate or volumetric stack gas flow rate. Annual emissions of the substance can then be estimated by multiplying the concentration by the annual flow rate of the discharged effluent or the gases in the stack or duct.

Predictive emission monitoring

Predictive emission monitoring (PEM) is based on developing a correlation between substance emission rates and process parameters (e.g., fuel usage, steam production, furnace temperature). PEM may be considered a hybrid of continuous monitoring, emission factors and stack tests. A correlation test must first be performed to determine the relationship between emission rates and process parameters. Emissions can then be calculated or predicted using process parameters to predict emission rates based on the results of the initial source test.

Source testing

Source testing involves collecting a sample of the emission or effluent, then determining the concentration of one or more substances in the sample. The concentration of the substance(s) of interest is then multiplied by the volumetric flow rate to determine the quantity of the substance(s) emitted over time.

Source testing of air emissions generally involves inserting a sampling probe into the stack or duct to collect a volume of exhaust effluent isokinetically. The substances collected in or on various media are subsequently analyzed. For liquid effluents, grab samples or composite samples are extracted from the effluent stream.

Remote quantification

Remote quantification, or optical remote sensing (ORS) methods, are measurement methods that are conducted away from the point or area where a pollutant is emitted. ORS methods measure the concentration of air pollutants based on their interaction with electromagnetic radiation (i.e., ultraviolet, visible or infrared light). Examples include

- Differential absorption lidar (DIAL)
- Differential optical absorption spectroscopy (DOAS)
- Fourier-transform infrared spectroscopy (FTIR)
- Solar occultation flux (SOF)
- Tunable diode laser (TDL)

Mass balance

Mass balance involves applying the law of conservation of mass to a facility, process or piece of equipment. If there is no accumulation, all the materials that go into the system must come out. Releases are determined from the differences in input, output, accumulation and depletion of a substance. The general equation for a mass balance is:

$$\mathrm{M_{in} = M_{out} + M_{accumulated/depleted}}$$

Where:
$\mathrm{M_{in}}$ = Mass of compound in the raw material feed
$\mathrm{M_{out}}$ = Mass of compound in the finished product and released to air, land and water ($\mathrm{M_{out} = M_{product} + M_{emitted}}$)
$\mathrm{M_{accumulated/depleted}}$ = Mass of compound accumulated or depleted in the system

The reliability of release estimates based on mass balances is dependent on the source type considered. Mass balance methods may be preferred for some releases, such as solvent use and loss. This method may not be suitable for many other sources, such as cases where chemical transformation of input streams occurs.

Site-specific and published emission factors

Generally, emission factors relate the quantity of substances emitted from a source to a common activity associated with those emissions. Emission factors may be published or developed by facilities using emission testing data and source-activity information. For a particular piece of equipment, specific emission factors may be available from the manufacturer or sales centre. The basic equations for determining emissions from emission factors are as follows:

$$\mathrm{E_x = A \times EF}$$

$$\text{Controlled Emissions} = \text{Uncontrolled emission} \times ((100 - \text{control efficiency})/100)$$

Where:
$\mathrm{E_x}$ = Emission of substance × (kg or other unit of mass)
A = Activity rate
EF= Emission factor

Care should be taken when using published emission factors, as some emission factors may be out of date or underestimate releases. Before using emission factors, facilities should find the most appropriate emission factors for their operations; ensure that they are as up-to-date as possible; and verify that they reflect actual emissions, particularly in cases where emission factors have been known to underestimate releases.

Speciation profile

Speciation profiles provide estimates of the chemical composition of emissions, and are used to disaggregate substance quantities (e.g., total VOCs and PM) into more detailed species (e.g., individual VOCs and PM fractions). Speciation profiles may be published (e.g., the US Environmental Protection Agency's SPECIATE 5.4 database), or developed for site-specific use.

Engineering estimates

In many cases, sound engineering assessment is the most appropriate approach to determining process factors and base quantity values. Releases can be estimated from engineering principles and judgement by using knowledge of the chemical and physical processes involved, the design features of the source, and an understanding of the applicable physical and chemical laws. The reliability of these estimates depends on the complexity of the process and the level of understanding of its physical and chemical properties.

To apply an engineering assessment method, follow these four basic principles:

1. Review all data pertaining to the specific source and to the industrial sector in general.
2. Use this data to provide gross approximations—and refine the approximations using sound engineering principles as data become available, in order to provide more accurate estimations.
3. Whenever possible, use alternate methods of calculation to cross-check each level of approximation.
4. Employ good record keeping.

3.6.3 Method detection limit and use of non-detect values

In NPRI reporting, the issue of measurements below the method detection limit (MDL) arises in several situations. The MDL is the smallest concentration of the substance under analysis (i.e., the analyte) that produces an instrumental response different from background levels, for a given test method and that meets all analyte detection and identification criteria of the specified test method. An indication that a reportable substance is below the MDL is not equivalent to stating that the substance is not present. If there is reason to believe that the substance is present based on input materials and processes, a value of half the MDL should be used to estimate the release.

In a year where multiple measurements of the concentration of a substance in a given process stream are all below the MDL, and there is no other reason to believe that the substance is present, it can be assumed that the concentration of the substance in that process stream is zero.

In a year where multiple measurements are taken, and some measurements indicate that the concentration is above the MDL and some indicate that it is below the MDL, there is reason to assume that the substance is present. Therefore, the mean value of all detectable and non-detectable measurements is recommended to be used.

3.6.4 Other guidance documents and tools

Environment and Climate Change Canada, the U.S. Environmental Protection Agency (US EPA), and industry associations provide resources to complete threshold calculations and to estimate releases, disposals and transfers for recycling of NPRI substances. These resources can be accessed through the NPRI Toolbox. Useful information can also be found in Safety Data Sheets, and in permits and certificates of approval.

The NPRI Toolbox includes a number of tools:

- General Guidance
- Emission Calculation References
- Information on Fuel Combustion and Fugitive Emission Sources
- Sector-Specific Resources
- Substance-specific Guidance
- Additional Guidance and Resources

4.0 Information to be reported

4.1 Facility information

4.1.1 General facility information

Table 3 summarizes the general information that must be provided for all facilities that report to the NPRI. Other facility information may also be required, depending on the type of facility and the substances reported.

Table 3. Facility information required to be reported

Type of Information	Information to be Reported
Facility name and location	▪ Name of the facility ▪ Address of the physical location of the facility (e.g., a civic address, a legal land description, or just a description if no other type of physical address is applicable [e.g., for an offshore installation]) ▪ Latitude and longitude coordinates of the facility if the facility is reporting for the first time or if the facility is portable
Employees	Number of full-time employee equivalents, obtained by dividing by 2 000 hours the sum of (a) the total hours worked by individuals employed at the facility and the total hours of paid vacation and of sick leave taken by individuals employed at the facility; (b) the hours worked on-site at the facility by the owner of the facility, if not employed by the facility; and (c) the hours worked on-site at the facility by a person, such as a contractor, who, at the facility, performs work related to the operations of the facility
Organization (company)	▪ Legal and trade name of the facility's company ▪ Mailing address ▪ Dun & Bradstreet (D-U-N-S) number(1) ▪ Federal business number(2)
Parent companies (if any)(3)	▪ Legal names of any Canadian parent companies and their percentage of ownership ▪ Civic addresses of the parent companies ▪ D-U-N-S numbers(1) of the parent companies ▪ Federal business numbers(2) of the parent companies
North American Industry Classification System (NAICS) Canada 2022 code(4)	▪ The primary six-digit NAICS Canada code of the facility and the secondary and tertiary codes, if applicable.(4)

[1] Dun & Bradstreet (D-U-N-S) number is a unique nine-digit identification number for a single business entity.

[2] A federal business number is a nine-digit registration number issued by the Canada Revenue Agency (CRA) to Canadian businesses that register for one or more of the following: corporate income tax; importer/exporter account number; payroll deductions; or goods and services tax. This number can be found on all forms issued to a business by the CRA. The first nine digits that appear on these forms is the federal business number.

[3] The parent company is the highest level company or group of companies that owns or directly controls the reporting facility. The parent companies of interest to NPRI are those Canadian companies that have greater than 10% ownership in the company.

[4] NAICS is an industry classification system developed by the statistical agencies of Canada, Mexico and the United States.

4.1.2 Identification numbers

Environment and Climate Change Canada identification numbers

The NPRI identification number is a unique identifier provided by Environment and Climate Change Canada that must be used when reporting to the NPRI.

Where applicable, the Greenhouse Gas Reporting Program identification number must also be reported.

Provincial identification numbers for oil and gas facilities

Facilities classified as NAICS 211110 [Oil and gas extraction (except oil sands)] must report all provincial license or identification numbers (e.g., Petrinex numbers) associated with their NPRI identification number.

Petrinex is a joint strategic organization supporting Canada’s upstream, midstream and downstream petroleum industry and is currently represented by the Alberta Department of Energy (DOE), the Alberta Energy Regulator (AER) and the Saskatchewan Ministry of the Economy (ECON), and industry [represented by the Canadian Association of Petroleum Producers (CAPP) and The Explorers and Producers Association of Canada (EPAC)]. The Petrinex identification number is four letters followed by seven numbers.

If a facility in NAICS 211110 does not have a Petrinex ID number, a provincial facility licence number or other provincial or territorial identification number must be reported.

Other provincial or territorial identification numbers

Facilities are required to indicate any relevant provincial or territorial facility identification numbers (or “identifiers”), such as permit numbers. The requirement is limited to identifiers that are issued by the province or territory, with the exception of facilities in Metro Vancouver, where British Columbia has delegated responsibility for issuing operating permits to the Metro Vancouver Regional District. Required identifiers are those that apply at the facility level, as opposed to identifiers for specific equipment.

There are two broad categories of unique facility identifiers that may need to be reported:

1. identifiers that relate to operating conditions/restrictions on environmental releases from the facility – typically the “operating permit” of the facility, which can also be referred to as the approval, authorization, license or certificate. These can also be unique identifiers that relate to operating conditions/restrictions outside of the “operating permits,” such as identifiers issued under specific Regulations, Codes of Practice or other non “operating permit” restrictions
2. identifiers that relate to the reporting of environmental data – for example, identifiers issued by provincial air emissions inventories of criteria air contaminants or greenhouse gases

Facilities can opt to report additional identifiers that do not fall within the first two categories, if those identifiers can provide added context to reported releases, disposals and recycling.

Applicable identification numbers will vary depending on the province or territory. Identifiers are generally 4 to 12 alphanumeric characters and may contain special characters (e.g., “-” or “/”). Identifiers can change over time for a wide range of reasons, e.g., renewal, amendment or change of ownership. Updated numbers should be reported.

Specific provincial/territorial programs/initiatives could have more than one facility identifier for each unique NPRI facility or there may be more than one NPRI facility associated with one unique facility identifier under a specific provincial/territorial program/initiative. All unique facilities identifiers must be reported, even if the NPRI-defined facility is only part of a facility as defined by the permitting agency.

Table 4 provides some information on provincial programs which may apply to the facility and on which identification numbers should be reported to the NPRI. Table 4 does not list all possible programs that could apply; it only presents the most common. Facilities should also consider other identification numbers that may need to be reported.

The information provided in Table 4 is based on responses by the provinces to a survey conducted in late 2020. For the most up-to-date information, please refer to provincial/territorial web pages or contact your provincial/territorial government departments.

Table 4. Provincial and territorial identification numbers and their formats

Province/ Territory	Legislation/Program	Identifier Format
British Columbia	Environmental Management Act waste discharge or air discharge permit, approval, operational certificate, regulation or code of practice	Identifiers are numeric
	Metro Vancouver Regional District (MVRD) permit or approval	MVRD identifiers are a mix of numbers and letters. A permit identifier is “GVA” followed by unique four-digit number (e.g., GVA0001) while an approval identifier is “GVU” followed by unique four-digit number (e.g., GVU0001)
Alberta	Environmental Protection and Enhancement Act (EPEA) approval EPEA Code of Practice	EPEA approval and Code of Practice registration numbers are whole numeric values (with values ranging from 1 to approximately 424245). These ID numbers can range from one to six digits, but could potentially be more than six digits in the future. This applies to facilities that report air releases of Part 4 substances or hydrogen sulphide to the NPRI.
	Alberta Energy Regulator (AER)	AER facility identifiers are alphanumeric (e.g., ABOS00555555) and only apply to facilities in NAICS 21, 22, and 32. This may also be known as the Petrinex facility identifier.
Saskatchewan	The Environmental Management and Protection Act The Environmental Management and Protection (General) Regulations	Identifiers are alphanumeric (e.g., Approval to Operate Pollutant Control Facilities PO20-132 would be the 132nd approval issued in the year 2020; Permit to Construct Industrial Waste Works PC19-034 would be the 34th permit to construct issued in 2019)

Province/ Territory	Legislation/Program	Identifier Format
	The Mineral Industry Environmental Protection Regulations	For sites that are subject to the Industrial Source Air Quality (ISAQ) chapter of the Saskatchewan Environmental Code, an Environmental Protection Permit (EPP) is issued with a 9-digit number identifying the submission of the application (e.g., 10022731)
	Hazardous Materials and Impacted Sites (HMIS)	HMIS approval/permit identifiers are the year, followed by the district, followed by the next in sequence (e.g., 20-15-00001 would be 20 for the year 2020, 15 for the 15th district, and 0001 for the 1st in the sequence)
Manitoba	Environment Act	An Environment Act Licence has a 4-digit number that is issued under the Environment Act (e.g., 1234). When a licence is revised, it gets a suffix of letter "R" (e.g., 1234 R). The letter "R" is added every time a licence is revised (e.g., "RR", "RRR", etc.) However, with many changes it is shortened as "6R" or "7R". In the event a licence is altered due to an appeal, then the suffix will be a letter "E" (e.g., 1234 E)
	Dangerous Goods Handling and Transportation Act	Dangerous Goods Handling and Transportation Act licence issued under The Dangerous Goods Handling and Transportation Act is a 3-digit number followed by "HW" (e.g., 123 HW). If a licence is revised it follows the same procedure as in the Environment Act licence.
	Hazardous Waste Regulation	Hazardous waste generator registration issued as per the Hazardous Waste Regulation. This has two registration numbers - one for generators and the other for receivers. It has five digit numbers prefixed with three letters and written as follows: Consignor (Generator) Registration No.: MBG12345 Consignee (Receiver) Registration No.: MBR12345
	Water and Wastewater Facility Operators Regulation	Water and Wastewater Facility Operators Regulation certification numbers are numeric (e.g., 2006-123)
Ontario	Environmental Protection Act environmental compliance approval	Environmental compliance identifiers are four numeric characters followed by 6 alphanumeric digits (e.g., 9473-953Q2Q). Older identifiers can be a string of numbers separated by dashes, or a series of numbers following a letter (e.g., 1-234-56-789, A123456 or W123456)
	Environmental Activity and Sector Registry (EASR)	EASR numbers are one letter followed by 14 digits and contain dashes (e.g., R-001-0000000001)
Quebec	Loi sur la qualité de l'environnement autorisation environnementale	9-digit number
	Québec Air Emissions Inventory (IQEA) under the Regulation Respecting the Mandatory Declaration of Certain Emissions of Contaminants into the Atmosphere (RDOCECA)	IQEA facility identification numbers can be 8 numbers or an "X" or "Y" followed by 7 digits

Province/ Territory	Legislation/Program	Identifier Format
New Brunswick	New Brunswick Air Quality Regulation approval New Brunswick Water Quality Regulation approval	Identifiers are alphanumeric (e.g., I-12345, S-1234)
Nova Scotia	Nova Scotia Environment Act industrial, municipal, on-site sewage disposal or water approval	Approval identifiers are 10 to 11 digits, with the first four digits being the year in which the permit was issued with another 6 to 7 following the year (e.g., 2015-092352). Some identifiers may have an additional 3 alphanumeric characters at the end, preceded by a "-" (e.g., 2006-052877-T01, 2004-039856-R01)
Prince Edward Island	Air Quality Regulations approval Sewage Disposal Systems Regulations approval Boiler and Pressure Vessels Act Regulations licence number Power Engineering Act Regulations license number	Approval numbers can be numeric or alphanumeric (e.g., INC20455) License numbers are up to 6 alphanumeric characters (e.g., PL-C-195 or PL-089)
Newfoundland and Labrador	Newfoundland and Labrador Environmental Protection Act Certificates of Approval for the Construction and/or Operation of industrial approvals	The identifier is in the form "AAYY-MMXXXXO". "AA" is AA. "YY" is the 2 digit year. "MM" is the 2-digit month. "XXXX" is the 4 digit sequential counter and "O" is the optional for revisions [e.g., AA18-085652A is the permit dated August 2018, it is sequentially number 5652, and is the first revision (A)]
Yukon	Air emissions permit	9-digit number with 2 hyphens (e.g., 4201-60-010, 4201-60-0023, 4201-60-030)
Northwest Territories	Northwest Territories land use permit	11 alphanumeric characters with no special characters. (e.g., MV2012C0025, MV2019X0008, MV2019X0027)
Nunavut	Nunavut land use permit	10 alphanumeric characters with no special characters (e.g., N2005X0013, N2012C0026, N2018X0011)

4.1.3 Geographic information

When reporting geographic information for a facility, it is important to provide the address and geographical coordinates for the physical facility, and not that of the head office of the company. If access to geographic coordinates is not immediately available, searching for a facility through free mapping services available online can provide a reporter with the specific coordinate information.

4.2 Contact information

For each of the following, the name, position, telephone number and email address must be provided:

- Technical contact: the person who prepared the report and who will be able to answer any questions pertaining to its contents. A technical contact must be identified. All correspondence from Environment and Climate Change Canada regarding the NPRI will be sent to the technical contact if no coordinator (see below) is identified.

- Public contact: the person responsible for answering any questions from the public concerning the report. This name will appear on the NPRI website as the contact for the facility. A public contact must be identified.
- Coordinator (if any): the person who is responsible for preparing and submitting NPRI reports for more than one facility for the same company. The coordinator is responsible for answering any questions concerning all of the NPRI reports they filed. All NPRI correspondence from Environment and Climate Change Canada will be sent to the coordinator, if one is identified.
- Certifying official: the person who is legally responsible for the contents of the NPRI report. The certifying official is usually the owner or operator, or a company official authorized to act on his/her behalf. A certifying official must be identified.
- Independent contractor (if any): if an independent contractor prepared the report, contact information must be provided, including the name of the contracting company.

It is important that contact and ownership information be kept up-to-date using the online reporting system or by contacting Environment and Climate Change Canada, if:

- there is a change in the name, telephone number or email address of the contacts identified for the facility; or
- there is a change in the owner or operator of a facility.

4.3 Substance-specific information

Quantities of NPRI substances that are released, disposed of or transferred for recycling that must be reported are described in sections 5-9 of this Guide. The following sections summarize additional information that must be reported.

4.3.1 Information to be reported for Parts 1-3 substances

Nature of the manufacturing, processing or other use of the substance

Facilities are required to indicate whether a substance was manufactured, processed, or otherwise used, by selecting the nature of such activities from a pick-list in the reporting system:

- Manufacture
    - For on-site use/processing
    - For sale/distribution
    - As a by-product
    - As an impurity
- Process
    - As a reactant
    - As a formulation component
    - As an article component
    - Repackaging only
    - As a by-product
- Otherwise Use
    - As a physical or chemical processing aid

  - As a manufacturing aid
  - Ancillary/Other use
  - As a by-product

Reasons why the substance is disposed of or recycled

Facilities are required to indicate why a substance is disposed of or transferred off-site for recycling by selecting from a pick-list in the reporting system:

- Production Residues
- Off-specification products
- Expiration date passed
- Contaminated materials
- Unusable parts or discards
- Pollution abatement residues
- Machine or finishing residues
- Site remediation
- Other

Name and location of receiving water bodies

Facilities are required to provide the name and province or territory of any surface water bodies into which NPRI substances are released by direct discharge, spills or leaks. Reporting facilities can select the name of the water body from a list in the online reporting system.

Name and location of receiving off-site facilities

Where NPRI substances are transferred off-site for disposal, treatment prior to final disposal or recycling, facilities are required to provide the name and location of the receiving off-site facilities. Reporting facilities can select the name of the receiving off-site facility from a list in the online reporting system or create a new entry in the system, if the off-site isn't listed.

Substance concentration data

The average concentration and method detection limit (MDL) in parts per million (ppm) related to the following must be reported:

- a direct discharge to surface waters, based on source testing or direct monitoring
- the disposal or removal of a substance to tailings management areas
- the disposal or removal of a substance in waste rock

The average annual concentration and method detection limit (MDL) in parts per million (ppm) must be reported. Depending on how the concentration measurement was taken, the units can be converted from a percentage (%), mg/kg (for solids) or mg/L (for liquids) into ppm as follows:

$$0.0001\% = 1\ \text{ppm}$$
$$1.0\% = 10{,}000\ \text{ppm}$$
$$1\ \text{mg/kg} = 1\ \text{ppm}$$
$$1\ \text{mg/L} = 1\ \text{ppm}$$

The MDL of the method used to determine the average annual concentration and the situation upon which the average concentration is based must also be reported. A number of scenarios are possible with multiple measurements of the concentration of a substance in a given process stream:

- all samples are above the detection limit – the average concentration is based on the measured concentrations of the substance
- half or more than half of samples above detection limit – the average concentration is based on the measured values and half of the MDL for each measurement that is below the MDL
- less than half of samples above detection limit – the average concentration is based on the measured values and half of the MDL for each measurement that is below the MDL
- no samples above detection limit – if there is no reason to believe that the substance is present, the concentration of the substance in that process can be assumed to be zero
- no sampling – other information is used to estimate (this applies to tailings and waste rock reporting)
- no information available on concentration

An indication of whether the reported quantity (release to water or disposal of tailings or waste rock) was estimated using half the MDL is also required. In addition, if more than one MDL applies, this must also be indicated. In the case of multiple MDLs, additional information can be provided in the comment field.

4.3.2 Information to be reported for all substances

Reasons for changes in reported quantities compared to the previous year

Facilities are required to compare their reported quantities in the current year to the previous year and provide the reason(s) for changes in reported quantities from a pick-list in the reporting system:

- Increase in production levels
- Decrease in production levels
- Changes in estimation methods, including changes in emission factors (specify in comment field the previous estimation method, the current estimation method, and the reason for changing the method.)
- Pollution Prevention Activities (provide details in the Pollution Prevention section of this report)
- Changes in quantity and/or composition of combusted materials or fuels
- Changes in process and/or raw/produced/processed materials
- Changes in composition of materials released/disposed of/transferred
- Nature of activities results in annual variation in releases/disposals/transfers (describe the activity and how it impacts the reported quantity in the comments field)
- Activities/events of a non-annual nature (e.g. a spill, tailings pond breach, or fire). (Describe the activity/events in the comments field)
- Other (specify in comment field)
- No significant change (i.e. <10% or no change)
- Not applicable (first year reporting this substance)

Monthly and quarterly breakdown of releases

For Parts 1-3 substances, facilities are required to report a percentage breakdown by quarter. For Parts 4-5 substances, facilities are required to report a percentage breakdown by month. In both cases, percentages must add up to 100%.

4.4 Additional information for electricity generating units

Facilities in all North American Industry Classification System (NAICS) codes that report releases of mercury or criteria air contaminants to air must assign those releases to each electricity generating unit that meets the following criteria:

1. The unit has a nameplate capacity of 25 MW or more
2. The unit distributes or sells to the grid 33% or more of its potential electrical output

An electricity generation unit means physically connected equipment that operates together to produce electricity for sale or distribution to the grid by means of thermal energy produced by the combustion of fossil fuels and is stationary when used and is not in or on a machine that is self-propelled.

Potential electrical output means the quantity of electricity that would be generated by a unit in a calendar year if the unit were to operate at capacity at all times during that calendar year.

The 33% threshold must be assessed on an annual basis. If a unit meets the 33% threshold in a calendar year, but does not meet it in the subsequent year, reporting at the unit level for that unit is still required. This requirement applies for three years. For example, if a unit met the 33% threshold only in 2024, emissions from the unit must be reported separately for 2024, 2025 and 2026 reports, but not from 2027 onwards (unless it were to meet the threshold again in a future year).

Facilities that meet the threshold requirements for unit-level reporting must also provide details about the unit, including:

- unit gross generating capacity
- commissioning year
- technology or fuel type
- whether the unit includes emissions from duct firing or other secondary combustion sources
- air pollutant controls installed and operating on the unit

4.5 Pollution prevention activities

Facilities are required to report:

- Whether and why a pollution prevention (P2) plan was prepared in that reporting year;
- The name of the P2 notice, jurisdiction, or program for which the P2 plan is required;
- Information on P2 activities undertaken during the year; and
- The substances for which the P2 activities were undertaken.

Environment and Climate Change Canada analyzes P2 information and publishes a summary of the P2 information submitted by facilities in Pollution Prevention in Practice. The published information is updated on an annual basis.

4.6 Comments

Comment fields are provided on many screens in the online reporting system. Comments can be used to provide additional information, such as details about a facility's operations, how a substance is used, details of pollution prevention activities, reasons for changes in quantities reported from the previous year, or the methods used to calculate reported quantities.

The information provided in comment fields can help users understand the context around the reported information. Clear and concise comments contribute to the understandability and completeness of the NPRI data set. Explanations of changes or anomalies in submitted data help to prevent unnecessary contact with facilities during the quality control process.

4.7 Other requirements

4.7.1 Electronic statement of certification

A statement of certification must be electronically signed and submitted with the NPRI report using the online reporting system. The certifying official should verify that the information submitted is true, complete and accurate, and acknowledge that the data will be made public. The certifying official is legally responsible for the contents of the NPRI report.

4.7.2 Record keeping

Pursuant to subsection 46(8) of CEPA, the owner/operator of a facility is required to retain copies of all information on which their report is based, including any calculations, measurements and other related data, for three years from the applicable reporting deadline. This information must be kept at the facility or at the principal place of business in Canada of the owner/operator of the facility to which the information relates, for three years.

4.7.3 Other reports

There are several other types of NPRI reports that can be filed using the online reporting system:

- Does Not Meet Criteria (DNMC) report: A facility that submitted a report for the previous year, but no longer meets NPRI reporting criteria for the current year, is required to submit a "Does Not Meet Criteria" report by the reporting deadline.
- Sale/Close/Purchase report: Submit a "sale/close/purchase" report when transfers of ownership occur, or if a facility closes during the calendar year.
- Update: An update to current and previous reports can also be submitted using the online reporting system.

4.8 Voluntary reporting

The NPRI also accepts voluntary reporting for NPRI substances when a facility does not meet the reporting requirements. Voluntary reports assist the NPRI in providing a more comprehensive description of releases and transfers of pollutants in Canada. A voluntary report for a release, disposal or transfer of a substance should be specified as such by selecting the appropriate option within the online reporting system.

5.0 Reporting for Part 1 substances

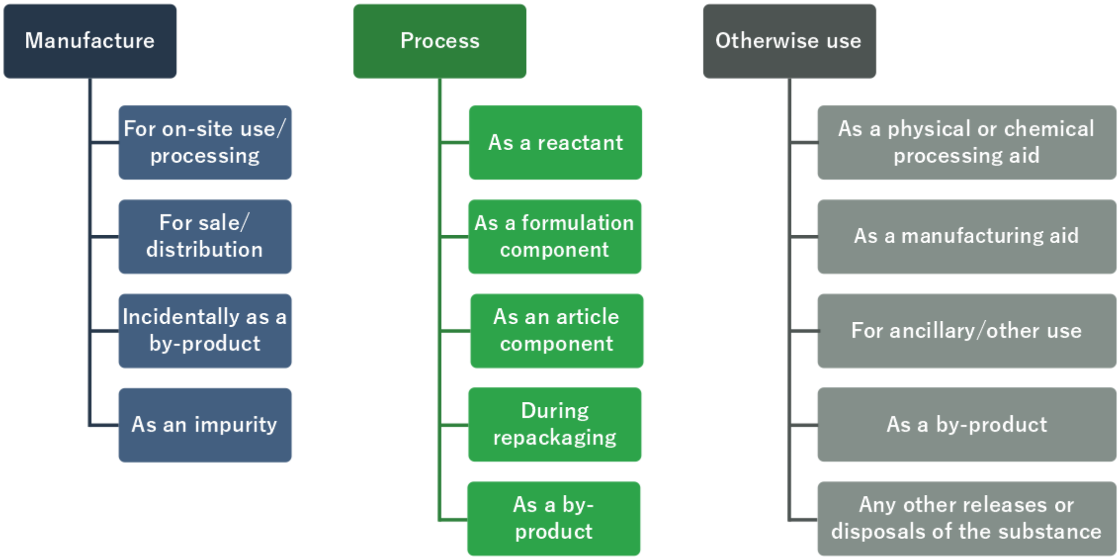
5.1 Requirements for Part 1 substances

Part 1 of the NPRI substance list contains 373 substances or substance groupings that are divided into three categories: Part 1A, Part 1B and Part 1C. Part 1A and Part 1B reporting requirements share many similarities, with the main difference being that substances listed in Part 1B have lower mass and concentration thresholds compared to those in Part 1A. Part 1C contains PFAS that are listed at a lower mass and concentration threshold than substances listed in Part 1A. The following terms apply to Part 1A, Part 1B, and Part 1C substances.

Manufacture, process, or otherwise use

When reporting for substances listed on Part 1, a facility must first consider the quantity of the substance manufactured, processed or otherwise used at the facility. Figure 3 gives an overview of activities to consider when calculating the quantity of Part 1 substances manufactured, processed, or otherwise used.

Figure 3. Activities to consider in the manufacture, process or otherwise use of an NPRI substance



Manufacture means to produce, prepare or compound an NPRI substance. It also includes the incidental production of an NPRI substance as a by-product. The production of chlorine dioxide by a chemical plant is an example of manufacturing. The production of hydrochloric acid during the manufacture of chlorofluorocarbons is an example of the incidental manufacture of hydrochloric acid.

Process means the preparation of an NPRI substance, after its manufacture, for distribution in commerce. Processing includes the preparation of a substance with or without changes in physical state or chemical form. The term also applies to the processing of a mixture or formulation that contains an NPRI substance as one component, the processing of articles (see glossary for definition), and the processing of a substance as a by-product. The use of chlorine to manufacture hypochloric acid (not an NPRI substance) is an example of processing of chlorine. The use of toluene and xylene to blend paint solvent mixtures is an example of processing without changes in chemical form.

Otherwise use (or other use) means any use, disposal or release of an NPRI substance that does not fall under the definitions of manufacture or process. This includes the use of the substance as a chemical processing aid, manufacturing aid or some other ancillary use, and the other use of by-products. For example, the use of trichloroethylene in the maintenance of manufacturing and process equipment is an example of an "other use" of that substance. Certain specified uses of substances are excluded and are listed in Section 3.5.2.

The quantity of a substance that is manufactured, processed, or otherwise used is not reported to the NPRI. Instead, if the manufacture, process, or otherwise use threshold is met, the quantity of the substance released, disposed of, or transferred off-site for recycling is required to be reported, even if the quantity is zero.

By-products

The term "by-product" refers to the quantity of an NPRI Part 1 substance that is incidentally manufactured, processed or otherwise used at the facility at any concentration, and released to the environment or disposed of. The quantity of a substance that is recycled or that remains in the final product is not considered to be a by-product for the purpose of the NPRI threshold calculation.

In general, if a quantity of a substance is intentionally manufactured, processed or otherwise used at a facility, then that quantity of the substance is not a by-product, even if it is unintentionally manufactured, processed or otherwise used at another step in the process.

Overall quantities of by-products can be significant, even though their concentration may be low. Therefore, the quantity of a substance that is a by-product must be included in the calculation of the reporting threshold, regardless of concentration. The by-product requirements only apply to Part 1 substances and are only used for the purpose of determining whether or not the mass threshold for a substance has been met.

Some examples of by-products are:

- Hydrogen fluoride is incidentally manufactured and released during aluminum smelting. Therefore, the hydrogen fluoride is a by-product and must be included in the calculation of the reporting threshold, regardless of concentration.
- Manganese and nickel are incidentally present in coal. During combustion, a portion of these metals is concentrated in the ash, which is disposed of, and a portion of the metals is released in stack emissions. The weight of the metal by-products, must be included in the calculation of the reporting threshold, regardless of concentration.

An example of when substances are not considered by-products:

- Metal cuttings, sent for disposal, contain alloyed chromium and nickel at a concentration of less than 1%. The chromium and nickel are essential components of the alloy; therefore, they are not incidentally processed and are not considered to be by-products. Consequently, the chromium and nickel in the metal cuttings do not need to be included in the calculation of the reporting threshold, because the substances are present at a concentration less than the concentration threshold of 1%.

5.2 Reporting for Part 1A substances – Core substances

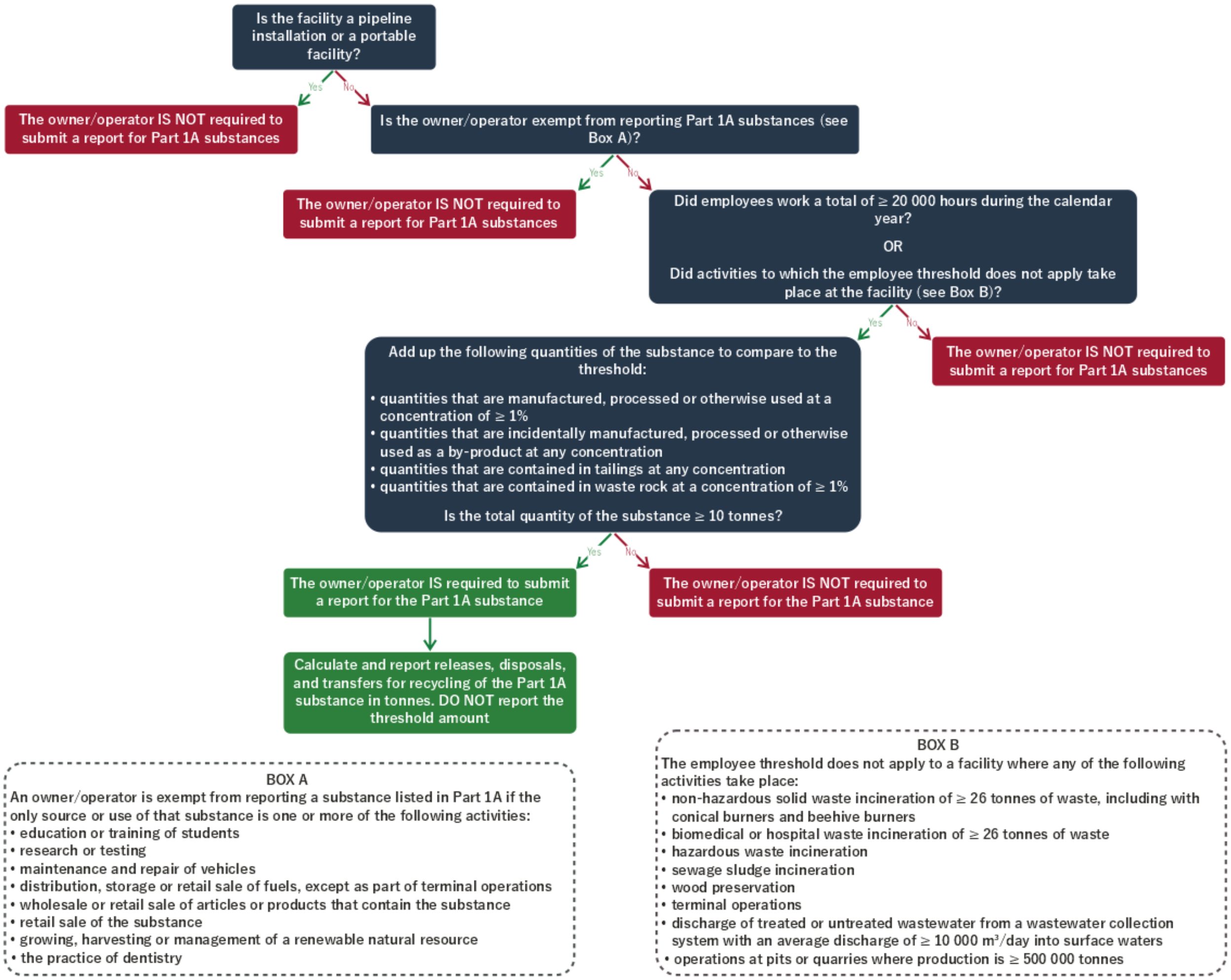
Part 1A lists 177 substances and groups of substances of concern, most of which have been listed on the NPRI since its inception. These substances are commonly referred to as the "core substances," and comprise the majority of the NPRI substance list.

In general, any person who owns or operates a **contiguous facility or offshore installation** must submit an NPRI report for a Part 1A substance if both of the following criteria are met:

1. employees work a total of ≥ 20 000 hours, or activities to which the employee threshold does not apply (see Section 3.4.3) take place at the facility; and
2. the total quantity of the Part 1A substance present in the following scenarios is ≥ 10 tonnes:
   - manufactured, processed or otherwise used at a concentration (by weight) of 1% or more,
   - incidentally manufactured, processed or otherwise used as a by-product at any concentration,
   - contained in tailings disposed of during the calendar year at any concentration, and
   - contained in waste rock disposed of during the calendar year that is not clean or inert (see section 3.5.4) at a concentration (by weight) of 1% or more.

Figure 4 illustrates the steps for determining if a report is required for Part 1A substances.

Figure 4. Reporting for Part 1A substances



5.2.1 Part 1A substance qualifiers

Some Part 1A substances and groups of substances have additional qualifiers that specify the physical or chemical form, state or particle size of the substance that is to be included. The qualifiers, described in Table 5, help to determine whether a report will be required for a given substance.

