



Supplementary Guide for Reporting to the National Pollutant Release Inventory

Alternate Thresholds

2000

Canadian Environmental Protection Act

Canada



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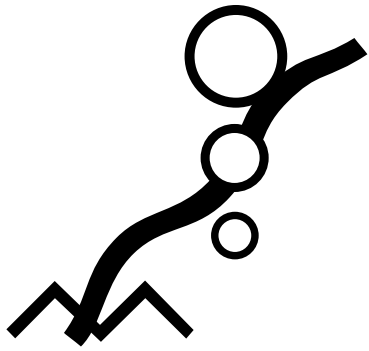
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Disclaimer

Should any inconsistencies be found between this *Supplementary Guide* and the official *Canada Gazette* notice and its amendment, the notice published on December 25, 1999, and the amendment published on December 23, 2000, in the *Canada Gazette* Part I will prevail.



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Preface

The National Pollutant Release Inventory (NPRI) is at the centre of Environment Canada's efforts to track toxic substances. It is the only nation-wide, publicly-accessible program of its type in Canada that provides information on pollutants released to the environment and transferred for disposal. Since its inception in 1992, the role of the NPRI has expanded to include the collection of information on NPRI substances being recycled and pollution-prevention activities. For the 2000 reporting year, there are 268 substances listed in the NPRI, 55 of which have been declared toxic under the *Canadian Environmental Protection Act*.

The original 10-tonne manufacture, process or other use reporting threshold applies to 248 substances in the NPRI for the 2000 reporting year. The remaining 20 substances have alternate reporting thresholds. These substances are discussed in this *Supplementary Guide* – mercury (and its compounds), 17 individual polycyclic aromatic hydrocarbons (PAHs), polychlorinated dibenzo-*p*-dioxins (dioxins)/ polychlorinated dibenzofurans (furans), and hexachlorobenzene (HCB).

This *Supplementary Guide* is intended to assist owners and operators of facilities to determine whether they must report for any of the substances with alternate reporting thresholds, to understand the reporting criteria and to estimate on-site releases and off-site transfers of the relevant substances.

This *Supplementary Guide* is a companion document to the *Guide for Reporting to the National Pollutant Release Inventory – 2000* which outlines the NPRI reporting criteria for all substances listed in the NPRI and assists facility owners and operators to determine if they are required to report to the NPRI for the 2000 reporting year. The *Guide for Reporting* also provides instructions on how to complete the electronic reporting form and submit the report to Environment Canada. Facilities used for wood preservation should also refer to the *Guidance for Wood Preservation Facilities Reporting to the National Pollutant Release Inventory*, which will be available in 2001.

Cette publication est aussi disponible en français sous le titre de « Guide supplémentaire de déclaration à l'Inventaire national des rejets de polluants – Autres Seuils – 2000 ». L'autre guide général mentionné est aussi disponible en français sous le titre de « Guide de déclaration à l'Inventaire national des rejets de polluants – 2000 ».

Introduction

1 Introduction

The National Pollutant Release Inventory (NPRI) was created in 1992 by Environment Canada to provide Canadians with information on pollutants released to their environment. NPRI data also support a wide range of environmental initiatives, including pollution-prevention and -abatement activities.

On December 25, 1999, the “Notice with Respect to Substances in the National Pollutant Release Inventory for 2000” was published in the *Canada Gazette*, Part I, under the authority of subsection 16(1) of the *Canadian Environmental Protection Act (CEPA)*, 1988. This notice specifies that any person owning or operating a facility that met the reporting criteria prescribed in the notice, provide this information to the Minister of the Environment by no later than **June 1, 2001**.

An amendment to the *Canada Gazette* notice was published on December 23, 2000, to provide clarification on the reporting criteria. The clarifications published in the amendment are included in this *Supplementary Guide*. In this document, all references to the 2000 *Canada Gazette* notice refer collectively to the notice published on December 25, 1999, and its amendment published on December 23, 2000.

The purpose of this *Supplementary Guide* is to assist owners and operators of facilities to understand the reporting criteria for substances with alternate thresholds, to determine if they must report for any of these substances, and to provide examples of how to estimate on-site releases and off-site transfers of these substances. The substances listed in the NPRI for 2000 with alternate reporting thresholds are:

- mercury (and its compounds)
- 17 individual polycyclic aromatic hydrocarbons (PAHs), and
- dioxins/furans and hexachlorobenzene (HCB).

The *Guide for Reporting to the National Pollutant Release Inventory – 2000* (referred to as the *Guide for Reporting*) details the information that is required and explains how to complete an NPRI report for all NPRI-listed substances.

More information on the NPRI is available on Environment Canada’s Web site at <www.ec.gc.ca/pdb/npri>.

1.1 Changes for 2000

Significant changes were made to the NPRI for the 2000 reporting year. These changes are outlined below and are discussed in detail in the subsequent chapters of this *Supplementary Guide*.

A facility is required to report to the NPRI if, during the 2000 calendar year:

- employees worked a total of 20 000 hours or more, or the facility was used for an activity to which the 20 000-hour employee threshold does not apply (employee criteria)

AND

- the facility met the reporting criteria for the given substance (substance criteria).

1.1.1 Clarification of the Terms “Used for” and “Engaged in”

If a facility was “used for” one of the activities not required to meet the 20 000-hour employee threshold, that facility was used primarily or exclusively for that activity.

If a facility was “engaged in” an activity, then that facility was engaged in the activity at any time during the year, regardless of extent or the primary purpose of the facility.

1.1.2 Activities to Which the 20 000-hour Employee Threshold does not Apply

In previous years, a facility was exempt from reporting to the NPRI if its employees worked less than 20 000 hours during the reporting year (equivalent to 10 full-time employees). Environment Canada has removed the 20 000-hour employee threshold for facilities used for certain types of incineration and for wood preservation (see Schedule 2, Part 5, of the 2000 *Canada Gazette* notice). This change was made because, although facilities used for these activities are known to release significant quantities of NPRI pollutants to the environment, they may not have been required to report to the NPRI since they did not meet the 20 000-hour employee threshold.

1.1.3 New Substances and their Reporting Criteria

For the 2000 reporting year, the NPRI list of substances (see Appendix 3) is divided into four parts in Schedule 1 of the 2000 *Canada Gazette* notice, because there now are four sets of substance-specific reporting criteria (outlined in Schedule 2). These changes are summarized below.

Schedule 1, Part 1, Substances

For 2000, there are 248 substances listed in Schedule 1, Part 1, of the 2000 *Canada Gazette* notice. A facility is required to report on-site releases and off-site transfers of a substance listed in Schedule 1, Part 1, that was manufactured, processed, or otherwise used in a quantity equal to or greater than 10 tonnes. Only NPRI Part 1 substances at a concentration equal to or greater than 1% by weight, and NPRI by-products at a concentration of less than 1% by weight are included in the calculation of the 10-tonne threshold.

Four substances were added to Schedule 1, Part 1, of the 2000 *Canada Gazette* notice with the reporting criteria outlined above (10-tonne threshold). The substances and their Chemical Abstracts Service (CAS) registry numbers are:

- acrolein (CAS No. 107-02-8)
- 4-*tert*-octylphenol (CAS No. 140-66-9)
- oxirane, methyl-, polymer with oxirane, mono(nonylphenyl)ether (CAS No. 37251-69-7), and
- polymeric diphenylmethane diisocyanate, commonly referred to as PMDI (CAS No. 9016-87-9).

Schedule 1, Part 2, Substances [Mercury (and its compounds)]

Mercury has been on the substance list since the inception of the NPRI. The need to lower the reporting threshold was identified during consultations with stakeholders (see Chapter 3). Starting in the 2000 reporting year, a facility is required to report on-site releases and off-site transfers of mercury (and its compounds) if they were manufactured, processed or otherwise used, at any concentration, in a quantity of 5 kg or more.

Schedule 1, Part 3, Substances [Polycyclic Aromatic Hydrocarbons (PAHs)]

Seventeen polycyclic aromatic hydrocarbons (PAHs) were added to the NPRI for 2000 at an alternate threshold. These 17 PAHs are listed in Schedule 1, Part 3, of the 2000 *Canada Gazette* notice, and in Table 2 (Chapter 4) of this *Supplementary Guide*. The reporting criteria are based on quantities released or transferred rather than quantities manufactured, processed or otherwise used, except in the case of wood preservation using creosote.

Reporting of one or more of the 17 PAHs is required if:

- any individual PAH (listed in Table 2) was incidentally manufactured and the quantity of **all** PAHs released on site or transferred off site as a result of incidental manufacture together totalled 50 kg or more,

OR

- any of the 17 individual PAHs was released on site or transferred off site from a wood-preservation process using creosote.

You must consider these 17 PAHs together, as a group, in determining whether your facility met the 50-kg threshold and must report for one or more of the 17 listed PAHs. On-site releases and off-site transfers must be reported individually for each of the 17 PAH substances that was incidentally manufactured and released or transferred. The reporting criteria for PAHs are discussed in detail in Chapter 4.

Schedule 1, Part 4, Substances [Dioxins/Furans and Hexachlorobenzene (HCB)]

Environment Canada added polychlorinated dibenzo-*p*-dioxins (dioxins) and polychlorinated dibenzofurans (furans) to the NPRI for 2000. These substances must be reported together, and include the 17 most toxic dioxin and furan congeners. These substances are referred to in this *Supplementary Guide* as dioxins/furans. Hexachlorobenzene (HCB) was also added to the NPRI for 2000. Dioxins/furans and HCB are listed in the NPRI in Schedule 1, Part 4, of the 2000 *Canada Gazette* notice.

Facilities engaged in certain activities identified in Schedule 2, Part 4, of the 2000 *Canada Gazette* notice and Tables 4 and 5 (Chapter 5) are required to report dioxins/furans and HCB to the NPRI, and there is no substance-based quantitative reporting threshold. Some of the information that must be reported to the NPRI for dioxins/furans and HCB may differ from the information required in other NPRI substance reports. Further information is provided in Chapter 5.

1.2 Consultations

In 1998, Environment Canada established the NPRI Multistakeholder Ad Hoc Work Group on Substances. The Work Group considered several substances for addition to the NPRI at alternate reporting thresholds. The substances considered pose serious risks to human health and/or the environment in relatively low quantities. Because very limited data, if any, would be reported to the NPRI at a 10-tonne manufacture, process or other use reporting threshold, alternate thresholds were implemented for these substances. The Work Group provided recommendations to Environment Canada regarding candidates for addition and discussed appropriate reporting criteria for these substances.

Mercury, PAHs, dioxins, furans and HCB are all on the List of Toxic Substances of the *CEPA* (1999). Dioxins, furans and HCB have been identified as Track 1 substances under the Toxic Substances Management Policy (TSMP) and are considered to be persistent, bioaccumulative and toxic substances. Further details on the consultations used to consider substances for addition to the NPRI at alternate thresholds are provided in Chapters 3 to 5, in Appendix 6, and on the NPRI Web site.

2 Overview of Reporting Criteria

2.1 Understanding the 2000 *Canada Gazette* Notice

Notices pertaining to reporting to the NPRI are published annually in the *Canada Gazette*, Part I.

Reference to the 2000 *Canada Gazette* notice includes the “Notice with Respect to Substances in the National Pollutant Release Inventory for 2000” published on December 25, 1999, and its amendment published on December 23, 2000. The 2000 *Canada Gazette* notice sets out the NPRI list of substances, the criteria for reporting, the types of information subject to the notice, and several definitions. An overview of the 2000 *Canada Gazette* notice follows.

The 2000 *Canada Gazette* notice is divided into four schedules with several parts in each.

Schedule 1 – National Pollutant Release Inventory Substances

Schedule 1 lists all substances in the NPRI, and is broken into the following four parts according to the reporting criteria for the substances:

- Part 1 lists the 248 substances to which the original NPRI reporting criteria apply (10-tonne, manufacture, process and other use reporting threshold with 1% concentration exemption, except for by-products)
- Part 2 lists mercury (and its compounds)
- Part 3 lists 17 individual PAHs, and
- Part 4 lists dioxins/furans and HCB.

Schedule 2 – Criteria for Reporting

- General - reporting deadline, exclusions and exemptions
- Part 1 - reporting criteria for substances listed in Schedule 1, Part 1
- Part 2 - reporting criteria for mercury (and its compounds) listed in Schedule 1, Part 2
- Part 3 - reporting criteria for the 17 PAHs listed in Schedule 1, Part 3
- Part 4 - reporting criteria for dioxins/furans and HCB listed in Schedule 1, Part 4, and
- Part 5 - five activities to which the 20 000-hour employee threshold does not apply.

Schedule 3 – Types of Information Subject to Notice

Schedule 3 outlines the types of information that must be submitted by facilities which met the reporting criteria defined in Schedule 2, including the information that is reported to the NPRI for each substance. Some information in Schedule 3 is applicable only to alternate-threshold substances (i.e., sections 5-8).

Schedule 4 – Definitions

Schedule 4 provides definitions of several terms used in the notice.

If you have any difficulties understanding the 2000 *Canada Gazette* notice, this *Supplementary Guide* or the *Guide for Reporting*, please contact your regional NPRI office listed inside the front cover.

Overview of Reporting Criteria

2.2 Steps for Reporting

Reporting for NPRI-listed substances is a two-step process as outlined below:

1. Determine if the reporting criteria have been met for a substance listed in the NPRI.

The reporting criteria for all substances listed in the NPRI are provided in the flowchart in Figure 1 (see section 2.3). The criteria for the Schedule 1, Part 1, substances are further explained in the *Guide for Reporting*. This *Supplementary Guide* explains the reporting criteria for the alternate-threshold substances.

2. Complete the NPRI report for that substance.

Once you have determined that your facility is required to report to the NPRI for a certain substance, you must report the required information (in most cases, the quantities of on-site releases and off-site transfers) for that substance. This *Supplementary Guide* explains in detail, the information that must be reported for alternate-threshold substances (see “What You Must Report” in Chapters 3 to 5). The *Guide for Reporting* details the information required in the substance report and how to complete the NPRI electronic reporting form for **all** NPRI-listed substances.