Table 5. Qualifiers for Part 1A substances

Substance Qualifier	Substance(s) to Which the Qualifier Applies	Description
all isomers	▪ cresol (CAS RN 1319-77-3) ▪ HCFC-122 (41834-16-6) ▪ HCFC-123 (34077-87-7) ▪ HCFC-124 (63938-10-3) ▪ xylene (1330-20-7)	Total of all isomers reported as an aggregate of the individual isomers.
and its compounds	▪ antimony ▪ copper ▪ manganese ▪ nickel ▪ zinc	The pure metal and the equivalent weight of the metal in any compound, alloy or mixture must be reported as the equivalent weight of the metal itself.
	▪ Chromium	Pure chromium and chromium contained in any compound, alloy or mixture must be reported as the equivalent weight of chromium, excluding hexavalent chromium and its compounds.
	▪ Vanadium	Pure vanadium and vanadium in any compound or mixture must be reported as the equivalent weight of vanadium. Do not include vanadium contained in an alloy.
and its (their) salts	▪ acrylic acid (79-10-7) ▪ aniline (62-53-3) ▪ chloroacetic acid (79-11-8) ▪ cresol (1319-77-3) ▪ 2,4-diaminotoluene (95-80-7) ▪ 2,4-dichlorophenol (120-83-2) ▪ diethanolamine (111-42-2) ▪ *N,N*-dimethylaniline (121-69-7) ▪ 4,6-dinitro-*o*-cresol (534-52-1) ▪ hydroquinone (123-31-9) ▪ Michler's ketone (90-94-8) ▪ naphthenic acid fraction compounds (no specific CAS RN applies) ▪ nitrilotriacetic acid (139-13-9) ▪ peracetic acid (79-21-0) ▪ phenol (108-95-2) ▪ *p*-phenylenediamine (106-50-3) ▪ pyridine (110-86-1)	Weak acids and bases are listed with this qualifier. Although the CAS RN that appears on the NPRI list is specific to the acid or base, all salts of these substances must be reported as an equivalent weight of the acid or base.
expressed as hydrogen sulphide	▪ total reduced sulphur (TRS)	Total of hydrogen sulphide (7783-06-4), carbon disulphide (75-15-0), carbonyl sulphide (463-58-1), dimethyl sulphide (75-18-3), methyl mercaptan (74-93-1), and dimethyl disulphide (624-92-0), expressed as hydrogen sulphide. Only releases to air of total reduced sulphur are required to be reported. Quantities of total reduced sulphur released to water, released to land, disposed of and transferred off-site for recycling do not have to be reported.
fibrous forms only	▪ aluminum oxide (1344-28-1)	Fibrous refers to a synthetic form of aluminum oxide that is processed to produce strands or filaments. This includes the form of aluminum oxide found in brake linings, but excludes the more common granular, powdered or fumed forms of alumina.

Substance Qualifier	Substance(s) to Which the Qualifier Applies	Description
friable form only	▪ asbestos (1332-21-4)	Only asbestos that is brittle and readily crumbled (i.e., friable) should be reported.
fume or dust only	▪ aluminum (7429-90-5)	Include dry forms of aluminum only, with particle diameters of 0.001-1 micrometre for fumes and 1-100 micrometres for dust. Dust refers to solid particles generated by any mechanical processing of materials including crushing, grinding, rapid impact, handling, detonation, and decrepitation of organic and inorganic materials such as rock, ore, and metal. Dusts do not tend to flocculate except under electrostatic forces. A fume is an airborne dispersion consisting of small solid particles created by condensation from the gaseous state, in distinction to a gas or vapor. Fumes arise from the heating of solids. The condensation is often accompanied by a chemical reaction, such as oxidation. Fumes flocculate and sometimes coalesce.
in a solution at a pH of 6.0 or more	▪ nitrate ion	This distinguishes nitrate ion in neutral or basic solution from nitric acid (pH of less than 6.0). If nitric acid is neutralized to a pH of 6.0 or greater, report for both nitric acid (7697-37-2) and nitrate ion in solution.
ionic	▪ cyanides	Includes the salts of hydrogen cyanide, but excludes organocyanides, nitriles and organometallic cyanide compounds.
total	▪ ammonia	Total of ammonia (NH_3) (7664-41-7) and the ammonium ion (NH_4^+) (14798-03-9) in solution, expressed as ammonia.
	▪ Phosphorous	Total of all phosphorus, not including yellow or white phosphorus (7723-14-0).
yellow or white only	▪ Phosphorous	Total of the yellow and white allotropes of elemental phosphorus only.

5.2.2 Calculating the manufacture, process or otherwise use quantity for Part 1A substances

To calculate the amount to compare to the 10-tonne reporting threshold, add up the following quantities of a Part 1A substance:

- quantities that are manufactured, processed or otherwise used at a concentration equal to or greater than 1% by weight;
- quantities that are incidentally manufactured, processed or otherwise used (a by-product), at any concentration, and released on-site to the environment or disposed of on- or off-site;
- quantities that are contained in tailings disposed of during the calendar year, at any concentration; and
- quantities that are contained in waste rock that is not inert and that is disposed of during the calendar year at a concentration equal to or greater than 1% by weight

Any release or disposal of an NPRI substance must be included in the otherwise used category. For example, the quantity of the NPRI substance contained in dust released to air from materials stored on site would be included, whether or not the material is used for a specific purpose at the facility. Another example is a spill of an NPRI substance to water or land during storage or handling.

Since a substance may undergo many processes in a facility, care should be taken not to double-count process streams when calculating the reporting threshold. Do not include quantities of substances more than once in manufacture, process or otherwise use calculations. For example, if a substance is processed and released, the release quantity does not need to be added to the process quantity.

Do not include quantities of a Part 1A substance contained in any of the sources that are excluded, as listed in Section 3.5.2, or from the activities listed in section 3.5.3.

A quantity of a substance that is transferred off-site for recycling and returned to the facility should be treated as the equivalent of newly purchased material. A quantity of a substance that is recycled on-site and re-introduced to a process stream (e.g., substances in ore processing water that are recycled back into the process from tailings) should be included in the threshold calculation only once.

The total quantity of a Part 1A substance manufactured, processed or otherwise used at concentrations greater than or equal to 1%, at any time or in any part of the facility, must be included when calculating the 10 tonnes reporting threshold. For example, the quantity of a substance received by a facility at 30% concentration and then diluted to less than 1% for use is included in the threshold calculation. A substance received at the facility at less than 1% and subsequently concentrated to 5% would also be included in the threshold calculation. Activities to consider in the manufacture, process or otherwise use of a substance are listed in Figure 3.

Facilities that repackage or transfer Part 1A substances between containers must consider the entire quantity of the substance contained in the original container or in bulk for threshold calculations.

If only a range of concentrations is available for a substance present in a mixture, contact the supplier of the substance for more detailed information. If no additional information is available, use the average of the range for threshold determinations.

5.2.3 Calculating releases, disposals and transfers for recycling of Part 1A substances

If the reporting threshold for a Part 1A substance is met, a subsequent calculation is required to determine the quantities of that substance that are released, disposed of and transferred for recycling. If the reporting threshold is met, **all releases, disposals and transfers for recycling of that substance must be reported, regardless of their concentration or quantity and regardless of whether or not the quantity is used in the threshold calculation**. The only exceptions to this are quantities of the substance:

- contained in the materials listed in section 3.5.2;
- that are manufactured processed or otherwise used in the activities listed in section 3.5.3; and
- contained in waste rock where the substance is at a concentration of less than 1% (see section 3.5.4).

5.2.4 Reporting releases, disposals and transfers for recycling of Part 1A substances

All releases, disposals and transfers for recycling of Part 1A substances must be reported in tonnes. Note that the quantity manufactured, processed or otherwise used is not reported.

Note that even if on-site releases, disposals or off-site transfers for recycling are zero or below the mass or concentration thresholds, a report must be submitted for a Part 1A substance, once the 10-tonne reporting threshold has been met.

When total releases of a Part 1A substance are less than one tonne, a facility may choose to report the release as a total without specifying the environmental media (air, water, or land). Facilities are encouraged to report the breakdown by media, if the information is available.

5.3 Reporting for Part 1B substances – Alternate threshold substances

Part 1B substances may have significant environmental and human health impacts at relatively low levels. Because minimal releases of Part 1B substances may result in significant adverse effects, the reporting thresholds for Part 1B substances are lower than those for Part 1A substances. As such, these substances are commonly referred to as the “alternate threshold substances.”

In general, any person who owns or operates a **contiguous facility or an offshore installation** must submit a report for a Part 1B substance if **both** of the following criteria are met:

1. employees work a total of ≥ 20 000 hours, or activities to which the employee threshold does not apply (see Section 3.4.3) take place at the facility, and
2. the total quantity of the Part 1B substance present in one or more of the following scenarios is greater than or equal to the mass threshold specified in Table 6:

    - manufactured, processed or otherwise used at or above the concentration specified in Table 6;
    - incidentally manufactured, processed or otherwise used as a by-product at any concentration;
    - contained in tailings at any concentration; and
    - contained in waste rock that is not inert and that is disposed of, at any concentration (see section 3.5.4)

In addition, a facility that is subject to the Chromium Electroplating, Chromium Anodizing and Reverse Etching Regulations must report for hexavalent chromium (and its compounds), regardless of the number of employees and regardless of the mass and concentration thresholds listed in Table 6. If the facility does not meet any other NPRI requirements, only a report for releases, disposals, or transfers of hexavalent chromium (and its compounds) is required.

Table 6. Mass and concentration thresholds for Part 1B substances

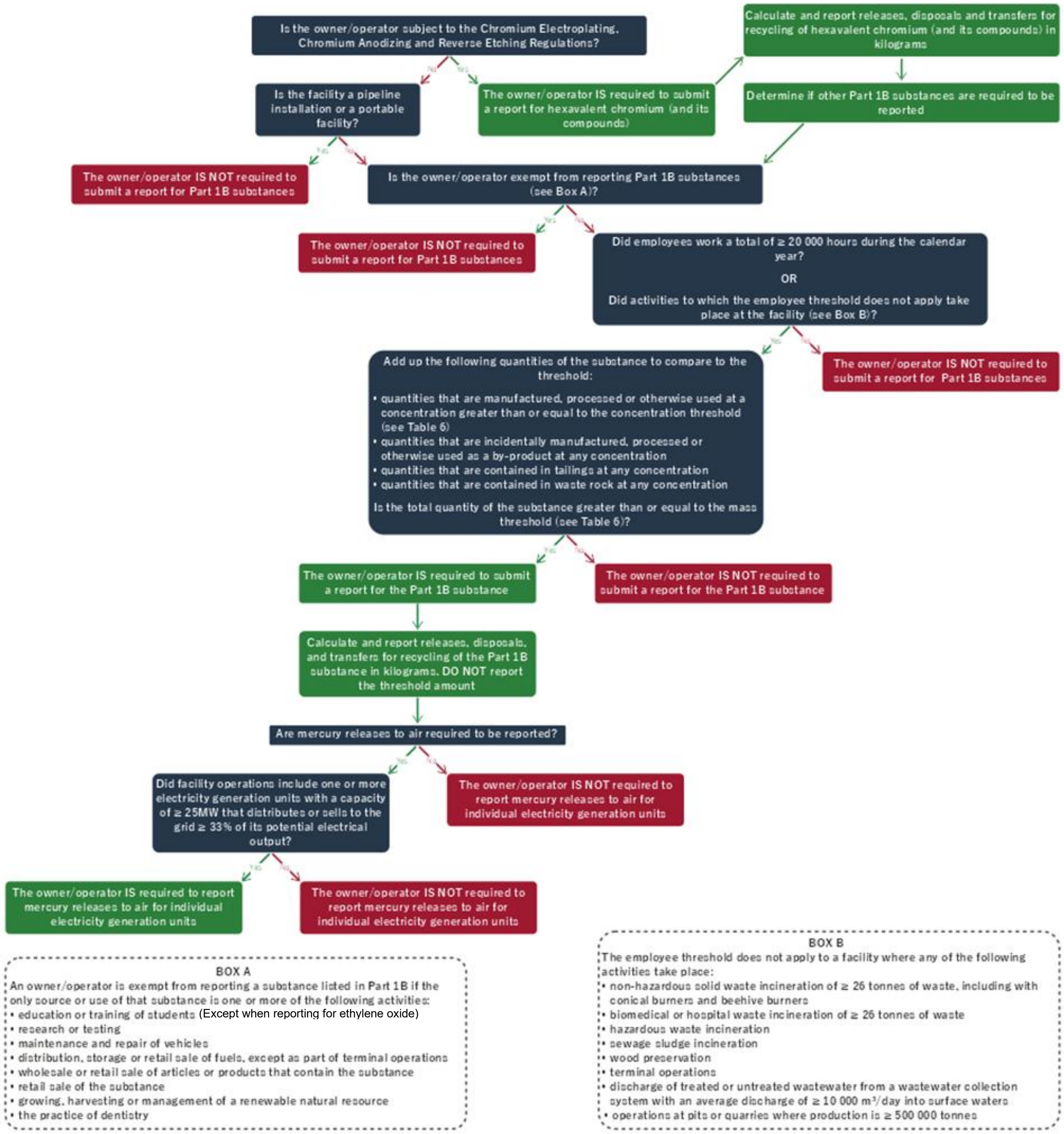
Substance Name	Mass reporting threshold	Concentration by weight
Acrylonitrile	1 000 kg	0.10%
Arsenic (and its compounds)	50 kg	0.10%
Azo disperse dyes	10 kg	0.10%
Basic Blue 7	100 kg	1%

Basic Violet 3	100 kg	1%
Basic Violet 4	100 kg	1%
1,4-Benzenediamine, N,N'-mixed phenyl and tolyl derivatives	50 kg	1%
Benzothiazoles that can form 2-mercaptobenzothiazole	100 kg	0.10%
Bisphenol A	100 kg	1%
Cadmium (and its compounds)	5 kg	0.10%
Chlorhexidine (and its salts)	100 kg	1%
Chlorinated alkanes, medium-chain, CnHxCl(2n+2–x), 14 ≤ n ≤ 17	1 000 kg	1%
Chlorinated alkanes, long-chain, CnHxCl(2n+2–x), 18 ≤ n ≤ 20	1 000 kg	1%
Cobalt (and its compounds)	50 kg	0.10%
Ethylene oxide	1 kg	0.10%
Free cyanide, cyanide salts, and cyanide complexes	1 000 kg	0.10%
Hexavalent chromium (and its compounds)[1]	50 kg	0.10%
Hydrazine (and its salts)	1 000 kg	1%
Hydrogen cyanide	1 000 kg	0.10%
Isoprene	100 kg	1%
Lead (and its compounds)	50 kg	0.10%
Long-chain aliphatic amines	5 000 kg	0.10%
Malachite Green	100 kg	1%
MAPBAP Acetate	100 kg	1%
Mercury (and its compounds)	5 kg	N/A
Nonylphenol and its ethoxylates	1 000 kg	1%
2-Propanone, reaction products with diphenylamine	50 kg	1%
Selenium (and its compounds)	100 kg	0.000005%
Tetraethyl lead	50 kg	0.10%
Thallium (and its compounds)	100 kg	1%
Toluene-2,4-diisocyanate	100 kg	0.10%
Toluene-2,6-diisocyanate	100 kg	0.10%
Toluenediisocyanate (mixed isomers)	100 kg	0.10%

[1] Any facility that is subject to the *Chromium Electroplating, Chromium Anodizing and Reverse Etching Regulations* must report any release, disposal, and transfer for recycling of hexavalent chromium (and its compounds), regardless of the number of employees and regardless of the 50 kg NPRI threshold.

Figure 5 illustrates the steps for determining if a report for Part 1B substances is required.

Figure 5. Reporting for Part 1B substances



BOX A

An owner/operator is exempt from reporting a substance listed in Part 1B if the only source or use of that substance is one or more of the following activities:

- education or training of students (Except when reporting for ethylene oxide)
- research or testing
- maintenance and repair of vehicles
- distribution, storage or retail sale of fuels, except as part of terminal operations
- wholesale or retail sale of articles or products that contain the substance
- retail sale of the substance
- growing, harvesting or management of a renewable natural resource
- the practice of dentistry

BOX B

The employee threshold does not apply to a facility where any of the following activities take place:

- non-hazardous solid waste incineration of ≥ 26 tonnes of waste, including with conical burners and beehive burners
- biomedical or hospital waste incineration of ≥ 26 tonnes of waste
- hazardous waste incineration
- sewage sludge incineration
- wood preservation
- terminal operations
- discharge of treated or untreated wastewater from a wastewater collection system with an average discharge of ≥ 10 000 m³/day into surface waters
- operations at pits or quarries where production is ≥ 500 000 tonnes

5.3.1 Part 1B substance qualifiers

Mercury, cadmium, arsenic, hexavalent chromium, lead, cobalt, selenium and thallium are listed with the qualifier “and its compounds.” The pure element and any compound, alloy or mixture of any Part 1B substance must be reported as the equivalent weight of the metal itself. For example, if potassium dichromate ($K_2Cr_2O_7$, molecular weight = 294 grams per mole [g/mol]) is used, only the mass contribution of hexavalent chromium (2×52 g/mol) in $K_2Cr_2O_7$ should be included in the threshold calculation for hexavalent chromium.

Note that lead has an additional qualifier: the lead contribution from tetraethyl lead, stainless steel, brass and bronze alloys should be excluded from threshold calculations for lead. Tetraethyl lead should be treated as a separate substance. If the criteria are met, separate reports should be submitted for lead (and its compounds) and tetraethyl lead, with the reporting criteria applied to each substance separately.

Hydrazine and chlorhexidine are listed with the qualifier “and its salts.” Weak acids and bases are listed with this qualifier. Although the CAS RN that appears on the NPRI list is specific to the acid or base, all salts of these substances must be reported as an equivalent weight of the acid or base.

Toluenediisocyanate is listed with the qualifier “mixed isomers.” The total of all isomers occurring in mixtures must be reported.

Any substance whose molecular formula meets the category definition for medium-chain (C_{14-17}) or long- chain (C_{18-20}) chlorinated alkanes must be included when calculating the manufacture, process or otherwise use threshold quantity, and reported if the threshold is exceeded. In addition, chemical mixtures that contain substances that meet the medium-chain (C_{14-17}) or long-chain (C_{18-20}) chlorinated alkane category definition must also be considered. However, for mixtures, NPRI reporting facilities would only include the chlorinated alkane component of the chemical mixture that meets the respective category definition in threshold calculations and reported quantities.

5.3.2 Calculating the manufacture, process or otherwise use quantity for Part 1B substances

To calculate the amount to compare to the reporting threshold, add up the following quantities of a Part 1B substance:

- quantities that are manufactured, processed or otherwise used at a concentration equal to or greater than the concentration threshold (if any) specified in Table 6;
- quantities that are incidentally manufactured, processed or otherwise used (a by-product), at any concentration, and released on-site to the environment or disposed of on- or off-site;
- quantities that are contained in tailings disposed of during the calendar year, at any concentration; and
- quantities that are contained in waste rock that is not inert and that is disposed of during the calendar year, at any concentration.

Any release or disposal of an NPRI substance must be included in the quantity otherwise used. For example, the quantity of the NPRI substance contained in dust released to air from materials stored on site would be included, whether or not the material is used for a specific purpose at the facility. Another example is a spill of an NPRI substance to water or land during storage or handling.

Since a substance may undergo many processes in a facility, care should be taken not to double-count process streams when calculating the reporting threshold. Do not include quantities of substances more than once in manufacture, process or otherwise use calculations. For example, if a substance is processed and released, the release quantity does not need to be added to the process quantity.

Do not include quantities of a Part 1B substance contained in any of the sources that are excluded, as listed in Section 3.5.2, or from the activities listed in section 3.5.3.

As noted previously, quantities of substances disposed of in inert or clean waste rock do not need to be included in threshold calculations. However, the quantity of arsenic contained in inert or clean waste rock can be excluded only if the concentration of arsenic is < 12 mg/kg of waste rock.

5.3.3 Calculating releases, disposals and transfers for recycling of Part 1B substances

If the reporting threshold for a Part 1B substance is met (as discussed in section 5.3.2), a subsequent calculation is required to determine the quantities of that substance that are released, disposed of and transferred for recycling.

If the reporting threshold for a Part 1B substance is met, a subsequent calculation is required to determine the quantities of that substance that are released, disposed of and transferred for recycling. If the reporting threshold is met, **all releases, disposals and transfers for recycling of that substance must be reported, regardless of their concentration or quantity and regardless of whether or not the quantity is used in the threshold calculation**. The only exceptions to this are quantities of the substance:

- contained in the materials listed in section 3.5.2; and
- that are manufactured processed or otherwise used in the activities listed in section 3.5.3.

5.3.4 Reporting releases, disposals and transfers for recycling of Part 1B substances

All releases, disposals and transfers for recycling of Part 1B substances must be reported in kilograms (kg). Note that the quantity manufactured, processed or otherwise used is not reported.

Any facility that is subject to the *Chromium Electroplating, Chromium Anodizing and Reverse Etching Regulations* must report releases, disposals, and transfers for recycling of hexavalent chromium (and its compounds), regardless of the number of employees and regardless of the 50 kg mass threshold and 0.1% concentration threshold. If the facility does not meet any other NPRI requirements, only a report for releases, disposals, or transfers of hexavalent chromium (and its compounds) is required

Note that even if on-site releases, disposals or off-site transfers for recycling are zero or below the mass or concentration thresholds, a report must be submitted for a Part 1B substance once the mass reporting threshold has been met.

5.4 Reporting for Part 1C substances – Per- and polyfluoroalkyl substances (PFAS)

Per- and polyfluoroalkyl substances (PFAS) are a class of thousands of human-made substances. Some typical uses of PFAS include surfactants, lubricants, and repellents (for dirt, water, and grease). PFAS can be found in certain firefighting foams, food packaging, drugs, cosmetics, sunscreens, pesticides, textiles (e.g., carpets, furniture, and clothing), non-stick cookware, vehicles, and electronics. Of the thousands of PFAS, 163 individual PFAS substances are listed on the NPRI (see Table 7), and the reporting thresholds apply to each substance individually.

In general, any person who owns or operates a **contiguous facility or an offshore installation** must submit a report for a Part 1C substance if **both** of the following criteria are met:

1. employees work a total of ≥ 20 000 hours, or activities to which the employee threshold does not apply (see Section 3.4.3) take place at the facility, and
2. the **total quantity** of the Part 1C substance present in one or more of the following scenarios is greater than or equal to 1 kg :
    - manufactured, processed or otherwise used at or above 0.1% concentration;
    - incidentally manufactured, processed or otherwise used as a by-product at any concentration;
    - contained in tailings at any concentration; and
    - contained in waste rock that is not inert and that is disposed of, at any concentration (see section 3.5.4)

Detailed guidance for reporting Part 1C substances can be found in the PFAS Guidance for Reporting to the National Pollutant Release Inventory prepared by Environment and Climate Change Canada.

Table 7. List of Part 1C substance names and CAS RNs

CAS RN	Substance Name
1078715-61-3	1-Propanaminium, 3-amino-N-(carboxymethyl)-N,N-dimethyl-, N-[2-[(γ-ω-perfluoro-C4-20-alkyl)thio]acetyl] derivs., inner salts
108427-53-8	Perfluorohexanesulfonate
113507-82-7	Perfluoro-2-ethoxyethanesulfonic acid
1169706-83-5	3:3 Fluorotelomer carboxylate, ion(1-)
122499-17-6	Perfluoro-2-propoxypropanoate
126105-34-8	Perfluorodecanesulfonate
13252-13-6	Perfluoro-2-propoxypropanoic acid
142636-88-2	2-Propenoic acid, 2-methyl-, octadecyl ester, polymer with 3,3,4,4,5,5,6,6,7,7, 8,8,9,9,10,10,11,11,12,12,12heneicosafluorododecyl 2-propenoate, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10heptadecafluorodecyl 2-propenoate and 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10heptadecafluorodecyl 2-propenoate and 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11, 12,12,13,13,14,14,14pentacosafluorotetradecyl 2-propenoate
1432017-36-1	Perfluoro-4-methoxybutanoate
143372-54-7	Siloxanes and Silicones, (3,3,4,4,5,5, 6,6,7,7,8,8,9,9,10,10,10heptadecafluorodecyl)oxy Me, hydroxy Me, Me octyl, ethers with polyethylene glycol mono-Me ether
146689-46-5	Perfluoroheptanesulfonate
149724-40-3	8:2 Fluorotelomer sulfonate, ammonium salt
151772-58-6	Perfluoro-3,6-dioxaheptanoic acid
1621485-21-9	Perfluoro(2-((6-chlorohexyl)oxy)ethanesulfonate)
16517-11-6	Octadecanoic acid, pentatriacontafluoro-
1652-63-7	1-Propanaminium, 3-[[(heptadecafluorooctyl)sulfonyl]amino]-N,N,N-trimethyl-, iodide
165457-57-8	Methyl perfluorohexadecanoate
1691-99-2	1-Octanesulfonamide, N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-N-(2-hydroxyethyl)
171978-95-3	Perfluorododecanoate
175905-36-9	Perfluoropentanesulfonate

CAS RN	Substance Name
1763-23-1	Perfluorooctane sulfonic acid
17741-60-5	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12, 12-heneicosafluorododecyl ester
1799325-94-2	2H,2H,3H,3H-Perfluorooctanoate
1799325-95-3	7:3 Perfluorodecanoate
19430-93-4	1-Hexene, 3,3,4,4,5,5,6,6,6-nonafluoro
196859-54-8	Perfluoroundecanoate
20109-59-5	Sodium perfluoroheptanoate
2043-53-0	Decane, 1,1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8 -heptadecafluoro-10-iodo-
2058-94-8	Perfluoroundecanoic acid
21049-36-5	Heptanoic acid, tridecafluoro-, potassium salt
2127366-90-7	2,2,3-Trifluoro-3-[1,1,2,2,3,3hexafluoro-3-(trifluoromethoxy) propoxy]propanoate
21615-47-4	Hexanoic acid, undecafluoro-, ammonium salt
21652-58-4	Perfluorooctyl ethylene
21934-50-9	Perfluoroheptanesulfonic acid, sodium salt
2196242-82-5	2-[(8-Chloro-1,1,2,2,3,3,4,4,5,5,6,6,7,7, 8,8-hexadecafluorooctyl)oxy]-1,1,2,2-tetrafluoroethanesulfonate
220689-13-4	Perfluoro-2-ethoxyethanesulfonate
2218-54-4	Butanoic acid, 2,2,3,3,4,4,4-heptafluoro-, sodium salt (1:1)
2250081-67-3	Sodium 4,8-dioxa-3Hperfluorononanoate
2263-09-4	1-Octanesulfonamide, N-butyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-N-(2-hydroxyethyl)-
2355-31-9	2-(N-Methylperfluorooctanesulfonamido)acetic acid
24448-09-7	1-Octanesulfonamide, 1,1,2,2,3,3,4,4,5,5, 6,6,7,7,8,8,8-heptadecafluoro-N-(2-hydroxyethyl)-N-methyl-
25268-77-3	2-[[(Heptadecafluorooctyl)sulfonyl]methylamino]ethyl acrylate
2706-90-3	Perfluoropentanoic acid
2706-91-4	Perfluoropentanesulfonic acid
27619-96-1	8:2 Fluorotelomer sulfonate, sodium salt
27619-97-2	1-Octanesulfonic acid, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro
27854-31-5	2-(Perfluorooctyl)ethanoic acid
27905-45-9	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8, 9,9,10,10,10-heptadecafluorodecyl ester
2795-39-3	Perfluorooctane sulfonic acid, potassium salt
2806-15-7	Sodium perfluorodecanesulfonate
29081-56-9	Perfluorooctane sulfonic acid, ammonium salt
29117-08-6	Poly(oxy-1,2-ethanediyl), α-[2-[ethyl[(heptadecafluorooctyl)sulfonyl]amino]ethyl]-ω-hydroxy-
2923-16-2	trifluoroacetate salt of potassium,
2923-18-4	Trifluoroacetic acid, sodium salt
2966-50-9	Trifluoroacetic acid, silver salt
2991-50-6	2-(N-Ethylperfluorooctanesulfonamido)acetic acid
30334-69-1	Perfluorobutanesulfonamide
307-24-4	Perfluorohexanoic acid
307-35-7	Perfluorooctylsulfonyl fluoride
307-55-1	Perfluorododecanoic acid

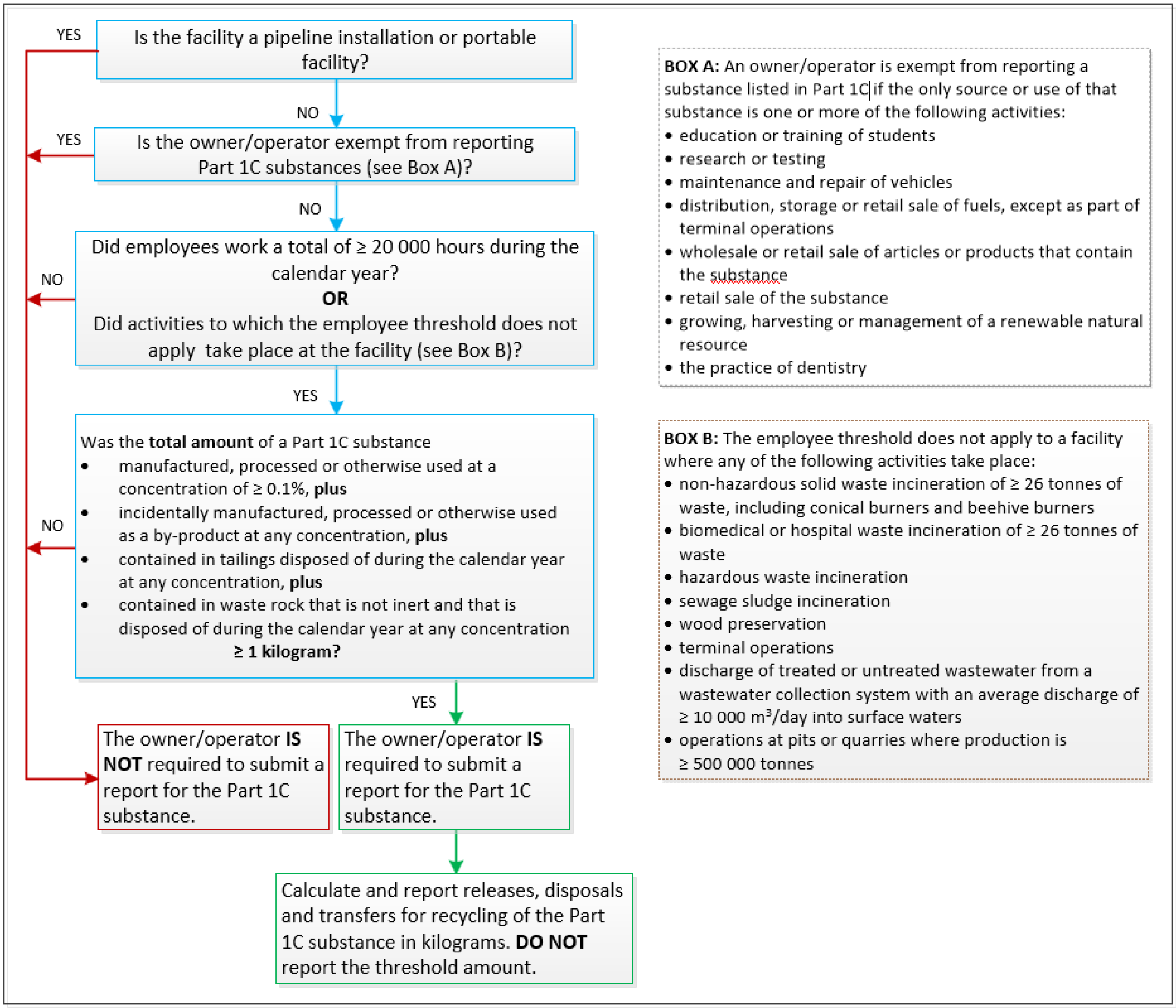
CAS RN	Substance Name
307-67-5	Perfluorododecanoic acid, sodium salt
31506-32-8	1-Octanesulfonamide, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8heptadecafluoro-N-methyl-
3336-58-1	Trifluoroacetic acid, ammonium salt
335-66-0	Octanoyl fluoride, pentadecafluoro-
335-67-1	Perfluorooctanoic acid
335-76-2	Perfluorodecanoic acid
335-77-3	Perfluorodecanesulfonic acid
335-95-5	Perfluorooctanoic acid, sodium salt
34362-49-7	1,1,2,2-Tetrahydroperfluorohexadecyl acrylate
343629-43-6	Perfluorododecanesulfonate
34395-24-9	2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8, 9,9,10,10,11,11,12,12,13,13,14,14, 14-pentacosafluorotetradecyl ester
355-46-4	Perfluorohexanesulfonic acid
356-02-5	3:3 Fluorotelomer carboxylic acid
365971-87-5	Perfluorotetradecanoate
37338-48-0	Poly[oxy(methyl-1,2-ethanediyl)], α-[2-[ethyl[(heptadecafluorooctyl)sulfonyl]amino]ethyl]-ω-hydroxy-
375-22-4	Perfluorobutanoic acid
375-73-5	Perfluorobutanesulfonic acid
375-85-9	Perfluoroheptanoic acid
375-92-8	Perfluoroheptanesulfonic acid
375-95-1	Perfluorononanoic acid
376-06-7	Perfluorotetradecanoic acid
376-27-2	Methyl perfluorooctanoate
377-73-1	Perfluoro-3-methoxypropanoic acid
382-21-8	Perfluoroisobutene
3830-45-3	Perfluorodecanoic acid, sodium salt
38436-16-7	Dichloromethyl(3,3,4,4,5,5,6,6,6nonafluorohexyl)silane
3871-99-6	Perfluorohexanesulfonic acid, potassium salt
39108-34-4	8:2 Fluorotelomer sulfonic acid
39187-41-2	Methyl perfluoro-3,6-dioxaheptanoate
414911-30-1	4:2 Fluorotelomer sulfonate
4151-50-2	1-Octanesulfonamide, N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro
425670-75-3	3,3,4,4,5,5,6,6,7,7,8,8,8Tridecafluorooctane-1-sulfonate
45048-62-2	Perfluorobutanoate
45167-47-3	Perfluoropentanoate
45187-15-3	Perfluorobutanesulfonate
45285-51-6	Perfluorooctanoate
45298-90-6	Perfluorooctanesulfonate
474511-07-4	Perfluorononanesulfonate
481071-78-7	3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10Heptadecafluorodecane-1-sulfonate
507-63-1	Perfluorooctyl iodide

CAS RN	Substance Name
53826-12-3	2-(Perfluorohexyl)ethanoic acid
56773-42-3	Ethanaminium, N,N,N-triethyl-, salt with 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8heptadecafluoro-1-octanesulfonic acid (1:1)
59587-39-2	1-Octanesulfonic acid, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-, ammonium salt
60871-96-7	Sodium perfluoro-n-undecanoate
6130-43-4	Heptanoic acid, tridecafluoro-, ammonium salt
62037-80-3	Hexafluoropropylene oxide dimer acid, ammonium salt
647-42-7	1-Octanol, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-
65104-45-2	2-Propenoic acid, 2-methyl-, 3,3,4,4,5,5, 6,6,7,7,8,8,9,9,10,10,11,11,12,12,12heneicosafluorododecyl ester, polymer with 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10, 10-heptadecafluorodecyl 2-methyl2-propenoate, methyl 2-methyl2-propenoate, and 3,3,4,4,5,5,6,6,7,7,8,8,8tridecafluorooctyl 2-methyl-2-propenoate
65530-61-2	Poly(difluoromethylene), α-fluoro-ω-[2-(phosphonooxy)ethyl]
65530-62-3	Poly(difluoromethylene), α,α′-[phosphinicobis(oxy-2,1-ethanediyl)]bis[ω-fluoro
65530-63-4	Ethanol, 2,2′-iminobis-, compd. with α-fluoro-ω-[2-(phosphonooxy)ethyl] poly(difluoromethylene) (2:1)
65530-64-5	Ethanol, 2,2′-iminobis-, compd. with α,α′-[phosphinicobis(oxy-2,1-ethanediyl)] bis[ω-fluoropoly(difluoromethylene)] (1:1)
65530-69-0	Poly(difluoromethylene), α-[2-[(2-carboxyethyl)thio]ethyl]-ω-fluoro-, lithium salt (1:1)
65530-70-3	Poly(difluoromethylene), α,α′-[phosphinicobis(oxy-2,1-ethanediyl)]bis[ω-fluoro-, ammonium salt (1:1)
65530-72-5	Poly(difluoromethylene), α-fluoro-ω-[2-(phosphonooxy)ethyl]-, ammonium salt (1:2)
65530-83-8	Poly(difluoromethylene), α-[2-[(2-carboxyethyl)thio]ethyl]-ω-fluoro
65545-80-4	Poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, ether with α-fluoro-ω-(2-hydroxyethyl)poly(difluoromethylene) (1:1)
65605-58-5	2-Propenoic acid, 2-methyl-, dodecyl ester, polymer with α-fluoro-ω-[2-[(2-methyl-1-oxo-2-propenyl)oxy]ethyl]poly(difluoromethylene)
65605-73-4	Poly(difluoromethylene), α-fluoro-ω-[2-[(1-oxo-2-propenyl)oxy]ethyl]-, homopolymer
65636-35-3	Ethanaminium, N,N-diethyl-N-methyl-2[(2-methyl-1-oxo-2-propenyl)oxy]-, methyl sulfate, polymer with 2-ethylhexyl 2-methyl-2-propenoate, α-fluoro-ω-[2-[(2-methyl-1-oxo-2propenyl)oxy]ethyl]poly (difluoromethylene), 2-hydroxyethyl 2-methyl-2-propenoate and N-(hydroxymethyl)-2-propenamide
67584-58-1	1-Propanaminium, N,N,N-trimethyl-3-[[(pentadecafluoroheptyl)sulfonyl]amino]-, iodide
678-39-7	1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10, 10,10-heptadecafluoro-
67905-19-5	Perfluorohexadecanoic acid
68140-18-1	Thiols, C4-10, γ-ω-perfluoro
68140-20-5	Thiols, C6-12, γ-ω-perfluoro
68140-21-6	Thiols, C10-20, γ-ω-perfluoro
68187-47-3	1-Propanesulfonic acid, 2-methyl-, 2-[[1-oxo-3-[(γ-ω-perfluoro-C4-16-alkyl)thio]propyl]amino] derivs., sodium salts
68227-96-3	2-Propenoic acid, butyl ester, telomer with 2-[[(heptadecafluorooctyl)sulfonyl] methylamino]ethyl 2-propenoate, 2-[methyl[(nonafluorobutyl) sulfonyl]amino]ethyl 2-propenoate, α-(2-methyl-1-oxo-2-propenyl)-ωhydroxypoly(oxy-1,4-butanediyl), α-(2-methyl-1-oxo-2-propen-1-yl)-ω[(2-methyl-1-oxo-2-propen-1-yl)oxy]poly (oxy-1,4-butanediyl), 2-[methyl[(1,1,2,2,3,3,4,4,5,5,6,6,7,7,7pentadecafluoroheptyl)sulfonyl] amino]ethyl 2-propenoate, 2-[methyl[(1,1,2,2,3,3,4,4,5,5,6,6,6tridecafluorohexyl)sulfonyl]amino] ethyl 2-propenoate, 2-[methyl[(1,1,2,2,3,3,4,4,5,5,5-undecafluoropentyl) sulfonyl]amino]ethyl 2-propenoate and 1-octanethiol
68259-10-9	1-Butanesulfonic acid, 1,1,2,2,3,3,4,4,4-nonafluoro-, ammonium salt
68259-11-0	Pentanoic acid, nonafluoro-, ammonium salt
68259-12-1	Perfluorononanesulfonic acid
68391-08-2	Alcohols, C8-14, γ-ω-perfluoro

CAS RN	Substance Name
68391-09-3	Sulfonic acids, C6-12-alkane, perfluoro potassium salts
68412-68-0	Phosphonic acid, perfluoro-C6-12-alkyl derivs.
68412-69-1	Phosphinic acid, bis(perfluoro-C6-12-alkyl) derivs.
68957-57-3	1-Propanaminium, N,N,N-trimethyl-3-[[(undecafluoropentyl)sulfonyl]amino]-, iodide
68957-58-4	1-Propanaminium, N,N,N-trimethyl-3-[[(tridecafluorohexyl)sulfonyl]amino]-, iodide
68958-60-1	Poly(oxy-1,2-ethanediyl), α-[2-[ethyl[(pentadecafluoroheptyl)sulfonyl]amino]ethyl]-ω-methoxy-
70887-84-2	2H-Perfluoro-2-decenoic acid
70887-88-6	2H-Perfluoro-2-octenoic acid (6:2)
70969-47-0	Thiols, C8-20, γ-ω-perfluoro, telomers with acrylamide
70983-60-7	1-Propanaminium, 2-hydroxy-N,N,N-trimethyl-, 3-[(γ-ω-perfluoro-C6-20-alkyl)thio] derivs., chlorides
72007-68-2	Perfluorononanoate
72629-94-8	Perfluorotridecanoic acid
72654-51-4	Acetic acid, trifluoro-, rhodium(2+) salt
73829-36-4	Perfluorodecanoate
754-91-6	Perfluorooctanesulfonamide
756426-58-1	Perfluoro(2-((6-chlorohexyl)oxy)ethanesulfonic acid)
757124-72-4	2-(Perfluorobutyl)-1-ethanesulfonic acid
76-05-1	Acetic acid, trifluoro-
763051-92-9	11-Chloroperfluoro-3-oxaundecanesulfonic acid
79780-39-5	Perfluorododecanesulfonic acid
798556-82-8	Perfluorooctadecanoate anion
812-70-4	3-(Perfluoroheptyl)propanoic acid
83329-89-9	11-Chloroperfluoro-3-oxaundecanesulfonate, potassium salt
862374-87-6	Perfluorotridecanoate
863090-89-5	Perfluoro-4-methoxybutanoic acid
865-86-1	1-Dodecanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9, 10,10,11,11,12,12,12-heneicosafluoro
914637-49-3	2H,2H,3H,3H-Perfluorooctanoic acid
919005-14-4	4,8-Dioxa-3H-perfluorononanoic acid
92612-52-7	Perfluorohexanoate
93572-72-6	Sulfonic acids, C6-12-alkane, perfluoro
98789-57-2	Perfluorononanesulfonic acid, sodium salt

Figure 5 illustrates the steps for determining if a report for Part 1C substances is required.

Figure 6. Reporting for Part 1C substances



Is the facility a pipeline installation or portable facility?

Is the owner/operator exempt from reporting Part 1C substances (see Box A)?

Did employees work a total of ≥ 20 000 hours during the calendar year?
OR
Did activities to which the employee threshold does not apply take place at the facility (see Box B)?

Was the **total amount** of a Part 1C substance
- manufactured, processed or otherwise used at a concentration of ≥ 0.1%, **plus**
- incidentally manufactured, processed or otherwise used as a by-product at any concentration, **plus**
- contained in tailings disposed of during the calendar year at any concentration, **plus**
- contained in waste rock that is not inert and that is disposed of during the calendar year at any concentration

≥ 1 kilogram?

The owner/operator **IS NOT** required to submit a report for the Part 1C substance.

The owner/operator **IS** required to submit a report for the Part 1C substance.

Calculate and report releases, disposals and transfers for recycling of the Part 1C substance in kilograms. **DO NOT** report the threshold amount.

BOX A: An owner/operator is exempt from reporting a substance listed in Part 1C if the only source or use of that substance is one or more of the following activities:
- education or training of students
- research or testing
- maintenance and repair of vehicles
- distribution, storage or retail sale of fuels, except as part of terminal operations
- wholesale or retail sale of articles or products that contain the substance
- retail sale of the substance
- growing, harvesting or management of a renewable natural resource
- the practice of dentistry

BOX B: The employee threshold does not apply to a facility where any of the following activities take place:
- non-hazardous solid waste incineration of ≥ 26 tonnes of waste, including conical burners and beehive burners
- biomedical or hospital waste incineration of ≥ 26 tonnes of waste
- hazardous waste incineration
- sewage sludge incineration
- wood preservation
- terminal operations
- discharge of treated or untreated wastewater from a wastewater collection system with an average discharge of ≥ 10 000 m^3/day into surface waters
- operations at pits or quarries where production is ≥ 500 000 tonnes

5.4.1 Calculating the manufacture, process or otherwise use quantity for Part 1C substances

Facilities need to determine which products they MPO contain any of the 163 PFAS listed in the NPRI. Sources of information to identify the presence of individual PFAS can involve reviewing the Safety Data Sheet and/or Technical Data Sheet for the products that the facility MPOs that have the potential of containing PFAS. Contacting the manufacturer or supplier of these products could also be a source to obtain relevant information.

To calculate the amount to compare to the reporting threshold, add up the following quantities of each Part 1C substance:

- quantities that are manufactured, processed or otherwise used at a concentration equal to or greater than 0.1%;
- quantities that are incidentally manufactured, processed or otherwise used (a by-product), at any concentration, and released on-site to the environment or disposed of on- or off-site;
- quantities that are contained in tailings disposed of during the calendar year, at any concentration; and
- quantities that are contained in waste rock that is not inert and that is disposed of during the calendar year, at any concentration.

Any release or disposal of an NPRI substance must be included in the quantity otherwise used. For example, the quantity of the NPRI substance contained in dust released to air from materials stored on site would be included, whether or not the material is used for a specific purpose at the facility. Another example is a spill of an NPRI substance to water or land during storage or handling.

Since a substance may undergo many processes in a facility, care should be taken not to double-count process streams when calculating the reporting threshold. Do not include quantities of substances more than once in manufacture, process or otherwise use calculations. For example, if a substance is processed and released, the release quantity does not need to be added to the process quantity.

Do not include quantities of a Part 1C substance contained in any of the sources that are excluded, as listed in Section 3.5.2, or from the activities listed in section 3.5.3.

5.4.2 Calculating releases, disposals and transfers for recycling of Part 1C substances

If the reporting threshold for a Part 1C substance is met (as discussed in section 5.4.2), a subsequent calculation is required to determine the quantities of that substance that are released, disposed of and transferred for recycling. If the reporting threshold is met, **all releases, disposals and transfers for recycling of that substance must be reported, regardless of their concentration or quantity and regardless of whether or not the quantity is used in the threshold calculation**. The only exceptions to this are quantities of the substance:

- contained in the materials listed in section 3.5.2; and
- that are manufactured processed or otherwise used in the activities listed in section 3.5.3.

5.4.3 Reporting releases, disposals and transfers for recycling of Part 1C substances

All releases, disposals and transfers for recycling of Part 1C substances must be reported in kilograms (kg). Note that the quantity manufactured, processed or otherwise used is not reported.

Note that even if on-site releases, disposals or off-site transfers for recycling are zero or below the mass or concentration thresholds, a report must be submitted for a Part 1C substance once the mass reporting threshold has been met.

6.0 Reporting for Part 2 substances – Polycyclic aromatic hydrocarbons

Polycyclic aromatic hydrocarbons (PAHs) may be used as commercial chemicals, incidentally manufactured in certain industrial processes and during combustion, or contained in tailings. There are 31 PAHs listed in Part 2 of the NPRI substance list.

6.1 Reporting criteria for Part 2 substances

With the exception of facilities where wood preservation using creosote takes place (see below), reporting for PAHs is based on the quantities of PAHs that are released, disposed of or transferred for recycling as a result of incidental manufacture or from the generation of tailings. A person who owns or operates a **contiguous facility, a portable facility, or an offshore installation** must submit reports for PAHs if both of the following criteria are met:

1. employees work a total of ≥ 20 000 hours, or activities to which the employee threshold does not apply (listed in Section 3.4.3) take place at the facility; and
2. the sum of all PAHs released, disposed of or transferred off-site for recycling as a result of incidental manufacture and/or as a result of the generation of tailings is ≥ 50 kg.

Wood preservation facilities using creosote must report for Part 2 substances, regardless of quantities and regardless of the number of hours worked by employees. See the Guidance for Wood Preservation Facilities Reporting to the NPRI for more information.

Figure 7 illustrates the steps for determining if reports for Part 2 substances are required, and, if so, what information must be reported.

6.2 Calculating the quantity of Part 2 substances to compare to the threshold

The sum of the quantities of individual PAHs incidentally manufactured and/or contained in tailings disposed of during the calendar year should be compared to the 50 kg threshold. In some cases, only information on unspeciated PAHs may be available, or a combination of information on individual and unspeciated PAHs may be available. Add the quantities of each individual PAH and the quantity of unspeciated PAHs to determine if the 50 kg reporting threshold is met.

Do not include quantities of PAHs that are incidentally manufactured from activities listed in section 3.5.3. Do not include naphthalene (CAS RN 91-20-3) when determining the reporting threshold for PAHs under Part 2. Although naphthalene is a PAH, it is a Part 1A substance and is therefore subject to Part 1A reporting requirements.

Figure 7. Reporting for Part 2 substances

BOX A

An owner/operator is exempt from reporting substances listed in Part 2 if the only source or use of those substances is one or more of the following activities:

- education or training of students
- research or testing
- maintenance and repair of vehicles
- distribution, storage or retail sale of fuels, except as part of terminal operations
- wholesale or retail sale of articles or products that contain the substance
- retail sale of the substance
- growing, harvesting or management of a renewable natural resource
- the practice of dentistry

BOX B

The employee threshold does not apply to a facility where any of the following activities take place:

- non-hazardous solid waste incineration of ≥ 26 tonnes of waste, including with conical burners and beehive burners
- biomedical or hospital waste incineration of ≥ 26 tonnes of waste
- hazardous waste incineration
- sewage sludge incineration
- wood preservation
- terminal operations
- discharge of treated or untreated wastewater from a wastewater collection system with an average discharge of ≥ 10 000 m^3/day into surface waters
- operations at pits or quarries where production is ≥ 500 000 tonnes

BOX C

There are three ways to report Part 2 substances, based on the information that is available:

- If information on releases, disposals and transfers for recycling for individual PAHs is available, those PAHs that are released, disposed of or transferred for recycling in quantities ≥ 5 kg must be reported individually.
- If only a combination of information on individual and total PAHs is available, quantities of individual PAHs in quantities ≥ 5 kg and quantities of "total unspeciated PAHs" should both be reported.
- If the only available information is for total PAHs, "total unspeciated PAHs" should be reported.

6.3 Reporting releases, disposals and transfers for recycling of Part 2 substances

All releases, disposals and transfers for recycling of Part 2 substances must be reported in kilograms.

If the 50 kg threshold is met, or if wood preservation using creosote takes place at the facility, a report must be submitted for PAHs. Releases, disposals and transfers for recycling must be reported for the individual PAHs, even though the 50 kg threshold applies to the aggregate total of all 31 PAHs.

Depending on the information that is available, there are three ways to report PAHs (also described in Box C of Figure 7 and Table 8):

- If information on releases, disposals and transfers for recycling for individual PAHs is available, those PAHs that are released, disposed of or transferred for recycling in quantities ≥ 5 kg must be reported individually.
- If only a combination of information on individual and total PAHs is available, quantities of individual PAHs in quantities ≥ 5 kg and quantities of "total unspeciated PAHs" should both be reported.
- If the only available information is for total PAHs, "total unspeciated PAHs" should be reported.

Table 8. How to report polycyclic aromatic hydrocarbons

Type of Information Available	Comparison to Thresholds	What to Report
Quantities of individual PAHs	Add quantities of individual PAHs. If the total is ≥ 50kg, reporting is required	▪ Report quantities of individual PAHs that are released, disposed of or transferred for recycling in quantities ≥ 5 kg ▪ Quantities of individual PAHs that are < 5 kg are not required to be reported
Combination of quantities of individual PAHs and quantity of total PAHs	Add quantities of total PAHs and any individual PAHs that are not already included in the total unspeciated PAHs. If the total is ≥ 50kg, reporting is required	▪ Report quantities of individual PAHs that are ≥ 5 kg, **and** ▪ Report "total unspeciated PAHs" (not including quantities of individually reported PAHs) ▪ Quantities of individual PAHs that are < 5 kg are not required to be reported
Quantity of total PAHs	If total PAHs are ≥ 50kg, reporting is required	▪ Report "total unspeciated PAHs"

Note that "total unspeciated PAHs" is not intended to include the quantity of PAHs that are reported individually. In order to avoid double counting when reporting both individual PAHs and "total unspeciated PAHs", the quantities of individual PAHs that are reported separately should not be included in the quantity reported for "total unspeciated PAHs".

In addition, do not include release, disposal and transfer for recycling quantities of PAHs from activities listed in section 3.5.3 when reporting PAHs. Do not include release, disposal and transfer for recycling quantities of naphthalene (PAH listed in Part 1A) when reporting for total PAHs.

Facilities using creosote for wood preservation must report for PAHs regardless of the quantity of PAHs released, disposed of or transferred for recycling or the number of hours worked by employees.

7.0 Reporting for Part 3 substances – Dioxins, furans and hexachlorobenzene

Polychlorinated dibenzo-*p*-dioxins (dioxins), polychlorinated dibenzofurans (furans) and hexachlorobenzene are released primarily as by-products of industrial and combustion processes; they are also found as contaminants in certain pesticides or chlorinated solvents. Hexachlorobenzene may also be found as a contaminant in the wood preservative pentachlorophenol (PCP).

Hexachlorobenzene and 17 dioxin and furan congeners are listed in Part 3. For a list of these congeners, see Table 12.

7.1 Reporting criteria for Part 3 substances

Reporting for dioxins, furans and hexachlorobenzene is mandatory for a **contiguous facility, a portable facility or an offshore installation** where the activities specified in Table 9 take place, regardless of quantity or concentration. The employee threshold applies to some of these activities, but does not apply to others, as indicated in Table 9. For those activities to which the employee threshold applies, both criteria must be met (i.e., the activity must take place, and the employee threshold must be met). For activities to which the employee threshold does not apply, reporting for dioxins, furans and hexachlorobenzene is mandatory, regardless of the number of hours worked by employees.

The employee threshold does not apply to wood preservation activities in general. However, only wood preservation using PCP triggers mandatory reporting of Part 3 substances. PCP, by its chemical structure, is a close surrogate to hexachlorobenzene. PCP is derived from hexachlorobenzene by substituting one of HCB's six chloro-substituents with a hydroxyl group. Given its chemical similarity to HCB and that its manufacturing ingredients contain the precursors for dioxin and furan production (i.e., chlorinated aromatics), the manufacture of PCP often results in the incidental manufacture of HCB, dioxins and furans.

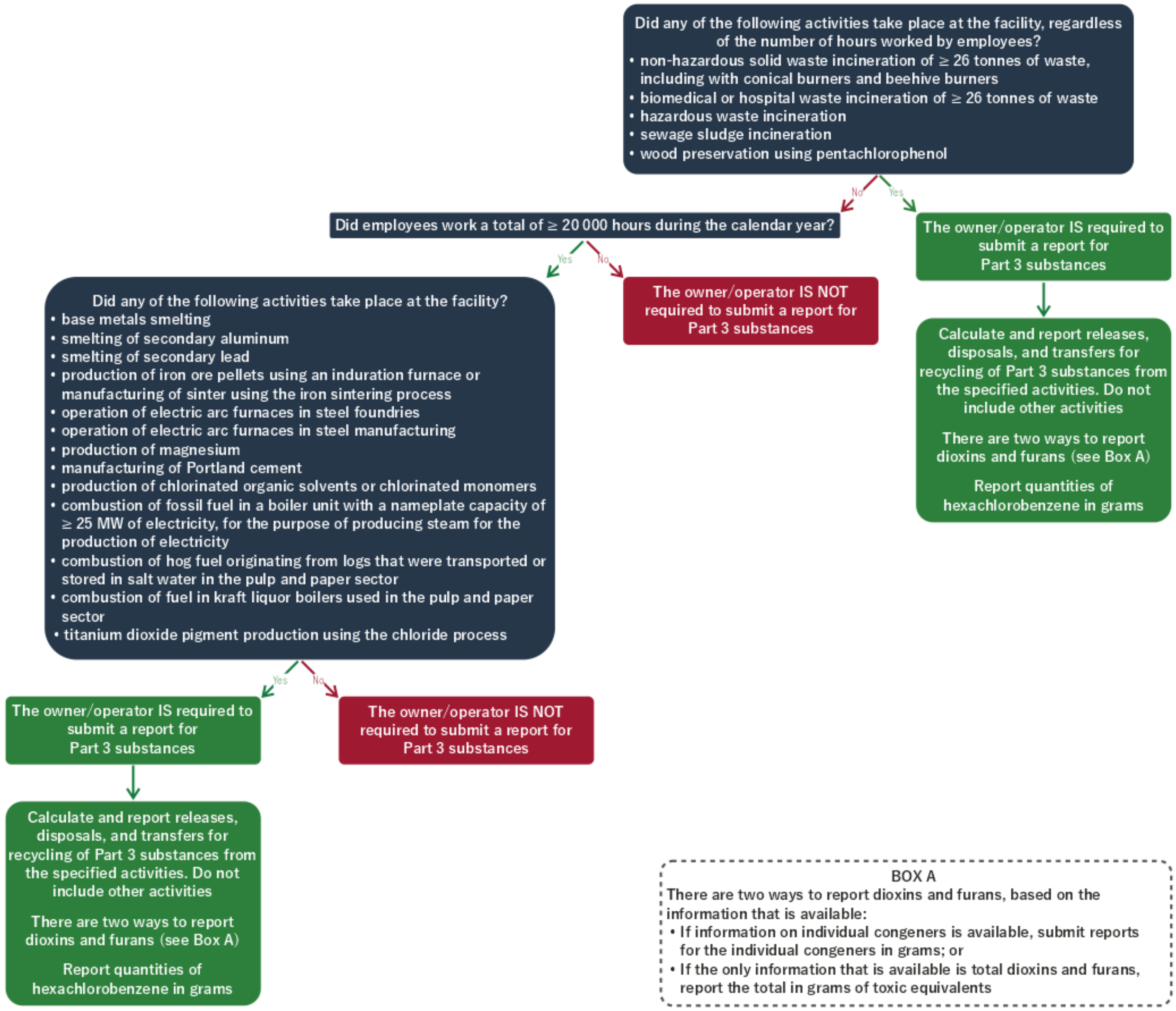
Figure 8 illustrates the steps for determining if a report for Part 3 substances is required, and, if so, what information must be reported.

Table 9. Activities for which reports on dioxins, furans and hexachlorobenzene are required

Employee Threshold	Activity
Employee threshold does not apply	Non-hazardous solid waste incineration of ≥ 26 tonnes of waste, including conical burners and beehive burners
	Biomedical or hospital waste incineration of ≥ 26 tonnes of waste
	Hazardous waste incineration
	Sewage sludge incineration
	Wood preservation using pentachlorophenol

Employee threshold applies	Base metals smelting (copper, lead, nickel or zinc only)
	Smelting of secondary aluminum
	Smelting of secondary lead
	Production of iron ore pellets using an induration furnace or manufacturing of sinter using the iron sintering process
	Operation of electric arc furnaces in steel foundries
	Operation of electric arc furnaces in steel manufacturing
	Production of magnesium
	Manufacturing of Portland cement
	Production of chlorinated organic solvents or chlorinated monomers
	Combustion of fossil fuel in a boiler unit, with a nameplate capacity of ≥ 25 megawatts of electricity, for the purpose of producing steam for the production of electricity
	Combustion of hog fuel originating from logs that were transported or stored in salt water in the pulp and paper sector
	Combustion of fuel in kraft liquor boilers used in the pulp and paper sector
	Titanium dioxide pigment production using the chloride process

Figure 8. Reporting for Part 3 substances



Did any of the following activities take place at the facility, regardless of the number of hours worked by employees?
- non-hazardous solid waste incineration of ≥ 26 tonnes of waste, including with conical burners and beehive burners
- biomedical or hospital waste incineration of ≥ 26 tonnes of waste
- hazardous waste incineration
- sewage sludge incineration
- wood preservation using pentachlorophenol

The owner/operator IS required to submit a report for Part 3 substances

Calculate and report releases, disposals, and transfers for recycling of Part 3 substances from the specified activities. Do not include other activities

There are two ways to report dioxins and furans (see Box A)

Report quantities of hexachlorobenzene in grams

Did employees work a total of ≥ 20 000 hours during the calendar year?

The owner/operator IS NOT required to submit a report for Part 3 substances

Did any of the following activities take place at the facility?
- base metals smelting
- smelting of secondary aluminum
- smelting of secondary lead
- production of iron ore pellets using an induration furnace or manufacturing of sinter using the iron sintering process
- operation of electric arc furnaces in steel foundries
- operation of electric arc furnaces in steel manufacturing
- production of magnesium
- manufacturing of Portland cement
- production of chlorinated organic solvents or chlorinated monomers
- combustion of fossil fuel in a boiler unit with a nameplate capacity of ≥ 25 MW of electricity, for the purpose of producing steam for the production of electricity
- combustion of hog fuel originating from logs that were transported or stored in salt water in the pulp and paper sector
- combustion of fuel in kraft liquor boilers used in the pulp and paper sector
- titanium dioxide pigment production using the chloride process

The owner/operator IS required to submit a report for Part 3 substances

The owner/operator IS NOT required to submit a report for Part 3 substances

Calculate and report releases, disposals, and transfers for recycling of Part 3 substances from the specified activities. Do not include other activities

There are two ways to report dioxins and furans (see Box A)

Report quantities of hexachlorobenzene in grams

BOX A

There are two ways to report dioxins and furans, based on the information that is available:
- If information on individual congeners is available, submit reports for the individual congeners in grams; or
- If the only information that is available is total dioxins and furans, report the total in grams of toxic equivalents

7.2 Reporting releases, disposals and transfers for recycling of Part 3 substances

Only those quantities of dioxins, furans and hexachlorobenzene that result from the activities listed in Table 9 need to be reported. Quantities of Part 3 substances that result from other activities do not need to be reported.

The information that needs to be reported for Part 3 substances depends on the method used to determine the quantities released, disposed of and transferred for recycling. There are three possible scenarios:

- quantities are determined using CEMS, PEM or source testing;
- quantities are estimated using other methods; or
- no information is available.

To determine what is required to be reported, the quantities determined using CEMS, PEM or source testing must be compared to the level of quantification (LoQ). LoQ is defined in CEPA as “the lowest concentration that can be accurately measured using sensitive but routine sampling and analytical methods.” Table 10 lists estimated LoQs for dioxins, furans and HCB, determined by Environment and Climate Change Canada for gases, liquids and solids.

Table 10. Estimated level of quantification for dioxins, furans and hexachlorobenzene

Material State	Estimated Level of Quantification	
	Dioxins and Furans(1)	Hexachlorobenzene
Gaseous(2)	32 picograms (pg) toxicity equivalents (TEQ)/m^3	6 nanograms (ng)/m^3
Liquid(3)	20 pg TEQ/L	70 ng/L
Solid(4)	9 pg TEQ/g	2 ng/g

[1] See section 7.2.1 for an explanation of toxicity equivalents (TEQ).

[2] Environment Canada, 1999. Use these values to determine whether concentrations in releases to air from stacks and other sources are above, equal to or below the LoQ.

[3] The LoQ for concentrations of dioxins and furans in liquids was extrapolated from the effective LoQ for 2,3,7,8-TCDD in the Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations. Use 70 ng/L as the estimated LoQ for concentrations of HCB in liquids (Environment Canada, 1997).

[4] Environment Canada, 2000. Use these values to determine whether concentrations of dioxins and furans or HCB in solid materials are above, equal to or below the LoQ. Incinerator bottom ash, pollution-abatement residues and sludge are examples of solid materials containing dioxins and furans or HCB.

Measured concentrations must be compared to the LoQ for each type of release, disposal and transfer for recycling. If measured quantities are greater than or equal to the LoQ, the quantities must be reported. If measured quantities are less than the LoQ, reporting the quantities is optional.

If quantities of dioxins, furans and HCB are estimated using remote quantification, mass balance, emission factors, a speciation profile or engineering estimates, the quantities that are released, disposed of or transferred for recycling do not need to be compared to an LoQ, and must be reported.

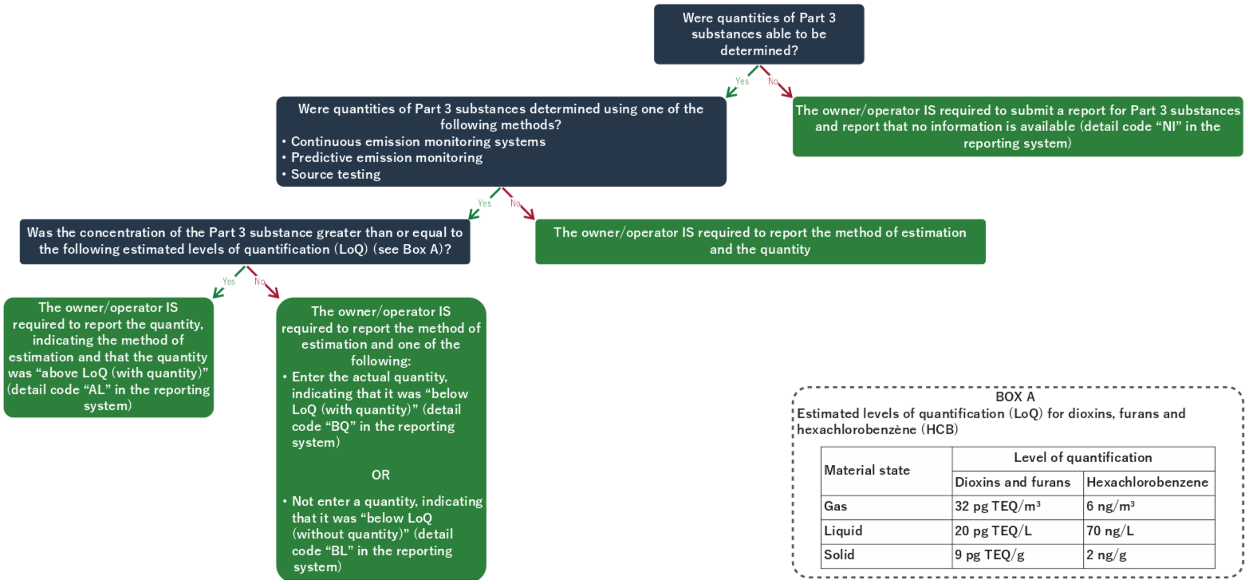
Table 11 summarizes the information that should be reported for Part 3 substances, depending on the method of estimation and the comparison to the LoQ. The online reporting system allows up to six decimal places to be reported. If a quantity is being reported, it must be 0.000001 g or more.

Figure 9 illustrates the steps for determining the information that should be reported for Part 3 substances.

Table 11. How to report dioxins, furans and hexachlorobenzene

Method of Estimation	Comparison to Level of Quantification	What Must be Reported
CEMS, PEM or source testing	at or above LoQ	Report the quantity, and report that the quantity is at or above the LoQ (detail code “AL” in the reporting system)
CEMS, PEM or source testing	below LoQ	Report that the quantity is below the LoQ (detail code “BL”). The quantity can also be reported, but this is optional when it is below the LoQ (detail code “BQ”)
Remote quantification	n/a	Report the quantity
Mass balance		
Site-specific emission factor or published emission factor		
Speciation profile		
Engineering estimate		
No information available	n/a	Report that no information is available under “Basis of Estimate” in the reporting system

Figure 9. How to report dioxins, furans and hexachlorobenzene



Were quantities of Part 3 substances able to be determined?

The owner/operator IS required to submit a report for Part 3 substances and report that no information is available (detail code "NI" in the reporting system)

Were quantities of Part 3 substances determined using one of the following methods?
- Continuous emission monitoring systems
- Predictive emission monitoring
- Source testing

The owner/operator IS required to report the method of estimation and the quantity

Was the concentration of the Part 3 substance greater than or equal to the following estimated levels of quantification (LoQ) (see Box A)?

The owner/operator IS required to report the quantity, indicating the method of estimation and that the quantity was "above LoQ (with quantity)" (detail code "AL" in the reporting system)

The owner/operator IS required to report the method of estimation and one of the following:
- Enter the actual quantity, indicating that it was "below LoQ (with quantity)" (detail code "BQ" in the reporting system)

OR

- Not enter a quantity, indicating that it was "below LoQ (without quantity)" (detail code "BL" in the reporting system)

BOX A

Estimated levels of quantification (LoQ) for dioxins, furans and hexachlorobenzène (HCB)

Material state	Level of quantification	
	Dioxins and furans	Hexachlorobenzene
Gas	32 pg TEQ/m³	6 ng/m³
Liquid	20 pg TEQ/L	70 ng/L
Solid	9 pg TEQ/g	2 ng/g

7.2.1 Reporting dioxins and furans as individual congeners or toxic equivalents

Depending on the information that is available, there are two ways to report dioxins and furans (also described in Box A of Figure 9):

- Information on individual congeners of dioxins and furans must be reported if it is available, in grams; or
- If the only information available is for total dioxins and furans, the total must be reported in grams of toxic equivalents (TEQ).

Dioxins and furans are often found in complex mixtures, typically at extremely low concentrations, making it difficult to determine the cumulative toxicity of the mixture. Accordingly, toxic equivalency factors (TEFs) have been assigned to each dioxin and furan congener as weighting factors. These TEFs are assigned relative to the toxicity of 2,3,7,8-TCDD, the most toxic congener.

The TEFs listed in Table 12 should be used. To calculate TEQ: multiply the concentration (or quantity) of an individual congener by its respective TEF. For example, 1,2,3,4,7,8-HxCDF has a TEF of 0.1, and a sample concentration of 30 ng/kg 1,2,3,4,7,8-HxCDF is therefore equal to 3 ng TEQ/kg.

Table 12. Toxicity equivalent weighting factors for dioxins and furans

Congener	Abbreviation	CAS RN	Toxicity Equivalent Factor
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin	2,3,7,8-TCDD	1746-01-6	1
1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin	1,2,3,7,8-PeCDD	40321-76-4	1
1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin	1,2,3,4,7,8-HxCDD	39227-28-6	0.1
1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin	1,2,3,6,7,8-HxCDD	57653-85-7	0.1
1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin	1,2,3,7,8,9-HxCDD	19408-74-3	0.1
1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin	1,2,3,4,6,7,8-HpCDD	35822-46-9	0.01
Octachlorodibenzo-*p*-dioxin	OCDD	3268-87-9	0.0003
2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-TCDF	51207-31-9	0.1
2,3,4,7,8-Pentachlorodibenzofuran	2,3,4,7,8-PeCDF	57117-31-4	0.3
1,2,3,7,8-Pentachlorodibenzofuran	1,2,3,7,8-PeCDF	57117-41-6	0.03
1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,4,7,8-HxCDF	70648-26-9	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-HxCDF	72918-21-9	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-HxCDF	57117-44-9	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran	2,3,4,6,7,8-HxCDF	60851-34-5	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-HpCDF	67562-39-4	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1,2,3,4,7,8,9-HpCDF	55673-89-7	0.01
Octachlorodibenzofuran	OCDF	39001-02-0	0.0003

Source: Van den Berg et al., 2006.

8.0 Reporting for Part 4 substances – Criteria air contaminants

Air issues, such as smog and acid rain, result from the presence of, and interactions between, a group of pollutants known as criteria air contaminants (CACs) and related pollutants. There are seven CACs listed in Part 4 (see Table 14). The following sections provide information on what should be included and excluded when reporting releases of CACs.

8.1 Nitrogen oxides

Nitrogen oxides (NOx) include nitric oxide (NO) and nitrogen dioxide (NO_2). Since NOx is a mixture, both NO and NO_2 must be expressed on an NO_2-equivalent basis before the individual quantities are combined for the total NOx release. Do not include nitrous oxide (N_2O) when calculating NOx releases.

8.2 Sulphur dioxide

Sulphur dioxide (SO_2) is part of the sulphur oxide (SOx) family of gases. However, reporting to the NPRI is only required for SO_2, not SOx. Therefore, the quantity of the other gases in the SOx family, (i.e., sulphite, sulphur trioxide [SO_3] and sulphate [SO_4]) released should not be considered when calculating SO_2 releases.

8.3 Particulate matter

Three size fractions of particulate matter (PM) are required to be reported to the NPRI:

- total PM with a diameter less than 100 micrometres (TPM)
- PM with a diameter less than or equal to 10 micrometres (PM_{10})
- PM with a diameter less than or equal to 2.5 micrometres ($PM_{2.5}$)

As shown in Figure 10, the TPM fraction includes PM_{10} and $PM_{2.5}$, while PM_{10} includes $PM_{2.5}$. It is therefore impossible for $PM_{2.5}$ or PM_{10} releases to exceed TPM releases. It is also impossible for $PM_{2.5}$ releases to exceed PM_{10} releases.

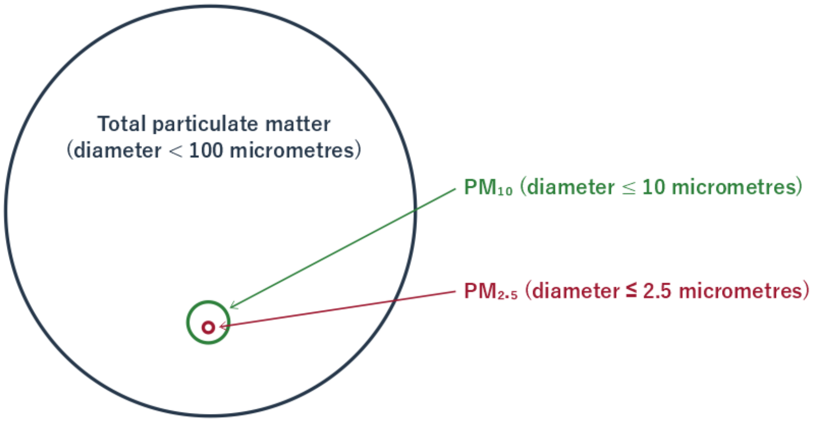
Only filterable PM is reportable to the NPRI; condensable PM should not be included in release calculations. If the best available estimation method includes both filterable and condensable PM, and it is not possible to determine how much of the quantity is condensable PM to remove from the total, then the total can be reported. Facilities are required to indicate whether their reported PM quantities include condensable PM and can include a comment in the reporting system to provide more information.

Filterable particulate matter is particles that are directly emitted by a source as a solid or liquid (aerosol) at stack or release conditions and that are captured on the filter of a stack test sampling train. Filterable PM is a component of primary PM.

Condensable particulate matter (CPM) is material that is a vapor at stack conditions, but that condenses and/or reacts upon cooling and dilution in ambient air to form solid or liquid PM immediately after discharge from the stack. CPM is a component of primary PM. All CPM is assumed to be in the $PM_{2.5}$ fraction.

TPM, PM_{10} and $PM_{2.5}$ releases from road dust caused by vehicular traffic on unpaved roads within facility boundaries are required to be included in release calculations, when travel on these roads is ≥ 10 000 vehicle kilometres travelled per year, where the air release threshold is also met.

Figure 10. Particulate matter size fractions



8.4 Volatile organic compounds (total)

Volatile organic compounds (VOCs) are an aggregate grouping of more than 1 000 organic substances that readily volatilize and undergo photochemical reactions in the atmosphere.

VOCs (total) should be reported as the total quantity of VOCs that participate in atmospheric photochemical reactions. Do not include any of the 63 substances or groups of substances that are specified in Schedule 1 of CEPA as being excluded from the VOC definition (Table 12).