2.3 Determining Whether You Are Required to Report

In general, any person who owns or operates a facility must submit a report to the NPRI for a substance listed in Schedule 1 of the 2000 *Canada Gazette* notice if, during the 2000 calendar year:

- the facility was not exempt (see section 2.5)
- employees worked a total of 20 000 hours or more OR the facility was used for an activity to which the 20 000-hour employee threshold does not apply (see section 2.6), and
- the facility met the substance-specific reporting criteria for the NPRI-listed substance.

Figure 1 outlines the reporting criteria for all NPRI substances.

Details about the reporting criteria for mercury (and its compounds), PAHs, dioxins/furans, and HCB are in Chapters 3 to 5 of this *Supplementary Guide*. The lower reporting threshold (5 kg) for mercury (and its compounds) is based on quantities manufactured, processed or otherwise used. The reporting criteria for PAHs are based on the quantities released or transferred as a result of incidental manufacture. The reporting criteria for dioxins/furans and HCB are based on the activity in which the facility was engaged. There are special reporting criteria for PAHs, dioxins/furans and HCB for facilities used for wood preservation.

Chapter 6 summarizes the reporting criteria for facilities used for wood preservation. A facility used for wood preservation is required to report for PAHs if it used creosote, and to report for dioxins/furans and HCB if it used pentachlorophenol.

Further information, including an explanation and examples of calculating the reporting threshold for substances listed in Schedule 1, Part 1, of the 2000 *Canada Gazette* notice, can be found in the *Guide for Reporting*.

2.4 Facility

A “facility” refers to all buildings, equipment, structures and stationary items that are located on a single site or on contiguous or adjacent sites that are owned or operated by the same person and function as a single integrated site.

2.5 Exempt Facilities

Certain facilities, or parts thereof, as identified in the 2000 *Canada Gazette* notice are currently **exempt** from reporting to the NPRI. A facility, or any part thereof, is exempt from reporting if used exclusively for one of the following activities:

- educating or training students, such as universities, colleges and schools
- research or testing
- the maintenance and repair of transportation vehicles, such as automobiles, trucks, locomotives, ships or aircraft
- the distribution, storage or retail sale of fuels
- the wholesale or retail sale of articles or products which contain NPRI substances, provided that the substances are not released to the environment during normal use at the facility
- the retail sale of NPRI substances
- growing, harvesting or managing renewable natural resources, such as fisheries, forestry or agriculture, **but not** those facilities that process or otherwise use their products
- mining, **but not** those facilities engaged in further processing of mined materials
- drilling or operating wells to obtain oil and gas products, **but not** those facilities engaged in further processing of these oil and gas products, or
- the practice of dentistry.

2.6 Employee Criteria

A facility is not required to report to the NPRI if, during the 2000 calendar year:

- **the total number of hours worked by all employees was less than 20 000 hours (employee threshold),**

AND

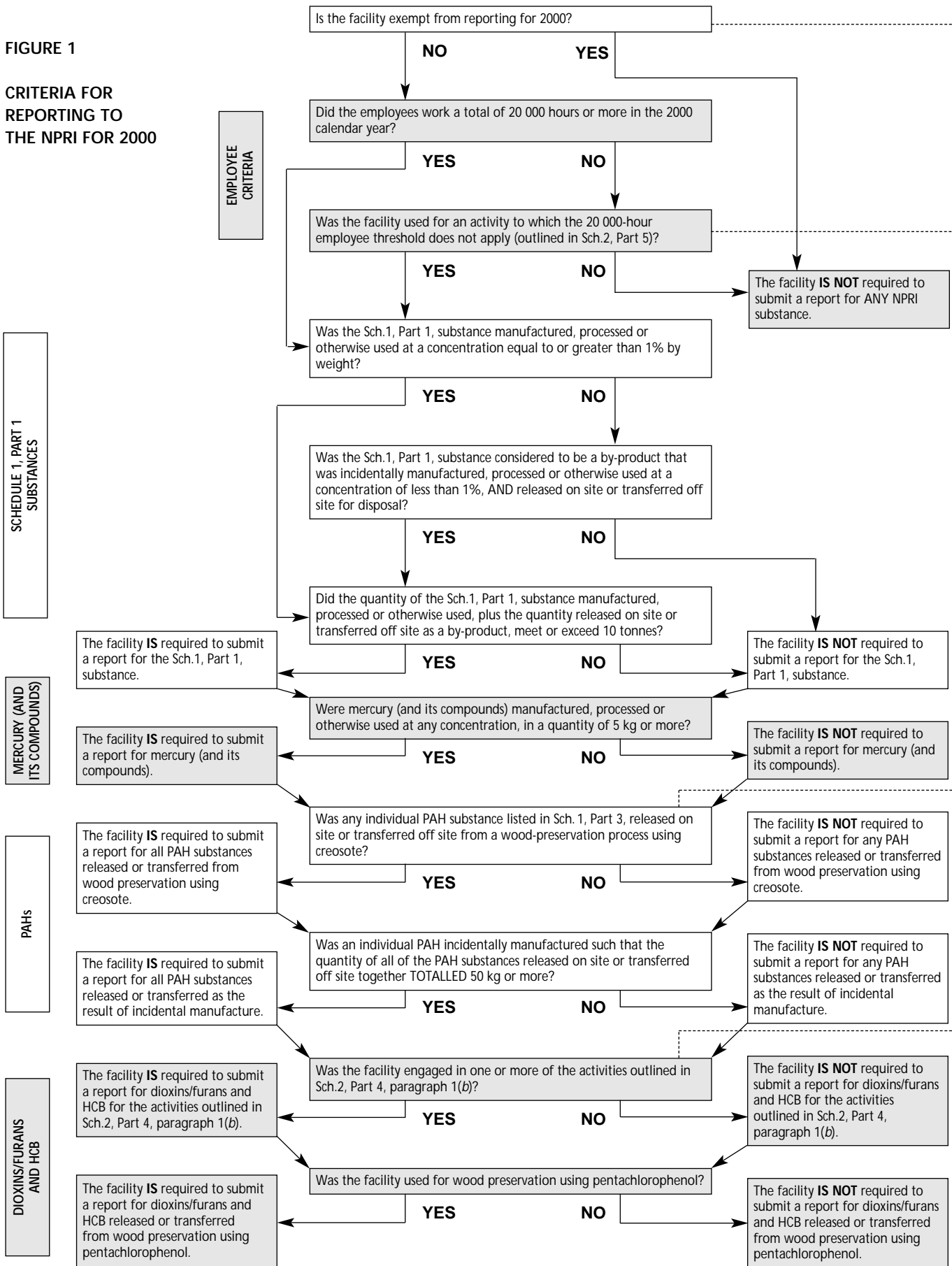
- **the facility was not used for any of the activities listed in Schedule 2, Part 5, of the 2000 *Canada Gazette* notice (see Table 1).**

The total number of hours worked includes paid vacation and sick leave. Owners, students, part-time and contract employees are included in this calculation. This threshold depends specifically on the number of hours worked by all employees at the facility during the calendar year and not on the number of persons working. When reporting to the NPRI, 10 “full-time employees” is equivalent to 20 000 hours worked.

2.7 Activities to Which the 20 000-hour Employee Threshold does not Apply

If your facility was **used for** any activity set out in Schedule 2, Part 5, of the 2000 *Canada Gazette* notice, you must submit a substance report for any NPRI substance that met its respective reporting criteria, regardless of the number of hours worked by employees. These activities are listed in Table 1 and further described below.

FIGURE 1
CRITERIA FOR
REPORTING TO
THE NPRI FOR 2000



A facility, or any part thereof, is exempt from reporting if it is used exclusively for one of the following activities (listed in Schedule 2, section 2, of the 2000 *Canada Gazette* notice):

- educating or training students, such as universities, colleges and schools
- research or testing
- the maintenance and repair of transportation vehicles, such as automobiles, trucks, locomotives, ships or aircraft
- the distribution, storage or retail sale of fuels
- the wholesale or retail sale of articles or products which contain NPRI substances, provided that the substances are not released to the environment during normal use at the facility
- the retail sale of NPRI substances
- growing, harvesting or managing renewable natural resources, such as fisheries, forestry or agriculture, **but not** those facilities that process or otherwise use their products
- mining, **but not** those facilities engaged in further processing of mined materials
- drilling or operating wells to obtain oil and gas products, **but not** those facilities engaged in further processing of these oil and gas products, or
- the practice of dentistry.

Was the facility used for any of the following activities to which the 20 000-hour employee threshold does not apply (listed in Schedule 2, Part 5, of the 2000 *Canada Gazette* notice)?:

- non-hazardous solid waste incineration of 100 tonnes or more of waste per year, including small combustion units, teepee burners and beehive burners
- biomedical or hospital waste incineration of 100 tonnes or more of waste per year
- hazardous waste incineration
- sewage sludge incineration, or
- wood preservation.

Seventeen individual PAHs are listed in Schedule 1, Part 3, of the 2000 *Canada Gazette* notice:

- | | | | |
|------------------------|------------|----------------------------|------------|
| • Benzo(a)anthracene | (56-55-3) | • Dibenzo(a,h)anthracene | (53-70-3) |
| • Benzo(a)phenanthrene | (218-01-9) | • Dibenzo(a,i)pyrene | (189-55-9) |
| • Benzo(a)pyrene | (50-32-8) | • 7H-Dibenzo(c,g)carbazole | (194-59-2) |
| • Benzo(b)fluoranthene | (205-99-2) | • Fluoranthene | (206-44-0) |
| • Benzo(e)pyrene | (192-97-2) | • Indeno(1,2,3-c,d)pyrene | (193-39-5) |
| • Benzo(g,h,i)perylene | (191-24-2) | • Perylene | (198-55-0) |
| • Benzo(j)fluoranthene | (205-82-3) | • Phenanthrene | (85-01-8) |
| • Benzo(k)fluoranthene | (207-08-9) | • Pyrene | (129-00-0) |
| • Dibenz(a,j)acridine | (224-42-0) | | |

Was the facility engaged in one or more of the following activities (listed in Schedule 2, Part 4, paragraph 1(b) of the 2000 *Canada Gazette* notice)?:

- non-hazardous solid waste incineration of 100 tonnes or more of waste per year, including small combustion units, teepee burners and beehive burners
- biomedical or hospital waste incineration of 100 tonnes or more of waste per year
- hazardous waste incineration
- sewage sludge incineration
- base metals smelting (copper, lead, nickel and zinc)
- smelting of secondary lead
- smelting of secondary aluminum
- manufacturing of iron using a sintering process
- operation of electric arc furnaces in steel manufacturing
- operation of electric arc furnaces in steel foundries
- production of magnesium
- manufacturing of portland cement
- production of chlorinated organic solvents or chlorinated monomers
- combustion of fossil fuel in a boiler unit, for the purpose of producing steam for the production of electricity, with a generating capacity of 25 megawatts or greater of electricity
- combustion of fuel in kraft liquor boilers used in the pulp and paper sector, or
- combustion of hog fuel originating from logs that were transported or stored in salt water in the pulp and paper sector.

Industrial classifications are a means of identifying different types of businesses and industries. The NPRI has adopted the North American Industry Classification System (NAICS) as the standard for identifying sectors. The NAICS codes listed in Table 1 are provided to help identify facilities that may be used for these activities, however **it is the activity and not the NAICS code that determines whether a facility is required to report to the NPRI for activities listed in Table 1.**

TABLE 1: ACTIVITIES TO WHICH THE 20 000-HOUR EMPLOYEE THRESHOLD DOES NOT APPLY

ACTIVITY	NAICS CODE
<i>Waste Incineration Activities</i>	
(a) non-hazardous solid waste incineration of 100 tonnes or more of waste per year, including small combustion units, teepee burners and beehive burners	5622
(b) biomedical or hospital waste incineration of 100 tonnes or more of waste per year	5622
(c) hazardous waste incineration	5622
(d) sewage sludge incineration	5622
<i>Wood Preservation Activity</i>	
(e) wood preservation (using heat or pressure treatment or both)	3211

2.7.1 Waste Incineration Activities

The first four activities listed in Table 1 are forms of waste incineration. ***Waste incineration***, for the purposes of the NPRI, only includes incineration that takes place in a waste incinerator. Waste incineration does not include open burning of wastes.

A ***waste incinerator*** is a device, mechanism or structure constructed primarily to thermally treat (e.g., combust or pyrolyze) a waste for the purpose of reducing its volume, destroying a hazardous chemical present in the waste, or destroying pathogens present in the waste. This includes facilities where waste heat is recovered as a by-product from the exhaust gases from an incinerator (e.g., energy-from-waste incinerators). This also includes conical (or teepee) 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.

a) Non-hazardous solid waste incineration of 100 tonnes or more of waste per year, including small combustion units, teepee burners and beehive burners

Non-hazardous solid waste means any waste, regardless of origin, which might normally be disposed of in a non-secure manner, such as at a sanitary landfill site, if not incinerated. 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 (e.g., pentachlorophenol) or decorative coatings. Non-hazardous solid waste incineration includes incineration of residential and other municipal wastes in conical (or teepee) burners, and clean wood waste in beehive burners.

A facility used for the incineration of 100 tonnes or more of non-hazardous solid waste per year is required to report to the NPRI if it met the substance criteria, regardless of the number of hours worked by employees.

b) *Biomedical or hospital waste incineration of 100 tonnes or more of waste per year*

Biomedical waste is defined fully in Appendix 4. Biomedical or hospital waste refers to waste that is generated by:

- human or animal health-care facilities
- medical or veterinary research and testing establishments
- health-care teaching establishments
- clinical testing or research laboratories, and
- facilities involved in the production or testing of vaccines.

Biomedical or hospital waste includes human anatomical waste and animal waste. It also includes microbiology laboratory waste, human blood and body fluid waste, and waste sharps that have not been disinfected or decontaminated. It does not include waste from animal husbandry, or waste that is controlled in accordance with the *Health of Animals Act* (Canada).