Table 13. Substances and groups of substances that are excluded from the definition of volatile organic compounds

CEPA Schedule 1 number	Name of substance or group of substances	CAS RN
(a)	methane	74-82-8
(b)	ethane	74-84-0
(c)	methylene chloride (dichloromethane)	75-09-2
(d)	1,1,1-trichloroethane (methyl chloroform)	71-55-6
(e)	1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113)	76-13-1
(f)	trichlorofluoromethane (CFC-11)	75-69-4
(g)	dichlorodifluoromethane (CFC-12)	75-71-8

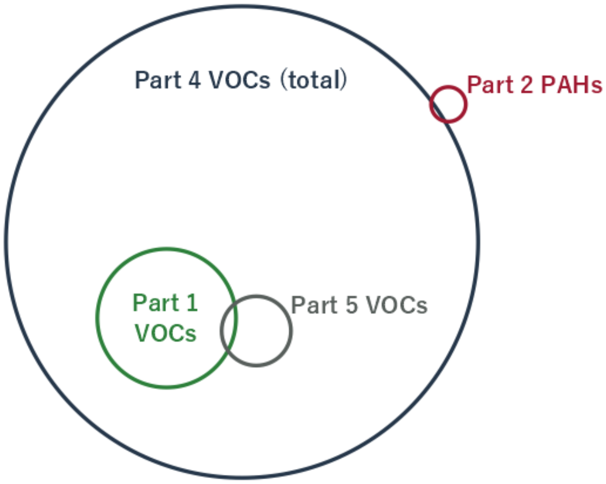
CEPA Schedule 1 number	Name of substance or group of substances	CAS RN
(h)	chlorodifluoromethane (HCFC-22)	75-45-6
(i)	trifluoromethane (HFC-23)	75-46-7
(j)	1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114)	76-14-2
(k)	chloropentafluoroethane (CFC-115)	76-15-3
(l)	1,1,1-trifluoro-2,2-dichloroethane (HCFC-123)	306-83-2
(m)	1,1,1,2-tetrafluoroethane (HFC-134a)	811-97-2
(n)	1,1-dichloro-1-fluoroethane (HCFC-141b)	1717-00-6
(o)	1-chloro-1,1-difluoroethane (HCFC-142b)	75-68-3
(p)	2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124)	2837-89-0
(q)	pentafluoroethane (HFC-125)	354-33-6
(r)	1,1,2,2-tetrafluoroethane (HFC-134)	359-35-3
(s)	1,1,1-trifluoroethane (HFC-143a)	420-46-2
(t)	1,1-difluoroethane (HFC-152a)	75-37-6
(u)	parachlorobenzotrifluoride (PCBTF)	98-56-6
(v)	cyclic, branched, or linear completely methylated siloxanes	various
(w)	acetone	67-64-1
(x)	perchloroethylene (tetrachloroethylene)	127-18-4
(y)	3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca)	422-56-0
(z)	1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb)	507-55-1
(z.1)	1,1,1,2,3,4,4,5,5,5-decafluoropentane (HFC-43-10mee)	138495-42-8
(z.2)	difluoromethane (HFC-32)	75-10-5
(z.3)	ethylfluoride (HFC-161)	353-36-6
(z.4)	1,1,1,3,3,3-hexafluoropropane (HFC-236fa)	690-39-1
(z.5)	1,1,2,2,3-pentafluoropropane (HFC-245ca)	679-86-7
(z.6)	1,1,2,3,3-pentafluoropropane (HFC-245ea)	24270-66-4
(z.7)	1,1,1,2,3-pentafluoropropane (HFC-245eb)	431-31-2
(z.8)	1,1,1,3,3-pentafluoropropane (HFC-245fa)	460-73-1
(z.9)	1,1,1,2,3,3-hexafluoropropane (HFC-236ea)	431-63-0
(z.10)	1,1,1,3,3-pentafluorobutane (HFC-365mfc)	406-58-6
(z.11)	chlorofluoromethane (HCFC-31)	593-70-4
(z.12)	1-chloro-1-fluoroethane (HCFC-151a)	1615-75-4
(z.13)	1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a)	354-23-4
(z.14)	1,1,1,2,2,3,3,4,4-nonafluoro-4-methoxy-butane ($C_4F_9OCH_3$)	163702-07-6
(z.15)	2-(difluoromethoxymethyl)-1,1,1,2,3,3,3-heptafluoropropane ($(CF_3)_2CFCF_2OCH_3$)	163702-08-7
(z.16)	1-ethoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane ($C_4F_9OC_2H_5$)	163702-05-4
(z.17)	2-(ethoxydifluoromethyl)-1,1,1,2,3,3,3-heptafluoropropane ($(CF_3)_2CFCF_2OC_2H_5$)	163702-06-5
(z.18)	methyl acetate and perfluorocarbon compounds that fall into the following classes, namely, (i) methyl acetate and perfluorocarbon compounds that fall into the following classes: cyclic, branched or linear completely fluorinated alkanes (ii) methyl acetate and perfluorocarbon compounds that fall into the following classes: cyclic, branched, or linear completely fluorinated ethers with no unsaturations (iii) methyl acetate and perfluorocarbon compounds that fall into the following classes: cyclic, branched or linear completely fluorinated tertiary amines with no unsaturations	79-20-9 (and various)

CEPA Schedule 1 number	Name of substance or group of substances	CAS RN
	(iv) methyl acetate and perfluorocarbon compounds that fall into the following classes: sulfur containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine	
(z.19)	1,1,1,2,2,3,3-heptafluoro-3-methoxy-propane (HFE-7000)	375-03-1
(z.20)	3-ethoxy-1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-(trifluoromethyl) hexane (HFE-7500)	297730-93-9
(z.21)	1,1,1,2,3,3,3-heptafluoropropane (HFC-227ea)	431-89-0
(z.22)	methyl formate ($HCOOCH_3$)	107-31-3
(z.23)	*t*-butyl acetate	540-88-5
(z.24)	1,1,1,2,2,3,4,5,5,5-decafluoro-3-methoxy-4-trifluoromethyl-pentane (HFE-7300)	132182-92-4
(z.25)	propylene carbonate	108-32-7
(z.26)	dimethyl carbonate	616-38-6
(z.27)	*trans*-1,3,3,3-tetrafluoropropene (HFO-1234ze)	29118-24-9
(z.28)	HCF_2OCF_2H (HFE-134)	1691-17-4
(z.29)	$HCF_2OCF_2OCF_2H$ (HFE-236cal2)	78522-47-1
(z.30)	$HCF_2OCF_2CF_2OCF_2H$ (HFE-338pcc13)	188690-78-0
(z.31)	$HCF_2OCF_2OCF_2CF_2OCF_2H$	188690-77-9
(z.32)	2,3,3,3-tetrafluoropropene (HFO-1234yf)	754-12-1
(z.33)	*trans* 1-chloro-3,3,3-trifluoroprop-1-ene [HCFO-1233zd(E)]	102687-65-0
(z.34)	2-amino-2-methyl-1-propanol	124-68-5

VOCs are listed in Parts 1, 2, 4 and 5 of the NPRI, as illustrated in Figure 11. When reporting VOCs, it is important to note the following:

- Total organic compounds (TOCs) and VOCs do not have the same definition. All VOCs can be considered TOCs; however, not all TOCs are considered VOCs.
- Base the VOC emissions on the total mass of all VOC substances emitted annually.
- Part 1 of the substance list includes 93 substances or groups of substances that meet the VOC definition. Individual reports must be submitted for each of these VOCs that meet the Part 1 criteria (based on quantities manufactured, processed or otherwise used). Regardless of whether the Part 1 criteria are met, any releases to air of these substances must also be included in threshold calculations for Part 4 VOCs, along with all other VOCs emitted.
- Five of the PAHs listed in Part 2 also meet the CEPA definition of a VOC (acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene). These PAHs must be included in the calculation for total Part 4 VOCs, and are also subject to Part 2.
- When calculating Part 4 total VOCs, include any substance that meets the CEPA definition of VOC, even if it is not listed separately in Part 1 or Part 5.
- In addition to total VOCs, facilities may be required to report additional information on speciated VOCs listed in Part 5 (see section 9 for more information). Eighteen VOCs are listed on both Part 1 and Part 5, and are subject to reporting requirements for both Parts.

Figure 11. VOCs listed in Parts 1, 2, 4, and 5 of the NPRI substance list

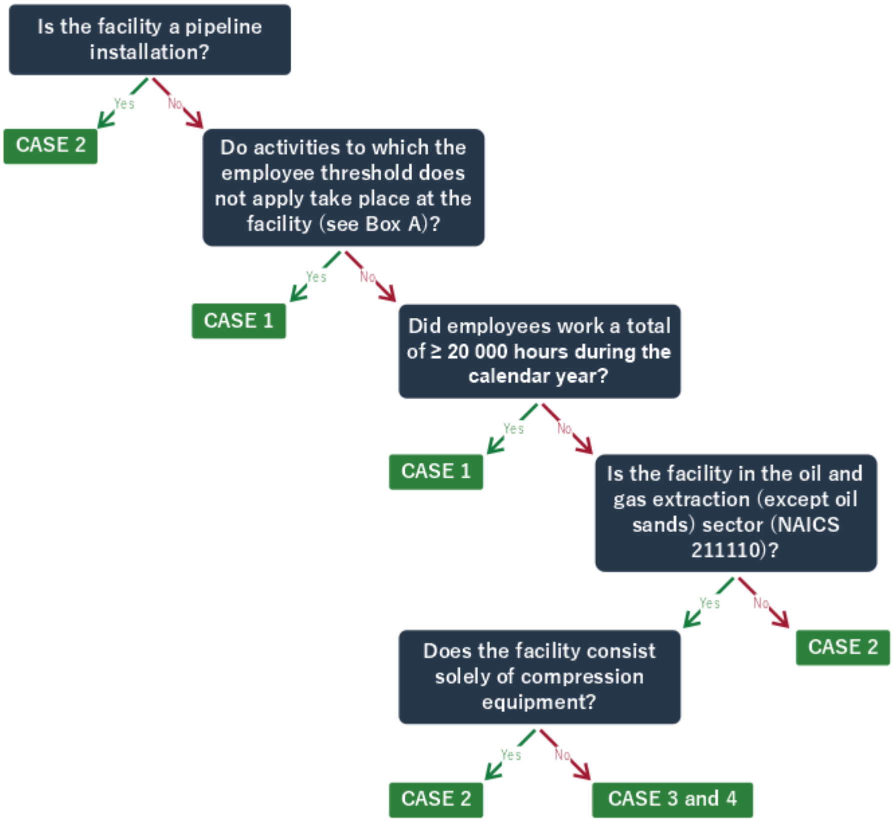


8.5 Reporting criteria for Part 4 substances for Case 1 and 2 facilities

The criteria for reporting Part 4 substances and the information to be reported vary depending on the number of employees and the activities that take place at the facility. Facilities can belong to one of the four categories, or “cases” shown in Figure 12. Case 1 and 2 facilities can be classified under any NAICS code and the criteria for reporting for these facilities are described below.

Case 3 and Case 4 facilities are facilities in the oil and gas extraction (except oil sands) sector (NAICS 211110) and do not meet the employee threshold. Requirements for Case 3 and 4 facilities are not described further in this Guide. For more information on the reporting requirements for oil and gas facilities, see the Oil and gas industry: guide to reporting.

Figure 12. Determining which case applies for reporting Part 4 and 5 substances



BOX A

The employee threshold does not apply to a facility where any of the following activities take place:

- non-hazardous solid waste incineration of ≥ 26 tonnes of waste, including with conical burners and beehive burners
- biomedical or hospital waste incineration of ≥ 26 tonnes of waste
- hazardous waste incineration
- sewage sludge incineration
- wood preservation
- terminal operations
- discharge of treated or untreated wastewater from a wastewater collection system with an average discharge of ≥ 10 000 m³/day into surface waters
- operations at pits or quarries where production is ≥ 500 000 tonnes

In contrast to the majority of NPRI substances, the thresholds for CAC emissions are based on the quantity released to air. In general, any person who owns or operates **a contiguous facility, a portable facility, a pipeline installation or an offshore installation** must submit a report to the NPRI for a Part 4 substance if the total quantity of the Part 4 substance released to air is greater than or equal to the release threshold specified in Table 14 and the following criteria are met:

- employees work a total of ≥ 20 000 hours (Case 1 facilities); or
- activities to which the employee threshold does not apply (see Section 3.4.3) take place at the facility (Case 1 facilities);

- employees work a total of < 20 000 hours and stationary combustion equipment is operated at the facility (Case 2 facilities);
- employees work a total of < 20 000 hours, the facility is in the oil and gas extraction (except oil sands) sector (NAICS 211110) and consists solely of compression equipment (Case 2 facilities); or
- the facility is a pipeline installation where stationary combustion equipment is operated (see section 3.4.2 for the definition of a pipeline installation) (Case 2 facilities).

Table 14. Release thresholds for criteria air contaminants

Criteria Air Contaminant	Release Threshold (tonnes)
Nitrogen oxides (expressed as nitrogen dioxide)	20
Sulphur dioxide	
Carbon monoxide	
Total particulate matter	
Volatile organic compounds (total)	10
Particulate matter ≤ 10 micrometres (PM_{10})	0.5
Particulate matter ≤ 2.5 micrometres ($PM_{2.5}$)	0.3

For the purposes of determining if Case 2 applies (and for determining which sources need to be included for threshold calculations and which sources need to be reported; see section 8.6), stationary combustion equipment is defined as follows:

Stationary combustion equipment

Stationary combustion equipment includes devices that combust solid, liquid, or gaseous fuel, generally for the purposes of producing electricity, generating steam, or providing useful heat or energy for industrial, commercial, or institutional use, or reducing the volume of waste by removing combustible matter. This includes any combustion equipment that needs to be stationary to function or operate properly, or is not capable of self-propulsion. Both internal and external combustion equipment are included.

- External combustion equipment: any equipment with a combustion process that occurs at atmospheric pressure and with excess air, including heaters, furnaces, incinerators, boilers, flares, combustion chambers, external combustion engines such as steam engines and Stirling engines, steam/electric generating plants, and other commercial units
- Internal combustion equipment: any equipment with a combustion process that occurs in a confined space and above atmospheric pressure, including gas turbines, natural-gas-fired reciprocating engines, gasoline and diesel industrial engines, and large, stationary diesel and dual-fuel engines

Figure 13 illustrates the steps for determining if a report for Part 4 substances is required for Case 1 and 2 facilities, and, if so, what information must be reported.

Figure 13. Reporting for Part 4 substances – Case 1 and 2 facilities

BOX A
CAC release thresholds

CAC	Release threshold
NOx	20 tonnes
SO_2	20 tonnes
CO	20 tonnes
VOCs (total)	10 tonnes
TPM	20 tonnes
PM_{10}	0.5 tonnes
$PM_{2.5}$	0.3 tonnes

8.6 Calculating releases of Part 4 substances

Case 1 facilities must include releases of CACs from all sources when determining if the air release threshold is met. Case 2 facilities are required to include only releases of CACs from stationary combustion equipment when determining if the air release threshold is met.

Table 15 lists some of the most common sources of CAC emissions, with a brief description of each.

Table 15. Common sources of criteria air contaminant emissions

Source	Description
Abrasive blasting	Abrasive blasting is the process of cleaning or texturing materials with an abrasive material, such as sand, coal and smelter slag, as well as mineral, metallic or synthetic abrasives. The blasting process itself is a source of PM emissions, especially PM_{10} and $PM_{2.5}$.
Equipment leaks	Equipment connections, joints and interfaces can be the source of gaseous and liquid releases. If the equipment is handling a gaseous stream containing a CAC, the gaseous leak would result in a fugitive CAC release. Depending on the properties of a liquid (such as vapour pressure, temperature and pressure), a liquid release may also result in a fugitive CAC release.
External combustion equipment	This comprises any equipment with a combustion process that occurs at atmospheric pressure and with excess air, including heaters, furnaces, incinerators, boilers, flares, combustion chambers, external combustion engines such as steam engines and Stirling engines, steam/electric generating plants, and other commercial units.
Fermenting	The process of fermentation involves the use of yeast, bacteria, enzymes, etc., to break down complex organic compounds. Many industries use fermentation, including the production of bread, spirits, pharmaceuticals, fuel, beer and wine, as well as environmental bioremediation processes.
Internal combustion equipment	This comprises any equipment with a combustion process that occurs in a confined space and above atmospheric pressure, including gas turbines, natural-gas-fired reciprocating engines, gasoline and diesel industrial engines, and large, stationary diesel and dual-fuel engines.
Loading and unloading	Fugitive CAC emissions can result from the loading and unloading of vehicles or containers. If the material being transferred is a liquid, the resulting emissions would likely be in the form of VOCs. If the material is a solid, the resulting emissions would likely be in the form of PM.
Painting	VOCs are released from paint during its application and drying. This category includes, but is not limited to, the painting of vehicles, furniture, storage tanks and any other painted product. $PM_{2.5}$ may also be emitted if paint is applied by pulverization.
Printing	VOCs are released from fixers, developers and solvents used during printing processes.
Road dust	TPM, PM_{10} and $PM_{2.5}$ releases from road dust caused by vehicular traffic on unpaved roads within facility boundaries are required to be included in release calculations, when travel on these roads is ≥ 10 000 vehicle kilometres travelled per year.
Solvent use	Solvent use includes, but is not limited to, solvent degreasing, waste solvent reclamation, product formulation and commercial solvent use.
Stationary combustion equipment	This comprises any combustion equipment that needs to be stationary to function or operate properly, or is not capable of self-propulsion, including both internal and external combustion equipment.
Storage piles	Storage piles generate PM emissions. Pile moisture content, wind speed and proportion of aggregate fines all influence total emissions from a storage pile.
Storage tanks	These comprise any storage tanks containing fuels, solvents, hydrocarbons, paints and other solutions that contain VOCs. This includes fixed roof, external floating roof, domed external floating roof, internal floating roof, variable vapour space and pressure storage tanks.

Possible exclusion from reporting CACs for Case 1 and 2 facilities

A facility is not required to submit a report for a CAC, if all the following criteria are met:

- the CAC is released to air only from stationary external combustion equipment; and
- the cumulative nameplate capacity of all stationary external combustion equipment is less than 10 million BTUs/hour (10.55 million kJ/hour); and
- the only type of fuel combusted in that equipment is commercial grade natural gas, liquefied petroleum gas, Number 1 or 2 fuel oil, or any combination thereof.

This exclusion does not apply if any other fuels are burned in the stationary external combustion equipment.

For the purposes of determining whether or not this exclusion applies, stationary external combustion equipment and nameplate capacity are defined as follows:

Stationary external combustion equipment: Any stationary equipment with a combustion process that occurs at atmospheric pressure and with excess air. This may include thermal electric generating plants, industrial boilers, and commercial and domestic combustion units.

Nameplate capacity: The total designed energy input capacity of the stationary, external combustion equipment. Cumulative nameplate capacity refers to the total nameplate capacities of all stationary external combustion equipment at the facility.

8.7 Reporting releases of Part 4 substances

If the reporting criteria are met for a Part 4 substance, the releases to air of that substance must be reported in tonnes. Facilities that report for one or more CACs must also report their operating schedule (days and hours) and any periods of one week or longer where the facility was shut down.

Case 1 facilities must report all releases from all sources. Case 2 facilities should only report releases from stationary combustion equipment.

Case 1 and 2 facilities may also be required to report CAC releases separately from individual stacks if certain thresholds are met (see Appendix D).

9.0 Reporting for Part 5 substances – Speciated volatile organic compounds

Part 5 lists 62 VOCs, collectively referred to as “speciated VOCs” (see Appendix A for the complete list).

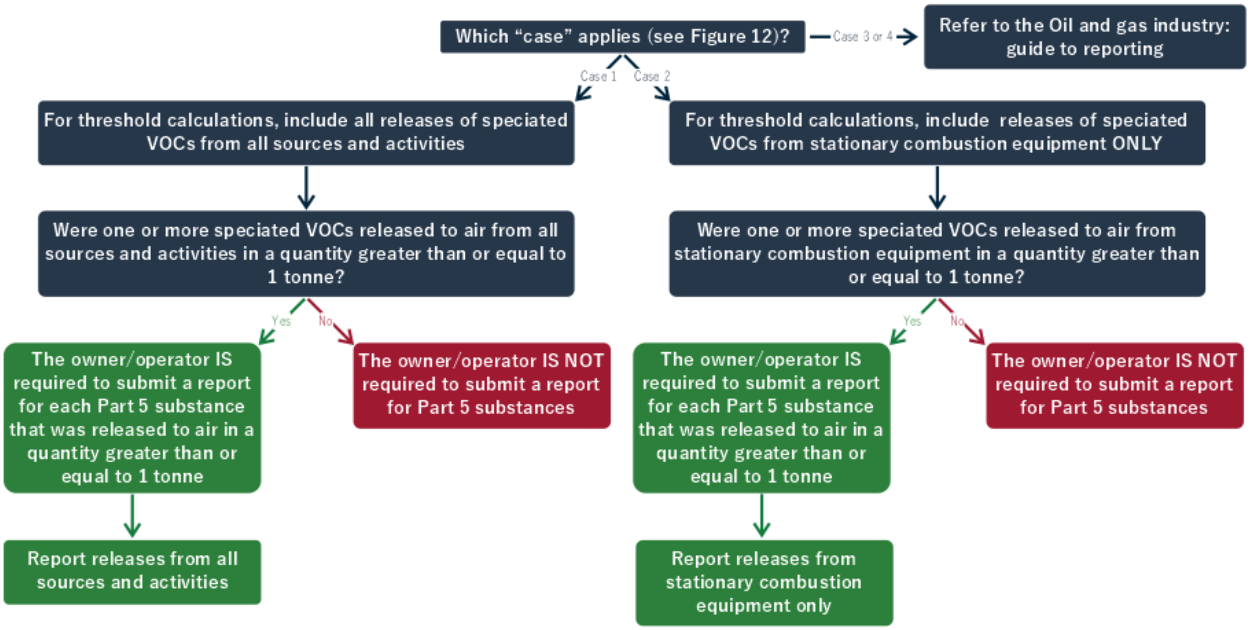
9.1 Reporting criteria for Part 5 substances

Like Part 4 substances, speciated VOCs must be reported based on quantities released to air. In general, any person who owns or operates a **contiguous facility, a portable facility, a pipeline installation or an offshore installation** must submit a report to the NPRI for a Part 5 substance if the total quantity of the Part 5 substance released to air is ≥ 1 tonne.

Figure 12 above describes the four categories of facilities, or “cases,” that determine which sources must be included in threshold calculations. Figure 14 illustrates the steps for determining if a report for Part 5 substances is required for Case 1 and 2 facilities, and, if so, what information must be reported.

Case 3 and Case 4 facilities are facilities in the oil and gas extraction (except oil sands) sector (NAICS 211110) that do not meet the employee threshold. For more information on the reporting requirements for oil and gas facilities, see the Oil and gas industry: guide to reporting.

Figure 14. Reporting for Part 5 substances – Case 1 and 2 facilities



9.2 Part 5 substance qualifiers

Some Part 5 substances and groups of substances are qualified in terms of what needs to be included when calculating releases. The qualifiers, described in Table 16, determine whether a report will be required for a given substance. Supplemental information on speciated VOCs and their isomers is presented in Appendix E.

Note that there is some overlap between the individual substances, isomer groups and other groups and mixtures listed in Part 5. For example, all isomers of decane are C_{10} hydrocarbons, therefore they also meet the definition of analytically unresolved hydrocarbons (C_{10} to C_{16}+) (URHCs). URHCs are an agglomeration of volatile organic compounds in the C_{10} to C_{16}+ range that could not be separated into individual components by the selected gas chromatography column.

Where there is overlap between different sections of the Part 5 list, information on individual substances should be reported if it is available. If information on individual substances is not available, but information on the total for an isomer group is available, the total for the isomer group should be reported. If information on the individual substance and the isomer group is not available, then information on URHCs should be reported if this range of species is appropriate.

Do not report the same quantity of a substance more than once *within Part 5*. For example, if the quantity of isomers of decane released to air is included as part of the total amount reported for isomers of decane, do not include that same quantity in the reported amount of URHCs.

Also note that there are 143 VOCs listed in Parts 1 and 2 of the NPRI substance list, many of which are C_{10} to C_{16}+ hydrocarbons. If thresholds are met for these substances, they should be reported in *both* Part 1 or 2 *and* Part 5 (either as an individual substance or isomer group that is on the Part 5 list, or as part of URHCs). For example, if the Part 1 threshold for naphthalene ($C_{10}H_8$) is met, releases of naphthalene must be reported under Part 1. Since naphthalene is not listed individually in Part 5, the quantity of naphthalene released to air should be included in the total URHCs reported under Part 5, if the thresholds for Parts 4 and 5 are met. In this case, the same quantity of naphthalene that is released to air will be reported twice.

Table 16. Qualifiers for Part 5 substances

Substance Qualifier	Substance(s) to Which the Qualifier Applies	Description
all isomers	▪ butane ▪ butene (25167-67-3) ▪ cycloheptane ▪ cyclohexene ▪ cyclooctane ▪ decane ▪ heptane ▪ hexene (25264-93-1) ▪ methylindan (27133- 93-3) ▪ nonane ▪ octane ▪ pentane ▪ pentene	Total of all isomers reported as an aggregate of the individual isomers

Substance Qualifier	Substance(s) to Which the Qualifier Applies	Description
	▪ propylene glycol methyl ether acetate (108-65-1)	
	▪ butyl acetate	Total of *n*-butyl acetate (CAS RN 123-86-4), isobutyl acetate (CAS RN 110-19-0), and *sec*-butyl acetate (CAS RN 105-46- 4). Excludes *tert*-butyl acetate (CAS RN 540-88-5)
	▪ ethyltoluene	Total of all isomers of ethyltoluene: 2-ethyltoluene (CAS RN 611-14-3), 3-ethyltoluene (CAS RN 620-14-4), and 4-ethyltoluene (CAS RN 622-96-8)
	▪ hexane	Total of all isomers reported as an aggregate of the individual isomers, excluding *n*-hexane (110-54-3)
	▪ propyl acetate	Total of all isomers of propyl acetate: isopropyl acetate (CAS RN 108-21-4) and propyl acetate (CAS RN 109-60-4)
	▪ trimethylbenzene (25551-13-7)	Total of 1,2,3-trimethylbenzene (526-73-8) and 1,3,5-trimethylbenzene (108-67-8). Excludes 1,2,4-trimethylbenzene (95-63-6)
	▪ xylene (1330-20-7)	Total of all isomers of xylene: *m*-xylene (CAS RN 108-38-3), *o*-xylene (CAS RN 95-47-6) and *p*-xylene (CAS RN 106-42-3).
and their isomers	▪ other glycol ethers and acetates	Total of CAS RNs 112-07-2, 112-15-2, 112-25-4, 112-34-5, 5131-66-8, 107-98-2, 109-59-1, 111-90-0, 124-17-4, 1569-01-3, 1569-02-4, 2807-30-9, 29911-27-1, 29911-28-2, 34590-94-8, 54839-24-6, 623-84-7 and 88917-22-0, and their isomers

9.3 Calculating releases of Part 5 substances

Case 1 facilities must include releases of speciated VOCs from all sources when determining if the air release threshold is met. Case 2 facilities are required to include only releases of speciated VOCs from stationary combustion equipment when determining if the air release threshold is met.

Exclusion from reporting speciated VOCs for Case 1 and 2 facilities

A facility is not required to submit a report for a speciated VOC, if all the following criteria are met:

- the VOC is released to air only from stationary external combustion equipment; and
- the cumulative nameplate capacity of all stationary external combustion equipment is less than 10 million BTUs/hour (10.55 million kJ/hour); and
- the only type of fuel combusted in that equipment is commercial grade natural gas, liquefied petroleum gas, Number 1 or 2 fuel oil, or any combination thereof.

This exclusion does not apply if any other fuels are burned in the stationary external combustion equipment.

For the purposes of determining whether or not this exclusion applies, stationary external combustion equipment and nameplate capacity are defined as follows:

Stationary external combustion equipment: Any stationary equipment with a combustion process that occurs at atmospheric pressure and with excess air. This may include thermal electric generating plants, industrial boilers, and commercial and domestic combustion units.

Nameplate capacity: The total designed energy input capacity of the stationary, external combustion equipment. Cumulative nameplate capacity refers to the total nameplate capacities of all stationary external combustion equipment at the facility.

9.4 Reporting releases of Part 5 substances

If the reporting criteria are met for a Part 5 substance, the releases to air of that substance must be reported in tonnes.

Case 1 facilities must report all releases from all sources. Case 2 facilities should only report releases from stationary combustion equipment.

Case 1 and 2 facilities may also be required to report speciated VOC releases separately from individual stacks if certain thresholds are met (see Appendix D).

Unlike Parts 1 through 4 substances, where releases to air must be reported separately in several categories (i.e., stack or point releases, storage tank and related handling releases, fugitive releases, etc.; see section 10.3), releases of speciated VOCs must be reported as

- The total for each individual stack that meets thresholds (see Appendix D), and
- The total of all other releases that are not from individual stacks that meet thresholds

10 Glossary

10.1 Types of facilities

10.1.1 Contiguous facility

All buildings, equipment, structures and stationary items that are located on a single site, or on contiguous sites or adjacent sites, that are owned or operated by the same person and that function as a single integrated site, including wastewater collection systems that release treated or untreated wastewater into surface waters.

10.1.2 Offshore installation

An offshore drilling unit, production platform or ship, or subsea installation that is related to the exploitation of oil or natural gas and that is attached or anchored to the continental shelf of Canada or within Canada's exclusive economic zone.

10.1.3 Pipeline installation

A collection of equipment, situated at a single site, used in the operation of a natural gas transmission or distribution pipeline. This definition includes pipeline compressor and storage stations along pipelines used to transport raw or processed natural gas. Pipeline installations are subject only to the reporting criteria for CACs (Part 4 substances) and speciated VOCs (Part 5 substances).

10.1.4 Portable facility

Portable polychlorinated biphenyl (PCB) destruction equipment, portable asphalt plants and portable concrete batching plants. The definition applies where the facility can be entirely relocated for operation. The owner or operator of a portable facility will submit a report for the location where the facility operated for the longest period of time in the calendar year, using the total quantity of releases, disposals, or transfers from all operating locations. For all other locations where the portable facility operated during the year, the dates, addresses and geographic coordinates are to be submitted in the facility comments section in the online reporting system.

10.1.5 Compressor station

A facility where gas pressure is increased to overcome friction losses through a pipeline or pipe system or for underground natural gas storage.

10.2 Manufacture, process and otherwise use

10.2.1 Manufacture

Manufacture means to produce, prepare or compound an NPRI substance. It also includes the incidental production of an NPRI substance as a by-product. The production of chlorine dioxide by a chemical plant is an example of manufacturing. The production of hydrochloric acid during the manufacture of chlorofluorocarbons is an example of the incidental manufacture of hydrochloric acid.

10.2.2 Process

Process means the preparation of an NPRI substance, after its manufacture, for distribution in commerce. Processing includes the preparation of a substance with or without changes in physical state or chemical form. The term also applies to the processing of a mixture or formulation that contains an NPRI substance as one component, the processing of articles (see glossary for definition), and the processing of a substance as a by-product. The use of chlorine to manufacture hypochloric acid (not an NPRI substance) is an example of processing of chlorine. The use of toluene and xylene to blend paint solvent mixtures is an example of processing without changes in chemical form.

10.2.3 Otherwise use

Otherwise use (or other use) means any use, disposal or release of an NPRI substance that does not fall under the definitions of manufacture or process. This includes the use of the substance as a chemical processing aid, manufacturing aid or some other ancillary use, and the other use of by-products. For example, the use of trichloroethylene in the maintenance of manufacturing and process equipment is an example of an "other use" of that substance. Certain specified uses of substances are excluded and are listed in sections 3.5.2 and 3.5.3.

10.3 Release, disposal, and recycling categories

10.3.1 On-site releases

A discharge of a substance to the environment within the physical boundaries of the facility. This includes releases to air, surface waters and land. Routine releases (e.g., fugitive releases) and accidental or non-routine releases (e.g., spills) are included. Releases do not include on-site or off-site disposals or off-site transfers for recycling.

Releases to air

Stack or point releases: Controlled releases to air that occur through confined air streams, including releases from stacks and flares, and controlled venting through ducts or pipes (local exhaust ventilation systems that capture process-generated emissions at the source and then vent to the atmosphere). Releases to air from pollution control equipment generally fall into this category. Examples of stack or point releases: releases from boilers, engines, flares, incinerators, kilns and furnaces.

Storage tank and related handling releases: Releases from the storage of liquids in tanks, releases associated with liquid storage tank operations, releases from the transfer, loading and unloading of liquids to and from storage tanks, losses associated with the storage of liquids in tanks, and losses associated with the cleaning, degassing and maintenance of storage tanks Examples of storage and related handling releases: working and breathing losses, tank roof landing losses, flashing losses and degassing and cleaning losses. All other releases that result from storage or handling should be reported as either stack or point releases or fugitive releases.

Fugitive releases: Releases to air that do not occur through a confined air stream, i.e., releases that could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening designed to direct or control its flow. Also includes individual small release points that cannot be practically inventoried separately because they are too small, too numerous or too geographically dispersed. Examples of fugitive releases:

- fugitive equipment leaks from valves, pump seals, flanges, compressors, sampling connections, open-ended lines, etc.
- evaporative losses from surface impoundments

- evaporative losses from spills or leaks to land or water. Spills (accidental releases) directly to air must be reported under the spills to air category
- releases from building general exhaust ventilation systems that use dilution air to disperse and exhaust process emissions
- uncontrolled releases from enclosed storage of solids inside silos and bunkers, and related transfer and loading/unloading operations (e.g., grain elevators)
- any other fugitive or non-point stationary air emissions from land treatment, tailings, waste rock, mine faces, pit faces, open conveyor transfer points, open storage piles loading and unloading, wind erosion from open storage piles and open areas, materials handling (that is not related to the storage of liquids in tanks), space heating, cooling towers, solvent use, wastewater treatment, etc.

Spills or other accidental releases: Accidental uncontrolled releases to air. Spills differ from fugitive releases since they normally occur over a short period of time (hours or days), whereas fugitive releases are chronic events that occur over a comparatively longer period of time (months or years). Examples of spills or other accidental releases: releases occurring during a process upset, releases from a pipeline rupture that occur over a short period of time, releases resulting from an accidental explosion or fire.

Unpaved road dust: total particulate matter, PM_{10} and $PM_{2.5}$ releases from road dust must be reported if vehicles travelled more than 10 000 kilometres on unpaved roads at the facility.

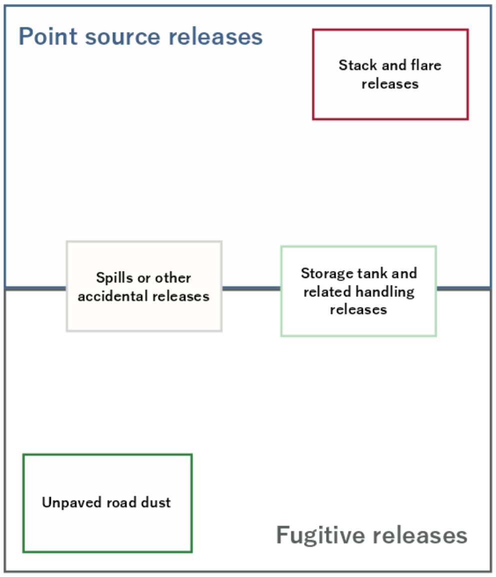
Other non-point releases: Any other non-point releases to air that are not captured in the categories above. Note that it is extremely unlikely that a release to air could not fall under one of the categories listed above. Releases should only be reported under the “other non-point releases” category after careful consideration of the other categories. Detailed comments should be provided to explain why releases were reported as “other non-point releases.”

Figure 15 below shows the air release categories and their relationship to one another. Note that the figure is not drawn to scale. It is intended to show that

- all releases to air are either point or fugitive;
- some subsets of point and fugitive releases to air must be reported separately to the NPRI (e.g., releases from storage of liquids in tanks could be point or fugitive, but get reported under the “storage tank and related handling releases” category; road dust is always fugitive but gets reported under the road dust category);
- the category for “other non-point releases to air” should not be used, since releases to air are always either point, fugitive or part of one of the specified subsets of releases.

Note that there may be specific circumstances where sources could either be reported as stack or point sources or fugitive sources. For example, large stand-alone cooling towers would be reported as stack or point sources (and may be subject to the individual stack reporting requirements if they are 25 m or more in height above grade; see Appendix D), whereas a collection of smaller rooftop cooling towers may be reported as fugitive sources. Emissions from a single large backup generator could be reported as stack or point releases, whereas a number of smaller backup generators dispersed throughout the facility property would be reported as fugitive releases.

Figure 15. Relationship between NPRI air release categories



Releases to surface waters

Releases to oceans, lakes, wetlands, rivers, streams, etc. are included.

- Direct discharges: releases that are directly discharged to surface waters (such as a river, lake or ocean) from within the site boundaries. These discharges typically occur through a pipe, ditch, or other similar conveyance system but can also include uncontrolled run-off. This category includes discharges from on-site wastewater treatment systems as well as discharges that leave the facility and do not feed into an off-site wastewater facility before reaching surface waters. Discharges to municipally owned sewer systems (regardless of the level of treatment) or other off-site wastewater treatment facilities are to be reported as off-site transfers for treatment prior to final disposal.
- Spills: spills include any accidental releases to surface waters, normally occurring over a short period of time (hours or days).
- Leaks: leaks differ from spills in that they are chronic events, occurring over a comparatively long time (weeks, months, etc.).

Releases to land

Releases to land include surface and underground releases which occur at a facility.

- Spills: spills include any accidental releases to land, normally occurring over a short period of time (hours or days).
- Leaks: leaks differ from spills in that they are chronic events, occurring over a comparatively long time (days, months, etc.).

- Other releases to land that are not disposals: net quantities of other releases to land that are not spills or leaks and are not for the purposes of disposal. This category includes NPRI substances that are injected underground for purposes other than disposal (for example, solvents used to enhance in situ bitumen extraction). NPRI substances sent to landfill, used for land application, disposed of by underground injection, or transferred for treatment or storage are categorized as disposals (see the following sections for more information on disposals). Disposal quantities should be reported under the disposal category only, and not under releases to land, to avoid double-reporting.

10.3.2 Disposals

The final disposal to landfill, land application or underground injection, either on the facility site or at a location off the facility site; transfer to a location off the facility site for storage or treatment prior to final disposal; or movement into an area where tailings or waste rock are discarded or stored, and further managed to reduce or prevent releases to air, water or land, either on the facility site or at a location off the facility site. The disposal of a substance is different from a direct release to air, water or land.

On-site disposals

- Landfill: total quantities of substances sent for final disposal to a designated landfill area located within the site boundaries.
- Land application: total quantities of substances sent for final disposal by application or incorporation into soil within the site boundaries.
- Underground injection: total quantities of substances disposed of by injection underground from within the site boundaries.
- Tailings and waste rock: net quantities of substances that are moved into an on-site area where tailings or waste rock are discarded or stored and further managed to reduce or prevent releases.

Off-site disposals

Off-site disposals include total quantities that are transferred off the facility site for final disposal.

- Landfill: total quantities of substances sent for final disposal to a designated landfill area located outside the site boundaries.
- Land application: total quantities of substances sent for final disposal by application or incorporation into soil outside the site boundaries.
- Underground injection: total quantities of substances sent for final disposal by injection underground from outside the site boundaries.
- Storage off-site prior to final disposal
- Tailings and waste rock: quantities of substances that are transferred to an off-site area where tailings or waste rock are discarded or stored and further managed to reduce or prevent releases.

Tailings and waste rock

Inert waste rock: Waste rock that is inert or clean according to a federal or provincial operating permit; or has a sulphur concentration of ≤ 0.2%; or has a sulphur concentration of > 0.2% and the ratio of neutralizing potential to acid generating potential is ≥ 3:1.

Tailings: The waste material (which may or may not be mixed with water) that remains after processing of ore or mined materials, in order to extract marketable components such as metals, minerals or bitumen. This can include ground rock material, sand, clay, process chemicals or residual metals, minerals or bitumen, petroleum coke (petcoke) and sulphur.

Unconsolidated overburden: Unconsolidated materials overlying the ore or bitumen deposit, including, but not limited to, soil, glacial deposits, sand and sediment.

Waste rock: Rock that is removed in the mining process to provide access to the ore and is not further processed during the reporting year. Waste rock does not include unconsolidated overburden.

10.3.3 Transfers

An NPRI-listed substance may be transferred to a location off the facility site for treatment prior to final disposal or for recycling and energy recovery.

Off-site transfers for treatment prior to final disposal

Treatment means subjecting the substance to physical, chemical, biological or thermal processes and includes:

- Physical treatment: A treatment process in which the substance is separated from the waste product by various physical methods. (e.g., drying, evaporation, encapsulation or vitrification)
- Chemical treatment: A treatment process in which the substance is altered by a chemical reaction to destroy the hazardous component. (e.g., precipitation, stabilization or neutralization)
- Biological treatment: A treatment process in which bacteria, fungi, and or/microorganisms are used to alter or destroy the substance. (e.g., bio-oxidation)
- Incineration or thermal treatment, where energy is not recovered: A treatment process involving the decomposition of the substance by thermal means to less hazardous or nonhazardous components.
- Treatment in a municipal wastewater treatment plant

Off-site transfers for recycling and energy recovery

Recycling refers to activities that keep a material or a component of the material from becoming a waste destined for final disposal. Recyclable materials may be cleaned, regenerated or reprocessed to their original specifications and reused for their original purpose. They may also be used for an entirely different purpose without any pre-treatment or modification. Components may be recovered or reclaimed from the recyclable material or the material may be used as a fuel for energy recovery. The recyclable material may be used in the manufacture of another product.

For the purposes of the NPRI, recycling also includes substances sent back to a manufacturer, supplier or recycler for reprocessing, repackaging, resale or for credit or payment. For example, metal shavings or turnings that are sold to a recycler are considered to be transfers off-site for recycling. The categories of recycling listed in the NPRI are:

- Energy recovery
- Recovery of solvents
- Recovery of organic substances (not solvents)
- Recovery of metals and metal compounds
- Recovery of inorganic materials (not metals)

- Recovery of acids or bases
- Recovery of catalysts
- Recovery of pollution abatement residues
- Refining or reuse of used oil
- Other recovery, reuse or recycling activities

10.4 Activities to which the employee threshold does not apply

10.4.1 Incineration

A waste incinerator is a device, mechanism or structure constructed primarily to thermally treat waste for the purpose of reducing its volume, or destroying hazardous chemicals or pathogens present in the waste. This includes facilities where waste heat is recovered as a by-product from the exhaust gases of an incinerator (e.g., energy-from-waste incinerators), conical burners and beehive burners. This does not include industrial processes where fuel derived from waste is fired as an energy source, such as industrial boilers. For example, if bark, wood chips or other wood waste are used as fuel to fire a boiler, these activities are not considered energy-from-waste incinerators.

Biomedical or hospital waste incineration

Biomedical or hospital waste includes human anatomical waste, animal waste, microbiology laboratory waste, human blood and body fluid waste, and waste sharps. It does not include waste that is from animal husbandry, is household in origin, or is controlled in accordance with the Health of Animals Act. Household wastes or wastes that are generated in food production, general building maintenance and office administration activities of those facilities to which this definition applies are considered to be non-hazardous waste, not biomedical or hospital waste. For more information, consult the Guide to Hazardous Waste and Hazardous Recyclable Material Classification.

Hazardous waste incineration

Hazardous waste includes wastes that are potentially hazardous to human health or the environment because of their nature and quantity, and that require special handling techniques. They are defined by taking into account the hazard criteria established under the Transportation of Dangerous Goods Regulations as well as wastes and materials specifically listed in the Cross-border Movement of Hazardous Waste and Hazardous Recyclable Material Regulations. This includes hazardous waste incinerated in a mobile incinerator temporarily located at a facility.

Non-hazardous solid waste incineration

Non-hazardous solid waste is any solid waste, regardless of origin, that, if not incinerated, might normally be disposed of in a non-secure manner (e.g., at a sanitary landfill site). It includes clean wood waste (i.e., waste from woodworking or forest product operations, including bark, where the wood waste has not been treated with preservative chemicals or decorative coatings), and residential and other municipal wastes.

Sewage sludge incineration

Sludge is a semi-liquid mass removed from a liquid flow of wastes. Sewage sludge is sludge from a facility treating wastewater from a sewer system. The drying of sludge to reduce water content is part of the incineration stage.

10.4.2 Other activities

Pit

An excavation that is open to the air, and any associated infrastructure, that is operated for the purpose of extracting sand, clay, marl, earth, shale, gravel, unconsolidated rock or other unconsolidated materials, but not bitumen. Pits and quarries are only required to report if annual production is 500 000 tonnes or more. An open-pit mine that is operated for the purpose of extracting ore, bitumen, coal or other materials not listed above is not included in the definition of a pit or quarry, and the 500 000 tonne production threshold does not apply to these facilities. For more information, consult the Pits and Quarries Reporting Guide.

Quarry

An excavation that is open to the air, and any associated infrastructure, that is operated for the purpose of working, recovering or extracting limestone, sandstone, dolostone, marble, granite or other consolidated rock. Pits and quarries are only required to report if annual production is 500 000 tonnes or more. For more information, consult the Pits and Quarries Reporting Guide.

Terminal operations

Terminal operations are either (i) the use of storage tanks and associated equipment at a site used to store or transfer crude oil, artificial crude or intermediates of fuel products into or out of a pipeline; or (ii) the operating activities of a primary distribution installation, normally equipped with floating roof tanks, that receives gasoline by pipeline, railcar, marine vessel or directly from a refinery. Terminal operations do not include bulk plants or service stations.

Wastewater collection systems

A wastewater collection system includes both the collection components (a system of sewers and/or ditches that convey sanitary or combined sewage for a community) and treatment components (a plant or process location that accepts collection system flows for the purposes of removing substances from the wastewater). A wastewater collection system that discharges treated or untreated wastewater to surface waters is required to report if the annual average discharge rate is 10,000 cubic metres or more per day. Note that this discharge rate threshold does not apply to industrial wastewater treatment facilities. For more information, consult the Reporting guidance for the wastewater sector to the National Pollutant Release Inventory.

Wood preservation

Wood preservation is the use of a preservative for the preservation of wood by means of heat or pressure treatment, or both, and includes the manufacture, blending or reformulation of wood preservatives for that purpose. For more information, consult the Guidance for Wood Preservation Facilities Reporting to the NPRI (Environment Canada, 2002).

10.5 Activities that trigger reporting of Part 3 substances (dioxins, furans and hexachlorobenzene), if the employee threshold is met

10.5.1 Combustion

Combustion of fossil fuel in a boiler unit, with a nameplate capacity of ≥ 25 megawatts of electricity, for the purpose of producing steam for the production of electricity

This activity includes fossil fuel combustion at electric power generation utilities and large industrial facilities co-generating electric power using waste heat from industrial processes. For the purposes of reporting to the NPRI, fossil fuel is fuel that is in a solid or liquid state at standard temperature and pressure, such as coal, petroleum or any fuel derivatives that are liquid or solid. It does not include natural gas or other fuels that are gases at ambient pressure and temperature. Fuel combustion in diesel generators is not included in this activity.

Combustion of fuel in kraft liquor boilers used in the pulp and paper sector

A kraft liquor boiler burns black liquor, composed mostly of lignin, which is the residue from the digester in a kraft (sulphate) pulping process. The boiler recovers chemical products from the combusted black liquor, which are later recycled. It also produces steam, which is used in mill process operations.

Combustion of hog fuel originating from logs that were transported or stored in salt water in the pulp and paper sector

Pulp and paper boilers burning salt-laden wood are unique to British Columbia. Dioxins and furans are emitted from the burning of salt-contaminated hog fuel. Chlorine is absorbed by the bark of logs transported and stored in salt water. The bark stripped from logs is ground up with other waste wood to produce hog fuel, which is used as boiler fuel to produce heat and electrical energy.

10.5.2 Smelting

Smelting is the melting of raw or scrap materials to produce metal for further processing into metal products. The smelting process is typically accompanied by a chemical change in which impurities are removed.

Base metals smelting

“Base metals” refer to copper, lead, nickel or zinc. Base metals smelting does not include smelting of aluminum, secondary lead or any other metals.

Smelting of secondary aluminum

“Secondary aluminum” refers to aluminum-bearing scrap or materials. Secondary aluminum smelting involves pre-cleaning and smelting, both of which may produce emissions of dioxins and furans.

Smelting of secondary lead

“Secondary lead” refers to lead-bearing scrap or materials, other than lead-bearing concentrates, derived from a mining operation. Facilities engaged in smelting of lead-bearing concentrates derived from a mining operation are considered to be base metal smelters.

10.5.3 Manufacturing/production

Production of iron ore pellets using an induration furnace or manufacturing of sinter using the iron sintering process

Sintering consists in agglomerating a fine fraction of iron-rich mill secondary materials and iron ore concentrate to become a coherent mass by heating without melting, or the growth of contact area between two or more initially distinct particles at temperatures below the melting point but above one half of the melting point. In sintering operations, dioxins and furans may be formed as by-products during high-temperature decomposition or combustion of raw materials containing chlorine and organic compounds. Pelletizing consists of agglomerating ultra-fine particles of iron ore concentrate with a binder into marble-size pellets before high temperature hardening in specialized furnaces. In these induration furnaces, dioxins and furans may be formed as by-products during high-temperature decomposition or combustion of raw materials containing chlorine and organic compounds.

Manufacturing of Portland cement

Portland cement is a fine greyish powder consisting of four basic materials: lime, silica, alumina and iron compounds. Cement production involves heating the raw materials to a very high temperature in a rotating kiln to induce chemical reactions that produce a fused material called clinker. The cement clinker is further ground into a fine powder and then mixed with gypsum to form Portland cement.

Operation of electric arc furnaces in steel foundries and in steel manufacturing

In an electric arc furnace, material is heated by an electric arc. Dioxins, furans and HCB may be formed as by-products during high-temperature decomposition or combustion of raw materials containing chlorine and organic compounds.

Production of chlorinated organic solvents or chlorinated monomers

This activity is limited to the intentional manufacturing of chlorinated organic solvents or chlorinated monomers and does not include coincidental production.

Production of magnesium

Production of magnesium from magnesium chloride by electrolysis may result in the generation of dioxins, furans and HCB.

Titanium dioxide pigment production using the chloride process

This activity is limited to titanium dioxide pigment manufactured by the chloride process, not the sulphate process.

10.6 Combustion and fuel use

10.6.1 Categories of individual stack and flare releases

Stationary fuel combustion for energy purposes

Stationary fuel combustion emissions: emissions resulting from the oxidation of solid, liquid, and gaseous fuels from stationary fuel combustion sources for the purpose of producing heat or work (electricity and mechanical energy).

Stationary fuel combustion sources: stationary devices that combust either a mix of or a specific type of solid, liquid, gaseous and waste fuels for the purpose of producing heat or work (electricity and mechanical energy). This includes boilers, electricity generating units, cogeneration units, combustion turbines, engines, incinerators with heat capture and use, heaters, kilns, furnaces, burners, ovens (including coke ovens), dryers, and any other stationary combustion devices, but does not include flares.

Combustion of fuels for non-energy purposes

Releases resulting from the oxidation of a fuel not for generating heat or work, for example, when the fuel is used as a reductant. When a fuel is used as both reductant and fuel in a process, the corresponding release would be considered for non-energy purposes; examples include blast furnaces in iron and steel plants, and smelting of base metals. Incineration without energy recovery falls into this category.

Flaring

Releases resulting from the controlled combustion of a gas or liquid stream produced at the facility, the purpose of which is not to produce useful heat or work. This includes releases from: waste petroleum incineration; hazardous emission prevention systems (in pilot or active mode); well testing; natural gas gathering systems; natural gas processing plant operations; crude oil production; pipeline operations; petroleum refining; chemical fertilizer production; and steel production.

Use of fuels for non-energy products

Releases resulting from the use of a fuel as an input to a chemical reaction to produce a non-energy product, such as the production of hydrogen (in stand-alone hydrogen plants only), ammonia or ethylene.

Releases from all other sources not included in the above categories

Any other activities that generate stack releases that are not covered under one of the above categories. This applies to Case 1 facilities only, which must report for all sources of emissions if thresholds are met. Case 2 facilities are only required to report combustion emissions under one or more of the categories above.

10.6.2 Exclusion for reporting Part 4 substances – Case 1 and 2 facilities

Nameplate capacity

The total designed energy input capacity of the stationary external combustion equipment. Cumulative nameplate capacity refers to the total nameplate capacities of all stationary external combustion equipment at the facility.

Stationary external combustion equipment

Any stationary equipment with a combustion process that occurs at atmospheric pressure and with excess air. This includes any combustion equipment that needs to be stationary to function or operate properly, or is not capable of self-propulsion. This may include thermal electric generating plants, industrial boilers, and commercial and domestic combustion units.

10.6.3 Determining sources to include in threshold calculations and to report – Case 2 facilities

Stationary combustion equipment

Devices that combust solid, liquid, or gaseous fuel, generally for the purposes of producing electricity, generating steam, or providing useful heat or energy for industrial, commercial, or institutional use, or reducing the volume of waste by removing combustible matter. This includes any combustion equipment that needs to be stationary to function or operate properly, or is not capable of self-propulsion. Both internal and external combustion equipment are included.

External combustion equipment: any equipment with a combustion process that occurs at atmospheric pressure and with excess air, including heaters, furnaces, incinerators, boilers, flares, combustion chambers, external combustion engines such as steam engines and Stirling engines, steam/electric generating plants, and other commercial units

Internal combustion equipment: any equipment with a combustion process that occurs in a confined space and above atmospheric pressure, including gas turbines, natural-gas-fired reciprocating engines, gasoline and diesel industrial engines, and large, stationary diesel and dual-fuel engines

10.7 Other NPRI terms

Article

A manufactured item that does not result in a release or disposal of an NPRI substance when it undergoes processing or other use. When articles are processed or otherwise used, and there are no releases or disposals, or the releases are recycled with due care, the NPRI substances in that article do not need to be included in the threshold calculation. For example:

- A metal reclamation facility accepts spent lead-acid batteries for recycling, and the batteries are broken into pieces in a hammer mill and their parts (sulphuric acid, lead and plastic) are subsequently reclaimed. The batteries lose their article status, because they are broken apart during the recycling process. The metal reclamation facility is now required to report any NPRI substances from these batteries if the thresholds are met.
- A sealed glass bulb containing mercury used in a levelling switch meets the definition of an article. However, the quantity of mercury in the switch must be included in a facility’s calculation of the reporting threshold if the item loses its article status (e.g., the bulb is broken during waste management operations, thus allowing a release of mercury). As long as the bulbs remain intact, they are considered articles and are therefore not included in calculating the reporting threshold.

By-product

The quantity of an NPRI Part 1 substance that is incidentally manufactured, processed or otherwise used at the facility at any concentration, and released to the environment or disposed of. The quantity of a substance that is recycled or that remains in the final product is not considered to be a by-product for the purpose of the NPRI threshold calculation. In general, if a quantity of a substance is intentionally manufactured, processed or otherwise used at a facility, then that quantity of the substance is not a by-product, even if it is unintentionally manufactured, processed or otherwise used at another step in the process. The quantity of a substance that is a by-product must be included in the calculation of the reporting threshold, regardless of concentration. The by-product requirements only apply to Part 1 substances and are only used for the purpose of determining whether or not the mass threshold for a substance has been met. For example:

- Hydrogen fluoride is incidentally manufactured and released during aluminum smelting. Therefore, the hydrogen fluoride is a by-product and must be included in the calculation of the reporting threshold, regardless of concentration.
- Manganese and nickel are incidentally present in coal and are therefore by-products of the coal combustion process. During combustion, a portion of these metals is concentrated in the ash, which is disposed of, and a portion of the metals is released in stack emissions. The weight of the metal released from the stack and in the ash sent for disposal must be included in the calculation of the reporting threshold, regardless of concentration.
- Metal cuttings, sent for disposal, contain alloyed chromium and nickel at a concentration of less than 1%. The chromium and nickel are essential components of the alloy; therefore, they are not incidentally processed and are not considered to be by-products. Consequently, the chromium and nickel in the metal cuttings do not

need to be included in the calculation of the reporting threshold, because the substances are present at a concentration less than the concentration threshold of 1%.

CAS Registry Number

CAS Registry Number, or CAS RN, refers to the Chemical Abstracts Service Registry Number.

Due care

Exercising due care means that the facility generated less than one kilogram of a Part 1A substance as waste during the year. There is no quantitative measure of due care in recycling Part 1B and Part 1C substances, because even minimal releases of these substances can cause significant adverse effects and can reasonably be expected to contribute to exceeding their low thresholds. Therefore, if an article containing a Part 1B or Part 1C substance is processed or otherwise used and there are releases, the Part 1B or Part 1C substance in the article must be included in the threshold calculation.

Electricity generation unit

Physically connected equipment that operates together to produce electricity for sale or distribution to the grid by means of thermal energy and is stationary when used, and is not in or on a machine that is self-propelled.

Emission factors

Numerical values that relate the quantity of substances emitted from a source to a common activity associated with those emissions, and that can be categorized as published emission factors or site-specific emission factors.

Employee

An individual employed at the facility and includes the owner of the facility who performs work on-site at the facility, and a person, such as a contractor, who, at the facility, performs work that is related to the operations of the facility, for the period of time that the person is performing that work, but does not include volunteer fire fighters.

Full-time employee equivalent

The unit obtained by dividing by 2 000 hours the sum of

1. the total hours worked by individuals employed at the facility and the total hours of paid vacation and of sick leave taken by individuals employed at the facility;
2. the hours worked on-site at the facility by the owner of the facility, if not employed by the facility; and
3. the hours worked on-site at the facility by a person, such as a contractor, who, at the facility, performs work related to the operations of the facility.

Level of quantification

In respect of a substance, the lowest concentration that can be accurately measured using sensitive but routine sampling and analytical methods.

National Pollutant Release Inventory substance identifier

National Pollutant Release Inventory substance identifier, or NPRI substance identifier, means a unique identification number assigned by Environment and Climate Change Canada to a substance listed on the NPRI substance list where no specific CAS RN applies or where multiple CAS RNs apply.

Parent company

The highest-level company or group of companies that owns or directly controls the reporting facility.

Pollution prevention

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.

Potential electrical output

The quantity of electricity that would be generated by a unit in a calendar year if the unit were to operate at capacity at all times during that calendar year.

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Appendix A – List of NPRI substances

Name	CAS RN	NPRI Part number (threshold category)
Acetaldehyde	75-07-0	1A
Acetonitrile	75-05-8	1A
Acetophenone	98-86-2	1A
Acrolein	107-02-8	1A
Acrylamide	79-06-1	1A
Acrylic acid (and its salts)[1]	79-10-7	1A
Allyl alcohol	107-18-6	1A
Aluminum (fume or dust only)	7429-90-5	1A
Aluminum oxide (fibrous forms only)	1344-28-1	1A
Ammonia (total)[2]	NA – 16	1A
Aniline (and its salts)[1]	62-53-3	1A
Antimony (and its compounds)[3]	NA – 01	1A
Asbestos (friable form only)	1332-21-4	1A
Benzene	71-43-2	1A
Benzoyl chloride	98-88-4	1A
Benzoyl peroxide	94-36-0	1A
Benzyl chloride	100-44-7	1A
Biphenyl	92-52-4	1A
Bis(2-ethylhexyl) adipate	103-23-1	1A
Bis(2-ethylhexyl) phthalate	117-81-7	1A

Boron trifluoride	7637-07-2	1A
Bromine	7726-95-6	1A
Bromomethane	74-83-9	1A
1,3-Butadiene	106-99-0	1A
2-Butoxyethanol	111-76-2	1A
Butyl acrylate	141-32-2	1A
i-Butyl alcohol	78-83-1	1A
n-Butyl alcohol	71-36-3	1A
sec-Butyl alcohol	78-92-2	1A
tert-Butyl alcohol	75-65-0	1A
Butyl benzyl phthalate	85-68-7	1A
1,2-Butylene oxide	106-88-7	1A
Butyraldehyde	123-72-8	1A
Calcium fluoride	7789-75-5	1A
Carbon disulphide	75-15-0	1A
Carbon tetrachloride	56-23-5	1A
Carbonyl sulphide	463-58-1	1A
Catechol	120-80-9	1A
CFC-11	75-69-4	1A
CFC-114	76-14-2	1A
CFC-115	76-15-3	1A
CFC-12	75-71-8	1A
CFC-13	75-72-9	1A
Chlorine	7782-50-5	1A
Chlorine dioxide	10049-04-4	1A

Chloroacetic acid (and its salts)[1]	79-11-8	1A
Chlorobenzene	108-90-7	1A
Chloroethane	75-00-3	1A
Chloroform	67-66-3	1A
Chloromethane	74-87-3	1A
Chromium (and its compounds)[4]	NA – 04	1A
Copper (and its compounds)[3]	NA – 06	1A
Cresol (all isomers, and their salts)[1, 5]	1319-77-3	1A
Cumene	98-82-8	1A
Cumene hydroperoxide	80-15-9	1A
Cyanides (ionic)	NA – 07	1A
Cyclohexane	110-82-7	1A
Cyclohexanol	108-93-0	1A
Dibutyl phthalate	84-74-2	1A
o-Dichlorobenzene	95-50-1	1A
p-Dichlorobenzene	106-46-7	1A
3,3′-Dichlorobenzidine dihydrochloride	612-83-9	1A
1,2-Dichloroethane	107-06-2	1A
Dichloromethane	75-09-2	1A
2,4-Dichlorophenol (and its salts)[1]	120-83-2	1A
1,2-Dichloropropane	78-87-5	1A
Dicyclopentadiene	77-73-6	1A
Diethanolamine (and its salts)[1]	111-42-2	1A
Diethyl phthalate	84-66-2	1A
Diethyl sulphate	64-67-5	1A

Dimethyl phthalate	131-11-3	1A
Dimethyl sulphate	77-78-1	1A
Dimethylamine	124-40-3	1A
N,N-Dimethylaniline (and its salts)[1]	121-69-7	1A
N,N-Dimethylformamide	68-12-2	1A
4,6-Dinitro-o-cresol (and its salts)[1]	534-52-1	1A
2,4-Dinitrotoluene	121-14-2	1A
Di-n-octyl phthalate	117-84-0	1A
1,4-Dioxane	123-91-1	1A
Diphenylamine	122-39-4	1A
2,6-Di-t-butyl-4-methylphenol	128-37-0	1A
Epichlorohydrin	106-89-8	1A
2-Ethoxyethanol	110-80-5	1A
2-Ethoxyethyl acetate	111-15-9	1A
Ethyl acrylate	140-88-5	1A
Ethylbenzene	100-41-4	1A
Ethylene	74-85-1	1A
Ethylene glycol	107-21-1	1A
Ethylene thiourea	96-45-7	1A
Fluorine	7782-41-4	1A
Formaldehyde	50-00-0	1A
Formic acid	64-18-6	1A
Halon 1211	353-59-3	1A
Halon 1301	75-63-8	1A
HCFC-122 (all isomers)[6]	41834-16-6	1A

HCFC-123 (all isomers)[7]	34077-87-7	1A
HCFC-124 (all isomers)[8]	63938-10-3	1A
HCFC-141b	1717-00-6	1A
HCFC-142b	75-68-3	1A
HCFC-22	75-45-6	1A
Hexachlorophene	70-30-4	1A
n-Hexane	110-54-3	1A
Hydrochloric acid	7647-01-0	1A
Hydrogen fluoride	7664-39-3	1A
Hydrogen sulphide	7783-06-4	1A
Hydroquinone (and its salts)[1]	123-31-9	1A
Iron pentacarbonyl	13463-40-6	1A
Isobutyraldehyde	78-84-2	1A
Isophorone diisocyanate	4098-71-9	1A
Isopropyl alcohol	67-63-0	1A
Lithium carbonate	554-13-2	1A
Maleic anhydride	108-31-6	1A
Manganese (and its compounds)[3]	NA - 09	1A
Methanol	67-56-1	1A
2-Methoxyethanol	109-86-4	1A
2-(2-Methoxyethoxy)ethanol	111-77-3	1A
2-Methoxyethyl acetate	110-49-6	1A
Methyl acrylate	96-33-3	1A
Methyl ethyl ketone	78-93-3	1A
Methyl isobutyl ketone	108-10-1	1A

Methyl methacrylate	80-62-6	1A
Methyl tert-butyl ether	1634-04-4	1A
N-Methyl-2-pyrrolidone	872-50-4	1A
p,p′-Methylenebis(2-chloroaniline)	101-14-4	1A
1,1-Methylenebis(4-isocyanatocyclohexane)	5124-30-1	1A
Methylenebis(phenylisocyanate)	101-68-8	1A
p,p′-Methylenedianiline	101-77-9	1A
N-Methylolacrylamide	924-42-5	1A
Michler's ketone (and its salts)[1]	90-94-8	1A
Molybdenum trioxide	1313-27-5	1A
Naphthalene	91-20-3	1A
Naphthenic acid fraction compounds (and their salts)[1, 9]	NA - 47	1A
Nickel (and its compounds)[3]	NA - 11	1A
Nitrate ion[10]	NA - 17	1A
Nitric acid	7697-37-2	1A
Nitrilotriacetic acid (and its salts)[1]	139-13-9	1A
Nitroglycerin	55-63-0	1A
2-Nitropropane	79-46-9	1A
N-Nitrosodiphenylamine	86-30-6	1A
Octylphenol and its ethoxylates[11]	NA - 21	1A
Peracetic acid (and its salts)[1]	79-21-0	1A
Phenol (and its salts)[1]	108-95-2	1A
p-Phenylenediamine (and its salts)[1]	106-50-3	1A
Phosgene	75-44-5	1A
Phosphorus (total)[12]	NA - 22	1A

Phosphorus (yellow or white only)	7723-14-0	1A
Phthalic anhydride	85-44-9	1A
Polymeric diphenylmethane diisocyanate	9016-87-9	1A
Potassium bromate	7758-01-2	1A
Propionaldehyde	123-38-6	1A
Propylene	115-07-1	1A
Propylene oxide	75-56-9	1A
Pyridine (and its salts)[1]	110-86-1	1A
Silver (and its compounds)[3]	NA - 13	1A
Sodium fluoride	7681-49-4	1A
Sodium nitrite	7632-00-0	1A
Styrene	100-42-5	1A
Sulphuric acid	7664-93-9	1A
1,1,2,2-Tetrachloroethane	79-34-5	1A
1,1,1,2-Tetrachloroethane	630-20-6	1A
Tetrachloroethylene	127-18-4	1A
Thiourea	62-56-6	1A
Thorium dioxide	1314-20-1	1A
Titanium tetrachloride	7550-45-0	1A
Toluene	108-88-3	1A
Total reduced sulphur (expressed as hydrogen sulphide)[13]	NA - M14	1A
1,2,4-Trichlorobenzene	120-82-1	1A
1,1,2-Trichloroethane	79-00-5	1A
Trichloroethylene	79-01-6	1A
Triethylamine	121-44-8	1A

1,2,4-Trimethylbenzene	95-63-6	1A
2,2,4-Trimethylhexamethylene diisocyanate	16938-22-0	1A
Vanadium (and its compounds)[14]	NA - 40	1A
Vinyl acetate	108-05-4	1A
Vinyl chloride	75-01-4	1A
Xylene (all isomers)[15]	1330-20-7	1A
Zinc (and its compounds)[3]	NA - 14	1A
Acrylonitrile	107-13-1	1B
Arsenic (and its compounds)[3]	NA - 02	1B
Azo disperse dyes[16]	NA - 46	1B
Basic Blue 7	2390-60-5	1B
Basic Violet 3	548-62-9	1B
Basic Violet 4	2390-59-2	1B
1,4-Benzenediamine, N,N′-mixed phenyl and tolyl derivatives	68953-84-4	1B
Benzothiazoles that can form 2-mercaptobenzothiazole[17]	NA - 50	1B
Bisphenol A	80-05-7	1B
Cadmium (and its compounds)[3]	NA - 03	1B
Chlorhexidine (and its salts)[1]	55-56-1	1B
Chlorinated alkanes, long-chain, CnHxCl(2n+2-x), 18 ≤ n ≤ 20 [18]	NA - 39	1B
Chlorinated alkanes, medium-chain, CnHxCl(2n+2-x), 14 ≤ n ≤17 [19]	NA - 38	1B
Cobalt (and its compounds)[3]	NA - 05	1B
Ethylene oxide	75-21-8	1B
Free cyanide, cyanide salts, and cyanide complexes[20]	NA - 49	1B
Hexavalent chromium (and its compounds)[3]	NA - 19	1B

Hydrazine (and its salts)[1]	302-01-2	1B
Hydrogen cyanide	74-90-8	1B
Isoprene	78-79-5	1B
Lead (and its compounds)[21]	NA - 08	1B
Long-chain aliphatic amines[22]	NA - 48	1B
Malachite Green	569-64-2	1B
MAPBAP Acetate	72102-55-7	1B
Mercury (and its compounds)[3]	NA - 10	1B
Nonylphenol and its ethoxylates[23]	NA - 20	1B
2-Propanone, reaction products with diphenylamine	68412-48-6	1B
Selenium (and its compounds)[3]	NA - 12	1B
Tetraethyl lead	78-00-2	1B
Thallium (and its compounds)[3]	NA - 37	1B
Toluene-2,4-diisocyanate	584-84-9	1B
Toluene-2,6-diisocyanate	91-08-7	1B
Toluenediisocyanate (mixed isomers) [24]	26471-62-5	1B
1,1,2,2-Tetrahydroperfluorohexadecyl acrylate	34362-49-7	1C
11-Chloroperfluoro-3-oxaundecanesulfonate, potassium salt	83329-89-9	1C
11-Chloroperfluoro-3-oxaundecanesulfonic acid	763051-92-9	1C
1-Butanesulfonic acid, 1,1,2,2,3,3,4,4,4-nonafluoro-, ammonium salt	68259-10-9	1C
1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10, 10,10-heptadecafluoro-	678-39-7	1C
1-Dodecanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9, 10,10,11,11,12,12,12-heneicosafluoro	865-86-1	1C
1-Hexene, 3,3,4,4,5,5,6,6,6-nonafluoro	19430-93-4	1C

1-Octanesulfonamide, 1,1,2,2,3,3,4,4,5,5, 6,6,7,7,8,8,8-heptadecafluoro-N-(2-hydroxyethyl)-N-methyl-	24448-09-7	1C
1-Octanesulfonamide, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8heptadecafluoro-N-methyl-	31506-32-8	1C
1-Octanesulfonamide, N-butyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-N-(2-hydroxyethyl)-	2263-09-4	1C
1-Octanesulfonamide, N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro	4151-50-2	1C
1-Octanesulfonamide, N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-N-(2-hydroxyethyl)	1691-99-2	1C
1-Octanesulfonic acid, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro	27619-97-2	1C
1-Octanesulfonic acid, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-, ammonium salt	59587-39-2	1C
1-Octanol, 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-	647-42-7	1C
1-Propanaminium, 2-hydroxy-N,N,N-trimethyl-, 3-[(γ-ω-perfluoro-C6-20-alkyl)thio] derivs., chlorides	70983-60-7	1C
1-Propanaminium, 3-[[(heptadecafluorooctyl)sulfonyl]amino]-N,N,N-trimethyl-, iodide	1652-63-7	1C
1-Propanaminium, 3-amino-N-(carboxymethyl)-N,N-dimethyl-, N-[2-[(γ-ω-perfluoro-C4-20-alkyl)thio]acetyl] derivs., inner salts	1078715-61-3	1C
1-Propanaminium, N,N,N-trimethyl-3-[[(pentadecafluoroheptyl)sulfonyl]amino]-, iodide	67584-58-1	1C
1-Propanaminium, N,N,N-trimethyl-3-[[(tridecafluorohexyl)sulfonyl]amino]-, iodide	68957-58-4	1C
1-Propanaminium, N,N,N-trimethyl-3-[[(undecafluoropentyl)sulfonyl]amino]-, iodide	68957-57-3	1C
1-Propanesulfonic acid, 2-methyl-, 2-[[1-oxo-3-[(γ-ω-perfluoro-C4-16-alkyl)thio]propyl]amino] derivs., sodium salts	68187-47-3	1C
2-(N-Ethylperfluorooctanesulfonamido)acetic acid	2991-50-6	1C
2-(N-Methylperfluorooctanesulfonamido)acetic acid	2355-31-9	1C
2-(Perfluorobutyl)-1-ethanesulfonic acid	757124-72-4	1C
2-(Perfluorohexyl)ethanoic acid	53826-12-3	1C

2-(Perfluorooctyl)ethanoic acid	27854-31-5	1C
2,2,3-Trifluoro-3-[1,1,2,2,3,3hexafluoro-3-(trifluoromethoxy) propoxy]propanoate	2127366-90-7	1C
2-[(8-Chloro-1,1,2,2,3,3,4,4,5,5,6,6,7,7, 8,8-hexadecafluorooctyl)oxy]-1,1,2,2-tetrafluoroethanesulfonate	2196242-82-5	1C
2-[[(Heptadecafluorooctyl)sulfonyl]methylamino]ethyl acrylate	25268-77-3	1C
2H,2H,3H,3H-Perfluorooctanoate	1799325-94-2	1C
2H,2H,3H,3H-Perfluorooctanoic acid	914637-49-3	1C
2H-Perfluoro-2-decenoic acid	70887-84-2	1C
2H-Perfluoro-2-octenoic acid (6:2)	70887-88-6	1C
2-Propenoic acid, 2-methyl-, 3,3,4,4,5,5, 6,6,7,7,8,8,9,9,10,10,11,11,12,12,12heneicosafluorododecyl ester, polymer with 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10, 10-heptadecafluorodecyl 2-methyl2-propenoate, methyl 2-methyl2-propenoate, and 3,3,4,4,5,5,6,6,7,7,8,8tridecafluorooctyl 2-methyl-2-propenoate	65104-45-2	1C
2-Propenoic acid, 2-methyl-, dodecyl ester, polymer with α-fluoro-ω-[2-[(2-methyl-1-oxo-2-propenyl)oxy]ethyl]poly(difluoromethylene)	65605-58-5	1C
2-Propenoic acid, 2-methyl-, octadecyl ester, polymer with 3,3,4,4,5,5,6,6,7,7, 8,8,9,9,10,10,11,11,12,12,12heneicosafluorododecyl 2-propenoate, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10heptadecafluorodecyl 2-propenoate and 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10heptadecafluorodecyl 2-propenoate and 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11, 12,12,13,13,14,14,14pentacosafluorotetradecyl 2-propenoate	142636-88-2	1C
2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8, 9,9,10,10,10-heptadecafluorodecyl ester	27905-45-9	1C
2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12, 12-heneicosafluorododecyl ester	17741-60-5	1C
2-Propenoic acid, 3,3,4,4,5,5,6,6,7,7,8,8, 9,9,10,10,11,11,12,12,13,13,14,14, 14-pentacosafluorotetradecyl ester	34395-24-9	1C

2-Propenoic acid, butyl ester, telomer with 2-[[(heptadecafluorooctyl)sulfonyl] methylamino]ethyl 2-propenoate, 2-[methyl[(nonafluorobutyl) sulfonyl]amino]ethyl 2-propenoate, α-(2-methyl-1-oxo-2-propenyl)-ωhydroxypoly(oxy-1,4-butanediyl), α-(2-methyl-1-oxo-2-propen-1-yl)-ω[(2-methyl-1-oxo-2-propen-1-yl)oxy]poly (oxy-1,4-butanediyl), 2-[methyl[(1,1,2,2,3,3,4,4,5,5,6,6,7,7,7pentadecafluoroheptyl)sulfonyl] amino]ethyl 2-propenoate, 2-[methyl[(1,1,2,2,3,3,4,4,5,5,6,6,6tridecafluorohexyl)sulfonyl]amino] ethyl 2-propenoate, 2-[methyl[(1,1,2,2,3,3,4,4,5,5,5-undecafluoropentyl) sulfonyl]amino]ethyl 2-propenoate and 1-octanethiol	68227-96-3	1C
3-(Perfluoroheptyl)propanoic acid	812-70-4	1C
3,3,4,4,5,5,6,6,7,7,8,8,8Tridecafluorooctane-1-sulfonate	425670-75-3	1C
3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10Heptadecafluorodecane-1-sulfonate	481071-78-7	1C
3:3 Fluorotelomer carboxylate, ion(1-)	1169706-83-5	1C
3:3 Fluorotelomer carboxylic acid	356-02-5	1C
4,8-Dioxa-3H-perfluorononanoic acid	919005-14-4	1C
4:2 Fluorotelomer sulfonate	414911-30-1	1C
7:3 Perfluorodecanoate	1799325-95-3	1C
8:2 Fluorotelomer sulfonate, ammonium salt	149724-40-3	1C
8:2 Fluorotelomer sulfonate, sodium salt	27619-96-1	1C
8:2 Fluorotelomer sulfonic acid	39108-34-4	1C
Acetic acid, trifluoro-	76-05-1	1C
Acetic acid, trifluoro-, rhodium(2+) salt	72654-51-4	1C
Alcohols, C8-14, γ-ω-perfluoro	68391-08-2	1C
Butanoic acid, 2,2,3,3,4,4,4-heptafluoro-, sodium salt (1:1)	2218-54-4	1C
Decane, 1,1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8 -heptadecafluoro-10-iodo-	2043-53-0	1C
Dichloromethyl(3,3,4,4,5,5,6,6,6nonafluorohexyl)silane	38436-16-7	1C

Ethanaminium, N,N,N-triethyl-, salt with 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8heptadecafluoro-1-octanesulfonic acid (1:1)	56773-42-3	1C
Ethanaminium, N,N-diethyl-N-methyl-2[(2-methyl-1-oxo-2-propenyl)oxy]-, methyl sulfate, polymer with 2-ethylhexyl 2-methyl-2-propenoate, α-fluoro-ω-[2-[(2-methyl-1-oxo-2propenyl)oxy]ethyl]poly (difluoromethylene), 2-hydroxyethyl 2-methyl-2-propenoate and N-(hydroxymethyl)-2-propenamide	65636-35-3	1C
Ethanol, 2,2′-iminobis-, compd. with α,α′-[phosphinicobis(oxy-2,1-ethanediyl)] bis[ω-fluoropoly(difluoromethylene)] (1:1)	65530-64-5	1C
Ethanol, 2,2′-iminobis-, compd. with α-fluoro-ω-[2-(phosphonooxy)ethyl] poly(difluoromethylene) (2:1)	65530-63-4	1C
Heptanoic acid, tridecafluoro-, ammonium salt	6130-43-4	1C
Heptanoic acid, tridecafluoro-, potassium salt	21049-36-5	1C
Hexafluoropropylene oxide dimer acid, ammonium salt	62037-80-3	1C
Hexanoic acid, undecafluoro-, ammonium salt	21615-47-4	1C
Methyl perfluoro-3,6-dioxaheptanoate	39187-41-2	1C
Methyl perfluorohexadecanoate	165457-57-8	1C
Methyl perfluorooctanoate	376-27-2	1C
Octadecanoic acid, pentatriacontafluoro-	16517-11-6	1C
Octanoyl fluoride, pentadecafluoro-	335-66-0	1C
Pentanoic acid, nonafluoro-, ammonium salt	68259-11-0	1C
Perfluoro(2-((6-chlorohexyl)oxy)ethanesulfonate)	1621485-21-9	1C
Perfluoro(2-((6-chlorohexyl)oxy)ethanesulfonic acid)	756426-58-1	1C
Perfluoro-2-ethoxyethanesulfonate	220689-13-4	1C
Perfluoro-2-ethoxyethanesulfonic acid	113507-82-7	1C
Perfluoro-2-propoxypropanoate	122499-17-6	1C
Perfluoro-2-propoxypropanoic acid	13252-13-6	1C
Perfluoro-3,6-dioxaheptanoic acid	151772-58-6	1C

Perfluoro-3-methoxypropanoic acid	377-73-1	1C
Perfluoro-4-methoxybutanoate	1432017-36-1	1C
Perfluoro-4-methoxybutanoic acid	863090-89-5	1C
Perfluorobutanesulfonamide	30334-69-1	1C
Perfluorobutanesulfonate	45187-15-3	1C
Perfluorobutanesulfonic acid	375-73-5	1C
Perfluorobutanoate	45048-62-2	1C
Perfluorobutanoic acid	375-22-4	1C
Perfluorodecanesulfonate	126105-34-8	1C
Perfluorodecanesulfonic acid	335-77-3	1C
Perfluorodecanoate	73829-36-4	1C
Perfluorodecanoic acid	335-76-2	1C
Perfluorodecanoic acid, sodium salt	3830-45-3	1C
Perfluorododecanesulfonate	343629-43-6	1C
Perfluorododecanesulfonic acid	79780-39-5	1C
Perfluorododecanoate	171978-95-3	1C
Perfluorododecanoic acid	307-55-1	1C
Perfluorododecanoic acid, sodium salt	307-67-5	1C
Perfluoroheptanesulfonate	146689-46-5	1C
Perfluoroheptanesulfonic acid	375-92-8	1C
Perfluoroheptanesulfonic acid, sodium salt	21934-50-9	1C
Perfluoroheptanoic acid	375-85-9	1C
Perfluorohexadecanoic acid	67905-19-5	1C
Perfluorohexanesulfonate	108427-53-8	1C
Perfluorohexanesulfonic acid	355-46-4	1C