Wastes that are household in origin, or that are generated in the food production, general building maintenance and office administration activities of those facilities to which this definition applies, are not considered to be biomedical or hospital waste but rather to be non-hazardous solid waste.

A facility used for the biomedical or hospital waste incineration of 100 tonnes or more of waste per year is required to report to the NPRI if it met the substance criteria, regardless of the number of hours worked by employees.

c) *Hazardous waste incineration*

Hazardous waste is defined fully in Appendix 5. Hazardous waste includes those wastes that are potentially hazardous to human health and/or the environment because of their nature and quantity, and that require special handling techniques. Hazardous waste incinerators must be licensed by the responsible jurisdiction. Hazardous waste incinerated in a mobile incinerator temporarily located at your facility must be included as part of this activity.

A facility used for the incineration of hazardous waste is required to report to the NPRI if it met the substance criteria, regardless of the number of hours worked by employees or the quantities incinerated.

d) *Sewage sludge incineration*

Sludge means a semi-liquid mass removed from a liquid flow of wastes. Sewage sludge means sludge from a facility treating wastewater from a sanitary sewer system.

A facility used for the incineration of sewage sludge is required to report to the NPRI if it met the substance criteria, regardless of the number of hours worked by employees or the quantities incinerated.

2.7.2 Wood Preservation Activity

Wood Preservation (using heat or pressure treatment, or both)

A facility used for wood preservation is required to report to the NPRI for Schedule 1, Part 1, substances and mercury (and its compounds), regardless of the number of hours worked by employees, if it met the substance criteria.

Wood Preservation Using Creosote

A facility used for wood preservation must report for any of the 17 individual PAHs released on site or transferred off site from a wood-preservation process using creosote, regardless of the number of hours worked by employees. This reporting criterion is found in Schedule 2, Part 3, of the 2000 *Canada Gazette* notice.

Wood Preservation Using Pentachlorophenol

A facility used for wood preservation using pentachlorophenol must report for dioxins/furans and HCB, regardless of the number of hours worked by employees or the quantities of dioxins/furans and HCB released or transferred. This reporting criterion is found in Schedule 2, Part 4, of the 2000 *Canada Gazette* notice.

2.8 On-site Releases and Off-Site Transfers for Disposal or Recycling

An “on-site release” is an on-site discharge of a pollutant to the environment. This includes emissions to air, discharges to surface waters, on-site releases to land and deep-well underground injection, within the boundaries of the facility.

An “off-site transfer” is a shipment of an NPRI substance to an off-site location for disposal or recycling.

“Disposal” is final disposal of the material (e.g., landfill), or storage and treatment (e.g., stabilization) prior to final disposal.

“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 reprocessed to their original specifications and reused for their original purpose or used for an entirely different purpose. Components may be recovered 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 the manufacturer or supplier for reprocessing, repackaging, resale or for credit or payment.

2.9 Manufacture, Process and Other Use

The terms “manufacture”, “process” and “other use” are defined in Schedule 4 of the 2000 *Canada Gazette* notice, and are part of the reporting criteria for Part 1 and 2 substances. A substance listed in Schedule 1, Part 1, of the 2000 *Canada Gazette* notice at a concentration equal to or greater than 1% by weight or an NPRI by-product at a concentration of less than 1% by weight, is only included in the calculation of the 10-tonne reporting threshold if it has been manufactured, processed or otherwise used.

The reporting threshold for mercury (and its compounds) is 5 kg manufactured, processed or otherwise used. The 1% concentration exemption does not apply to this substance and its compounds.

2.9.1 Manufacture

The term “manufacture” means to produce, prepare or compound an NPRI substance. This also includes the incidental manufacture of an NPRI substance as a *by-product* resulting from the manufacture, processing or other use of other substances.

A “by-product” is defined as a substance, listed in Schedule 1, which is incidentally manufactured, processed or otherwise used at the facility at a concentration of less than 1% by weight, and released on site to the environment or transferred off site for disposal. More detailed descriptions of the application of the term by-product and the 1% concentration exemption are provided in the *Guide for Reporting*.

For the purposes of the NPRI, “incidental manufacture” of a substance refers to the manufacture of that substance merely by chance or without intention or calculation.

The 50-kg reporting threshold for PAHs is based on the total of the on-site releases and off-site transfers resulting from the incidental manufacture of these compounds. Reporting is required for any of the 17 individual PAHs that were released and transferred from a facility used for wood preservation using creosote.

Only on-site releases and off-site transfers resulting from incidental manufacture of dioxins/furans and HCB by facilities engaged in specific activities are to be reported. Reporting of dioxins/furans and HCB is also required by facilities used for wood preservation using pentachlorophenol.

2.9.2 Process

The term “process” means the preparation of an NPRI substance, after its manufacture, for distribution in commerce. Processing includes 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, as well as the processing of “articles” (see section 2.10).

2.9.3 Other Use

The terms “other use” and “otherwise used” encompass any use of an NPRI substance at a facility 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. “Other use” does not include routine janitorial or facility grounds maintenance.

2.10 Article

An “article” is defined as a manufactured item that does not release an NPRI substance under normal conditions of processing or use. When articles such as metal sheets and bars are processed (punched, cut or sheared) and there are no releases, or the releases such as metal shearings or pieces are recycled 100% or with due care, the NPRI substances in that article need not be included in the threshold calculation. Exercising “due care” in ensuring 100% recycling means that the facility generated less than 1 kg of a substance listed in Schedule 1, Part 1, of the 2000 *Canada Gazette* notice as waste during the calendar year. Because of the low reporting threshold, Environment Canada has set no quantitative measure of “due care” in recycling mercury (and its compounds). Therefore, if an “article” containing mercury (and its compounds) is processed and there are releases, the mercury (and its compounds) must be included in the threshold calculation. Materials that are welded lose their “article” status because there are releases from the article during welding.

2.11 Exclusions

In calculating the quantity of an NPRI substance that is manufactured, processed or otherwise used at your facility [e.g., mercury (and its compounds)], **do not include** the quantity of the substance that is:

- **contained in “articles” that are processed or otherwise used**
- **contained in materials used as structural components of the facility** – The exclusion of structural components of the facility from the reporting threshold

is limited to buildings and other fixed structures but does not include process equipment.

- **contained in materials used in routine janitorial or facility grounds maintenance** – The maintenance of processing equipment is not considered “routine janitorial” or “facility grounds” maintenance. For example, if manufacturing or processing equipment is cleaned with a solvent, the amount of the NPRI substance(s) contained in the solvent should be included in the threshold calculation.
- **contained in materials used for personal use by employees or other persons**
- **used for the purpose of maintaining motor vehicles operated by the facility, or**
- **present in intake water or intake air** – This refers to water used for process cooling or air used either as compressed air or for combustion.

2.12 If You Are Required to Report for Alternate-Threshold Substances

Once you have determined that your facility is required to submit a report for an NPRI substance listed at an alternate threshold, all on-site releases and transfers off site for disposal or recycling of that substance must be reported for most substances, regardless of their concentration or quantity (including “zero” releases and transfers). There are special reporting requirements for dioxins/furans and HCB.

You must account for total releases of alternate-threshold substances (mercury, PAHs, dioxins/furans and HCB) from your facility to each environmental medium (air, water, land and underground injection). You may not report the total releases to all media combined, as is possible for Schedule 1, Part 1, substances with releases of less than 1 tonne.

If you have concluded that you are required to submit a report for your facility for 2000, please refer to the *Guide for Reporting* which describes all fields in the reporting software and the information required for each. It also explains the reporting criteria of the Schedule 1, Part 1, substances listed in the NPRI. It should be used in conjunction with this *Supplementary Guide* when completing an NPRI report.

The 2000 *Canada Gazette* notice states that the information required by the NPRI need only be reported to the Minister of the Environment if the facility owner or operator possesses or may reasonably be expected to have access to the information. **Consequently, the NPRI does not require additional monitoring or measurement of the quantities or concentration of substances released to the environment beyond those already required under the provisions of other laws or regulations.** You are, however, required to show “due diligence” in obtaining the information required by the 2000 *Canada Gazette* notice.

2.13 If You Are Not Required to Report for Alternate-Threshold Substances

If you have concluded that you are not required to submit a report for any NPRI substances listed at alternate thresholds (i.e., mercury, PAHs, dioxins/furans or HCB) for your facility, you must still consult the *Guide for Reporting* to determine whether you are required to submit a report for any substance listed in Schedule 1, Part 1, of the 2000 *Canada Gazette* notice.

3 Mercury (and its compounds)

3.1 Introduction, History and Intent

Mercury (and its compounds) have been on the NPRI list of substances since the program's inception, with a 10-tonne manufacture, process and other use reporting threshold. Environment Canada and the NPRI Work Group on Substances recognized the need to lower the reporting threshold for mercury (and its compounds) to better track sources of on-site releases and off-site transfers. Mercury and mercury compounds are micro-pollutants which have significant environmental and human health impacts at relatively low levels. Mercury (and its compounds) occur naturally in the environment, but human activities can concentrate them to levels that are toxic to human health and the environment. Under certain circumstances, exposure to high levels of mercury in the environment has been linked to adverse effects on human health and wildlife, such as sensory or neurological impairments.

The *Canada-Wide Standards for Mercury Emissions* currently targets reductions in mercury emissions from base metals smelting and waste-incineration activities. Canada has signed a protocol on heavy metals under the United Nations Economic Commission for Europe (UN ECE) Convention on Long-range Transboundary Air Pollution, which has reporting requirements for three heavy metal pollutants – lead, mercury and cadmium. Atmospheric emissions of these metals are transported long distances across national boundaries. Canada has also committed to report on mercury releases as part of the Commission on Environmental Cooperation (CEC) Regional Action Plan on Mercury under the North American Free Trade Agreement (NAFTA).

As mercury and mercury compounds are components of commercial products, the NPRI has retained reporting criteria that are based on the quantity manufactured, processed or otherwise used of the substance. Environment Canada examined the impacts of three alternate NPRI thresholds for mercury – 0.5, 5 and 50 kg. At a threshold level of 5 kg, Environment Canada estimated that about 95% of known facility-based mercury releases will be reported to the NPRI, from more than 160 facilities. This 5-kg threshold level is consistent with the new threshold level of 10 pounds (4.5 kg) introduced for the 2000 reporting year by the United States Environmental Protection Agency (U.S. EPA) Toxics Release Inventory (TRI).

Because minimal releases of mercury (and its compounds) may result in significant adverse effects and can reasonably be expected to significantly contribute to exceeding the lower thresholds, Environment Canada removed the 1% concentration exemption for mercury (and its compounds).

3.2 Substances

Mercury (and its compounds) are listed in Schedule 1, Part 2, of the 2000 *Canada Gazette* notice. The pure element and any substance, alloy or mixture must be reported as the equivalent weight of the element. No unique CAS number is provided for this listing.

3.3 Reporting Criteria

The reporting criteria for mercury (and its compounds) are outlined in Schedule 2, Part 2, of the 2000 *Canada Gazette* notice and in Figure 2.

Mercury (and its compounds)

A facility is required to report on-site releases and off-site transfers of mercury (and its compounds) if, during the 2000 calendar year:

- **employees worked a total of 20 000 hours or more or the facility was used for an activity to which the 20 000-hour employee threshold does not apply (listed in Table 1 of Chapter 2),**

AND

- **mercury (and its compounds) were manufactured, processed or otherwise used at any concentration in a quantity of 5 kg or more.**

The 1% concentration exemption included in the 10-tonne manufacture, process or other use threshold for Schedule 1, Part 1, substances **does not** apply to mercury (and its compounds).

A Material Safety Data Sheet (MSDS) is an important source of information on the composition of a purchased product. Suppliers of hazardous materials are required, as part of the Workplace Hazardous Materials Information System (WHMIS), to supply MSDSs on request.

An example of estimating releases and transfers of mercury (and its compounds) is provided in Chapter 7. Appendix 7 identifies potential sources of mercury. Appendix 8 lists various materials and products known to contain mercury. The emission factor database discussed in Appendix 9 contains a list of substances known to contain mercury and emission factors for mercury (and its compounds).

3.4 Manufacture, Process and Other Use

The terms “manufacture”, “process” and “other use” are defined below, as well as in Schedule 4 of the 2000 *Canada Gazette* notice.

3.4.1 Manufacture

The term “manufacture” means to produce, prepare or compound an NPRI substance. This also includes the incidental manufacture of an NPRI substance as a by-product resulting from the manufacture, processing or other use of other substances.

3.4.2 Process

The term “process” means the preparation of an NPRI substance, after its manufacture, for distribution in commerce. Processing includes 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, as well as the processing of “articles”.

3.4.3 Other Use

The terms “other use” and “otherwise used” encompass any use of an NPRI substance at a facility 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. “Other use” does not include routine janitorial or facility grounds maintenance.