Perfluorohexanesulfonic acid, potassium salt	3871-99-6	1C
Perfluorohexanoate	92612-52-7	1C
Perfluorohexanoic acid	307-24-4	1C
Perfluoroisobutene	382-21-8	1C
Perfluorononanesulfonate	474511-07-4	1C
Perfluorononanesulfonic acid	68259-12-1	1C
Perfluorononanesulfonic acid, sodium salt	98789-57-2	1C
Perfluorononanoate	72007-68-2	1C
Perfluorononanoic acid	375-95-1	1C
Perfluorooctadecanoate anion	798556-82-8	1C
Perfluorooctane sulfonic acid	1763-23-1	1C
Perfluorooctane sulfonic acid, ammonium salt	29081-56-9	1C
Perfluorooctane sulfonic acid, potassium salt	2795-39-3	1C
Perfluorooctanesulfonamide	754-91-6	1C
Perfluorooctanesulfonate	45298-90-6	1C
Perfluorooctanoate	45285-51-6	1C
Perfluorooctanoic acid	335-67-1	1C
Perfluorooctanoic acid, sodium salt	335-95-5	1C
Perfluorooctyl ethylene	21652-58-4	1C
Perfluorooctyl iodide	507-63-1	1C
Perfluorooctylsulfonyl fluoride	307-35-7	1C
Perfluoropentanesulfonate	175905-36-9	1C
Perfluoropentanesulfonic acid	2706-91-4	1C
Perfluoropentanoate	45167-47-3	1C
Perfluoropentanoic acid	2706-90-3	1C

Perfluorotetradecanoate	365971-87-5	1C
Perfluorotetradecanoic acid	376-06-7	1C
Perfluorotridecanoate	862374-87-6	1C
Perfluorotridecanoic acid	72629-94-8	1C
Perfluoroundecanoate	196859-54-8	1C
Perfluoroundecanoic acid	2058-94-8	1C
Phosphinic acid, bis(perfluoro-C6-12-alkyl) derivs.	68412-69-1	1C
Phosphonic acid, perfluoro-C6-12-alkyl derivs.	68412-68-0	1C
Poly(difluoromethylene), α,α′-[phosphinicobis(oxy-2,1-ethanediyl)]bis[ω-fluoro	65530-62-3	1C
Poly(difluoromethylene), α,α′-[phosphinicobis(oxy-2,1-ethanediyl)]bis[ω-fluoro-, ammonium salt (1:1)	65530-70-3	1C
Poly(difluoromethylene), α-[2-[(2-carboxyethyl)thio]ethyl]-ω-fluoro	65530-83-8	1C
Poly(difluoromethylene), α-[2-[(2-carboxyethyl)thio]ethyl]-ω-fluoro-, lithium salt (1:1)	65530-69-0	1C
Poly(difluoromethylene), α-fluoro-ω-[2-(phosphonooxy)ethyl]-	65530-61-2	1C
Poly(difluoromethylene), α-fluoro-ω-[2-(phosphonooxy)ethyl]-, ammonium salt (1:2)	65530-72-5	1C
Poly(difluoromethylene), α-fluoro-ω-[2-[(1-oxo-2-propenyl)oxy]ethyl]-, homopolymer	65605-73-4	1C
Poly(oxy-1,2-ethanediyl), α-[2-[ethyl[(heptadecafluorooctyl)sulfonyl]amino]ethyl]-ω-hydroxy-	29117-08-6	1C
Poly(oxy-1,2-ethanediyl), α-[2-[ethyl[(pentadecafluoroheptyl)sulfonyl]amino]ethyl]-ω-methoxy-	68958-60-1	1C
Poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, ether with α-fluoro-ω-(2-hydroxyethyl)poly(difluoromethylene) (1:1)	65545-80-4	1C
Poly[oxy(methyl-1,2-ethanediyl)], α-[2-[ethyl[(heptadecafluorooctyl)sulfonyl]amino]ethyl]-ω-hydroxy-	37338-48-0	1C

Siloxanes and Silicones, (3,3,4,4,5,5, 6,6,7,7,8,8,9,9,10,10,10heptadecafluorodecyl)oxy Me, hydroxy Me, Me octyl, ethers with polyethylene glycol mono-Me ether	143372-54-7	1C
Sodium 4,8-dioxa-3Hperfluorononanoate	2250081-67-3	1C
Sodium perfluorodecanesulfonate	2806-15-7	1C
Sodium perfluoroheptanoate	20109-59-5	1C
Sodium perfluoro-n-undecanoate	60871-96-7	1C
Sulfonic acids, C6-12-alkane, perfluoro	93572-72-6	1C
Sulfonic acids, C6-12-alkane, perfluoro potassium salts	68391-09-3	1C
Thiols, C10-20, γ-ω-perfluoro	68140-21-6	1C
Thiols, C4-10, γ-ω-perfluoro	68140-18-1	1C
Thiols, C6-12, γ-ω-perfluoro	68140-20-5	1C
Thiols, C8-20, γ-ω-perfluoro, telomers with acrylamide	70969-47-0	1C
Trifluoroacetate, salt of potassium	2923-16-2	1C
Trifluoroacetic acid, ammonium salt	3336-58-1	1C
Trifluoroacetic acid, silver salt	2966-50-9	1C
Trifluoroacetic acid, sodium salt	2923-18-4	1C
Acenaphthene	83-32-9	2
Acenaphthylene	208-96-8	2
Anthracene	120-12-7	2
Benz[a]anthracene	56-55-3	2
Benzo[a]pyrene	50-32-8	2
Benzo[b]fluoranthene	205-99-2	2
Benzo[e]pyrene	192-97-2	2
Benzo[ghi]perylene	191-24-2	2
Benzo[j]fluoranthene	205-82-3	2

Benzo[k]fluoranthene	207-08-9	2
Chrysene	218-01-9	2
Dibenz[a,h]acridine	226-36-8	2
Dibenz[a,h]anthracene	53-70-3	2
Dibenz[a,j]acridine	224-42-0	2
Dibenzo[a,e]fluoranthene	5385-75-1	2
Dibenzo[a,e]pyrene	192-65-4	2
Dibenzo[a,h]pyrene	189-64-0	2
Dibenzo[a,i]pyrene	189-55-9	2
Dibenzo[a,l]pyrene	191-30-0	2
7H-Dibenzo[c,g]carbazole	194-59-2	2
7,12-Dimethylbenz[a]anthracene	57-97-6	2
Fluoranthene	206-44-0	2
Fluorene	86-73-7	2
Indeno[1,2,3-cd]pyrene	193-39-5	2
3-Methylcholanthrene	56-49-5	2
5-Methylchrysene	3697-24-3	2
1-Nitropyrene	5522-43-0	2
Perylene	198-55-0	2
Phenanthrene	85-01-8	2
Pyrene	129-00-0	2
Quinoline	91-22-5	2
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	3
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	3
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	3

1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	3
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	3
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	3
Octachlorodibenzo-p-dioxin	3268-87-9	3
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	3
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	3
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	3
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	3
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	3
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	3
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	3
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	3
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	3
Octachlorodibenzofuran	39001-02-0	3
Hexachlorobenzene	118-74-1	3
Carbon monoxide	630-08-0	4
Nitrogen oxides (expressed as nitrogen dioxide)	11104-93-1	4
PM2.5 [25, 26]	NA - M10	4
PM10 [26, 27]	NA - M09	4
Sulphur dioxide	7446-09-5	4
Total particulate matter [26, 28]	NA - M08	4
Volatile organic compounds (total) [29]	NA - M16	4
Acetylene	74-86-2	5
Analytically unresolved hydrocarbons (C10 to C16+)[30]	NA - 44	5
Benzene	71-43-2	5

1,3-Butadiene	106-99-0	5
Butane (all isomers)	NA - 24	5
Butene (all isomers)	25167-67-3	5
2-Butoxyethanol	111-76-2	5
Butyl acetate [31]	NA - 41	5
Cycloheptane (all isomers)	NA - 25	5
Cyclohexene (all isomers)	NA - 26	5
Cyclooctane (all isomers)	NA - 27	5
Decane (all isomers)	NA - 28	5
p-Dichlorobenzene	106-46-7	5
1,2-Dichloroethane	107-06-2	5
Dimethylether	115-10-6	5
Ethanol	64-17-5	5
Ethyl acetate	141-78-6	5
Ethylene	74-85-1	5
Ethyltoluene (all isomers)	NA - 42	5
Formaldehyde	50-00-0	5
Furfuryl alcohol	98-00-0	5
Heavy aromatic solvent naphtha	64742-94-5	5
Heptane (all isomers)	NA - 31	5
n-Hexane	110-54-3	5
Hexane [32]	NA - 32	5
Hexene (all isomers)	25264-93-1	5
Hydrotreated heavy naphtha	64742-48-9	5
Hydrotreated light distillate	64742-47-8	5

Isopropyl alcohol	67-63-0	5
Light aromatic solvent naphtha	64742-95-6	5
D-Limonene	5989-27-5	5
Methanol	67-56-1	5
Methyl ethyl ketone	78-93-3	5
Methyl isobutyl ketone	108-10-1	5
Methylcyclopentane	96-37-7	5
Mineral spirits	64475-85-0	5
Myrcene	123-35-3	5
Naphtha	8030-30-6	5
Nonane (all isomers)	NA - 33	5
Octane (all isomers)	NA - 34	5
Other glycol ethers and acetates (and their isomers)[33]	NA - 45	5
Pentane (all isomers)	NA - 35	5
Pentene (all isomers)	NA - 36	5
beta-Phellandrene	555-10-2	5
alpha-Pinene	80-56-8	5
beta-Pinene	127-91-3	5
Propane	74-98-6	5
Propyl acetate (all isomers)	NA - 43	5
n-Propyl alcohol	71-23-8	5
Propylene	115-07-1	5
Propylene glycol methyl ether acetate (all isomers)	108-65-6	5
Solvent naphtha light aliphatic	64742-89-8	5
Solvent naphtha medium aliphatic	64742-88-7	5

Stoddard solvent	8052-41-3	5
Styrene	100-42-5	5
Tetrahydrofuran	109-99-9	5
Toluene	108-88-3	5
1,2,4-Trimethylbenzene	95-63-6	5
Trimethylbenzene [34]	25551-13-7	5
Vinyl acetate	108-05-4	5
VM & P naphtha	8032-32-4	5
Xylene (all isomers) [15]	1330-20-7	5

Notes:

1. Total of the acid or base and its salts, expressed as the molecular weight of the acid or base. Where provided, the CAS RN corresponds to the weak acid or base.
2. Total of ammonia (NH_3 — CAS RN 7664-41-7) and the ammonium ion (NH_4^+ — CAS RN 14798-03-9) in solution, expressed as ammonia.
3. Total of the pure element and the equivalent weight of the element contained in any compound, alloy or mixture.
4. Total of pure chromium and the equivalent weight of chromium contained in any compound, alloy or mixture. Excludes hexavalent chromium (and its compounds).
5. Total of all isomers of cresol: m-cresol (CAS RN 108-39-4), o-cresol (CAS RN 95-48-7) and p-cresol (CAS RN 106-44-5).
6. Total of all isomers, including, but not limited to, isomers with CAS RNs 354-12-1, 354-15-4 and 354-21-2.
7. Total of all isomers, including, but not limited to, isomers with CAS RNs 306-83-2, 354-23-4, 812-04-4 and 90454-18-5.
8. Total of all isomers, including, but not limited to, isomers with CAS RNs 76-14-2, 354-25-6, 374-07-2 and 2837-89-0.
9. Carboxylic acids that include chain compounds and compounds with one or more alicyclic ring structures with the general formula $C_nH_{2n+Z}O_xN_{\alpha}S_{\beta}$, where “n” indicates the carbon number; “Z” is referred to as the “hydrogen deficiency” (the number of hydrogen atoms that are lost as the structures become more compact) and is zero or a negative, even integer (from -2 to -12); “x” refers to the oxygen number; “α” refers to the nitrogen number; and “β” refers to the sulphur number. Includes diverse polar organic compounds present in bitumen and oil sands process-affected water. This includes several compound

classes, including aromatic, adamantine, or diamondoid structures, sulphur- and nitrogen-containing compounds, and oxygenated acids.

10. Nitrate ion in solution at a pH of 6.0 or more.
11. Total of six octylphenols and their ethoxylates, limited to CAS RNs 140-66-9, 1806-26-4, 27193-28-8, 68987-90-6, 9002-93-1 and 9036-19-5
12. Excludes yellow or white phosphorus (CAS RN 7723-14-0).
13. Total of hydrogen sulphide (CAS RN 7783-06-4), carbon disulphide (CAS RN 75-15-0), carbonyl sulphide (CAS RN 463-58-1), dimethyl sulphide (CAS RN 75-18-3), dimethyl disulphide (CAS RN 624-92-0), and methyl mercaptan (CAS RN 74-93-1), expressed as hydrogen sulphide.
14. Total of pure vanadium and the equivalent weight of vanadium contained in any compound or mixture. Excludes vanadium contained in an alloy.
15. Total of all isomers of xylene: m-xylene (CAS RN 108-38-3), o-xylene (CAS RN 95-47-6) and p-xylene (CAS RN 106-42-3).
16. Total of 26 azo disperse dyes with molar weights below 360 g/mol, limited to CAS RNs 12222-69-4, 16889-10-4, 20721-50-0, 21811-64-3, 2581-69-3, 27184-69-6, 2734-52-3, 2832-40-8, 2872-52-8, 31464-38-7, 31482-56-1, 3179-89-3, 3180-81-2, 40880-51-1, 43047-20-7, 4314-14-1, 6054-48-4, 6250-23-3, 6253-10-7, 6300-37-4, 6439-53-8, 65122-05-6, 6657-00-7, 69472-19-1, 730-40-5, 83249-52-9 and 842-07-9.
17. Limited to CAS RNs 149-30-4, 95-31-8, 95-33-0, 120-78-5, 2492-26-4, 4979-32-2, 95-29-4, 95-32-9, 102-77-2, 155-04-4, 3741-80-8, 7778-70-3, 21564-17-0, 22405-83-0, 32510-27-3, 38456-45-0, 65605-47-2, 65605-48-3, 68911-68-2, and 117920-00-0.
18. Including, but not limited to, chloroalkanes, C18-20 (CAS RN 106232-85-3), as well as substances or components of mixtures that meet the molecular formula definition.
19. Including, but not limited to, chloroalkanes, C14-17 (CAS RN 85535-85-9), as well as substances or components of mixtures that meet the molecular formula definition.
20. Total of nine cyanide substances limited to CAS RNs 143-33-9, 506-61-6, 13967-50-5, 13601-19-9, 13746-66-2, 13943-58-3, 14038-43-8, 25869-00-5, and 25869-98-1.
21. Total of pure lead and the equivalent weight of lead contained in any compound, alloy or mixture. Excludes lead (and its compounds) contained in stainless steel, brass or bronze alloys and lead contained in tetraethyl lead (CAS RN 78-00-2).
22. Total of 92 long-chain aliphatic amines, limited to the following CAS RNs: 112-69-6, 124-30-1, 61788-46-3, 61789-79-5, 61790-59-8, 61790-60-1, 61791-55-7, 68479-04-9, 68783-25-5, 111-86-4, 112-18-5, 112-75-4, 112-90-3, 112-99-2, 124-22-1, 124-28-7, 143-27-1, 929-73-7, 1120-24-7, 1613-17-8, 1838-08-0, 1920-05-4, 2016-56-0, 2016-57-1, 2190-04-7, 3007-31-6, 4455-26-9, 5538-95-4, 7173-62-8, 7378-99-6, 7396-58-9, 10460-00-1, 13281-06-6, 14676-61-0, 19855-61-9, 22020-14-0, 22023-23-0, 24287-35-2, 25324-14-5, 28061-69-0, 28701-67-9, 29317-52-0, 30113-45-2, 40165-68-2, 50291-24-2, 61788-45-2, 61788-62-3, 61788-63-4, 61788-91-8, 61788-93-0, 61788-95-2, 61789-76-2, 61790-18-9, 61790-33-8, 61790-57-6, 65059-85-0, 67700-98-5, 67700-99-6, 68037-91-2, 68037-92-3, 68037-95-6,

68037-98-9, 68130-68-7, 68155-38-4, 68439-70-3, 68513-50-8, 68603-64-5, 68603-65-6, 68610-26-4, 68610-68-4, 68783-23-3, 68783-24-4, 68784-38-3, 68814-69-7, 68855-63-0, 68909-95-5, 68955-53-3, 68955-54-4, 71011-01-3, 71011-03-5, 75444-69-8, 125328-36-1, 125328-37-2, 125328-38-3, 125328-39-4, 125328-41-8, 125328-42-9, 125328-43-0, 125328-44-1, 125328-45-2, 125328-46-3, and 1078712-76-1.

23. Total of nonylphenol, its ethoxylates and derivatives, limited to CAS RNs 104-40-5, 25154-52-3, 84852-15-3, 1323-65-5, 26523-78-4, 28987-17-9, 68081-86-7, 68515-89-9, 68515-93-5, 104-35-8, 20427-84-3, 26027-38-3, 27177-05-5, 27177-08-8, 28679-13-2, 27986-36-3, 37251-69-7, 7311-27-5, 9016-45-9, 27176-93-8, 37340-60-6, 51811-79-1, 51938-25-1, 68412-53-3, 68412-54-4, 9051-57-4, 37205-87-1 and 127087-87-0.
24. Total of all isomers occurring in mixtures.
25. Particulate matter with a diameter less than or equal to 2.5 micrometres.
26. Filterable particulate matter, on a dry basis. Excludes condensable particulate matter.
27. Particulate matter with a diameter less than or equal to 10 micrometres.
28. Particulate matter with a diameter less than 100 micrometres.
29. The total of volatile organic compounds as set out in section 65 of the List of Toxic Substances in Schedule 1 of the Canadian Environmental Protection Act, 1999.
30. An agglomeration of volatile organic compounds in the C10 to C16+ range that could not be separated into individual components by the selected gas chromatography column.
31. Total of n-butyl acetate (CAS RN 123-86-4), isobutyl acetate (CAS RN 110-19-0), and sec-butyl acetate (CAS RN 105-46-4). Excludes tert-butyl acetate (CAS RN 540-88-5).
32. Total of all isomers. Excludes n-hexane (CAS RN 110-54-3).
33. Total of CAS RNs 112-07-2, 112-15-2, 112-25-4, 112-34-5, 5131-66-8, 107-98-2, 109-59-1, 111-90-0, 124-17-4, 1569-01-3, 1569-02-4, 2807-30-9, 29911-27-1, 29911-28-2, 34590-94-8, 54839-24-6, 623-84-7 and 88917-22-0, and their isomers.
34. Total of 1,2,3-trimethylbenzene (CAS RN 526-73-8) and 1,3,5-trimethylbenzene (CAS RN 108-67-8). Excludes 1,2,4-trimethylbenzene (CAS RN 95-63-6).

Appendix B – Example calculations

B.1 Calculating the manufacture, process or otherwise use quantity

Table 17 illustrates the calculation of the reporting threshold for a Part 1A substance. In the example, a facility has several processes in which a Part 1A substance is manufactured, processed or otherwise used. The substance is also released as a by-product and is contained in tailings and waste rock.

This example assumes that the employee threshold is met, or an activity to which the employee threshold does not apply takes place at the facility. In this case, a report is required for this substance, because the total quantity of the Part 1A substance manufactured, processed, otherwise used, and contained in tailings and waste rock at the facility exceeded 10 tonnes, as explained below.

Table 17. Example of a threshold calculation for Part 1A substances

Material/Process Containing the Substance	Total Weight of Material Containing the Substance (tonnes)	Concentration/Equivalent Weight of the Substance in Material/Process (percent)	Net Weight of the Substance to Include in Threshold Calculation (tonnes)
1. Compound material in process stream A	150	5	7.5
2. Raw material in process B	2	100	2.0
3. Raw material in process C	45	0.20	n/a
4. By-product released from process D	10 000	0.01	1.0
5. Tailings	24 000 000	0.00001	2.4
6. Waste rock (that is not clean or inert)	20 000 000	0.00002	n/a
		Total	**12.9**

1. In process A, the Part 1A substance is present at 5% concentration (or equivalent weight for metallic compounds) and is included in the threshold calculation.

2. In process B, the raw material added to the process is a pure substance. It is included in the threshold calculation, regardless of any subsequent dilution in the process.

3. The weight of the substance in the raw material used in process C is not included in the threshold calculation because the concentration is less than 1%. Note that, as a report is required in this example, the releases, disposals and transfers for recycling from all processes, including process C, are required to be reported, regardless of concentration and regardless of whether or not the quantity is used in the threshold calculation.

4. The weight of the substance produced and released from process D is included in the calculation because it is a by-product, and the concentration threshold does not apply.

5. The weight of the substance contained in tailings is included in the threshold calculation because there is no concentration threshold for tailings.

6. The weight of the substance contained in waste rock is not included in the threshold calculation, because the concentration of the substance in the waste rock is less than 1%. The weight of the substance in the waste rock would also not be included when calculating disposals of the substance, because the concentration is less than 1%.

7. The total is the value that must be compared to the 10 tonnes reporting threshold. This value is only used to determine that a report is required for the Part 1A substance. A subsequent calculation must be done to obtain the actual value of releases, disposals, and transfers for recycling that must be reported.

B.2 Calculating releases using continuous emissions monitoring

This example estimates emissions from an oil-fired boiler that has the example continuous emission monitoring (CEM) data in Table 18.

Table 18. Example continuous emission monitoring data

Period	O_2 (%V)	Fuel rate, Q_{fuel} (10^3 kg/hr)	Stack gas flow rate, Q_{stack} (dRm^3/min)	Measured concentration, C (ppmvd)			Calculated emission rate, CER (kg/hr)		
				SO_2	NOx	CO	SO_2	NOx	CO
1:00	1.5	15.4	3 576	799	175	20.2	461	73	5
1:10	1.7	16.9	3 855	830	186	23.9	500	81	6
1:20	1.4	15.3	3 433	755	155	19.9	445	66	5
1:30	1.6	16.0	3 720	821	175	20.5	480	74	5
1:40	1.5	16.5	3 760	814	164	19.5	529	77	6
1:50	1.5	16.3	3 754	825	158	29.5	529	73	8

The following equation is used to calculate emissions from the measured concentrations:

$$\mathrm{CER_x} = \frac{\mathrm{C_x} \times \mathrm{MW_x} \times \mathrm{Q_{stack}} \times 60}{\mathrm{V} \times 10^6}$$

Where:
$\mathrm{CER_x}$ = calculated emission rate of contaminant "x", kg/hr
$\mathrm{C_x}$ = Concentration of contaminant "x", ppmvd
$\mathrm{MW_x}$ = Molecular weight of the contaminant "x", g/g-mole
  $\mathrm{MWSO_2} = 64$
  $\mathrm{MWNOx} = 46$ (as $\mathrm{MWNO_2}$)
  $\mathrm{MWCO} = 28$
$\mathrm{Q_{stack}}$ = Dry stack gas volumetric flow rate at reference conditions (101.325 kPa and 25°C), $\mathrm{dRm^3/min}$
V = Volume occupied by 1 mole of ideal gas at reference conditions (24.45 litres/g-mole)

The average SO_2 emissions for the 1 hour CEM period

$$= (461 + 500 + 445 + 480 + 529 + 529)/6$$

$$= 490 \text{ kg of } SO_2$$

B.3 Calculating releases using predictive emissions monitoring

TPM emissions from a boiler firing heavy fuel oil (HFO) are estimated in this example. To use the PEM approach, a model or relationship between TPM emission rates and fuel consumption must first be developed. An example of a model relationship is shown below.

Correlate the TPM emission rates to the HFO consumption rate of the boiler in the PEM as listed in Table 19.

Table 19. Example predictive emissions monitoring data

Parameters	PEM data									
HFO consumption rate (GJ/h)	71	72	73	74	75	76	77	78	79	80
TPM emission rate (kg/h)	16	17	17	17	17	18	18	18	18	19

Once the predictive model has been tested and verified it can then be used along with the fuel use consumption rate to estimate annual TPM emissions from the unit. Table 20 illustrates how the predictive model is used to estimate TPM emissions for a specific time period.

Table 20. Example predicted emission rates

Time (hour)	Fuel Rate (GJ/h)	Predicted TPM Emission Rate (kg/h)
1	74	17
2	74	17
3	76	18
4	75	17
5	76	18
6	77	18
7	78	18
8	79	18
9	80	19
10	80	19
Total for period	769	179
Average for period	76.9	17.9

The general formula for estimating emissions for contaminant "x" is:

$$E_x = E_{x,ave} \times T$$

Where:
E_x = Emission of contaminant "x", kg/year
$E_{x,ave}$ = Average emission rate of contaminant "x", kg/hr
T = Total operating hours in a given year

Given that the above boiler unit operated under the same condition for 7 500 hours in the year, the estimated TPM emissions would be

$$
\begin{aligned}
&= 17.9 \times 7\,500 \\
&= 134\,250 \text{ kg TPM/year} \\
&= 134.25 \text{ tonnes TPM per year}
\end{aligned}
$$

B.4 Calculating releases using source testing

This source testing example is based on measured concentrations of the substance in a waste stream and the volume/flow rate of that stream. A galvanizing facility discharges its wastewater to a nearby body of water. The electroplater is required to monitor this discharge once a month for various parameters, including the release of total zinc.

Step 1: Gather wastewater flow and concentration data from the monitoring results done in compliance with the municipal by-law for wastewater discharges. Analytical results for total zinc for the year are presented in Table 21.

Table 21. Example source testing concentrations

Day	Wastewater Flow (10^6 L/d)	Zinc Concentration (µg/L)	Releases(kg/d)
Jan. 8	1.57	918	1.44
Feb. 12	1.49	700	1.04
Mar. 10	1.58	815	1.28
Apr. 15	1.66	683	1.13
May 9	1.38	787	1.09
Jun. 13	1.29	840	1.08
Jul. 11	1.73	865	1.5
Aug. 10	1.6	643	1.03
Sept. 8	1.75	958	1.68
Oct. 12	1.56	681	1.06
Nov. 10	1.8	680	1.22
Dec. 8	1.63	627	1.02
Average			1.21

Step 2: Calculate the mass loading for those days on which a zinc analysis was performed. This is done by multiplying the daily flow by the measured zinc concentration.

Step 3: Calculate annual releases. Based on an average daily release of 1.21 kg over the year and 250 days of discharge during the year, the yearly total zinc discharged to water

$$
\begin{aligned}
&= 1.21 \text{ kg/d} \times 250 \text{ d/yr} \\
&= 302.5 \text{ kg/yr} \\
&= 0.303 \text{ tonnes/yr}
\end{aligned}
$$

B.5 Calculating releases using source testing, levels of quantification and toxic equivalency factors

At this facility, 200 tonnes of non-hazardous waste were incinerated during the year, with a waste feed rate of 100 kg/hr. The stack flow rate was 1.2 m^3/s. The facility has stack testing data for dioxins/furans. The measured stack gas concentrations of dioxins/furans in the air were:

- 4.0 ng/m^3 of 1,2,3,4,7,8-hexachlorodibenzo-*p*-dioxin
- 7.0 ng/m^3 of 1,2,3,4,7,8-hexachlorodibenzofuran
- 10.0 ng/m^3 of 1,2,3,6,7,8-hexachlorodibenzofuran

The facility produced 20 tonnes of incineration ash in the year which was shipped off site for disposal in a landfill. The facility has measured an average dioxins/furans concentration of:

- 2.5 mg/tonne ash of 1,2,3,4,7,8-hexachlorodibenzo-*p*-dioxin
- 4.6 mg/tonne ash of 1,2,3,4,7,8-hexachlorodibenzofuran
- 8.1 mg/tonne ash of 1,2,3,6,7,8-hexachlorodibenzofuran

Step 1: Determine if the equivalent measured concentration of dioxins/furans releases to air was greater than the LoQ of 32 pg TEQ/m^3

$$\begin{aligned}&= (4.0\ \text{ng/m}^3 \times 0.1\ \text{TEF}+7.0\ \text{ng/m}^3 \times 0.1\ \text{TEF}+10.0\ \text{ng/m}^3 \times 0.1\ \text{TEF}) \times (1\ 000\ \text{pg}/1\ \text{ng})\\ &= 2\ 100\ \text{pg TEQ/m}^3\end{aligned}$$

This facility is required to report releases to air for the individual congeners since the measured concentration of 2 100 pg TEQ/m^3 was greater than the LoQ of 32 pg TEQ/m^3.

Step 2: Calculate the hours of operation

$$\begin{aligned}&= (200\ \text{tonnes waste/yr}) \times (\text{hr}/100\ \text{kg waste}) \times (1\ 000\text{kg/tonne})\\ &= 2\ 000\ \text{hours/yr}\end{aligned}$$

Step 3: Calculate the quantity of dioxins/furans congeners released to the air, for example, 1,2,3,4,7,8-hexachlorodibenzo-*p*-dioxin

$$\begin{aligned}&= (\text{measured concentration}) \times (\text{flow rate}) \times (\text{hours of operation/yr})\\ &= (4.0\ \text{ng/m}^3) \times (1.2\ \text{m}^3/\text{s}) \times (3\ 600\ \text{s/hr}) \times (2\ 000\ \text{hr/yr}) \times (1\text{g}/10^9\ \text{ng})\\ &= 0.034560\ \text{g /yr}\end{aligned}$$

Step 4: Determine if the measured concentration of dioxins/furans in the incineration ash was greater than the LoQ of 9 pg TEQ/g ash.

$$\begin{aligned}&= (2.5\ \text{mg/tonne ash} \times 0.1\ \text{TEF} + 4.6\ \text{mg/tonne ash} \times 0.1\ \text{TEF} + 8.1\ \text{mg/tonne ash} \times 0.1\ \text{TEF}) \times\\ &(1\text{g}/1\ 000\text{mg}) \times (10^{12}\ \text{pg/g}) \times (1\ \text{tonne}/10^6\ \text{g})\\ &= 1\ 520\ \text{pg TEQ/g ash}\end{aligned}$$

The measured concentration of 1 520 pg TEQ/g ash was greater than the LoQ for dioxins/furans in ash of 9 pg TEQ/g ash; therefore the quantity of each individual congener in ash sent for off-site disposal must be reported in grams.

Step 5: Calculate the quantity of dioxins/furans congeners contained in the incineration ash that was sent for off-site disposal

$$\begin{aligned}&= (\text{ash produced}) \times (\text{concentration of congener in ash})\\ &= (20\ \text{tonnes of ash/yr}) \times (2.5\ \text{mg/tonnes of ash}) \times (1\text{g}/1\ 000\ \text{mg})\\ &= 0.050000\ \text{g/yr}\end{aligned}$$

B.6 Calculating releases using mass balance

An electroplating facility operates a vapour degreaser. Suppose that 14 tonnes of trichloroethylene are used as a degreasing agent. Spent solvent and sludge that accumulate on the bottom of the degreaser are collected in drums for shipment to an off-site solvent reclaimer. Thirteen drums of solvent were sent to the reclaimer during the past year.

A known volume of a representative sample taken from the drums is weighed, allowed to evaporate, and reweighed. From this, it is determined that the density of the sludge is 1.03 kg/L and that the trichloroethylene concentration in the sludge shipped to the reclaimer is 30%.

Step 1: The entire 14 tonnes of solvent is released from the facility either as an air emission or as a transfer in the sludge. If the quantity of spent solvent shipped to the reclaimer is known, then the quantity transferred can be calculated based on the volume of sludge and the density of the sludge as shown below:

Volume of trichloroethylene to reclaimer

$$\begin{aligned} &= 13 \text{ drums} \times 210 \text{ L/drum} \\ &= 2\,730 \text{ L} \end{aligned}$$

Mass of trichloroethylene to reclaimer:

$$\begin{aligned} &= \text{volume of sludge} \times \text{density of sludge} \times \%\text{ trichloroethylene in sludge} \\ &= 2\,730 \text{ L} \times 1.03 \text{ kg/L} \times 0.30 \\ &= 844 \text{ kg} \\ &= 0.844 \text{ tonnes} \end{aligned}$$

Step 2: The quantity of trichloroethylene emitted to air can then be calculated by mass balance by subtracting the quantity shipped in sludge to the reclaimer from the quantity purchased:

$$\begin{aligned} &= 14 \text{ tonnes (purchased) - } 0.84 \text{ tonnes (to reclaimer)} \\ &= 13.164 \text{ tonnes} \end{aligned}$$

Note: trichloroethylene is a VOC and the quantity released to air in this example would also require that a report for total VOCs under Part 4 be submitted.

B.7 Calculating releases using emission factors

A facility operated a cement kiln and process throughput amounted to 2 500 000 tonnes of clinker produced during the year. In this example, the facility uses the emission factors provided in the WebFIRE database, to calculate the quantities of the individual PAHs that were incidentally manufactured and released, disposed of, or transferred for recycling. For a throughput of 2 500 000 tonnes of clinker, the following quantities of individual PAHs that are released to air are shown in Table 22.

Table 22. Example emission factors

Individual PAHs in Part 2, for which there is an emission factor	Emission Factor (mg PAHs/tonne clinker produced)	Quantity	
		mg	kg
Fluoranthene	2.42	6 050 000	6.05

Phenanthrene	16.9	42 250 000	42.25
Pyrene	1.46	3 650 000	3.65
Total			**51.95**

The quantity of the individual PAHs resulting from incidental manufacture totaled more than 50 kg, so the facility has met the reporting threshold for PAHs, and must report those substances which have met the 5 kg threshold.

The facility must submit a substance report to the NPRI for two of the PAHs for which there are data. The substance reports and quantity reported for on-site releases to air are: 6.05 kg of fluoranthene, and 42.25 kg of phenanthrene. No report is required for pyrene because it did not meet the 5 kg threshold. No report is required for the individual PAHs for which there are no emission factors [e.g., benz(a)anthracene]. The releases are not reported under the listing "PAHs, total unspeciated (NA - P/H)" because the facility has information for some of the individual Part 2 PAHs.

There were no releases to water or land of any incidentally manufactured PAHs, so the facility reports no releases to these media.

There is no knowledge of the quantity of incidentally manufactured PAHs in the residue from the pollution control devices (e.g., electrostatic precipitator), so the facility reports no disposals of the three PAHs.

Note: In cases where multiple process streams are present, but information on individual PAH is not available for all streams, report information on the individual PAHs **and** report the remaining quantity under total PAHs, i.e. "PAHs, total unspeciated (NA - P/H)." Quantities reported as individual PAHs should not be included in the quantity reported for "PAHs, total unspeciated (NA - P/H)."

B.8 Calculating releases using a speciation profile

A facility that manufactures varnish is able to calculate total VOC releases of 26.71 tonnes using an emission factor. The US Environmental Protection Agency's SPECIATE 5.4 database contains a speciation profile that can be used to estimate releases of speciated VOCs based on the total VOCs quantity. Profile number 0066, for "Varnish Manufacturing – Bodying Oil," is based on total organic gas (TOG), which includes compounds that are not considered to be VOCs under the ECCC definition (e.g., methane and ethane). For SPECIATE profiles that are based on TOG, the TOG to VOC ratio must applied to the annual release value before applying the profile weight percentage to derive the quantity of each VOC species released

$$= \frac{(\text{total VOC releases} \times \text{TOG:VOC ratio} \times \text{profile weight percentage})}{100}$$

In this example, the quantity of methyl ethyl ketone released would be calculated as

$$= \frac{(26.71 \text{ tonnes} \times 1.631321 \times 41.6)}{100}$$
$$= 18.126 \text{ tonnes}$$

The quantity of methyl isobutyl ketone released would be calculated as

$$= \frac{(26.71 \text{ tonnes} \times 1.631321 \times 16.7)}{100}$$

$$= 7.277 \text{ tonnes}$$

B.9 Calculating releases using engineering estimates

This estimation method is based on physical/chemical properties (e.g., vapour pressure) of the substance and mathematical relationships (e.g., ideal gas law). In this example, rinse water from a copper-plating unit is treated separately from other process wastewater. Sodium hydroxide is added to precipitate the copper (Cu) in the wastewater. The precipitate formed from this reaction is removed as sludge from the facility's central clarification unit. Purchasing and inventory records indicate that 0.9 tonnes of sodium hydroxide were used for precipitating copper last year. The quantity of copper precipitated represents the quantity of copper released from this source as solid waste.

Step 1: For each mole of copper (Cu) present in the rinse water, two moles of sodium hydroxide (NaOH) must be added to precipitate the copper according to the following reaction:

$$Cu^{2+} + 2(NaOH) \rightarrow Cu(OH)_2 + 2Na^{+}$$

Scientific literature indicates that this reaction would be complete at a pH of 7.7. Sodium hydroxide is added until a pH of 8 is maintained in the reaction mixture to ensure complete precipitation. It is also known that:

Molecular Weight of Cu = 63.5 tonnes/tonne-mole
Molecular Weight of NaOH = 40 tonnes/tonne-mole

Step 2: Calculate the quantity of copper released in the wastewater treatment sludge:

2 tonne-moles NaOH reacts with 1 tonne-mole Cu

The ratio of NaOH to Cu by mass is calculated as follows:

$$= (40 \text{ tonnes NaOH/tonne-mole NaOH}) \times 2 \text{ tonne-moles NaOH:1 tonne-mole Cu} \times (63.5 \text{ tonnes Cu/tonne-mole Cu})$$
$$= 80 \text{ tonnes NaOH:63.5 tonnes Cu}$$

Using the proportions above, the following equation can be derived:

$$(80 \text{ tonnes NaOH}/0.9 \text{ tonne NaOH}) = (63.5 \text{ tonnes Cu}/A)$$

Where
A= the quantity of copper released in the wastewater
$A = (0.9 \times 63.5 \text{ tonnes Cu})/80$
$A = 0.71 \text{ tonnes Cu}$

The estimation method is valid only if the NaOH reacts only with the Cu present in the wastewater and the reaction is complete.

B.10 Calculating total reduced sulphur releases using hydrogen sulphide equivalence factors

Total reduced Sulphur (TRS) refers to a gaseous mixture of compounds containing one or more sulphur atoms in their reduced state. For the purposes of reporting to the NPRI, this grouping is restricted to the substances listed in Table 23 below. TRS must be expressed in terms of H_2S equivalents, and H_2S equivalence factors are shown in Table 24.

It is important to remember that three of these TRS compounds – hydrogen sulphide (H_2S), carbon disulphide (CS) and carbonyl sulphide (COS) – are also listed individually under Part 1A. If any one of these three substances meets the 10 tonne reporting threshold, that substance must also be reported individually.

Table 23. Total reduced sulphur substances

Substance name	Chemical formula	CAS RN
Hydrogen sulphide	H_2S	7783-06-4
Carbon disulphide	CS_2	75-15-0
Carbonyl sulphide	COS	463-58-1
Dimethyl sulphide	C_2H_6S	75-18-3
Methyl mercaptan	CH_4S	74-93-1
Dimethyl disulphide	$C_2H_6S_2$	624-92-0

To use the equivalence factor method to calculate TRS, each TRS compound is converted into the H_2S equivalent. The equivalent amounts are then summed and compared to the 10 tonnes MPO threshold. If the threshold is met or exceeded, a TRS substance report is required.

Table 24 illustrates how to calculate TRS using the equivalence factor method, when quantities of each of the six TRS substances are available. To calculate the amounts expressed as H_2S, add the quantities of the substances multiplied by the H_2S applicable equivalence factors

$$\begin{aligned}
&= \mathrm{H_2S} + (\mathrm{CS_2} \times 0.895) + (\mathrm{COS} \times 0.567) + (\mathrm{C_2H_6S} \times 0.548) + (\mathrm{CH_4S} \times 0.708) + (\mathrm{C_2H_6S_2} \times 0.724) \\
&= 3 \text{ tonnes} + (2 \text{ tonnes} \times 0.895) + (22 \text{ tonnes} \times 0.567) + (4 \text{ tonnes} \times 0.548) + (2 \text{ tonnes} \times 0.708) \\
&+ (6 \text{ tonnes} \times 0.724) \\
&= 25.223 \text{ tonnes}
\end{aligned}$$

Table 24. Example total reduced sulphur calculation

Substance name	Quantity (tonnes)	H_2S equivalence factor	H_2S equivalent (tonnes)
Hydrogen sulphide	3	1	3
Carbon disulphide	2	0.895	1.79
Carbonyl sulphide	22	0.567	12.481
Dimethyl sulphide	4	0.548	2.194
Methyl mercaptan	2	0.708	1.417
Dimethyl disulphide	6	0.724	4.341

B.11 Converting CAC releases from ppm (volume) to tonnes

Stack test results for NOx (expressed as NO_2), CO, or SO_2 are usually in units of parts per million volume or ppm (volume). Before these numbers can be used to estimate releases of these substances for the NPRI they need to be converted from ppm (volume) to a mass release in tonnes.

Step 1: Calculate the stack's volumetric gas flow rate ($\dot{V}$):

$$\dot{V}\ (\mathrm{m^3/min}) = (\text{gas velocity, m/s}) \times [\pi \times (\text{internal stack diameter, m}^2)/4] \times 60\ \mathrm{s/min}$$

Step 2: Correct the stack gas flow rate for the moisture content and standard conditions:

$$\text{Dry } \dot{V}\ (\mathrm{m^3/min}) = (\dot{V}, \mathrm{m^3/min}) \times \frac{273.15\ \mathrm{K}}{T_{\mathrm{actual}}} \times \frac{P_{\mathrm{actual}}}{1\ \mathrm{atm}} \times (1 - \text{fraction water vapour})$$

Example: If the stack gas volumetric flow is 1 330 m^3/min at 80°C and 1 atm pressure with a moisture content of 10%, the dry volumetric stack flow rate is:

$$\text{Dry } \dot{V}\ (\mathrm{m^3/min}) = (1\ 330\ \mathrm{m^3/min}) \times \frac{273.15\ \mathrm{K}}{273.15\mathrm{+}80\ \mathrm{K}} \times \frac{1\ \mathrm{atm}}{1\ \mathrm{atm}} \times (1 - 0.1)$$
$$= 925.84\ \mathrm{m^3/min}$$

Step 3: Convert from ppm (volume) to mass emission rate (kg/h):

$$\mathrm{kg/h} = \text{ppm} \times \text{density of air at standard conditions} \times \text{Dry } \dot{V} \times 60\ \mathrm{min/h} \times \frac{MW_{\mathrm{substance}}}{MW_{\mathrm{air}}}$$

Example: NOx is emitted from a stack that is 2.1 ppm by volume. The dry volumetric stack flow rate is 925.84 m^3/min. The density of air at standard conditions is 1.29 kg/m^3.

$$\mathrm{kg/h} = \frac{2.1}{1\ 000\ 000} \times 1.29\ \mathrm{kg/m^3} \times 925.84\ \mathrm{m^3/min} \times 60\ \mathrm{min/h} \times \frac{46}{28.97}$$
$$= 0.239\ \mathrm{kg/h}$$

Step 4: Use the mass emission rate to calculate the yearly NOx release.

$$\text{Yearly release} = \text{Mass emission rate} \times \frac{\text{hours}}{\text{year}}$$
$$= 0.239\ \mathrm{kg/h} \times \frac{8\ 760}{\text{year}}$$
$$= 2\ 093.64\ \mathrm{kg}$$
$$= 2.09\ \text{tonnes NOx released for the year}$$

B.12 Converting CAC releases from ppm (mass) to tonnes

Stack test results for total particulate matter (TPM), PM_{10} or $PM_{2.5}$ are usually in units of parts per million mass or ppm (mass). Before these numbers can be used to estimate releases of these substances for the NPRI, they need to be converted from ppm (mass) to a mass release in tonnes.

Step 1: Convert from ppm (mass) to the mass emission rate by converting ppm to grams/tonne and using the stack mass flow rate (kg/min) to convert to mass emission rate.

Example: The TPM emission rate from the stack is 250 ppm (mass). The dry mass flow rate is 10.54 kg/min. The stack is operational 24 hours a day, 365 days a year, i.e., 525 600 minutes per year.

$$1\ \text{ppm (mass)} = \frac{1\ \text{gram}}{1\ \text{tonne}}$$

$$250\ \text{ppm (mass)} = \frac{250\ \text{g TPM}}{1\ \text{tonne emissions}}$$

Step 2: Using stack dry mass flow rate, calculate the mass emission rate

$$= \frac{250\ \text{g TPM}}{1\ \text{tonne emissions}} \times \frac{10.54\ \text{kg emissions}}{\text{min}} \times \frac{1\ \text{tonne}}{1\ 000\ \text{kg}}$$

$$= \frac{2.635\ \text{g TPM}}{\text{min}}$$

Step 3: Use the mass emission rate to calculate the yearly TPM release

$$= \frac{2.635\ \text{g TPM}}{\text{min}} \times \frac{525\ 600\ \text{min}}{\text{year}} \times \frac{1\ \text{tonne}}{1\ 000\ 000\ \text{g}}$$

$$= \frac{1.384\ \text{tonnes TPM}}{\text{year}}$$

B.13 Converting CAC releases from mass per volume to tonnes

Stack test results for volatile organic compounds (VOCs) are usually in units of mass per volume, e.g., $\mu g/m^3$. These numbers need to be converted to an annual mass release in tonnes.

Step 1: Calculate the stack's volumetric gas flow rate ($\dot{V}$):

$$\dot{V}\ (\text{m}^3/\text{min}) = (\text{gas velocity, m/s}) \times [\pi \times (\text{internal stack diameter, m}^2)/4] \times 60\ \text{s/min}$$

Step 2: Correct the stack gas flow rate for the moisture content and standard conditions:

$$\text{Dry}\ \dot{V}\ (\text{m}^3/\text{min}) = (\dot{V}, \text{m}^3/\text{min}) \times \frac{273.15\ \text{K}}{\text{T}_{\text{actual}}} \times \frac{\text{P}_{\text{actual}}}{1\ \text{atm}} \times (1 - \text{fraction water vapour})$$

Example: If the stack gas volumetric flow is 1 330 m^3/min at 80°C and 1 atm pressure with a moisture content of 10%, the dry volumetric stack flow rate is:

$$\text{Dry}\ \dot{V}\ (\text{m}^3/\text{min}) = (1\ 330\ \text{m}^3/\text{min}) \times \frac{273.15\ \text{K}}{273.15+80\ \text{K}} \times \frac{1\ \text{atm}}{1\ \text{atm}} \times (1 - 0.1)$$

$$= 925.84\ \text{m}^3/\text{min}$$

Step 3: Use the stack flow rate (m^3/min) to convert to a mass emission rate.

Example: VOCs are emitted from a stack at a rate of 60 $\mu g/m^3$. The dry volumetric stack flow rate is 925.84 m^3/min.

$$= 925.84\ \text{m}^3/\text{min} \times 60\ \mu\text{g}\ /\text{m}^3 \times 60\ \text{minute/ hour}$$
$$= 3\ 333\ 024\ \text{g/hour}$$

Step 4: Use the mass emission rate to calculate the yearly VOCs release

$$= \text{Mass emission rate} \times \frac{8\ 760 \text{ hours}}{\text{year}}$$

$$= \frac{3\ 333\ 024\ \mu\text{g}}{\text{hour}} \times \frac{8\ 760 \text{ hours}}{\text{year}}$$

$$= \frac{29\ 197\ 290\ 240\ \mu\text{g}}{\text{year}} \times \frac{1 \text{ tonne}}{10^{12}\ \mu}$$

$$= 0.029 \text{ tonnes VOC}$$

B.14 Calculating CAC releases from source testing and fuel consumption data

Many facilities participating in a stack testing program will have information on the fuel feed rate during the test period and total annual fuel consumption. This data can be used to more accurately estimate CAC releases taking into account the process variations and production rates. For example, this method may be used if the equipment is only operational for part of the year or the fuel feed rate fluctuates based on the facility's production rate.

To illustrate this method the data in from the example in section B.12 was assigned to a boiler burning bituminous coal.

Step 1: Convert from ppm (mass) to the mass emission rate and, using the stack dry mass flow rate, calculate the mass emission rate, then convert to grams per hour (see section B.12). This results in a mass emission rate of 158.1 g/hr.

Step 2: Use the mass emission rate and the boiler fuel feed rate to create CAC production rate to fuel consumption to create an emission factor

$$= \frac{\text{CAC release (g/hr)}}{\text{Fuel feed rate during testing (kg/hr)}}$$

Example: The TPM emissions being released from the stack are the result of combustion in a bituminous coal fired boiler. The stack testing results were based on a one-hour test period. The fuel feed rate of the boiler during the test was 25 kg bituminous coal per hour.

$$= \frac{158.1 \text{ g TPM released/hr}}{25 \text{ kg bitumous coal burned/hr}}$$

$$= \frac{6.324 \text{ g TPM released}}{\text{kg bitumous coal burned}}$$

$$= \frac{6.324 \text{ kg TPM released}}{\text{tonne bitumous coal burned}}$$

Step 3: Use the emission factor calculated above along with the boiler's specific total annual consumption of bituminous coal.

Example: The boiler in question burned 218.85 tonnes of bituminous coal in the reporting year. The calculated emission factor for TPM for this boiler was 6.324 kg per tonne bituminous coal burned.

$$= \frac{6.324 \text{ kg TPM released}}{\text{tonne bitumous coal burned}} \times 218.85 \text{ tonnes bituminous coal burned}$$

$$= 1\ 384 \text{ kg TPM released}$$
$$= 1.384 \text{ tonnes TPM released}$$

B.15 Calculating CAC releases from source testing and total production data

Another method that can be used to estimate CAC releases is to correlate stack testing data with the facility's production data. Most facilities participating in a stack testing program will have information on the production rate during the test period and total annual production. This data can be used to more accurately estimate CAC releases, taking into account the process variations and production rates. For example, this method can be used if the process line is only operational for part of the year or the production rate fluctuates with demand for the product.

To illustrate this method, the data from the example in section B.13 was assigned to the fluidized bed prilling process used in urea production.

Step 1: Calculate the stack's volumetric gas flow rate ($\dot{\text{V}}$) and correct the stack gas flow rate for the moisture content and standard conditions (see section B.13). This results in a dry stack volumetric gas flow rate of 925.84 m^3/min.

Step 2: Use the stack flow rate (m^3/min) to convert to a mass emission rate.

Example: VOCs are emitted from a stack at a rate of 60 µg/m^3. The dry volumetric stack flow rate is 925.84 m^3/min.

$$= 925.84 \text{ m}^3/\text{min} \times 60 \text{ µg}/\text{m}^3 \times 60 \text{ minute/hour}$$
$$= 3\ 333\ 024 \text{ µg/hour}$$
$$= 3.33 \text{ g/hour}$$

Step 3: Use the mass emission rate and the facility's production rate to create an emission factor for CAC releases to total production

$$= \frac{\text{CAC release (g/hour)}}{\text{Facility production rate during testing (tonnes product produced/hour)}}$$

The facility's production rate can be in tonnes product produced, number of units produced or any other applicable measure of production. Likewise, the CAC release could be in any units of mass. This example will use tonnes product produced and grams of substance released to illustrate the process.

Example: The VOC emissions being released from the stack are the result of the fluidized bed prilling processes used in urea production. The stack testing results were based on a one-hour test period. The production rate of the facility during the test was 23 tonnes of urea per hour.

$$= \frac{3.33 \text{ g VOC released/hour}}{23 \text{ tonnes urea produced/hour}}$$

$$= \frac{0.145 \text{ g VOC released}}{\text{tonne urea produced}}$$

Step 4: Use the emission factor calculated above along with the facility's total annual production of urea.

Example: The facility in question produces a total of 203 210 tonnes of urea in the reporting year. The emission factor, calculated above, for VOCs from the fluidized bed prilling process, was 0.145 g per tonne urea produced.

$$= \frac{0.145 \text{ g VOC released}}{\text{tonne urea produced}} \times 203\ 210 \text{ tonnes urea produced}$$

$$= 29\ 465.45 \text{ g VOC released}$$
$$= 0.029 \text{ tonnes VOC released}$$

Appendix C – Conversion factors

Table 25. General conversion factors from imperial to metric units

Convert from	To	Multiply by
pounds (lb)	kilograms (kg)	0.453592
ton (short ton)	Tonnes	0.907185
foot (ft)	metre (m)	0.304804
gallon (U.S. gal)	litres (L)	3.785412
cubic foot (ft^3)	cubic metre (m^3)	0.0283168

Table 26. Power and energy conversions from imperial to metric units

Convert from	To	Multiply by
million BTUs/hour	kilowatts (kW)	293.1
million BTUs/hour	Horsepower (Hp)	393
million BTUs	kilojoules (kJ)	1.055 million
million BTUs	Gigajoules (GJ)	1.055

Table 27. Emission factor conversions from imperial to metric units

Convert from	To	Multiply by
lb/1 000 gal	kg/1 000 L	0.1198
lb/ton	kg/tonne	0.5
lb/million BTUs	kg/million BTUs	0.454
lb/1 000 ton	kg/1 000 tonnes	0.5
lb/million ft^3	kg/million m^3	16.018

Appendix D – Reporting requirements for individual stacks

D.1 Reporting criteria for individual stacks

CAC and speciated VOC releases to air must be assigned to individual stacks or flares when all of the following criteria are met:

- The facility-wide release threshold is met (see Table 28),
- The stack release threshold is met (see Table 28),
- The height of the stack or the effective height of the flare is ≥ 25 m or more above grade (including the height of any building that the stack or flare is on), and
- The annual average exit temperature of the stack or flare is either not measured or is ≥ 50°C or more

Table 28. Facility-wide and stack-specific release thresholds for criteria air contaminants and speciated VOCs

Substance part	Substance	Facility-wide release threshold (tonnes)	Stack release threshold (tonnes)
Part 4	Carbon monoxide	20	10
	Nitrogen oxides (expressed as nitrogen dioxide)		
	Sulphur dioxide	20	25
	Total particulate matter		
	Particulate matter ≤ 10 micrometres (PM_{10})	0.5	0.5
	Particulate matter ≤ 2.5 micrometres ($PM_{2.5}$)	0.3	0.25
	Volatile organic compounds (total)	10	5
Part 5	Speciated VOCs	1(1)	0.25(1)

(1) The 1-tonne facility-wide threshold and 0.25-tonne stack threshold applies to each of the speciated VOCs individually, as opposed to the total of speciated VOCs.

Note that the threshold for the average annual exit temperature can only be applied if the exit temperature is determined through measurement. Estimations, values supplied by manufacturers, values used for the purposes of obtaining an operating approval or permit and default values cannot be used to compare to the temperature threshold.

Figure 16 illustrates the steps for determining if report for Part 4 or Part 5 substances for individual stacks are required for Case 1 and 2 facilities. Case 1 facilities must include releases of CACs and speciated VOCs from all sources when determining if the stack air release threshold is met. Case 2 facilities are required to include only releases of CACs and speciated VOCs from stationary combustion equipment when determining if the stack air release threshold is met.

Figure 16. Reporting for individual stacks and flares – Case 1 and 2 facilities

Substance	Stack release threshold
NOx	10 tonnes
SO_2	25 tonnes
CO	10 tonnes
VOCs (total)	5 tonnes
TPM	25 tonnes
PM_{10}	0.5 tonnes
$PM_{2.5}$	0.25 tonnes
Speciated VOCs	0.25 tonnes

D.2 Reporting releases of criteria air contaminants from individual stacks

If the reporting criteria are met for a stack or flare, releases to air of that CAC must be assigned to that stack or flare.

Case 1 facilities must report all releases from all sources. Case 2 facilities should only report releases from stationary combustion equipment.

D.2.1 Releases from specified sources

Quantities of CACs released from each stack that meets the criteria must be reported separately for each of the following categories, defined below:

1. Stationary fuel combustion for energy purposes
2. Combustion of fuels for non-energy purposes
3. Flaring
4. Use of fuels for non-energy products
5. Releases from all other sources not included in the above categories

Where possible, in instances where industrial process emissions are produced in combination with emissions from fuel combusted to supply energy, the emissions are to be calculated and reported separately. In cases where it is not possible to calculate emissions separately, co-mingled emissions would be reported based on the primary purpose of the unit of operation. Facilities must provide a detailed comment to explain that combined emissions are being reported, including an estimate of the percentage contribution of each category where possible.

Stationary fuel combustion for energy purposes

Stationary fuel combustion emissions: emissions resulting from the oxidation of solid, liquid, and gaseous fuels from stationary fuel combustion sources for the purpose of producing heat or work (electricity and thermal and mechanical energy).

Stationary fuel combustion sources: stationary devices that combust either a mix of or a specific type of solid, liquid, gaseous and waste fuels for the purpose of producing heat or work (electricity, and thermal and mechanical energy). This includes boilers, electricity generating units, cogeneration units, combustion turbines, engines, incinerators with heat capture and use, heaters, kilns, furnaces, burners, ovens (including coke ovens), dryers, and any other stationary combustion devices, but does not include flares.

Combustion of fuels for non-energy purposes

Releases resulting from the oxidation of a fuel not for generating heat or work, for example, when the fuel is used as a reductant. When a fuel is used as both reductant and fuel in a process, the corresponding release would be considered for non-energy purposes; examples include blast furnaces in iron and steel plants, and smelting of base metals. Incineration without energy recovery falls into this category.

Flaring

Flaring emissions: releases resulting from the controlled combustion of a gas or liquid stream produced at the facility, the purpose of which is not to produce useful heat or work. This includes releases from: waste petroleum incineration; hazardous emission prevention systems (in pilot or active mode); well testing; natural gas gathering systems; natural gas processing plant operations; crude oil production; pipeline operations; petroleum refining; chemical fertilizer production; and steel production.

Use of fuels for non-energy products

Releases resulting from the use of a fuel as an input to a chemical reaction to produce a non-energy product, such as the production of hydrogen (in stand-alone hydrogen plants only), ammonia or ethylene.

Releases from all other sources not included in the above categories

Any other activities that generate stack releases that are not covered under one of the above categories. This applies to Case 1 facilities only, which must report for all sources of emissions if thresholds are met. Case 2 facilities are only required to report combustion emissions under one or more of the categories above.

D.2.2 Fuel type(s)

Where a release quantity is reported for a stack under any of the first four source categories described above, the type(s) of fuel associated with the releases must also be reported. For the purposes of reporting to the NPRI, fuels are categorized as follows:

- Solid fossil fuels
- Liquid fossil fuels – refined petroleum products
- Gaseous fossil fuels
- Natural gas liquids
- Industrial production by-products used as fuel
- Biomass/biofuels
- Waste materials
- Other fuels

Definitions of each of the fuel types are provided in the following sections.

Solid fossil fuels

Coal: A sedimentary deposit composed predominantly of carbon which has a composition (including inherent moisture) consisting of more than 50% by weight and more than 70% by volume of carbonaceous material. Coal is formed from plant remains that have been compacted, hardened, chemically altered, and metamorphosed by heat and pressure over geologic time. The four types of coal are generally considered to be anthracite, bituminous, sub-bituminous and lignite.

Petroleum coke: A black solid residue, obtained mainly by cracking and carbonizing of petroleum derived feedstocks, vacuum bottoms, tar and pitches in processes such as delayed coking or fluid coking. It consists mainly of carbon (90-95%), has low ash content, and may be used as a feedstock in coke ovens.

Coke (from metallurgical coal): Solid carbonaceous residue derived from low-ash, low-sulphur bituminous coal from which the volatile constituents are driven off by baking in an oxygen free atmosphere (in coke ovens) at high temperatures so that the fixed carbon and residual ash are fused together.

Coke breeze: Fine sizes of crushed coke that will usually pass through a 1-2 cm screen opening and which is commonly used to produce iron ore pellets.

Liquid fossil fuels – refined petroleum products

Heavy fuel oil (HFO): A mixture of hydrocarbons composed of residual fractions from crude oil distillation and processing, characterized by its black colour, high specific gravity and high viscosity. HFO is usually composed of carbon (86% wt.), hydrogen (11% wt.) and sulphur, however it also contains impurities such as ash, metals and water. HFO is sometimes referred to as bunker fuel, or residual fuel oil. Within Canada there are three main categories of HFO:

- Type 4 is an industrial type of fuel intended primarily for burner installations not equipped with preheating facilities (viscosity of 15 centistokes at 40°C).
- Type 5 is a residual type of oil for burner installations equipped with preheating facilities requiring an oil with lower viscosity than Type 6 (viscosity of 50 centistokes at 40°C).

- Type 6 is a high-viscosity residual oil (360 centistokes at 40°C) for use in burner installations equipped with preheating facilities adequate for handling oil of high viscosity.

In Canada, HFO must meet the requirements of the National Standard of Canada CAN/CGSB-3.2-2020.

Light fuel oil (LFO): A crude oil distillate, light in colour, composed mostly of carbon (86% wt.), hydrogen (13% wt.) and sulphur (0.1 to 0.2% wt.) with trace amounts of ash and sediments. Since LFO is only slightly viscous (in the range of 1.2 to 3.6 centistokes at 40°C), it can be used without preheating. There are three types of LFO, type 0, 1, and 2, which are used mostly for the generation of heat in domestic and small commercial liquid-fuel burning equipment. In Canada, LFO must meet the requirements of CAN/CGSB-3.2-2020.

Kerosene: A light petroleum distillate typically used in space heaters, cook stoves and water heaters and which is suitable for use as a light source when burned in wick-fed lamps. Kerosene has a maximum distillation temperature of 204°C at the 10% recovery point and a final boiling point of 300°C. In Canada, kerosene must meet the requirements of CAN/CGSB-3.3-2019.

Diesel fuel: Middle distillate fuel composed of conventional hydrocarbons, synthetic hydrocarbons or mixtures of conventional and synthetic hydrocarbons that boils in the range of 130–400°C and that is intended for use as fuel in compression-ignition engines. In Canada, diesel fuel must meet the requirements of CAN/CGSB-3.517-2020.

Gasoline: A petroleum distillate, or a mixture of petroleum distillates, oxygenates or additives, that is suitable for use in a spark ignition engine and that has the following characteristics, as determined from the applicable test method listed in CAN/CGSB-3.5-2016:

- a vapour pressure of at least 35 kPa;
- an antiknock index of at least 80;
- a distillation temperature at which 10% of the fuel has evaporated of not less than 35°C and not greater than 70°C; and
- a distillation temperature at which 50% of the fuel has evaporated of not less than 60°C and not greater than 120°C.

Naphtha: A refined or partially refined petroleum fraction with an approximate boiling temperature between 50-204°C other than aviation gasoline, aviation turbo fuel, gasoline, heavy fuel oil, kerosene, light fuel oil or petroleum coke. Products that might meet the definition of naphtha but are not suitable to be put into a fuel system that produces heat or energy and is not burned or flared (such as some solvents) are not included in this definition. In Canada, naphtha used as fuel must meet the requirements of CAN/CGSB-3.27-2018.

Gaseous fossil fuels

Natural gas: An odorless, gaseous mixture of hydrocarbons, predominantly made up of methane (CH_4).

Natural gas liquids

Propane (C_3H_8): A straight-chain saturated aliphatic hydrocarbon extracted from natural gas or refinery gas streams which is odorless, colourless and flammable. It is gaseous at standard temperature and pressure, however can also take liquid form when kept under pressure such as when stored in a propane tank. An odorant (e.g. ethyl mercaptan) is added for leak detection. In Canada, propane used as fuel must meet the requirements of CAN/CGSB-3.14-2018.

Butane (C_4H_{10}): A straight-chain or branch-chain colourless and odorless flammable hydrocarbon extracted from natural gas or refinery gas streams, which is gaseous at standard temperature and pressure, but condenses into a liquid when pressurized. The compound in which the carbon atoms are linked in a straight chain is called normal butane, or n-butane; the branched-chain form is isobutane.

Ethane (C_2H_6): A straight-chain saturated (paraffinic) colourless, flammable hydrocarbon extracted predominantly from natural gas streams and to a lesser extent, refinery gas streams. It is gaseous at standard temperature and pressure.

Other natural gas liquids (NGLs): extracted as a mixture of hydrocarbons and other gases, are produced and separated during either natural gas processing or crude oil refining. NGLs include ethane, propane, butane, isobutane, and pentanes plus. Pentanes plus is a mixture of hydrocarbons and includes isopentane, normal pentane, natural gasoline, plant condensates and hexane plus.

Industrial production by-products used as fuel

Coke oven gas: A by-product gas (containing hydrogen, methane, light oil, ammonia, pitch, tar and other minerals) generated during the production of metallurgical coke in a coke oven battery, where metallurgical coal is carbonized by heating it in the absence of air at temperatures in excess of 1 000°C.

Blast furnace gas: A by-product gas generated in a blast furnace when iron ore is reduced through the combustion of coke to metallic (liquid) iron. It typically contains about 20-30% carbon monoxide (CO) and about 2-6% hydrogen (H_2) as combustible components, and a significant amount of inert gases with about 45-60% nitrogen (N_2), and 20-25% carbon dioxide (CO_2).

Basic oxygen furnace gas: During the process of steelmaking in a basic oxygen furnace, oxygen (O_2) is blown in the charge mix and due to the chemical reactions taking place in the converter vessel, a large amount of (basic oxygen furnace) gas at high temperature and rich in carbon monoxide (CO) is generated.

Spent pulping liquor: The residual liquid collected from on-site pulping operations at chemical pulp facilities that is subsequently fired in chemical recovery furnaces at kraft and soda pulp facilities or chemical recovery combustion units at sulphite or semi-chemical pulp facilities. Spent pulping liquor is primarily made up of lignin, other wood constituents and chemicals that are by-products of the manufacture of chemical pulp.

Refinery still gas: Any form or mixture of gases produced in refineries during the processing of crude oil into various petroleum products through such processes as distillation, cracking, reforming, etc. The principal constituents are typically methane, ethane, ethylene, normal butane, butylene, propane, propylene, etc., although the actual composition directly depends on the type of crude oil used as feedstock.

Hydrogen (H_2): The lightest of all gases, occurring chiefly in combination with oxygen in water; exists also in acids, bases, alcohols, petroleum, and other hydrocarbons. Hydrogen is generated as a by-product from some industrial chemical processes such as ethylene production, chlorine and sodium hydroxide (caustic) production, methanol production from natural gas, carbon black production from natural gas and sodium chlorate production. This hydrogen is typically burned as a fuel on-site and/or, in some cases, captured and sold to third parties.

Chemical plant fuel gases: Any form or mixture of residual process gases generated within chemical plants (e.g. ethylene or carbon black plants) during the manufacture of chemical products, which is subsequently used as fuel in the plant.

Biomass/biofuels

Wood and wood byproducts/residues: Includes wood and wood byproducts/residues generated from a wide range of activities, including but not limited to:

- wood harvested from forest thinning and fuels reduction activities in managed woodlands, urban tree trimmings and forest-derived fuels like the tops of sawn logs, wood chips and slash;
- waste residue generated when manufacturing wood-based products such as lumber, furniture, pallets, and paper; and
- waste generated during construction and demolition operations.

Agricultural waste: Use of residual agricultural waste materials such as damaged hay, straw, corn stalks, nut shells, orchard prunings, etc. for fuel, typically, although not necessarily, in pellet form.

Peat: A soft, crumbly, dark brown heterogeneous mixture of partly decomposed organic matter, derived mostly from plant material, that has accumulated under conditions of waterlogging, oxygen deficiency, high acidity and nutrient deficiency over a long period of time. Peat contains energy that the plants it contains created using photosynthesis.

Biochar: A black, highly porous, carbonaceous, lightweight, fine-grained solid substance that is made by burning organic material generally from agricultural and forestry wastes at temperatures higher than 250°C in a low- or no-oxygen atmosphere in a controlled process called pyrolysis. Gasification can also be used to produce biochar, however it produces a smaller char yield compared with pyrolysis.

Charcoal: A solid fuel used for heating and cooking that results from the carbonization of solid biomass, typically wood.

Ethanol: A liquid alcohol produced biologically from the fermentation of various sugars from carbohydrates found in agricultural crops and cellulosic residues contained in crops or wood residue. Fuel ethanol has been distilled and dehydrated to create a high-octane, water-free alcohol. Ethanol is often used as a gasoline octane enhancer and oxygenate, and is commonly blended into gasoline at varying concentrations.

Biodiesel: A biodegradable fuel made up of mono-alkyl esters of long chain fatty acids derived entirely from biological matter (e.g. soybean, canola or other vegetable oil, recycled cooking oil, animal fats). Biodiesel is made through a chemical process called transesterification which is a reaction between the oil or animal fat with an alcohol and a catalyst resulting in two products – methyl esters (i.e. biodiesel) and glycerin. Biodiesel can be used as a pure product (B100) or a blend with petroleum-based diesel fuel (e.g., B20) and should meet the requirements of CAN/CGSB-3.524-2017.

Glycerol ($C_3H_8O_3$): A trivalent alcohol that is also known as glycerine, it is an organic co-product of biodiesel production. Depending upon the feedstock used during biodiesel production, glycerol may contain alcohol, water, catalyst, and a host of other organic material collectively called MONG (matter organic non-glycerol).

Bio-oil/pyrolysis oil: A liquid biofuel produced through pyrolysis which rapidly heats biomass (typically to 350-650°C) in an oxygen-free environment to a carefully controlled temperature and then very quickly cools the volatile products formed during the reaction to produce a dark brown water-based emulsion composed of fragments of the original hemicellulose, cellulose and lignin molecules contained in the biomass.

Biogas: A gas mixture composed mainly of methane (CH_4) and carbon dioxide (CO_2), along with water and other trace gases. Biogas results from a natural degradation process of biomass performed by a large variety of micro-organisms. Included in this category are landfill gas and sludge gas (sewage gas and gas from animal slurries) as well as other forms of biogas. The ‘bio’ aspect of biogas refers to its biological production process and renewable (biomass) origin, in opposition to ‘natural gas’ which is of fossil origin.

Syngas: A gas mixture composed primarily of hydrogen (H_2) and carbon monoxide (CO) along with hydrocarbons from the thermochemical decomposition of organic or inorganic materials. Syngas is chemically similar to natural gas and is produced from bio-fuels, oil shale, lignite coal or landfill gas. It is also referred to as substitute natural gas or synthetic natural gas.

Biobutanol: A fermentation isobutyl alcohol that is derived from biomass feedstocks. It must meet ASTM international specification D7862 for butanol for blending with gasoline for use as automotive spark-ignition engine fuel.

Waste materials

Tires: A component that is designed to surround the rim of a vehicle’s wheel and has an actual weight of one kilogram or more. A "waste tire" is a tire that is no longer mounted on a vehicle and is no longer suitable for use as a vehicle tire due to wear, damage, or deviation from the manufacturer’s original specifications. A waste tire includes scrap tires or repairable tires, and includes various types of waste fuel products derived from tires – such as tire derived fuel or tire derived chips.

Plastics: A material made from linking monomers through a chemical reaction to create a polymer chain that can be molded or extruded at high heat into various solid (though sometimes flexible) forms retaining their defined shapes during their life cycle and after disposal. Plastics can include material derived from either petroleum or a biologically based polymer, such as corn or other plant sources.

Municipal solid waste: Material that is composed of residential, commercial, and institutional solid waste and which is managed at waste disposal, recycling or composting sites. This definition specifically excludes: (i) hazardous waste; (ii) liquid industrial waste; (iii) gaseous waste; (iv) agricultural wastes; (v) mining wastes; (vi) liquid effluents discharged from processing or manufacturing sites; (vii) nuclear wastes; (viii) auto hulks; (ix) pathological wastes; and (x) gravel and rocks.

Used oil and lubricants: A petroleum-derived, mineral-based, bio-based or synthetic product (semi-solid or liquid) including engine oil, hydraulic fluid, transmission fluid, gear oil, heat transfer fluid, or other oil or fluid utilized for lubrication or heat-transfer that as a result of its use, storage or handling, is altered so that it is no longer suitable for its intended purpose but is suitable for re-refining or other permitted uses (e.g. energy recovery).

Sewage sludge: Solid, semi-solid, or liquid residue which contains materials removed from municipal or domestic wastewater during secondary treatment. Sewage sludge does not include ash generated in a sewage sludge incinerator, grit and screenings generated during preliminary treatment of domestic sewage in a treatment works, animal manure, residue generated during treatment of animal manure, or domestic septage.

Asphalt shingles: A small unit of prepared roofing for installation with similar units in overlapping rows, with one or more layers of felt (organic or fiberglass) impregnated and coated on both sides with asphalt and surfaced with mineral granules or an alternative surfacing material that provides protection for the asphaltic coating.

Refuse derived fuel: A waste fuel produced by shredding and dehydrating solid waste. It mainly consists of combustible components of municipal and industrial waste such as paper, wood and plastics. It can be sold in its processed form, or it can be compressed into pellets, bricks, or logs.

Other wastes: New waste products suitable for use as fuel are being identified on an on-going basis. This category includes any waste material that does not fall under the other waste types already identified and defined within the waste materials category.

Other fuels

Any other substances or materials used as fuel that does not fall under any of the categories described above.

D.3 Reporting releases of speciated VOCs from individual stacks

The total quantity of each speciated VOC must be reported for each individual stack that meets thresholds. Unlike total VOCs under Part 4, quantities of speciated VOCs do not need to be reported separately by source and the fuel type(s) associated with speciated VOC releases do not need to be reported.

Case 1 facilities must report all releases from all sources. Case 2 facilities should only report releases from stationary combustion equipment.

D.4 Information on stacks and flares to be reported

D.4.1 Stack/flare identification

Stack name

Each stack/flare is required to have a name, which should be as descriptive as possible to help users of the data better understand the purpose of the stack/flare and the sources associated with it.

Latitude and longitude

The latitude and longitude of each stack/flare must be reported in decimal degrees to at least five decimal places.

Provincial or territorial identification number(s)

The provincial or territorial identification number (e.g., as specified in a provincial or territorial approval or permit) for each stack/flare must be reported, where available or applicable.

D.4.2 Stack parameters (excluding flares)

Stack parameters that are reported to the NPRI should be based on measurements or estimations made at the source or in similar installations, or on values supplied by manufacturers. Default values used for modelling and permissible maximum values should not be used. Calculations may be made, based upon specific equations, to develop representative values for the effective stack parameters (see below), however this is typically only done in the case of flares. For other (i.e., non-flare) stacks, the use of representative/effective stack parameters generally should not be the norm.

Stack height

The physical height of the stack (in metres) from ground level to the level at which emissions occur. This is also referred to as the height of the stack above grade. The physical height of the stack is determined by taking the measurement from ground level to the exit level of the stack. If a stack is located on top of a building, the height of the building must be added to the height of the stack.

Stack exit diameter

The inner physical diameter (in metres) at the exit level of the stack.

If the opening at the top of the stack is circular, stack exit diameter can be calculated as follows:

$$d = 2\sqrt{\frac{A}{\pi}}$$

Where:
d = diameter (m)
A = cross-sectional area (m^2)
π = 3.1416 (approximately)

If the opening at the top of the stack is not circular, equivalent diameter and hydraulic diameter can be calculated as follows:

Equivalent diameter

$$d_{eq} = 2\sqrt{\frac{L \times W}{\pi}}$$

Where:
d_{eq} = equivalent diameter (m)
L = length (m)
W = width (m)
π = 3.1416 (approximately)

Hydraulic diameter

$$d_h = 2\left(\frac{L \times W}{L + W}\right)$$

Where:
d_h = hydraulic diameter (m)
L = length (m)
W = width (m)

Average stack exit velocity

The annual average exit velocity (in metres/second) of the gas where it exits the stack.

If unknown, the stack exit velocity can be computed from flow rate and stack diameter for rectangular and circular stacks as follows:

Rectangular stacks

$$v = \frac{\dot{V}}{A}$$

Where:
v = exit velocity (m/s)
$\dot{V}$ = *volumetric flow rate* (m^3/s)
A = *stack area* (m^2)

Circular stacks

$$v = \frac{4Q}{\pi d_s^2}$$

Where:
v = exit velocity (m/s)
Q = flow rate (m^3/s)
π = 3.1416 (approximately)
d_s = stack exit diameter (m)

Exit temperature

The annual average temperature [in degrees Celsius (°C)] of the released gas when it exits the stack, if known. If the actual temperature is not known, the facility can report the annual average stack exit temperature that was used for the purposes of obtaining a current approval or a permit, or can indicate that the annual average exit temperature is unknown. Due to the wide variety of possible non-flare stacks, ECCC does not recommend a default exit temperature for non-flare stacks.

D.4.3 Flare parameters

The unique exhaust characteristics of flares necessitate the calculation and use of exhaust effective “pseudo-parameters” to appropriately characterize the flare, in order to ensure that the resulting plume rise and plume spread are reasonably representative. The pseudo-stack parameters that are required are: (i) effective stack height; (ii) effective stack diameter; (iii) effective stack exit velocity; and (iv) effective stack exit temperature. It is these pseudo stack parameters that are required – not the actual dimensions of the flare (i.e., actual flare height or actual flare diameter) or conditions at the flare nozzle (i.e. flare exit velocity, flare exit temperature).

Facilities should refer to guidance that has been provided directly by their respective provincial ministry of the environment or contained in the air emissions dispersion guidance document that is available in their province, if such guidance is available. This guidance may have already been used by facilities for air dispersion modelling activities that the facility has been required to undertake in support of their operating permit. The same values should be reported to the NPRI.