3.5 Exemptions

The practice of dentistry was added to the list of activities exempt from reporting to the NPRI for 2000. Environment Canada estimated that a dental facility would need to employ more than 14 dentists to meet the reporting criteria for mercury (and its compounds). As the resources required to inform this sector of the reporting requirements would be great and very few dental offices would be expected to meet the reporting criteria, Environment Canada chose to exempt dentists from reporting

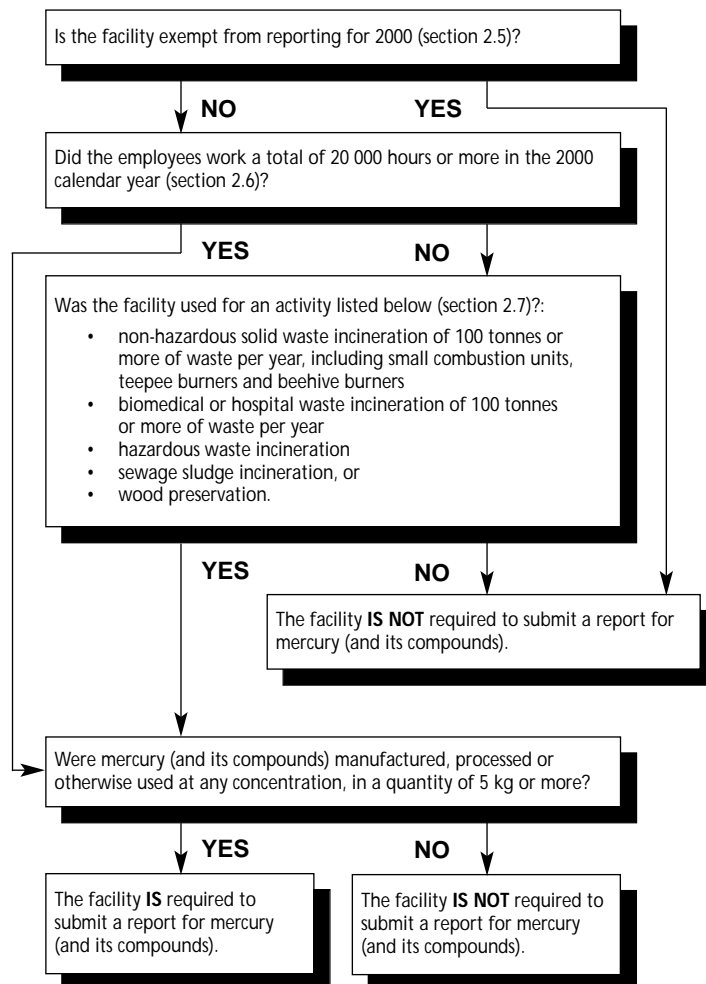


FIGURE 2

REPORTING CRITERIA FOR MERCURY (AND ITS COMPOUNDS)

until further information becomes available. In an effort to reduce the releases of mercury to the environment, the Canadian Council of Ministers of the Environment (CCME) has developed a Canada-Wide Standard (see Appendix 6) to address the issue of mercury in dental amalgams.

3.6 Article

An “article” is defined as a manufactured item that does not release an NPRI substance under normal conditions of processing or use. When articles such as metal sheets and bars are processed (punched, cut or sheared) and there are no releases, or the releases such as metal shearings or pieces are recycled 100% or with due care, the NPRI substances in that article need not be included in the threshold calculation. Exercising “due care” in ensuring 100% recycling means that the facility generated less than 1 kg of a substance listed in Schedule 1, Part 1, of the 2000 *Canada Gazette* notice as waste during the calendar year. Because of the low reporting threshold, Environment Canada has set no quantitative measure of “due care” in recycling mercury (and its compounds). Therefore, if an “article” containing mercury (and its compounds) is processed and there are releases, the mercury (and its compounds) must be included in the threshold calculation. Materials that are welded lose their “article” status because there are releases from the article during welding.

Example

A fluorescent lamp meets the above definition of an article. The mercury content of a fluorescent lamp is only included in a facility's calculation of the 5-kg reporting threshold if the item loses its article status, i.e., the lamp is broken, thus allowing release of mercury. Therefore, as long as fluorescent lamps remain articles, they are not included in calculating the reporting threshold.

3.7 What You Must Report

If the reporting criteria are met for mercury (and its compounds), then **all** on-site releases and off-site transfers of mercury (and its compounds) must be reported **regardless of the concentration or amount**. The facility is required to submit a substance report even if on-site releases or off-site transfers are zero. You must account for total releases of mercury (and its compounds) from your facility to each environmental medium (air, water, land and underground injection).

3.7.1 Units

Report on-site releases and off-site transfers of mercury (and its compounds) in units of kilograms (kg).

4 Polycyclic Aromatic Hydrocarbons (PAHs)

4.1 Introduction, History and Intent

Polycyclic aromatic hydrocarbons (PAHs) may be used as commercial chemicals or incidentally manufactured. There were two substances on the NPRI prior to 2000 that are considered PAHs – anthracene (CAS No. 120-12-7) and naphthalene (CAS No. 91-20-3). These substances are commercial chemicals used in significant quantities, and are less toxic than the 17 PAHs added at an alternate threshold to the NPRI for 2000. Environment Canada has retained the 10-tonne manufacture, process and other use reporting threshold for anthracene and naphthalene.

PAHs are listed as a group on the List of Toxic Substances under the *CEPA* (1999) (see Appendix 6). Many individual PAHs meet criteria for persistence, bioaccumulation and toxicity, as defined by various international bodies. PAHs as a group have been assigned Track 2 status under the *CEPA* because many sources are natural rather than resulting from human activity.

Environment Canada considered various reporting criteria for the alternate-threshold PAHs. Individual reporting of PAHs is necessary as Environment Canada has international obligations under the UN ECE Persistent Organic Pollutants (POPs) Protocol to report releases of four indicator PAHs (noted in Table 2). No national, facility-specific data exist for PAHs, and reporting to the NPRI will be the most efficient method to gather these data from facilities.

The lack of facility-specific data prevented Environment Canada from performing a release analysis for PAHs to select an appropriate alternate reporting threshold. A 50-kg threshold level for the PAH category will meet Canada's requirements for reporting to the UN ECE POPs Protocol. The 50-kg reporting threshold is consistent with reporting to the U.S. EPA Toxics Release Inventory, which lowered the reporting thresholds for its PAH group to 100 pounds (45.4 kg) for the 2000 reporting year.

In selecting individual PAHs to be reported to the NPRI at alternate thresholds, Environment Canada and the Work Group on Substances examined several lists. The final list selected for inclusion is based on the PAHs classified as persistent, bioaccumulative and toxic substances by Environment Canada's Accelerated Reduction/Elimination of Toxics (ARET) program, known as ARET Group A. Based on ARET data collected up to 1997, no facilities reported releases for two of the 19 PAHs on the ARET list (1,6- and 1,8-dinitropyrene). Environment Canada could find no information on releases in Canada and no emission factors, so these two PAHs were excluded from the NPRI list.

Since these 17 PAHs are predominantly incidentally manufactured and released or transferred from facilities, rather than used as commercial chemicals, Environment Canada set alternate reporting criteria based on releases and transfers resulting from incidental manufacture.

Polycyclic Aromatic Hydrocarbons (PAHs)

4.1.1 Wood Preservation

Special criteria for PAHs from the wood-preservation sector are included in the NPRI at the request of the Issue Table for the Wood Preservation Sector Strategic Options Process. The Issue Table is developing reduction strategies for *CEPA*-toxic substances released to the environment by this sector. The members of the wood-preservation sector have committed to reporting all releases and transfers of *CEPA*-toxic substances to Environment Canada, with no quantitative reporting criteria. They chose the NPRI as the reporting mechanism. **A facility is required to report any of the 17 individual PAHs released on site or transferred off site from a wood-preservation process using creosote.** Environment Canada is preparing guidance specific to this sector for reporting of all applicable *CEPA*-toxic substances. Details are provided in Chapter 6.

4.2 Substances

The 17 individual PAHs that were added to the NPRI for 2000 at an alternate reporting threshold are listed in Schedule 1, Part 3, of the 2000 *Canada Gazette* notice and below in Table 2. These 17 PAHs are listed individually in the NPRI. On-site releases and off-site transfers must be reported for the individual PAH substances even though the 50-kg reporting threshold applies to the total releases and transfers of all 17 alternate-threshold PAHs.

TABLE 2 : SEVENTEEN PAH SUBSTANCES LISTED AT AN ALTERNATE THRESHOLD

CAS No.	SUBSTANCE NAME	CAS No.	SUBSTANCE NAME
56-55-3	Benzo(a)anthracene*	224-42-0	Dibenz(a,j)acridine
218-01-9	Benzo(a)phenanthrene	53-70-3	Dibenzo(a,h)anthracene
50-32-8	Benzo(a)pyrene	189-55-9	Dibenzo(a,i)pyrene
205-99-2	Benzo(b)fluoranthene*	194-59-2	7H-Dibenzo(c,g)carbazole
192-97-2	Benzo(e)pyrene	206-44-0	Fluoranthene
191-24-2	Benzo(g,h,i)perylene	193-39-5	Indeno(1,2,3-c,d)pyrene*
205-82-3	Benzo(j)fluoranthene	198-55-0	Perylene
207-08-9	Benzo(k)fluoranthene*	85-01-8	Phenanthrene
		129-00-0	Pyrene

* PAHs listed under the UN ECE POPs Protocol.

The NPRI has added an additional substance listing in the NPRI reporting software – “PAHs, total Schedule 1, Part 3” – which refers to all 17 PAHs or any combination thereof listed in Schedule 1, Part 3, of the 2000 *Canada Gazette* notice. The 17 PAHs may be reported under the substance listing titled “PAHs, total Schedule 1, Part 3” **only** if you do not have information available to estimate releases and transfers for any of the individual PAHs.

4.3 Reporting Criteria

The substance-specific reporting criteria for the 17 PAHs listed in Table 2 are outlined in Schedule 2, Part 3, of the 2000 *Canada Gazette* notice and in Figure 3.

With the exception of the activity of wood preservation (see section 4.3.1), you must submit substance reports on one or more of the 17 PAHs listed in Table 2 that were incidentally manufactured if, during the 2000 calendar year:

- **employees worked a total of 20 000 hours or more, or the facility was used for an activity to which the 20 000-hour employee threshold does not apply (listed in Table 1 of Chapter 2)**

AND

- **any individual PAH (listed in Table 2) was incidentally manufactured, and the quantity of all of the PAHs incidentally manufactured and released on site or transferred off site together totalled 50 kg or more.**

Except for the activity of wood preservation using creosote, the reporting criteria for PAHs are different from other NPRI-listed substances in the following ways:

- reporting the 17 PAHs is based on the quantities of the substances incidentally manufactured and released or transferred, **not** on the quantities manufactured, processed, or otherwise used
- you must consider the quantities of **all** 17 individual PAHs incidentally manufactured together in determining if your facility meets the reporting threshold, and
- the reporting threshold is 50 kg.

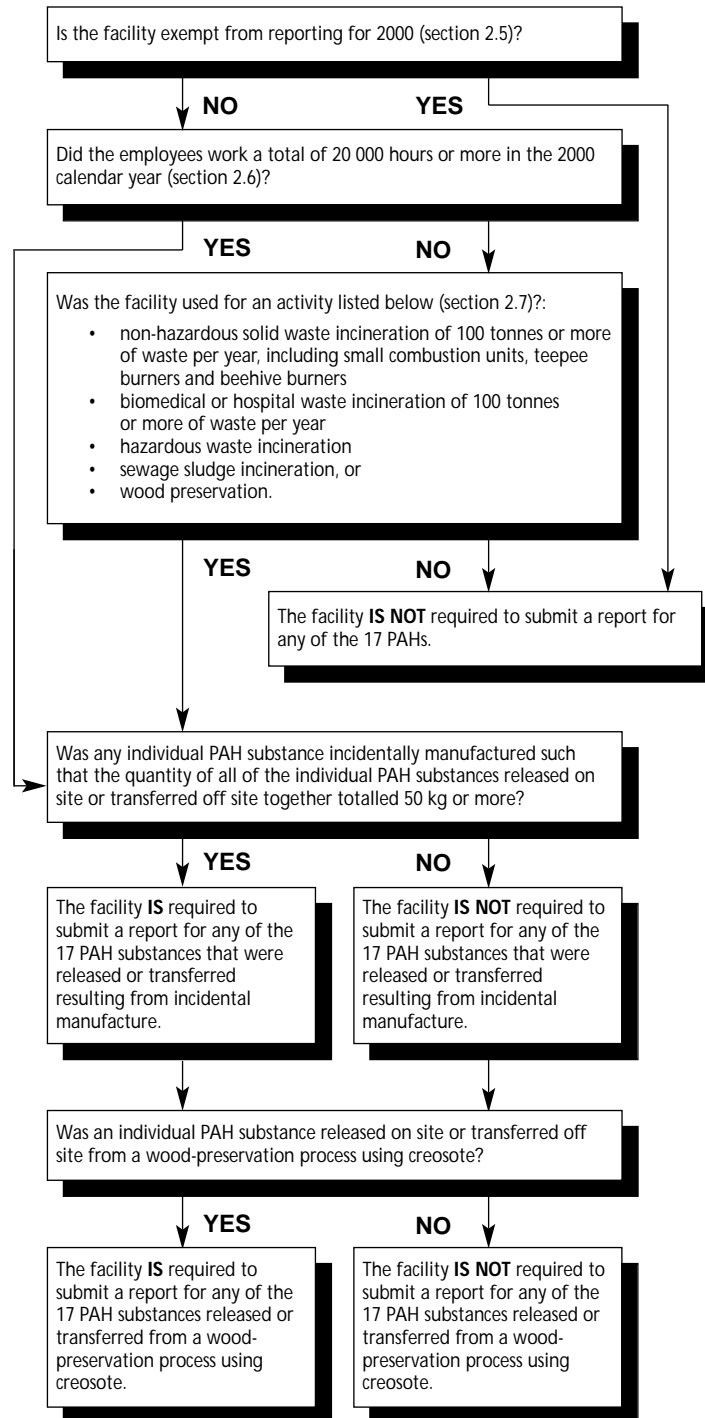
4.3.1 Wood Preservation Using Creosote

A facility used for wood preservation must submit a report for any of the 17 individual PAHs released on site or transferred off site from a wood-preservation process using creosote, regardless of the number of hours worked by employees.

Wood preservation means the preservation of wood using heat or pressure treatment, or both. There is no 50-kg reporting threshold for PAHs released or transferred from a wood-preservation process using creosote, since the PAHs are contained in the creosote and not incidentally manufactured. All PAHs released on site or transferred off site from wood-preservation processes using creosote must be reported, regardless of the quantity.

FIGURE 3

REPORTING CRITERIA FOR THE 17 PAHs LISTED AT AN ALTERNATE THRESHOLD



4.4 What You Must Report

With the exception of the activity of wood preservation using creosote (see section 4.3.1), if your facility met the 50-kg reporting threshold for the 17 PAHs, you must report on-site releases and off-site transfers *individually* for each of the 17 PAHs that were incidentally manufactured and released or transferred.

If you do not have information available to estimate releases and transfers for any of the 17 individual PAHs, the PAHs may be reported together under the listing “PAHs, total Schedule 1, Part 3”. You may report for the 17 individual PAHs, or “PAHs, total Schedule 1, Part 3”, **but not both**. If you report under the listing of “PAHs, total Schedule 1, Part 3”, indicate in the “Comments” field which substances are included in the data, if known.

You must account for total releases of the 17 PAHs from your facility to each environmental medium (air, water, land and underground injection) and transfers off site for disposal or recycling.

Anthracene and naphthalene are listed in Schedule 1, Part 1, of the 2000 *Canada Gazette* notice and the reporting criteria differ from those discussed in this Chapter. The reporting criteria for these substances are discussed in the *Guide for Reporting*. Anthracene and naphthalene must not be considered when you are determining whether your facility met the reporting criteria for the 17 alternate-threshold PAHs, nor in calculating on-site releases or off-site transfers of the 17 PAHs. Anthracene and naphthalene are not included under the “PAHs, total Schedule 1, Part 3” listing.

4.4.1 Units

Report on-site releases and off-site transfers of individual PAHs listed in Schedule 1, Part 3, or “PAHs, total Schedule 1, Part 3” in units of kilograms (kg).

5 Dioxins/Furans and Hexachlorobenzene (HCB)

5.1 Introduction, History and Intent

Polychlorinated dibenzo-*p*-dioxins (PCDD or dioxins), polychlorinated dibenzofurans (PCDF or furans) and hexachlorobenzene (HCB) are released primarily as by-products of industrial and combustion processes, but are also found as contaminants in certain pesticides or chlorinated solvents. HCB may also be found as a contaminant in ferric chloride used for water or wastewater treatment. These substances have been identified as Track 1 toxic substances under the *CEPA* (1999) (see Appendix 6) and as such are slated for virtual elimination* of releases to the environment. The *Canada-Wide Standards for Dioxins and Furans* target reductions of dioxin and furan emissions from pulp and paper boilers burning salt-laden wood, and waste incineration. Canada has international obligations under the UN ECE POPs Protocol to report releases of dioxins, furans and HCB.

Releases of substances classified as dioxins and furans are typically reported in units of toxic equivalent (TEQ) to the most toxic congener of this group, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin. More information on the use of TEQ units is provided in section 5.4.4.

Environment Canada and the Work Group on Substances considered several options for addition of these substances to the NPRI. A release analysis was carried out using existing data gathered by Environment Canada. This analysis for dioxins/furans showed that a release-based reporting threshold of 0.1 g TEQ per year would capture about 98% of the known sources of facility-based releases of dioxins/furans in 1995. Similarly, a 0.5 kg per year release-based reporting threshold would capture about 99% of the known sources of facility-based releases of HCB in 1995.

While members of the Work Group supported the addition of dioxins/furans and HCB to the NPRI, they did not reach a consensus on selecting reporting criteria for these substances. Environmental groups supported the reporting of any release from specified sectors and processes. Industry associations supported setting a quantitative reporting threshold for all facilities reporting to the NPRI to capture almost 90% of known point-source releases, accompanied by guidance for reporting facilities on which sectors are expected to release dioxins/furans or HCB.

However, because of the persistent and bioaccumulative nature of dioxins/furans and HCB, and their classification as Track 1 substances, Environment Canada has enhanced the reporting requirements for these substances. Environment Canada must be able to set priorities, to implement short-term management strategies, to determine which sectors and which facilities have to virtually eliminate these substances, and to track progress toward the long-term goal of virtual elimination. A quantitative reporting threshold for dioxins/furans and HCB does not address the two requirements related to virtual elimination. To meet these information needs, Environment Canada has adopted a very different approach to reporting of these substances to the NPRI.

Environment Canada requires all facilities engaged in identified activities (see Tables 4 and 5) that have the potential to incidentally manufacture dioxins/furans or HCB, to submit a report to the NPRI. The identified activities were selected by Environment

* Virtual elimination of a toxic substance released into the environment as a result of human activity, is defined in subsection 65(1) of the *CEPA* (1999) as “the ultimate reduction in the quantity or concentration of the substance in the release below the level of quantification (LoQ)”.

Dioxins/ Furans and Hexachloro- benzene (HCB)

Canada to cover all main point sources of dioxins/furans and HCB releases being targeted by the Canada-Wide Standards (see Appendix 6) initiatives for dioxins, furans and HCB. Reporting by limited sectors known to release these substances will capture all significant releases from such facilities, while minimizing reporting burden on other facilities reporting to the NPRI.

However, if your facility is engaged in activities other than those identified in Tables 4 and 5, and you know that your facility has released or transferred dioxins/furans or HCB, you may submit substance reports to the NPRI using measured or estimated data. Environment Canada will re-examine the list of activities for which dioxins/furans and HCB reports are required and consult with stakeholders to determine if any changes need to be made.

5.1.1 Wood Preservation

Environment Canada accepted the recommendation from the Issue Table for the Wood Preservation Sector Strategic Options Process, that **any facility used for wood preservation using pentachlorophenol must submit a report for dioxins/furans and HCB, regardless of the quantity of dioxins/furans or HCB released or transferred**. This activity is considered separately from other activities for which reporting for dioxins/furans and HCB is required, because dioxins/furans and HCB are present in pentachlorophenol as contaminants, rather than being incidentally manufactured.

5.2 Substances

5.2.1 Dioxins/Furans

Dioxins/furans are listed in Schedule 1, Part 4, of the 2000 *Canada Gazette* notice as “polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans”. There is no CAS number provided for the dioxin/furan group since the listing includes the 17 most toxic dioxin and furan congeners. A congener is a compound belonging to a family of compounds having similar chemical skeletons, but differing in the number and position of hydrogen substitutes. The 17 congeners and their CAS numbers are referenced in Schedule 1, Part 4, of the 2000 *Canada Gazette* notice in a footnote to the “polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans” listing, and below in Table 3.

Because these 17 congeners have related toxic effects that are cumulative, report on-site releases and off-site transfers of dioxins/furans together as a group, in grams of toxicity equivalent (TEQ) to the most toxic congener of dioxin (2,3,7,8-tetrachlorodibenzo-*p*-dioxin). You estimate the quantity in grams of TEQ of dioxins/furans released or transferred by adding the individual units of TEQ for each congener. A more detailed description of TEQ and its calculation is in section 5.4.4.

TABLE 3: DIOXIN AND FURAN CONGENERS INCLUDED IN THE NPRI DIOXINS/FURANS GROUP

CAS No.	NAME OF CONGENER
1746-01-6	2,3,7,8-Tetrachlorodibenzo- <i>p</i> -dioxin
40321-76-4	1,2,3,7,8-Pentachlorodibenzo- <i>p</i> -dioxin
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo- <i>p</i> -dioxin
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo- <i>p</i> -dioxin
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo- <i>p</i> -dioxin
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo- <i>p</i> -dioxin
3268-87-9	Octachlorodibenzo- <i>p</i> -dioxin
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran
39001-02-0	Octachlorodibenzofuran

5.2.2 Hexachlorobenzene (HCB)

Hexachlorobenzene (HCB) has the CAS No. 118-74-1 and is listed in Schedule 1, Part 4, of the 2000 *Canada Gazette* notice.

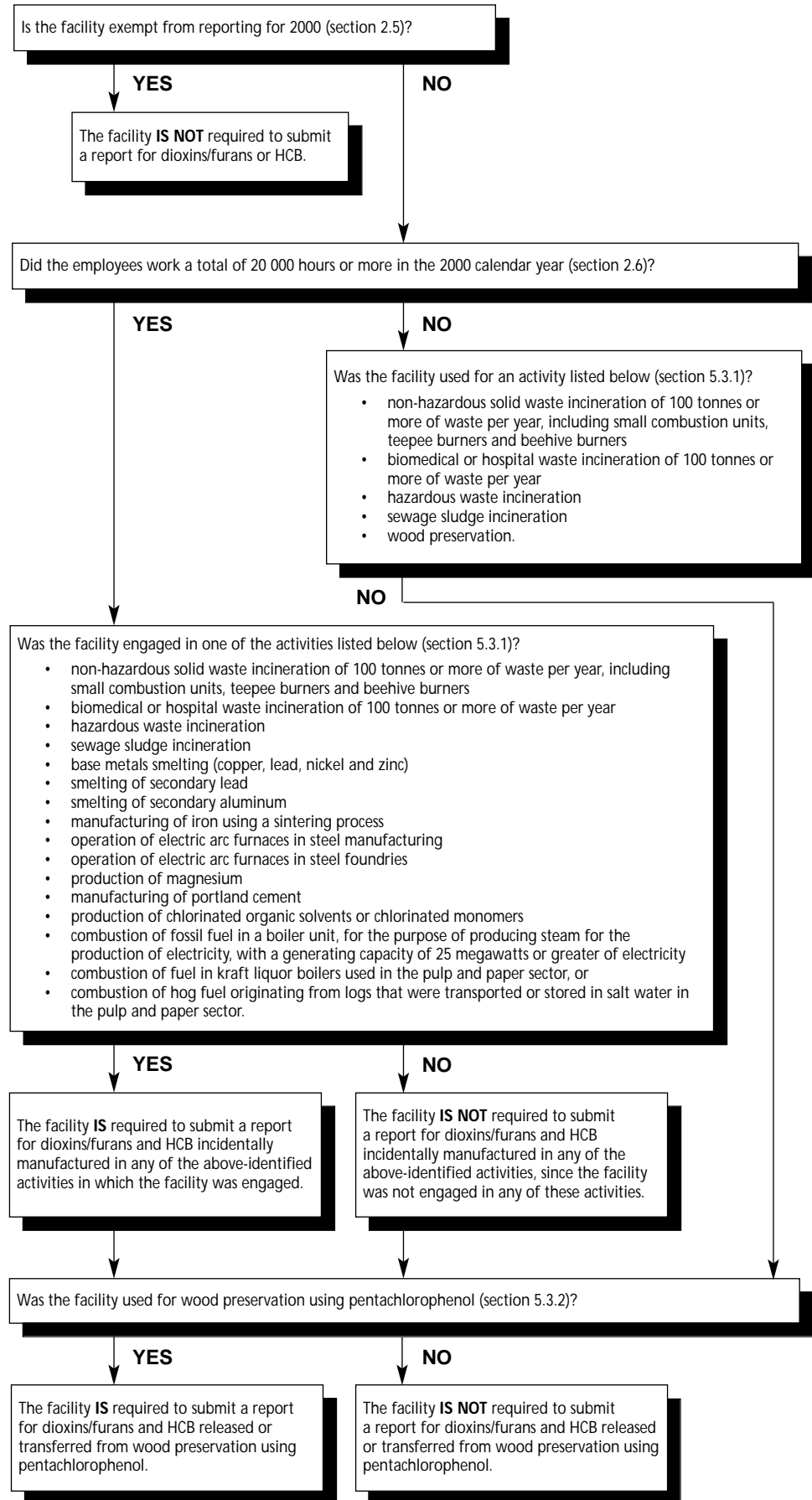
5.3 Reporting Criteria

The reporting criteria for dioxins/furans and HCB are outlined in Schedule 2, Part 4, of the 2000 *Canada Gazette* notice, and are summarized in the flowchart in Figure 4.

If a facility was “used for” one of the activities not required to meet the 20 000-hour employee threshold, that facility was used primarily or exclusively for that activity.

If a facility was “engaged in” an activity, then that facility was engaged in the activity at any time during the year, regardless of extent or the primary purpose of the facility.

FIGURE 4

REPORTING CRITERIA
FOR DIOXINS/FURANS
AND HCB

You must submit substance reports for dioxins/furans and HCB if your facility met one or more of the following criteria, **regardless of the quantity of dioxins/furans or HCB released on site or transferred off site**:

- your facility was used for one or more of the activities in Table 4, **regardless** of the 20 000-hour employee threshold
- your facility engaged in one or more of the activities in Tables 4 or 5, **and** your facility met the 20 000-hour employee threshold, and/or
- your facility was used for wood preservation using pentachlorophenol, **regardless** of the 20 000-hour employee threshold.

The NAICS codes listed in Tables 4 and 5 are provided to help identify facilities that may engage in these activities. However, **it is the activity and not the NAICS code that determines whether a facility is required to submit substance reports to the NPRI for dioxins/furans and HCB.**

Table 4 lists the activities for which substance reports are required for dioxins/furans and HCB, regardless of the total number of hours worked by employees at the facility in the 2000 calendar year.

If your facility was used for one or more of the activities set out in Table 4, you must submit substance reports for dioxins/furans and HCB. Only report on-site releases and off-site transfers that resulted from the incidental manufacture of dioxins/furans or HCB while engaging in the listed activities. A description of the activities listed in Table 4 is provided in section 5.3.1.

TABLE 4: ACTIVITIES FOR WHICH DIOXINS/FURANS AND HCB REPORTS ARE REQUIRED
(20 000-HOUR EMPLOYEE THRESHOLD DOES NOT APPLY)

ACTIVITY	NAICS CODE
a) Non-hazardous solid waste incineration of 100 tonnes or more of waste per year, including small combustion units, teepee burners and beehive burners	5622
b) Biomedical or hospital waste incineration of 100 tonnes or more of waste per year	5622
c) Hazardous waste incineration	5622
d) Sewage sludge incineration	5622

If your facility is engaged in one or more of the activities set out in Table 5, and your facility met the 20 000-hour employee threshold in the 2000 calendar year, you must submit substance reports for dioxins/furans and HCB. A description of the activities listed in Table 5 is provided in section 5.3.1.