In the absence of such provincial guidance, facilities can use the following Ontario Ministry of the Environment and Climate Change guidance to determine pseudo-parameters for flares.

Effective stack height

The following equations should be used to estimate the effective stack height:

$$H_{eff} = H_s + 4.56 \times 10^{-3} \times \left(\frac{Q_n}{4.1868}\right)^{0.478}$$

$$Q_n = Q_T \times (1 - f)$$

Where:
H_{eff} = effective stack height (m) [includes the physical stack height plus the flame length, and assumes 45° flame tilt due to wind]
H_s = physical stack height above ground (m)
Q_n = net heat released (J/s)
Q_T = total heat available from combustion (J/s) [sensible and radiative heat available estimated based on the properties of the flared gas stream including the pilot fuel and combustible lift gas]
f = % heat lost by radiation [a function of the molecular weight of the flared gas stream. Flares with smoky, dark plumes lose more heat via radiation (i.e., higher value for f) than clean burning flares with no visible plumes]

Ranges of molecular weights of the gas stream to be flared corresponding to a given f value are outlined in Table 29 [Ontario Ministry of the Environment and Climate Change (OMECC), 2017]. Facilities should calculate the molecular weight of their flared gas stream, based on the documented and/or measured composition considering all potential chemical constituents (e.g., flare gas, non-inert lift or sweep gas, etc.) and then select the corresponding f value. In the absence of sufficient documentation to verify or support the composition and calculation of the molecular weight, facilities should use an f value of 55% in calculations.

Table 29. Radiative heat loss (f values) based on molecular weight

Molecular weight (gram/mole)	Radiative heat loss values (f values)
≤20	25%
21-35	30%
36-50	35%
51-65	40%
66-80	45%
81-95	50%
>95	55%

Effective stack diameter

If province-specific guidance is not available, the following equation should be used to estimate the effective stack diameter (OMECC, 2017):

$$d_{eff} = 2 \times \sqrt{\frac{(F_{b,actual} \times T_{stack})}{g \times v_{eff} \times (T_{stack} - T_{amb})}}$$

Where:
d_{eff} = effective diameter at the flame tip (m)
$F_{b,actual}$ = buoyancy flux (m^4/s^3)
T_{stack} = combusted gas temperature (K) [Ontario assumes 1273 K]
g = acceleration due to gravity (9.81 m/s^2)
v_{eff} = effective velocity at the flame tip (m/s) [minimum value = 1.5 m/s]
T_{amb} = ambient temperature (K)

Effective stack exit velocity

If province-specific guidance is not available, the following equations should be used to estimate the effective stack exit velocity (OMECC, 2017):

$$v_{eff} = g \times \frac{F_m}{F_b} \times \frac{(T_{stack} - T_{amb})}{T_{amb}}$$

Where:
v_{eff} = effective velocity at the flame tip (m/s)
g = acceleration due to gravity (9.81 m/s^2)
F_m = momentum flux (m^4/s^2)
F_b = buoyancy flux (m^4/s^3) (K) [Ontario assumes 1273 K]
T_{amb} = ambient temperature (K)

$$F_m = \frac{\rho_{gas}}{\rho_{air} \times 4} \times d_{nozzle}^2 \times v_{nozzle}^2$$

Where:
F_m = momentum flux (m^4/s^2)
ρ_{gas} = density of gas to be flared (kg/m^3)
ρ_{air} = density of ambient air (kg/m^3)
d_{nozzle} = flare nozzle diameter (m)
v_{nozzle} = actual gas exit velocity (including lift gas) at flare nozzle before combustion (m/s)

$$F_{b,actual} = g \times \frac{Q_n}{(\pi \times \rho_{air} \times T_{amb} \times C_{p,air})}$$

Where:
F_b = buoyancy flux (m^4/s^3)
g = acceleration due to gravity (9.81 m/s^2)
Q_n = net heat release rate (J/s)
ρ_{air} = density of air at ambient temperature and pressure (kg/m^3)
T_{amb} = ambient temperature (K)
$C_{p,air}$ = specific heat of dry air constant at T_{amb} (J/kg-K)

If information is not available to a facility to undertake the above calculations, then a default value of 20 m/s should be used.

Effective stack exit temperature

The annual average temperature [in degrees Celsius (°C)] of the released gas when it exits the stack. If the actual temperature is not known, the facility can report the annual average stack exit temperature that was used for the purposes of obtaining a current approval or a permit, or a default value of 1 000°C can be used, or the facility can indicate that the annual average exit temperature is unknown.

D.5 Exemptions from individual stack reporting requirements

D.5.1 Exemptions for certain types of facilities

Certain facilities in the oil and gas extraction except oil sands sector (NAICS code 211110) with fewer than ten employees are exempt from individual stack reporting requirements ("Case 3" and "Case 4" facilities). Releases from stacks and flares at these facilities still need to be reported, just not at the individual stack level.

D.5.2 Exemptions for certain sources

Stacks and vents from storage tanks that emit releases at or near ambient temperatures are exempt from individual stack reporting requirements. Releases from these tanks still need to be reported, just not at the individual stack level.

D.5.3 Exemptions based on stack characteristics

The following types of stacks are exempted from individual stack reporting requirements: horizontal or non-vertical stacks (e.g., gooseneck shape), and vertical stacks with rain caps. Releases from these stacks must still be reported as part of stack or point releases, but do not need to be reported separately at the individual stack level.

D.6 Stack grouping

Similar stacks can be reported as a group instead of individually, if certain conditions are met. If a facility has received prior permission from a regulatory authority to group stacks for air dispersion modelling for the purposes of obtaining approval or a permit (e.g., Ontario's Environmental Compliance Approval), then the facility is allowed to report for those stacks as a group to the NPRI. If no prior permission has been obtained, ECCC will allow reporting of more than one stack as a group, provided the following conditions are met:

- The grouped stacks are ≥25 m and <50 m in height. Stacks ≥50 m in height cannot be grouped and will continue to be reported individually.
- The grouped stacks must be within 250 m of the approximate geographic centre of the group;
- Releases from the grouped stacks must be ±35% of the average releases from all stacks in the group; and
- The stack height, inside diameter, exit temperature and exit velocity must be within ±35% of the average.
- Total releases from the grouped "stack" are greater than or equal to the stack air release threshold.

When reporting for a grouped or virtual stack:

- The stack name needs to include the word "group" and the number of stacks included in the group;
- The average height, inside diameter, and exit temperature and velocity need to be reported for the group;
- The geographic coordinates of the approximate centre of the group must be reported;
- A list of the stacks in each group, and information on their characteristics, provincial identification numbers and latitude and longitude need to be provided to ECCC (by email to inrp-npri@ec.gc.ca); and
- Total releases from each grouped "stack" would be reported through the reporting software or bulk upload.

Appendix E – Supplemental information on volatile organic compounds

Table 30 shows the substances that are listed in Part 5, along with the synonyms and common names of those substances, where applicable. Where more than one CAS RN applies, Table 30 also lists the names and CAS RNs that must be reported. These CAS RNs are for information only and do not necessarily include all the CAS RNs that may apply to the group or mixture. Also note that isomers of the listed substances may exist in mixtures of isomers, and the CAS RNs of these mixtures of isomers may not necessarily be listed in Table 30.

Table 30. Speciated VOCs, their synonyms, and substances that must be reported

Substance name	CAS RN† or NPRI substance identifier*	Synonym(s)	Substance(s) that must be reported	CAS RNs that must be reported
Acetylene	74-86-2	Ethyne	Acetylene	74-86-2
Analytically unresolved hydrocarbons (C_{10} to C_{16}+)	NA - 44	Unresolved hydrocarbons (URHCs)	Analytically unresolved hydrocarbons (C_{10} to C_{16}+)	Various
Benzene	71-43-2	Cyclohexatriene, phenyl hydride	Benzene	71-43-2
1,3-Butadiene	106-99-0	Vinyl ethylene, biethylene, bivinyl	1,3-Butadiene	106-99-0
Butane (all isomers)	NA - 24	C4 paraffins, C4 alkanes	*n*-Butane	106-97-8
			Isobutane	75-28-5
Butene (all isomers)	25167-67-3	C4 olefin, C4 alkenes, butylene	Butene (mixed isomers)	25167-67-3
			1-Butene	106-98-9
			2-Butene (mixed isomers)	107-01-7
			Isobutylene	115-11-7
			cis-2-Butene	590-18-1
			trans-2-Butene	624-64-6
2-Butoxyethanol	111-76-2	Butyl cellosolve, *n*-butoxyethanol, EGBE	2-Butoxyethanol	111-76-2
Butyl acetate (all isomers, exlcuding *tert*-butyl acetate)	NA - 41	Acetic acid, *n*-butyl ester, 1-acetoxybutane, 1-butyl acetate	*n*-Butyl acetate	123-86-4
			Isobutyl acetate	110-19-0
			sec-Butyl acetate	105-46-4
Cycloheptane (all isomers)	NA - 25	C7 cycloparaffins, C7 cycloalkanes, C2 cyclopentane	Methylcyclohexane	108-87-2
			1,2-Dimethylcyclopentane	1192-18-3
			1,1-Dimethylcyclopentane	1638-26-2
			Ethylcyclopentane	1640-89-7
			1,3-*trans*-Dimethylcyclopentane	1759-58-6
			1,3-Dimethylcyclopentane	2453-00-1
			1,3-Dimethylcyclopentane	2532-58-3

Substance name	CAS RN† or NPRI substance identifier*	Synonym(s)	Substance(s) that must be reported	CAS RNs that must be reported
			trans-1,2-Dimethylcyclopentane	28729-52-4
			Cycloheptane	291-64-5
			1,2-Dimethylcyclopentane	822-50-4
Cyclohexene (all isomers)	NA - 26	C6 cycloalkenes	Cyclohexene	110-83-8
			3-Methylcyclopentene	1120-62-3
			1,2-Dimethylcyclobutene	1501-58-2
			4-Methylcyclopentene	1759-81-5
			1-Methylcyclopentene	693-89-0
Cyclooctane (all isomers)	NA - 27	C8 cycloparaffins, C8 cycloalkanes, C2 cyclohexane	1-Ethyl-1-methylcyclopentane	16747-50-5
			Ethylcyclohexane	1678-91-7
			Propylcyclopentane	2040-96-2
			cis-1,2-Dimethylcyclohexane	2207-01-4
			trans-1,3-Dimethylcyclohexane	2207-03-6
			trans-1,4-Dimethylcyclohexane	2207-04-7
			cis,cis-1,2,3-Trimethylcyclopentane	2613-69-6
			Dimethylcyclohexane	27195-67-1
			Cyclooctane	292-64-8
			Trimethylcyclopentane	30498-64-7
			Isopropylcyclopentane	3875-51-2
			Methylcycloheptane	4126-78-7
			1,1,2-Trimethylcyclopentane	4259-00-1
			1,1,3-Trimethylcyclopentane	4516-69-2
			cis,cis,trans-1,2,4-Trimethylcyclopentane	4850-28-6
			1,2-Dimethylcyclohexane	583-57-3
			1,4-Dimethylcyclohexane	589-90-2
			1,1-Dimethylcyclohexane	590-66-9
			1,3-Dimethylcyclohexane	591-21-9
			cis-1,4-Dimethylcyclohexane	624-29-3
			cis-1,2-Dimethylcyclohexane	638-04-0
			trans-1,2-Dimethylcyclohexane	6876-23-9
			cis-1-Methyl-2-ethylcyclopentane	930-89-2
			trans-1-Ethyl-2-methylcyclopentane	930-90-5
Decane (all isomers)	NA - 28	C10 paraffins, C10 alkanes	2,2,5,5-Tetramethylhexane	1071-81-4
			2,7-Dimethyloctane	1072-16-8
			Decane	124-18-5
			2,2,3,3-Tetramethylhexane	13475-81-5
			2-Methyl-3-ethylheptane	14676-29-0
			2,2,4-Trimethylheptane	14720-74-2
			5-Methylnonane	15869-85-9
			4-Ethyloctane	15869-86-0
			2,2-Dimethyloctane	15869-87-1
			3,5-Dimethyloctane	15869-93-9
			3,6-Dimethyloctane	15869-94-0
			4,4-Dimethyloctane	15869-95-1
			2,2,4,5-Tetramethylhexane	16747-42-5
			4-Methylnonane	17301-94-9

Substance name	**CAS RN† or NPRI substance identifier***	**Synonym(s)**	**Substance(s) that must be reported**	**CAS RNs that must be reported**
			3-Ethyl-3-methylheptane	17302-01-1
			3,3,4-Trimethylheptane	20278-87-9
			3,4,5-Trimethylheptane	20278-89-1
			2,6-Dimethyloctane	2051-30-1
			2,4,6-trimethylheptane	2613-61-8
			Isodecane	34464-38-5
			2,3,6-Trimethylpentane	4032-93-3
			3,3-Dimethyloctane	4110-44-5
			3,3,4,4-Tetramethylhexane	5171-84-6
			4-Isopropylheptane	52896-87-4
			3-Ethyloctane	5881-17-4
			3-Methylnonane	5911-04-6
			n-Decane	63335-87-5
			2,3-Dimethyloctane	7146-60-3
			3,3,5-Trimethylheptane	7154-80-5
			Tetramethylhexane	79004-85-6
			2-Methylnonane	871-83-0
p-Dichlorobenzene	106-46-7	1,4-Dichlorobenzene, *p*-chlorophenyl chloride, PDCB	*p*-Dichlorobenzene	106-46-7
1,2-Dichloroethane	107-06-2	Ethylene dichloride, Freon 150	1,2-Dichloroethane	107-06-2
Dimethylether	115-10-6	Methyl ether, methoxymethane	Dimethylether	115-10-6
Ethanol	64-17-5	Ethyl alcohol, ethyl hydroxide, methylcarbinol	Ethanol	64-17-5
Ethyl acetate	141-78-6	Ethyl acetic ester, acetoxyethane	Ethyl acetate	141-78-6
Ethylene	74-85-1	Ethene	Ethylene	74-85-1
Ethyltoluene (all isomers)	NA - 42	*o*-Ethyltoluene, *o*-methylethylbenzene, *m*-ethyltoluene, *p*-ethylmethylbenzene, *p*-ethyltoluene	2-Ethyltoluene	611-14-3
			3-Ethyltoluene	620-14-4
			4-Ethyltoluene	622-96-8
Formaldehyde	50-00-0	Methyl aldehyde, methylene glycol, oxomethane	Formaldehyde	50-00-0
Furfuryl alcohol	98-00-0	2-Furancarbinol, furanol, 2-furanmethanol	Furfuryl alcohol	98-00-0
Heavy aromatic solvent naphtha	64742-94-5	Solvent naphtha (petroleum), heavy aromatic, heavy aromatic naphtha, high-flash aromatic naphtha	Heavy aromatic solvent naphtha	64742-94-5

Substance name	CAS RN† or NPRI substance identifier*	Synonym(s)	Substance(s) that must be reported	CAS RNs that must be reported
Heptane (all isomers)	NA - 31	C7 paraffins, C7 alkanes, isomers of heptane	2,4-Dimethylpentane	108-08-7
			n-Heptane	142-82-5
			Methylhexane	25495-88-9
			Isoheptane	31394-54-4
			Dimethylpentane	38815-29-1
			2,2,3-Trimethylpentane	464-06-2
			3,3-Dimethylpentane	562-49-2
			2,3-Dimethylpentane	565-59-3
			3-Methylhexane	589-34-4
			2,3-Dimethylpentane	590-35-2
			2-Methylhexane	591-76-4
			3-Ethylpentane	617-78-7
			Isohexane	73513-42-5
n-Hexane	110-54-3	Normal hexane, dipropyl, hexyl hydride	*n*-Hexane	110-54-3
Hexane (all isomers, excluding *n*-hexane)	NA - 32	C6 paraffins, C6 alkanes	Isohexane	107-83-5
			2,2- or 2,3-Dimethylbutane	38719-68-5
			Methylpentane	43133-95-5
			2,2-Dimethylpentane	75-83-2
			2,3-Dimethylpentane	79-29-8
			3-Methylpentane	96-14-0
Hexene (all isomers)	25264-93-1	C6 olefins, C6 alkenes	Hexene	25264-93-1
			2-Methylpent-1-ene	27236-46-0
			2-Methyl-2-pentene	37275-41-5
			4-Methyl-2-pentene	4461-48-7
			3,3-Dimethyl-1-butene	558-37-2
			2,3-Dimethyl-1-butene	563-78-0
			2,3-Dimethyl-2-butene	563-79-1
			1-Hexene	592-41-6
			trans-2-Hexene	592-43-8
			trans-3-Hexene	592-47-2
			2-Methyl-2-pentene	625-27-4
			4-Methyl-1-pentene	691-37-2
			3-Methyl-1-pentene	760-20-3
			2-Ethyl-1-butene	760-21-4
			2-Methyl-1-pentene	763-29-1
			cis-3-Hexene	7642-09-3
			(Z)-2-Hexene	7688-21-3
Hydrotreated heavy naphtha	64742-48-9	Naphtha (petroleum), hydrotreated heavy, hydrotreated light steam cracked naphtha residuum (petroleum), low boiling point hydrogen treated naphtha	Hydrotreated heavy naphtha	64742-48-9

Substance name	CAS RN† or NPRI substance identifier*	Synonym(s)	Substance(s) that must be reported	CAS RNs that must be reported
Hydrotreated light distillate	64742-47-8	Hydrotreated kerosene, distillate fuel oils, light, distillates (petroleum), hydrotreated light	Hydrotreated light distillate	64742-47-8
Isopropyl alcohol	67-63-0	2-Propanol, isopropanol, rubbing alcohol	Isopropyl alcohol	67-63-0
Light aromatic solvent naphtha	64742-95-6	Aromatic naphtha, type 1, high flash aromatic naphtha (HFAN)	Light aromatic solvent naphtha	64742-95-6
D-Limonene	5989-27-5	D-1,8-*p*-Menthadiene	D-Limonene	5989-27-5
Methanol	67-56-1	Methyl alcohol, wood alcohol, monohydroxymethane	Methanol	67-56-1
Methyl ethyl ketone	78-93-3	2-Butanone, methyl acetone	Methyl ethyl ketone	78-93-3
Methyl isobutyl ketone	108-10-1	Hexanone, isopropylacetone	Methyl isobutyl ketone	108-10-1
Methylcyclopentane	96-37-7	Methyl cyclopentane, methylpentamethylene	Methylcyclopentane	96-37-7
Mineral spirits	64475-85-0		Mineral spirits	64475-85-0
Myrcene	123-35-3	7-Methyl-3-methylene-octadiene	Myrcene	123-35-3
Naphtha	8030-30-6	Benzine, light ligroin, petroleum distillates (naphtha), rubber solvent (naphtha)	Naphtha	8030-30-6
Nonane (all isomers)	NA - 33	C9 paraffins, C9 alkanes	Tetraethylmethane	1067-20-5
			4,4-Dimethylheptane	1068-19-5
			3-Ethyl-2,4-dimethylpentan	1068-87-7
			2,3,5-Trimethylhexane	1069-53-0
			2,2,4,4-Tetramethylpentane	1070-87-7
			2,2-Dimethylheptane	1071-26-7
			2,6-Dimethylheptane	1072-05-5
			Nonane	111-84-2
			2,2,3,4-Tetramethylpentane	1186-53-4
			3-Ethylheptane	15869-80-4
			2,2,3-Trimethylhexane	16747-25-4
			2,2,4-Trimethylhexane	16747-26-5
			4,4-Dimethylheptane	16747-30-1
			3,3,4-Trimethylhexane	16747-31-2
			3-Ethyl-2,2-dimethylpentane	16747-32-3
			2,3,3,4-Tetramethylpentane	16747-38-9
			3-Ethyl-2-methylhexane	16789-46-1
			2,4-Dimethylheptane	2213-23-2
			2,5-Dimethylheptane	2216-30-0

Substance name	CAS RN† or NPRI substance identifier*	Synonym(s)	Substance(s) that must be reported	CAS RNs that must be reported
			4-Ethylheptane	2216-32-2
			3-Methyloctane	2216-33-3
			4-Methyloctane	2216-34-4
			2,2-Dimethylheptane	26447-41-6
			2-Methyloctane	30498-66-9
			2,3-Dimethylheptane	3074-71-3
			4-Ethyl-2-methylhexane	3074-75-7
			3-Ethyl-4-methylhexane	3074-77-9
			2-Methyloctane	3221-61-2
			2,2,5-Trimethylhexane	3522-94-9
			3,3-Dimethylheptane	4032-86-4
			2,2,3-Trimethylhexane	60265-51-2
			n-Nonane	61193-19-9
			2,2,3,3-Tetramethylpentane	7154-79-2
			2,3,4-Trimethylhexane	921-47-1
			3,4-Dimethylheptane	922-28-1
			3,5-Dimethylheptane	926-82-9
Octane (all isomers)	NA - 34	C8 paraffins, C8 alkanes	3-Ethyl-3-methylpentane	1067-08-9
			3-Methylheptane	111002-96-1
			n-Octane	111-65-9
			2-Methylheptane	28777-67-5
			Trimethylpentane	29222-48-8
			Methylheptane	50985-84-7
			2,2,4-Trimethylpentane	540-84-1
			2,3,3-Trimethylpentane	560-21-4
			3,3-Dimethylhexane	563-16-6
			2,2,3-Trimethylpentane	564-02-3
			2,3,4-Trimethylpentane	565-75-3
			3,4-Dimethylhexane	583-48-2
			2,3-Dimethylhexane	584-94-1
			2,4-Dimethylhexane	589-43-5
			4-Methylheptane	589-53-7
			3-Methylheptane	589-81-1
			2,2-Dimethylhexane	590-73-8
			2,5-Dimethylhexane	592-13-2
			2-Methylheptane	592-27-8
			2,2,3,3-Tetramethylbutane	594-82-1
			3-Ethyl-2-methylpentane	609-26-7
			3-Ethylhexane	619-99-8
			Ethylmethylpentane	79914-21-9
Other glycol ethers and acetates (limited to 18 substances and their isomers)	NA - 45		2-butoxyethanol acetate, EGBEA	112-07-2
			2-(2-ethoxyethoxy)-ethanol acetate, DGEEA	112-15-2
			2-(hexyloxy)ethanol, EGHE	112-25-4
			2-(2-butoxyethoxy)ethanol, DGBE	112-34-5
			1-butoxy-2-Propanol, PGBE, PnB	5131-66-8

Substance name	CAS RN† or NPRI substance identifier*	Synonym(s)	Substance(s) that must be reported	CAS RNs that must be reported
			1(or 2)-Butoxypropanol, PGBE, PnB	29387-86-8
			1-Methoxy-2-propanol, PGME, PM	107-98-2
			PGME, PM	1589-42-7
			1(or 2)-Methoxypropanol, PGME, PM	1320-67-8
			2-(1-Methylethoxy)ethanol, 2-isopropoxyethanol, EGiPE	109-59-1
			2-(2-Ethoxyethoxy)ethanol, DGEE	111-90-0
			2-(2-Butoxyethoxy)ethanol acetate, DGBEA	124-17-4
			1-Propoxy-2-propanol, PGPE	1569-01-3
			Propoxy propanol, PGPE	30136-13-1
			1-Ethoxy-2-propanol, PGEE	1569-02-4
			1(or2)-Ethoxypropanol, ethoxy propanol, PGEE	52125-53-8
			2-Propoxyethanol, EGPE	2807-30-9
			1-(1-Methyl-2-propoxyethoxy)-2-propanol, dipropylene glycol *n*-propyl ether, DPGPE, DGPE, DPnP	29911-27-1
			1-(2-Butoxy-1-methylethoxy)-2-propanol, DGBE, DPnB	29911-28-2
			1-(3-Butoxypropoxy)propan-1-ol, DGBE, DPnB	35884-42-5
			1(or 2)-(2-Methoxymethylethoxy)propanol, DPGME, DGME, DPM	34590-94-8
			1-(2-Methoxypropoxy)-2-propanol, DPGME, DGME, DPM	13429-07-7
			1-(2-Methoxy-1-methylethoxy)-2-propanol, DPGME, DGME, DPM	20324-32-7
			2-(2-Methoxypropoxy)propan-1-ol, DPGME, DGME, DPM	13588-28-8
			2-(2-Methoxy-1-methylethoxy)-1-propanol, DPGME, DGME, DPM	55956-21-3
			Ethoxy propyl acetate, PGEEA	54839-24-6
			1,2-Propyleneglycol diacetate, 1,2-Propanediol diacetate, PGDA	623-84-7
			1(or 2)-(2-Methoxymethylethoxy)propanol acetate, DPGMEA, DGMEA, DPMA	88917-22-0
Pentane (all isomers)	NA - 35	C5 paraffins, C5 alkanes	Pentane	102056-77-9
			n-Pentane	109-66-0
			2,2-Dimethylpropane	463-82-1
			Isopentane	78-78-4
Pentene (all isomers)	NA - 36	C5 olefin, C5 alkenes, amylene	1-Pentene	109-67-1
			2-Pentene	109-68-2
			Pentene	25377-72-4
			2-Methyl-1-Butene	26760-64-5
			2-Methyl-2-butene	513-35-9
			3-Methyl-1-butene	563-45-1

Substance name	CAS RN† or NPRI substance identifier*	Synonym(s)	Substance(s) that must be reported	CAS RNs that must be reported
			2-Methyl-1-butene	563-46-2
			(Z)-*cis*-2-Pentene, 2-Pentene	627-20-3
			(E)-*trans*-2-Pentene, 2-Pentene	646-04-8
			trans-Pent-2-ene	68527-11-7
beta-Phellandrene	555-10-2	1(7)-2-*p*-Menthadiene	beta-Phellandrene	555-10-2
alpha-Pinene	80-56-8	Cyclic dexadiene	alpha-Pinene	80-56-8
beta-Pinene	127-91-3	Nopinene	beta-Pinene	127-91-3
Propane	74-98-6	Dimethylmethane, liquefied propane, propyl hydride	Propane	74-98-6
Propyl acetate (all isomers)	NA - 43	1-Acetoxypropane, 2-acetoxypropane, propyl ethanoate	Isopropyl acetate	108-21-4
			Propyl acetate	109-60-4
n-Propyl alcohol	71-23-8	1-Propanol, 1-propyl alcohol	*n*-Propyl alcohol	71-23-8
Propylene	115-07-1	Propene	Propylene	115-07-1
Propylene glycol methyl ether acetate (PGMEA; all isomers)	108-65-6	Propylene glycol monomethyl ether acetate, acetic acid, 2-methoxy-1-methyl ethyl ester, 1-methoxy-2-acetoxypropane	alpha-PGMEA	108-65-6
			beta-PGMEA	70657-70-4
			mixtures of PGMEA	84540-57-8
Solvent naphtha light aliphatic	64742-89-8	Solvent naphtha (petroleum), light aliphatic, light aliphatic solvent naphtha, light aliphatic solvent naphtha (petroleum)	Solvent naphtha light aliphatic	64742-89-8
Solvent naphtha medium aliphatic	64742-88-7	Solvent naphtha (petroleum), medium aliphatic, medium aliphatic solvent naphtha, medium aliphatic solvent naphtha (petroleum)	Solvent naphtha medium aliphatic	64742-88-7
Stoddard solvent	8052-41-3	White spirits, high flash naphtha, safety solvent naphtha	Stoddard solvent	8052-41-3
Styrene	100-42-5	Phenylethylene, vinyl benzene	Styrene	100-42-5
Tetrahydrofuran	109-99-9	Butylene oxide, cyclotetramethylene oxide, diethylene oxide	Tetrahydrofuran	109-99-9
Toluene	108-88-3	Methylbenzene, phenyl methane	Toluene	108-88-3
1,2,4-Trimethylbenzene	95-63-6	Pseudocumene	1,2,4-Trimethylbenzene	95-63-6
	25551-13-7		Trimethylbenzene (mixed isomers)	25551-13-7

Substance name	CAS RN† or NPRI substance identifier*	Synonym(s)	Substance(s) that must be reported	CAS RNs that must be reported
Trimethylbenzene (all isomers, excluding 1,2,4-trimethylbenzene)			1,2,3-Trimethylbenzene	526-73-8
			1,3,5-Trimethylbenzene	108-67-8
Vinyl acetate	108-05-4	Acetic acid ethylene ether	Vinyl acetate	108-05-4
VM & P naphtha	8032-32-4	Ligroine	VM & P naphtha	8032-32-4
Xylene (all isomers)	1330-20-7		Xylene (mixed isomers)	1330-20-7
			m-Xylene	108-38-3
			o-Xylene	95-47-6
			p-Xylene	106-42-3

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* NPRI Substance Identifiers (i.e., NA - ## and NA - M##) are used where no single CAS RN applies to a substance.

Appendix F – Individual CAS RNs of new substance groupings added to Part 1B of the NPRI substance list for 2025-2027

List of benzothiazoles that can form 2-mercaptobenzothiazole

CAS RN	Substance Name
149-30-4	2-Mercaptobenzothiazole or 2(3H)-Benzothiazolethione (MBT)
95-31-8	2-Benzothiazolesulfenamide, N-(1,1-dimethylethyl) (TBBS)
95-33-0	2-Benzothiazolesulfenamide, N-cyclohexyl- (CBS)
120-78-5	Benzothiazole, 2,2’-dithiobis- (MBTS)
2492-26-4	2(3H)-Benzothiazolethione, sodium salt (SMBT)
4979-32-2	2-Benzothiazolesulfenamide, N,N-dicyclohexyl- (DCBS)
95-29-4	2-Benzothiazolesulfenamide, N,N-bis(1-methylethyl)-
95-32-9	Benzothiazole, 2-(4-morpholinyldithio)-
102-77-2	Morpholine, 4-(2-benzothiazolylthio)-
155-04-4	2(3H)-Benzothiazolethione, zinc salt
3741-80-8	2-Benzothiazolesulfenamide, N-(2-benzothiazolylthio)-N-(1,1-dimethylethyl)-
7778-70-3	2(3H)-Benzothiazolethione, potassium salt
21564-17-0	Thiocyanic acid, (2-benzothiazolylthio)methyl ester
22405-83-0	Zinc, dichloro[2,2’-dithiobis[benzothiazole]]-, (T-4)-
32510-27-3	2(3H)-Benzothiazolethione, copper salt
38456-45-0	2(3H)-Benzothiazolethione, compd. with N-ethylethanamine (1:1)
65605-47-2	2(3H)-Benzothiazolethione, compd. with N-butyl-1-butanamine (1:1)
65605-48-3	2(3H)-Benzothiazolethione, compd. with N,N-diethylethanamine (1:1)
68911-68-2	Amines, C12-14-tert-alkyl, compds. with 2(3H)-benzothiazolethione
117920-00-0	Amines, C16-22-tert-alkyl, compds. with 2(3H)-benzothiazolethione (1:1)

List of long-chain aliphatic amines

CAS RN	Substance Name
112-69-6	1-Hexadecanamine, *N, N*-dimethyl-
124-30-1	1-Octadecanamine
61788-46-3[a]	Amines, coco alkyl
61789-79-5[a]	Amines, bis(hydrogenated tallow alkyl)
61790-59-8[a]	Amines, hydrogenated tallow alkyl, acetates
61790-60-1[a]	Amines, tallow alkyl, acetates
61791-55-7[a]	Amines, *N*-tallow alkyltrimethylenedi-
68479-04-9[a,b]	1,3-Propanediamine, *N*-[3-(tridecyloxy)propyl]-, branched

CAS RN	Substance Name
68783-25-5[a]	Amines, *N,N,N'*-trimethyl-*N'*-tallow alkyltrimethylenedi-
111-86-4	1-Octanamine
112-18-5	1-Dodecanamine, N,N-dimethyl-
112-75-4	1-Tetradecanamine, N,N-dimethyl-
112-90-3	9-Octadecen-1-amine, (Z)-
112-99-2	1-Octadecanamine, N-octadecyl-
124-22-1	1-Dodecanamine
124-28-7	1-Octadecanamine, N,N-dimethyl-
143-27-1	1-Hexadecanamine
929-73-7	1-Dodecanamine, hydrochloride
1120-24-7	1-Decanamine, N,N-dimethyl-
1613-17-8	1-Octadecanamine, N,N-dimethyl-, hydrochloride
1838-08-0	1-Octadecanamine, hydrochloride
1920-05-4	1-Dodecanamine, N,N-dimethyl-, acetate
2016-56-0	1-Dodecanamine, acetate
2016-57-1	1-Decanamine
2190-04-7	1-Octadecanamine, acetate
3007-31-6	1-Dodecanamine, N-dodecyl-
4455-26-9	1-Octanamine, N-methyl-N-octyl-
5538-95-4	1,3-Propanediamine, N-dodecyl-
7173-62-8	1,3-Propanediamine, N-9-octadecenyl-, (Z)-
7378-99-6	1-Octanamine, N,N-dimethyl-
7396-58-9	1-Decanamine, N-decyl-N-methyl-
10460-00-1	9-Octadecen-1-amine, (Z)-, acetate
13281-06-6	1,3-Propanediamine, N-(2-ethylhexyl)-
14676-61-0	1-Propanamine, 3-(tridecyloxy)-
19855-61-9	1-Octadecanamine, N,N-dimethyl-, acetate
22020-14-0	1-Decanamine, N-methyl-N-octyl-
22023-23-0	1,3-Propanediamine, N-[3-(tridecyloxy)propyl]-
24287-35-2	1-Tetradecanamine, N,N-dimethyl-, acetate
25324-14-5	1-Hexadecanamine, N,N-dimethyl-, acetate
28061-69-0	Octadecen-1-amine, N,N-dimethyl-
28701-67-9	1-Propanamine, 3-(isodecyloxy)-, acetate
29317-52-0	1-Propanamine, 3-(isononyloxy)-
30113-45-2	1-Propanamine, 3-(isodecyloxy)-
40165-68-2	9-Octadecen-1-amine, N-9-octadecenyl-, (Z,Z)-
50291-24-2	1-Dodecanamine, sulfate
61788-45-2	Amines, hydrogenated tallow alkyl
61788-62-3	Amines, dicoco alkylmethyl
61788-63-4	Amines, bis(hydrogenated tallow alkyl)methyl
61788-91-8	Amines, dimethyl soya alkyl
61788-93-0	Amines, coco alkyldimethyl
61788-95-2	Amines, (hydrogenated tallow alkyl)dimethyl
61789-76-2	Amines, dicoco alkyl

CAS RN	Substance Name
61790-18-9	Amines, soya alkyl
61790-33-8	Amines, tallow alkyl
61790-57-6	Amines, coco alkyl, acetates
65059-85-0	1-Heptadecanamine, N,N-dimethyl-, acetate
67700-98-5	Amines, C_{10-16}-alkyldimethyl
67700-99-6	Amines, di-C_{14-18}-alkylmethyl
68037-91-2	Amines, C_{14-18}-alkyl
68037-92-3	Amines, C_{16-22}-alkyl
68037-95-6	Amines, C_{16-18} and C_{18}-unsatd. alkyl
68037-98-9	Amines, di-C_{14-18}-alkyl
68130-68-7	1,3-Propanediamine, N-[3-(C_{12-18}-alkyloxy)propyl] derivs.
68155-38-4	Amines, C_{14-18} and C_{16-18}-unsatd. alkyl
68439-70-3	Amines, C_{12-16}-alkyldimethyl
68513-50-8	1-Tridecanamine, N-tridecyl-, branched
68603-64-5	Amines, N-(hydrogenated tallow alkyl)trimethylenedi-
68603-65-6	Amines, methylditallow alkyl
68610-26-4	1-Propanamine, 3-(C_{12-15}-alkyloxy) derivs.
68610-68-4	1-Propanamine, 3-(C_{8-10}-alkyloxy) derivs., acetates
68783-23-3	Amines, disoya alkyl
68783-24-4	Amines, ditallow alkyl
68784-38-3	1-Propanamine, 3-(C_{8-10}-alkyloxy) derivs.
68814-69-7	Amines, dimethyltallow alkyl
68855-63-0	Amines, C_{16} and C_{18}-unsatd. alkyl
68909-95-5	1-Propanamine, 3-(tridecyloxy)-, branched and linear
68955-53-3	Amines, C_{12-14}-tert-alkyl
68955-54-4	Amines, C_{16-22}-tert-alkyl
71011-01-3	Amines, bis(hydrogenated tallow alkyl), acetates
71011-03-5	Amines, ditallow alkyl, acetates
75444-69-8	Amines, C_{16-22}-alkyldimethyl
125328-36-1	Amines, C_{20-22}, acetates
125328-37-2	Amines, C_{20-22}-alkyl
125328-38-3	Amines, canola-oil alkyl
125328-39-4	Amines, N-canola-oil alkyltrimethylenedi-
125328-41-8	Amines, hydrogenated canola-oil alkyl
125328-42-9	Amines, (hydrogenated canola-oil alkyl)dimethyl
125328-43-0	Amines, hydrogenated rape-oil alkyl
125328-44-1	Amines, hydrogenated rape-oil alkyl, acetates
125328-45-2	Amines, hydrogenated tallow alkyl, distn., residues
125328-46-3	Amines, rape-oil alkyl
1078712-76-1	Amines, (2-ethylhexyl)(hydrogenated tallow alkyl)methyl

[a] This CAS RN is a UVCB (unknown or variable composition, complex reaction products, or biological materials).

[b] This the only substance that is proposed both eco-toxic and health toxic.

List of hydrogen cyanide, free cyanide, cyanide salts and cyanide complexes

CAS RN	Substance Name	Common name(s)
143-33-9	Sodium cyanide	Sodium cyanide
506-61-6	Argentate(1-), bis(cyano-C)-, potassium	Potassium dicyanoargentate
13967-50-5	Aurate(1-), bis(cyano-C)-, potassium	Potassium dicyanoaurate
13601-19-9	Ferrate(4-), hexakis(cyano-C)-, tetrasodium, (OC-6-11)	Tetrasodium ferrocyanide (Yellow prussiate of soda)
13746-66-2	Ferrate(3-), hexakis(cyano-C)-, tripotassium, (OC-6-11)-	Tripotassium ferricyanide
13943-58-3	Ferrate(4-), hexakis(cyano-C)-, tetrapotassium, (OC-6-11)-	Tetrapotassium ferrocyanide (Yellow prussiate of potash)
14038-43-8	Ferrate(4-), hexakis(cyano-C)-, iron(3+) (3:4), (OC-6-11)-	Ferric ferrocyanide or Prussian blue, insoluble
25869-00-5	Ferrate(4-), hexakis(cyano-C)-, ammonium iron(3+) (1:1:1),(OC-6-11)-	Ferric ammonium ferrocyanide
25869-98-1	Ferrate(4-), hexakis(cyano-C)-, iron(3+) potassium (1:1:1), (OC-6-11)-	Potassium ferric ferrocyanide (Turnbull's blue or Prussian blue, soluble)