**TABLE 5 : ACTIVITIES FOR WHICH DIOXINS/FURANS AND HCB REPORTS ARE REQUIRED
(20 000-HOUR EMPLOYEE THRESHOLD APPLIES)**

ACTIVITY	NAICS CODE
a) Non-hazardous solid waste incineration of 100 tonnes or more of waste per year, including small combustion units, teepee burners and beehive burners	5622
b) Biomedical or hospital waste incineration of 100 tonnes or more of waste per year	5622
c) Hazardous waste incineration	5622
d) Sewage sludge incineration	5622
e) Base metals smelting (this refers to copper, lead, nickel and zinc)	3314
f) Smelting of secondary lead	3314
g) Smelting of secondary aluminum	3313
h) Manufacturing of iron using a sintering process	3311
i) Operation of electric arc furnaces in steel manufacturing	3311
j) Operation of electric arc furnaces in steel foundries	3315
k) Production of magnesium	3314
l) Manufacturing of portland cement	3273
m) Production of chlorinated organic solvents or chlorinated monomers	3251
n) Combustion of fossil fuel in a boiler unit, for the purpose of producing steam for the production of electricity, with a generating capacity of 25 megawatts or greater of electricity	2211
o) Combustion of hog fuel originating from logs that were transported or stored in salt water in the pulp and paper sector	(not available)
p) Combustion of fuel in kraft liquor boilers used in the pulp and paper sector	(not available)

A description of what and how you must report is given in Sections 5.4 and 5.5; examples of estimation methods and reporting scenarios are provided in Chapter 7.

5.3.1 Description of Activities Listed in Tables 4 and 5

The first four activities listed in Tables 4 and 5 are forms of waste incineration. Waste incineration, for the purposes of the NPRI, only includes incineration that takes place in a waste incinerator. Waste incineration does not include open burning of wastes.

A **waste incinerator** is a device, mechanism or structure constructed primarily to thermally treat (e.g., combust or pyrolyze) a waste for the purpose of reducing its volume, destroying a hazardous chemical present in the waste, or destroying pathogens present in the waste. This includes facilities where waste heat is recovered as a by-product from the exhaust gases from an incinerator (e.g., energy-from-waste incinerators). This also includes conical (or teepee) 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. Refer to Table 5 if you combust wastes in industrial boilers, as your facility may meet dioxins/furans and HCB reporting criteria for another activity.

a) ***Non-hazardous solid waste incineration of 100 tonnes or more of waste per year, including small combustion units, teepee burners and beehive burners***

Non-hazardous solid waste means any waste, regardless of origin, which might normally be disposed of in a non-secure manner, such as at a sanitary landfill site, if not incinerated. 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 (e.g., pentachlorophenol) or decorative coatings. Non-hazardous solid waste incineration includes incineration of residential and other municipal wastes in conical (or teepee) burners, and clean wood waste in beehive burners.

A facility engaged in the incineration of 100 tonnes or more of non-hazardous solid waste per year must submit substance reports for dioxins/furans and HCB.

b) ***Biomedical or hospital waste incineration of 100 tonnes or more of waste per year***

Biomedical waste is defined fully in Appendix 4. Biomedical or hospital waste refers to waste that is generated by:

- human or animal health-care facilities
- medical or veterinary research and testing establishments
- health-care teaching establishments
- clinical testing or research laboratories, and
- facilities involved in the production or testing of vaccines.

Biomedical or hospital waste includes human anatomical waste and animal waste. It also includes microbiology laboratory waste, human blood and body fluid waste, and waste sharps that have not been disinfected or decontaminated. It does not include waste from animal husbandry, or waste that is controlled in accordance with the *Health of Animals Act* (Canada).

Wastes that are household in origin, or that are generated in the food production, general building maintenance and office administration activities of those facilities to which this definition applies are not considered to be biomedical or hospital waste but rather to be non-hazardous solid waste.

A facility engaged in the biomedical or hospital waste incineration of 100 tonnes or more of waste per year must submit substance reports for dioxins/furans and HCB.

c) ***Hazardous waste incineration***

Hazardous waste is defined fully in Appendix 5. Hazardous waste includes those wastes that are potentially hazardous to human health and/or the environment because of their nature and quantity, and that require special handling techniques. Hazardous waste incinerators must be licensed by the responsible jurisdiction. Hazardous waste incinerated in a mobile incinerator temporarily located at your facility must be included as part of this activity.

A facility engaged in the incineration of hazardous waste must submit substance reports for dioxins/furans and HCB, regardless of the quantities incinerated.

d) Sewage sludge incineration

Sludge means a semi-liquid mass removed from a liquid flow of wastes. Sewage sludge means sludge from a facility treating wastewater from a sanitary sewer system.

A facility engaged in the incineration of sewage sludge must submit substance reports for dioxins/furans and HCB, regardless of the quantities incinerated.

e) Base metals smelting

Base metals refers to copper, lead, nickel and zinc. This activity does not include smelting of aluminum or any other metals. It also does not include the smelting of secondary lead, which is a separate activity in Table 5 (see description below). The *Canada Gazette* notice of December 25, 1999, limited reporting to base metals smelters using chlorinated plastics or other chlorinated substances in their feeds but, at the request of the sector, this qualifier was removed in an amendment to the *Canada Gazette* notice.

f) Smelting of secondary lead

Secondary lead refers to lead-bearing scrap or lead-bearing 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 metals smelters (see description above).

g) Smelting of secondary aluminum

Secondary aluminum refers to aluminum-bearing scrap or aluminum-bearing materials. Secondary aluminum smelting involves two processes – pre-cleaning and smelting – both of which may produce emissions of dioxins/furans.

h) Manufacturing of iron using a sintering process

Sintering is the welding together and 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 degrees Kelvin). In sintering operations, dioxins/furans may be formed as unwanted by-products during high-temperature decomposition and combustion of raw materials containing chlorine and organic compounds.

i) Operation of electric arc furnaces in steel manufacturing

In an electric arc furnace, material is heated by the heat energy released from an electric arc. The electric arc is a component of an electric circuit, like a resistor, but with its own peculiar characteristics. Dioxins/furans may be formed as unwanted by-products during high-temperature decomposition and combustion of raw materials containing chlorine and organic compounds.

j) Operation of electric arc furnaces in steel foundries

In an electric arc furnace, material is heated by the heat energy released from an electric arc, during which dioxins/furans and HCB may be formed.

k) Production of magnesium

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

l) 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 (pyroprocessing) 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, then mixed with gypsum to form portland cement.

m) 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.

n) Combustion of fossil fuel in a boiler unit, for the purpose of producing steam for the production of electricity, with a generating capacity of 25 megawatts or greater of electricity

Fossil fuel includes solid or liquid fuel (e.g., coal, petroleum or any liquid or solid fuel derived from such). This clearer definition of electric power generation is provided in the 2000 *Canada Gazette* amendment. It includes electric power-generation utilities and large industrial facilities co-generating electric power using waste heat from industrial processes. It does not include combustion of natural gas or other fuels that are gaseous in form at ambient pressure and temperature. It also does not include diesel generators, which are not boiler units.

o) 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/furans are emitted from the burning of salt-contaminated hog fuel. Logs transported and stored in salt water take up chlorine into the bark. The bark is stripped from logs and ground up with other waste wood to produce hog fuel. The material is then used as boiler fuel to produce heat and electrical energy for pulp and paper processes. The *Canada-Wide Standards for Dioxins and Furans* state that every boiler covered by the Standards will be tested twice each year to determine the emissions of dioxins/furans to air for the years prior to 2003, and annually for the year 2003 and beyond.

p) 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, 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, and also produces steam which is used in mill process operations.

5.3.2 Wood Preservation Using Pentachlorophenol

Wood preservation means the preservation of wood using heat or pressure treatment, or both. If your facility was used for wood preservation using pentachlorophenol, you must submit substance reports for dioxins/furans and HCB, **regardless of the number of hours worked by employees.**

5.4 What You Must Report – Overview

This section provides an overview of the types of information you will be required to report for dioxins/furans or HCB, if your facility met the reporting criteria set out in Section 5.3. Section 5.5 provides details of the types of information that you will be required to report. Chapter 7 provides some sample calculations for facilities that must report on-site releases or off-site transfers of dioxins/furans and HCB.

With the exception of facilities used for wood preservation using pentachlorophenol, **a facility should only consider quantities of dioxins/furans or HCB that were incidentally manufactured as the result of the activities listed in Tables 4 or 5.** Wood-preservation facilities using pentachlorophenol must consider all sources of releases or transfers of dioxins/furans or HCB arising from the use of pentachlorophenol for the purpose of wood preservation.

5.4.1 Special Reporting Criteria

A facility that met the criteria set out in Section 5.3 must provide substance reports for dioxins/furans and HCB. However, what you report for releases and transfers may differ from a typical NPRI substance report. The dioxins/furans or HCB substance report submitted to the NPRI will indicate, for on-site releases to each environmental medium and for each off-site transfer activity:

- the **quantity** released on site or transferred off site as the result of incidental manufacture during an activity listed in Tables 4 or 5
- the **quantity** released on site or transferred off site resulting from wood preservation using pentachlorophenol
- that **directly-measured releases to a specific medium or transfers off site** were at concentrations above, equal to or below the Level of Quantification (LoQ) concentrations set out in Table 8 (this option is available only if estimates were based on direct measurements)
- that there were **no releases to a specific medium or no transfers off site**, or
- that **no information** was available on which to base an estimate.

5.4.2 “Basis of Estimate” and “Detail” Codes

Basis of Estimate Codes

When you report on-site releases to each environmental medium and off-site transfer for disposal or recycling, you will enter a “Basis of Estimate” code in the NPRI reporting software. There are four methods of estimating releases.

The following are the “Basis of Estimate” codes, listed in declining order of expected accuracy:

- monitoring or direct measurement (Code M)
- mass balance (Code C)
- emission factors (Code E)
- engineering estimates (Code O)

Selecting Code “NA” (Not applicable) as the “Basis of Estimate” indicates that there were no releases from your facility to this medium, or no transfers off site.

A new “Basis of Estimate” code (Code NI) was added for the 2000 reporting year only for dioxins/furans and HCB for instances when no information is available. You should enter “NI” as your “Basis of Estimate” code if your facility met reporting criteria for dioxins/furans or HCB, but you have no information available on which to base an estimate of the quantity released or transferred.

Detail Codes

For dioxins/furans and HCB substance reports only, a “Detail” code field is available in the NPRI reporting software adjacent to the “Basis of Estimate” field. There are three “Detail” codes:

- concentrations at or above LoQ (Code AL)
- concentrations below LoQ (no quantity entered) (Code BL), and
- concentrations below LoQ (enter a quantity) (Code BQ).

These “Detail” codes only apply to data from monitoring or direct measurements (Code “M” in the “Basis of Estimate” field). If you enter the “AL” Detail code, you must enter the quantities released or transferred. If your concentrations are below LoQ, then reporting of quantities released or transferred is optional – you must select one of two Detail codes. If you enter the “BL” Detail code for concentrations below LoQ, you have chosen not to report the quantities released or transferred. If you enter the other Detail code for concentrations below LoQ (Code “BQ”), you have chosen to report the quantities released or transferred.

The use of “Basis of Estimate” and “Detail” codes is discussed in the following sections and summarized in Table 6. More information on completing an NPRI report using the NPRI reporting software is provided in the *Guide for Reporting*.

TABLE 6 : HOW TO REPORT RELEASES AND TRANSFERS OF DIOXINS/FURANS AND HCB

BASIS OF ESTIMATE CODE	DETAIL CODE	QUANTITY FIELD
Monitoring or Direct Measurement (Code M)	At or above LoQ (Code AL)	you must enter quantity released or transferred
Monitoring or Direct Measurement (Code M)	Below LoQ (no quantity entered) (Code BL)	<i>not applicable</i>
Monitoring or Direct Measurement (Code M)	Below LoQ (quantity entered) (Code BQ)	you must enter quantity released or transferred
Mass Balance (Code C)	<i>not applicable</i>	you must enter quantity released or transferred
Emission Factors (Code E)	<i>not applicable</i>	you must enter quantity released or transferred
Engineering Estimate (Code O)	<i>not applicable</i>	you must enter quantity released or transferred
No Information Available (Code NI)	<i>not applicable</i>	<i>not applicable</i>
Not Applicable (Code NA)	<i>not applicable</i>	<i>not applicable</i>

5.4.3 Units

Dioxins/Furans

Report quantities of dioxins/furans released on site and transferred off site in units of grams of toxic equivalents (g TEQ) of the 17 congeners listed in Table 3. Units of grams TEQ are further discussed in Section 5.4.4.

HCB

You must report the quantities of HCB released on site and transferred off site in units of grams (g).

5.4.4 What Are Toxic Equivalents (TEQs) of Dioxins/Furans?

You must report on-site releases and off-site transfers of dioxins/furans in units of grams TEQ of the 17 congeners listed in Table 3. 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, scientists have assigned toxic equivalency factors (TEFs) to each dioxin/furan congener as weighting factors. These TEFs are assigned relative to the toxicity of 2,3,7,8-TCDD, the most toxic congener, which is assigned a TEF of 1.

To apply and compare TEQs, the values must be calculated using the same set of TEFs. Most release data on dioxins/furans currently available in Canada are in units of international TEQs (North Atlantic Treaty Organization/Committee on the Challenges of Modern Society, NATO/CCMS, 1989). More recent work undertaken for the World Health Organization (van den Berg, 1998) has resulted in a revised set of TEFs, not just for humans, but for mammals, fish and birds. However, since most of the emission factors currently available are in international TEQs, these TEF values (NATO/CCMS, 1989), listed in Table 7, must be used for reporting to the NPRI.

To calculate the TEQ of a mixture, you must first multiply the concentration of an individual congener by its respective TEF, or weighting factor, to obtain the congener-specific TEQ concentration. The sum of the TEQ concentrations for the individual congeners is the TEQ concentration for the mixture.

TABLE 7: TOXIC EQUIVALENCY FACTOR (TEF) VALUES FOR DIOXINS AND FURANS

CAS No.	CONGENER	ABBREVIATION	TEF
<i>Dioxins</i>			
1746-01-6	2,3,7,8-Tetrachlorodibenzo- <i>p</i> -dioxin	2,3,7,8-TCDD	1
40321-76-4	1,2,3,7,8-Pentachlorodibenzo- <i>p</i> -dioxin	1,2,3,7,8-PeCDD	0.5
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo- <i>p</i> -dioxin	1,2,3,4,7,8-HxCDD	0.1
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo- <i>p</i> -dioxin	1,2,3,6,7,8-HxCDD	0.1
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo- <i>p</i> -dioxin	1,2,3,7,8,9-HxCDD	0.1
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo- <i>p</i> -dioxin	1,2,3,4,6,7,8-HpCDD	0.01
3268-87-9	Octachlorodibenzo- <i>p</i> -dioxin	OCDD	0.001
<i>Furans</i>			
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	2,3,7,8-TCDF	0.1
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	2,3,4,7,8-PeCDF	0.5
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	1,2,3,7,8-PeCDF	0.05
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	1,2,3,4,7,8-HxCDF	0.1
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	1,2,3,7,8,9-HxCDF	0.1
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	1,2,3,6,7,8-HxCDF	0.1
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	2,3,4,6,7,8-HxCDF	0.1
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	1,2,3,4,6,7,8-HpCDF	0.01
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	1,2,3,4,7,8,9-HpCDF	0.01
39001-02-0	Octachlorodibenzofuran	OCDF	0.001

(NATO/CCMS, 1989)

Example of a TEQ Calculation

The following table shows the different concentrations of four dioxin and furan congeners in an ash sample. If these concentrations were simply summed together, the sample would be reported as containing 80 nanograms (ng) of dioxins/furans in each kilogram (kg) of ash. However, 1,2,3,4,7,8-HxCDF is 10 times less toxic than 2,3,7,8-TCDD. By applying the TEFs to each congener and summing the values, the resulting toxic equivalent (TEQ) for the mixture is 25 ng TEQ of dioxins/furans in each kg of ash, or 25 ng TEQ/kg.

DIOXINS/FURANS CONGENER	SAMPLE CONCENTRATION (ng/kg)	TOXIC EQUIVALENCY FACTOR (TEF)	TOXIC EQUIVALENT (ng TEQ/kg ASH)
2,3,7,8-TCDD	10	1	10
1,2,3,7,8-PeCDD	20	0.5	10
1,2,3,4,7,8-HxCDF	30	0.1	3
1,2,3,6,7,8-HxCDF	20	0.1	2
Total Concentration			25 ng TEQ/kg

5.5 What You Must Report – Details

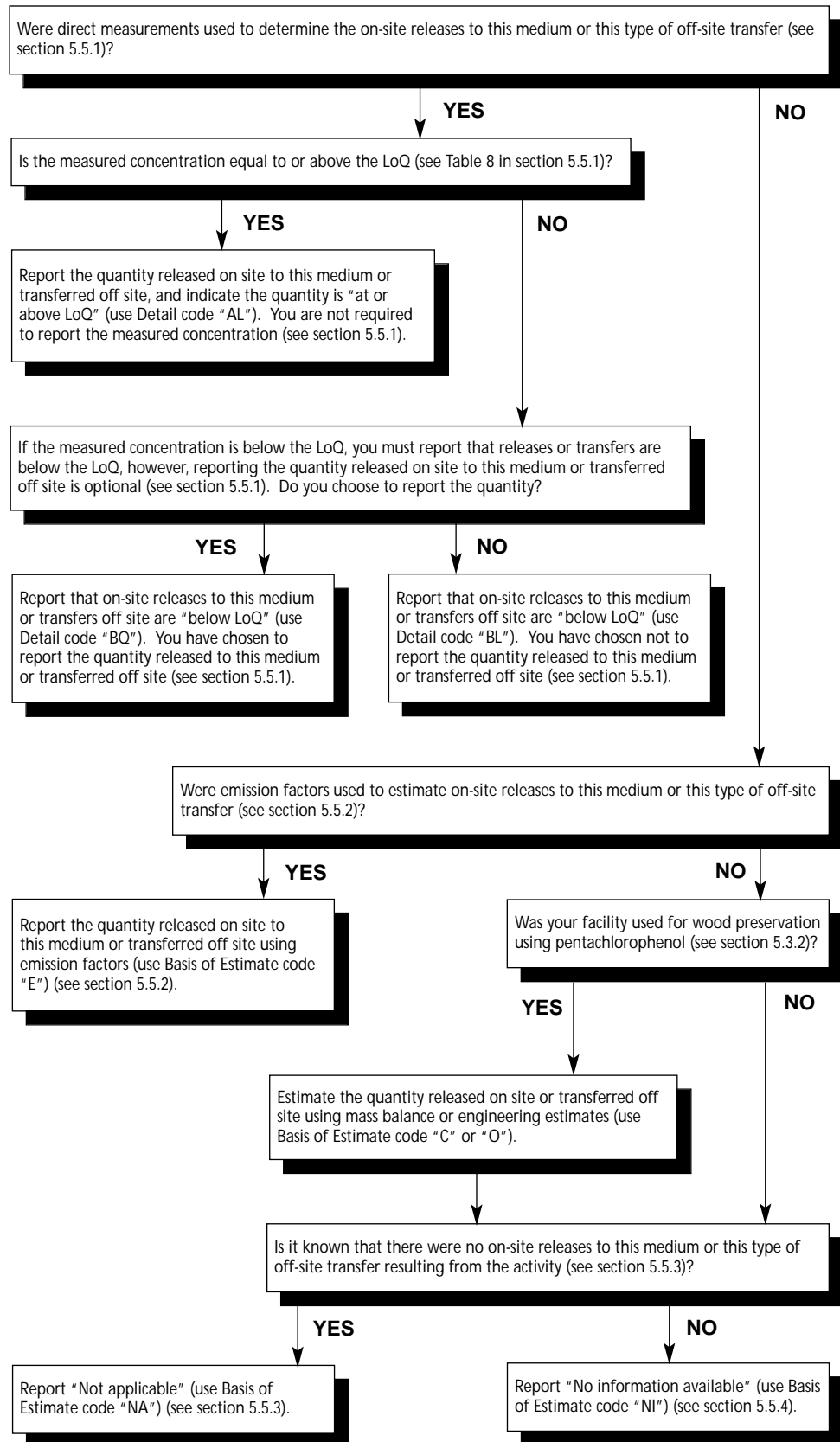
First, determine whether you must report quantities released on site to each environmental medium and transferred off site. You must report quantities released on site and transferred off site unless:

- you directly measure dioxins/furans and HCB resulting from incidental manufacture from an activity listed in Tables 4 or 5, and the concentrations are below the LoQ values defined below, or
- you have no information available on which to base estimates of on-site releases and off-site transfers.

Use the flowchart in Figure 5 to determine what you must report to the NPRI for dioxins/furans and HCB. Read the flowchart for on-site releases to each environmental medium (i.e., air, water, land and underground injection) and for each type of off-site transfer. You must account for total releases of dioxins/furans and HCB from your facility to each environmental medium. Explanations of the terms used in the flowchart are provided in sections 5.5.1 to 5.5.4.

FIGURE 5

**WHAT YOU MUST
REPORT FOR
DIOXINS/FURANS
AND HCB**



5.5.1 Direct Measurements

As defined in the *Guide for Reporting*, a direct measurement is based on measured concentrations of the substance in a waste stream and the volume/flow rate of that stream. Direct measurements should be made of on-site releases and off-site transfers representative of the facility's normal operating conditions or production levels.

If your facility has made direct measurements of dioxins/furans or HCB, then you should use these data to determine which releases and transfers, if any, you must report to the NPRI. Enter Code "M" in the "Basis of Estimate" field in the NPRI reporting software. Chapter 7 provides examples of how to estimate releases using measured data.

The following sections will help you determine if your measured concentrations are above, equal to or below the LoQ for each type of material that you release on site and transfer off site.

Level of Quantification (LoQ)

The level of quantification is defined in Section 65.1 of the *CEPA* (1999) as "the lowest concentration that can be accurately measured using sensitive but routine sampling and analytical methods". Environment Canada determines LoQ values by carrying out statistical analyses of several sets of measurements from a variety of emission sources. The LoQ is calculated as 10 times the standard deviation of replicated measurements. The standard deviation is the variability of the test data associated with the sampling, analysis and actual source emission changes during testing, using standard test methods (Environment Canada, 1989).

Table 8 provides estimated LoQs for dioxins/furans and for HCB for three types of material or waste streams that may be released on site or transferred off site – gaseous, liquid and solid. The LoQ values listed include both final and draft values published by Environment Canada. You must compare your measured concentrations to the appropriate LoQ for each type of on-site release and off-site transfer that you report to the NPRI. Containment in an off-site landfill is an example of a type of off-site transfer for disposal. Recovery of pollution-abatement residues is an example of a type of off-site transfer for recycling.

Environment Canada published estimated LoQ values for dioxin/furan and HCB concentrations in gaseous releases (Environment Canada, 1999). You should use these values to determine whether concentrations in releases to air from stacks and other sources are above, equal to or below the LoQ.

TABLE 8 : ESTIMATED LoQ VALUES FOR CONCENTRATIONS OF DIOXINS/FURANS AND HCB

STATE OF MATERIAL	ESTIMATED LoQ FOR CONCENTRATIONS OF DIOXINS/FURANS	ESTIMATED LoQ FOR CONCENTRATIONS OF HCB
Gaseous	32 pg TEQ/m ³	6 ng/m ³
Liquid	20 pg TEQ/L	70 ng/L
Solid	9 pg TEQ/g	2 ng/g

Environment Canada has not published an LoQ for dioxin/furan concentrations in liquids, but has extrapolated a draft LoQ for dioxins/furans in liquids from the effective LoQ for 2,3,7,8-TCDD in the *Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations*. Facilities should use 20 pg TEQ/L as the LoQ for concentrations of dioxins/furans in liquids.

Environment Canada has developed an estimated LoQ for concentrations of HCB in chlorinated solvents. Facilities should use 70 ng/L as the estimated LoQ for concentrations of HCB in all liquids.

Environment Canada published proposed LoQ values for dioxins/furans and HCB in soil in early 2000 (Environment Canada, 2000). You should use LoQ values of 9 pg TEQ/g for dioxins/furans and 2 pg/g for HCB to determine whether concentrations of dioxins/furans or HCB in solid materials are equal to or above the LoQ. Incinerator bottom ash, pollution-abatement residues and sludges are examples of solid materials containing dioxins/furans or HCB that may be released on site or transferred off site.

Are Your Measured Concentrations Equal to or Above LoQ?

When comparing measured concentrations to LoQ values, measurements should be made of on-site releases and off-site transfers representative of your facility's normal operating conditions or production levels. If you determine that your measured concentrations are equal to or above the LoQ, then you must estimate and report the quantities of on-site releases and off-site transfers for the 2000 calendar year using these concentrations. Enter Code "AL" (At or above LoQ) in the "Detail" code field in the NPRI reporting software.

Are Your Measured Concentrations Below LoQ?

When comparing measured concentrations to LoQ values, measurements should be made of on-site releases and off-site transfers representative of your facility's normal operating conditions or production levels. If you directly measure dioxins/furans and HCB in an on-site release or off-site transfer resulting from incidental manufacture from an activity listed in Tables 4 or 5, and the concentrations are below LoQ, reporting the quantities released on site and transferred off site is optional. You must select one of two Detail codes. If you enter Code "BL" for concentrations below LoQ, you are not required to enter the quantities released or transferred. If you enter Code "BQ" for concentrations below LoQ, you have chosen to report the quantities released or transferred.

Example

A facility has directly measured dioxins/furans resulting from incineration of non-hazardous solid waste (incidental manufacture of dioxins/furans from an activity listed in Table 4). The facility determined that dioxins/furans were released to air from a stack at a concentration of 20 pg TEQ/m³. The measured concentration is below the LoQ of 32 pg TEQ/m³, so the facility does not need to report the quantities of dioxins/furans released on site from stacks. The facility will report that releases to air of dioxins/furans from the stack are below LoQ (Detail code "BL").

Dealing with Multiple Data Points and Non-detected Values

If you have several sets of directly measured concentrations for a given release or transfer, you should compare the average or mean value of all the concentrations with the appropriate LoQ. The method detection limit (MDL) is the smallest concentration of the substance under analysis (analyte) that produces an instrumental response and that meets all analyte detection and identification criteria of a specified test method. If some of the concentration data are below the MDL (i.e., they are non-detected), you should use a value of one-half the MDL to calculate the mean concentration for comparison with the LoQ and to calculate the quantities of dioxins/furans and HCB released on site or transferred off site.

5.5.2 Emission Factors

As defined in the *Guide for Reporting*, an emission factor is based on average measured emissions from several similar processes. Emission factors usually express releases as a ratio of quantity released to process or equipment throughput. In the absence of data from direct measurements, your facility should estimate on-site releases or off-site transfers of dioxins/furans or HCB as a result of incidental manufacture, using emission factors that you possess or to which you have reasonable access. Enter Code “E” in the “Basis of Estimate” field in the NPRI reporting software.

Emission factors may be developed for one or more facilities using measured data under similar process conditions. Environment Canada compiled many emission factors for activities in Tables 4 and 5 in the *Emission Factor Database for Alternate-Threshold Substances* (see Appendix 9). You should indicate, in the “Comments” field of the NPRI reporting software, the source of any emission factor used. If Environment Canada has included an emission factor for your activity in the *Emission Factor Database for Alternate-Threshold Substances*, but you choose not to use it, you should provide your reason in the “Comments” field.

If you use emission factors to estimate on-site releases and off-site transfers, you must report the quantities released or transferred. You cannot report that your concentrations for a specific on-site release or off-site transfer are below the LoQ.

5.5.3 No On-site Releases to a Specific Medium or Transfers Off Site

If there are no dioxins/furans or HCB released on site to a given medium or transferred off site from the facility for the specified activity, the facility should report “Not applicable” for that medium or transfer category for that substance. Enter Code “NA” in the “Basis of Estimate” field in the NPRI reporting software, indicating that there were no releases to the given medium or transfers off site for that category.

For example, if dioxins/furans were only released to air from a combustion process of an activity listed in Table 4 or 5, and there was no related process with releases to water as a result of that activity, the facility reports “Not applicable” for on-site releases of dioxins/furans to water. Similarly, if there were no off-site transfers of material from the activity that generates the dioxins/furans, report “Not applicable” for each off-site transfer category.

5.5.4 No Information Available

If information is not available for releases to a specific medium or for an off-site transfer, either through direct measurements, emission factors or some other source to which the facility possesses or may reasonably be expected to have access, then the facility should report “No information available” for on-site releases to that medium or for that type of off-site transfer. Enter Code “NI” in the “Basis of Estimate” field in the NPRI reporting software. If you report “No information available” for an activity for which Environment Canada has included an emission factor in the *Emission Factor Database for Alternate-Threshold Substances*, you should provide your reason for not using the values in the emission factor database in the “Comments” field of the NPRI reporting software.

6 Wood Preservation

6.1 Introduction

Wood preservation refers to the preservation of wood using heat or pressure treatment, or both.

The Issue Table for the Wood Preservation Sector Strategic Options Process requested that reporting criteria agreed upon by industry and Environment Canada in the Strategic Options Process be implemented, using the NPRI as a reporting mechanism. Environment Canada is developing detailed guidance specific to wood-preservation facilities. The document, to be titled *Guidance for Wood-Preservation Facilities Reporting to the National Pollutant Release Inventory*, will provide a step-by-step methodology for estimating releases and transfers of NPRI substances from wood-preservation facilities. The guide will outline how to estimate releases and transfers of several NPRI substances listed at alternate thresholds, including PAHs, dioxins/furans and HCB. The guide will be posted on the NPRI Web site at <www.ec.gc.ca/pdb/npri> in 2001.

6.2 Reporting Criteria

Changes to the NPRI for the 2000 reporting year that are specific to the wood-preservation sector are:

- removal of the 20 000-hour employee threshold for the activity of wood preservation (using heat or pressure treatment, or both) for all NPRI-listed substances
- reporting all on-site releases and off-site transfers of PAHs by facilities used for wood preservation using creosote, and
- reporting all on-site releases and off-site transfers of dioxins/furans and HCB by facilities used for wood preservation using pentachlorophenol.

6.2.1 20 000-hour Employee Threshold

The 20 000-hour employee threshold does not apply to a facility used for wood preservation. The decision to remove the employee threshold was based on the request from the Issue Table for the Wood Preservation Sector Strategic Options Process.

6.3 Substances

6.3.1 Schedule 1, Part 1, Substances

There are no reporting criteria for substances listed in Schedule 1, Part 1, of the 2000 *Canada Gazette* notice that are specific to the activity of wood preservation. The reporting criteria for these substances are explained in the *Guide for Reporting*.

6.3.2 Mercury (and its compounds)

There are no reporting criteria for mercury (and its compounds) that are specific to the activity of wood preservation. The reporting criteria for mercury (and its compounds) are explained in Chapter 3.

6.3.3 PAHs

PAHs can constitute up to 90% of creosote and, for this reason, may be released or transferred from most activities using creosote.

Wood Preservation

If your facility was used for wood preservation using creosote, you must submit a report for each PAH that was released or transferred, regardless of the number of hours worked by employees and regardless of the quantity of PAHs released on site or transferred off site. This reporting requirement is found in Schedule 2, Part 3, of the 2000 *Canada Gazette* notice.

6.3.4 Dioxins/Furans and HCB

Environment Canada has determined that dioxins/furans and HCB are not likely to be incidentally manufactured as part of the activity of wood preservation. However, dioxins/furans and HCB are present as contaminants in pentachlorophenol used in the treatment of wood. For this reason, reporting is required by facilities used for wood preservation using pentachlorophenol.

If your facility was used for wood preservation using pentachlorophenol, you must submit a report for dioxins/furans and HCB, regardless of the number of hours worked by employees and regardless of the quantity of dioxins/furans and HCB released or transferred. This reporting requirement is found in Schedule 2, Part 4, of the 2000 *Canada Gazette* notice.

Note: If wood treated with pentachlorophenol is incinerated, this is considered hazardous waste incineration and on-site releases and off-site transfers of dioxins/furans and HCB from this activity must be reported.

6.4 Further Information

Documents discussing releases and transfers from the activity of wood preservation are listed below. These documents can be downloaded from the Environment Canada Web site at <www.ec.gc.ca/sop/english/wp.htm>:

- *Strategic Options for the Management of CEPA-Toxic Substances for the Wood-Preservation Sector, Volumes I, II, and III*, and
- *Recommendations for the Design and Operation of Wood-Preservation Facilities* – jointly prepared by Environment Canada and the Canadian Institute of Treated Wood (CITW).

Guidance for Wood-Preservation Facilities Reporting to the National Pollutant Release Inventory will be posted on the NPRI Web site <www.ec.gc.ca/pdb/npri> when it is available in 2001.

7 Examples of How to Estimate Releases

This chapter provides examples of how to estimate releases using monitoring data and emission factors (Examples 1-6), adapted from the draft U.S. EPA *Guidance for Reporting Toxic Chemicals within the Dioxin and Dioxin-like Compounds Category*, and examples of various reporting scenarios for alternate-threshold substances (Examples 7-9). With the exception of wood-preservation processes, PAHs, dioxins/furans and HCB are typically by-products formed during certain manufacturing and combustion processes, and as such the quantities released as a result of incidental manufacture cannot be determined using engineering calculations or a mass balance. Instead, direct measurements or emission factors must be used. Environment Canada has prepared a database with emission factors for all alternate-threshold substances, called the *NPRI Emission Factor Database for Alternate-Threshold Substances* (see Appendix 9).

Examples of How to Estimate Releases

7.1 Estimating Releases Using Direct Measurements

This section provides examples of how to calculate releases of dioxins/furans to air, water and land using direct measurements.

Example 1: Calculating Air Releases of Dioxins/Furans Using Stack Monitoring Data

Stack testing has determined that dioxins/furans were detected in the stack gases at your facility at a concentration of 10^{-9} g TEQ per dry standard cubic metre of gas (10 ng TEQ/dry m^3). The moisture content in the stack was typically 10%. The stack gas velocity was typically 8.0 m/s. The diameter of the stack is 0.3 m. Calculate the annual air release of dioxins/furans from the stack of your facility.

Step 1. Calculate volumetric flow of stack gas stream.

$$\begin{aligned} \text{Volumetric flow} &= (\text{gas velocity}) \times [\pi \times (\text{internal stack diameter})^2 \div 4] \\ &= (8.0 \text{ m/s}) \times [3.142 \times (0.3 \text{ m})^2 \div 4] \\ &= 0.6 \text{ m}^3/\text{s} \end{aligned}$$

Step 2. Correct volumetric flow for moisture content in stack gas stream.

Stack gases may contain large amounts of water vapour. The concentration of the chemical in the exhaust is often presented on a ‘dry gas’ basis. For an accurate release rate, you must correct the stack or vent gas flow rate in Step 1 for the moisture content in your facility’s stack gas. This is done as follows:

$$\begin{aligned} \text{Corrected dry gas volumetric flow} &= (\text{volumetric flow}) \times (1 - \text{fraction of water vapour}) \\ &= (0.6 \text{ m}^3/\text{s}) \times (1 - 0.10) \\ &= 0.5 \text{ m}^3/\text{s} \end{aligned}$$

Step 3. Estimate annual stack emissions to air.

Multiply the dry gas volumetric flow rate by the concentration of dioxins/furans measured in the stack gases.

$$R_{\text{air}} = C \times V \times CF \times H$$

Where:

$$\begin{aligned} R_{\text{air}} &= \text{Annual release of dioxins/furans to air (g TEQ/yr)} \\ C &= \text{Combustion stack gas concentration of dioxins/furans} \\ &\quad (\text{ng TEQ/dry standard } m^3) \\ V &= \text{Hourly volumetric flow rate of combustion stack gas (m}^3/\text{hour)} \\ &\quad (20^\circ\text{C, 1 atm, adjusted to 7\% O}_2) \end{aligned}$$

CF = Capacity factor, fraction of time that the facility operates on an annual basis (e.g. 0.85)

H = Total hours in a year (8760 hr/yr)

$$R_{air} = C \times V \times CF \times H$$

$$= \left(\frac{10 \text{ ng TEQ}}{\text{dry standard m}^3} \right) \times \left(\frac{0.5 \text{ m}^3}{\text{s}} \right) \times (0.85) \times \left(\frac{8760 \text{ hr}}{\text{yr}} \right) \times \left(\frac{3600 \text{ s}}{\text{hr}} \right) \times \left(\frac{\text{g}}{10^9 \text{ ng}} \right)$$

$$= 0.13 \text{ g TEQ/yr}$$

Note: If this facility met all of the NPRI reporting criteria for dioxins/furans, on-site releases of dioxins/furans to air would be reported to the NPRI in the following manner. The measured concentration of dioxins/furans was 10 ng TEQ/m³ (10 000 pg TEQ/m³), which is greater than the LoQ for dioxins/furans in a gaseous medium of 32 pg TEQ/m³. The substance report for dioxins/furans releases to air would indicate: *Basis of Estimate Code* - Monitoring or direct measurement (Code M); *Detail Code* - At or above LoQ (Code AL); *Quantity* - 0.13 g TEQ.

Example 2: Calculating Water Releases of Dioxins/Furans Using Monitoring Data

Your facility is subject to a provincial certificate of approval for the discharge of dioxins/furans into surface waters. You are required to conduct periodic monitoring of the effluent discharge from your facility. In this example, quarterly samples of effluent were taken and analyzed for the content of dioxins/furans. Each sample was an hourly, flow rate-based composite taken for one day to be representative of the discharge for that day. The total effluent volume for that day was also recorded. Your facility operated 350 days in the year. The following data were collected on each sample day.

QUARTER SAMPLE No.	DISCHARGE FLOW RATE (10 ⁶ L/day)	DIOXINS/FURANS CONCENTRATION (pg TEQ/L)
1	80	25
2	80	25
3	160	25
4	400	25

Determine if you are required to report for this facility and, if so, calculate the quantity of dioxins/furans released from this facility.

To calculate the amount of dioxins/furans discharged on each sample day, the concentration of dioxins/furans in the discharge is multiplied by the discharge flow rate for that day, as shown below for the first-quarter sample.

Step 1. Calculate the amount of dioxins/furans discharged per day from each day of sampling.

Daily discharge of dioxins/furans

$$= (\text{daily effluent flow rate}) \times (\text{dioxins/furans concentration in effluent})$$

From the table above, the calculation of daily dioxins/furans effluent discharge for the first sampling quarter is:

$$\begin{aligned} \text{Daily discharge of dioxins/furans} &= \left(\frac{80 \times 10^6 \text{ L}}{\text{day}} \right) \times \left(\frac{25 \text{ pg TEQ}}{\text{L}} \right) \times \left(\frac{\text{g}}{10^{12} \text{ pg}} \right) \\ &= 0.002 \text{ g TEQ/day} \end{aligned}$$

Step 2. Find the average quantity of dioxins/furans discharged in the effluent per day.

Using the same equation, the second-, third- and fourth-quarter dioxins/furans monitoring events are calculated to be 0.002 g TEQ/day, 0.004 g TEQ/day and 0.01 g TEQ/day, respectively. Then the average daily dioxins/furans discharge rate for all monitoring events at this facility was:

$$\begin{aligned} \text{Average daily discharge} &= \left(\frac{0.002 + 0.002 + 0.004 + 0.01}{4 \text{ sampling periods}} \right) \text{ g TEQ/day} \\ \text{of dioxins/furans} &= 0.0045 \text{ g TEQ/day} \end{aligned}$$

Step 3. Calculate the annual discharge of dioxins/furans to surface waters.

The facility operated 350 days in the year. The estimated annual discharge of dioxins/furans to the surface water is calculated as follows:

$$\begin{aligned} \text{Annual discharge of dioxins/furans} &= \left(\frac{350 \text{ operating days}}{\text{yr}} \right) \times \left(\frac{0.0045 \text{ g TEQ}}{\text{day}} \right) \\ &= 1.575 \text{ g TEQ/yr} \end{aligned}$$

Note: If this facility met all NPRI reporting criteria for dioxins/furans, on-site releases of dioxins/furans to water would be reported to the NPRI in the following manner. The measured concentration was 25 pg TEQ/L, which exceeds the LoQ for dioxins/furans in a liquid of 20 pg TEQ/L. The substance report for dioxins/furans released to water would indicate: *Basis of Estimate Code* - Monitoring or direct measurement (Code M); *Detail Code* - At or above LoQ (Code AL); *Quantity* - 1.575 g TEQ.

Example 3: Estimating Releases On Site to Land in the Disposal of Sludge

Under the NPRI, the disposal of NPRI-listed substances in on-site landfills is considered a release to land. The disposal of NPRI-listed substances in an off-site landfill is considered an off-site transfer for disposal.

Your facility generated approximately 1 kg of dry sludge per 4000 L of wastewater treated at the facility's on-site industrial wastewater treatment plant. The facility operations produce approximately 100 million litres of wastewater per day. The facility operated 350 days in the year. Monitoring indicated that the sludge, on average, contained approximately 3 ng TEQ dioxins/furans per kg dry sludge produced. All sludge from your facility was placed in an on-site landfill. What was the annual amount of dioxins/furans released to land from your facility as a function of land disposal of the sludge contaminated with dioxins/furans?

Step 1. Determine the amount of sludge produced per day from the wastewater treatment process.

$$\begin{aligned} \text{Total sludge generated} &= \left(\frac{1 \text{ kg sludge}}{4000 \text{ L wastewater}} \right) \times \left(\frac{1 \times 10^8 \text{ L wastewater}}{\text{day}} \right) \\ &= 25\,000 \text{ kg/day} \end{aligned}$$

Step 2. Determine the amount of dioxins/furans contained in the sludge produced each day.

$$\begin{aligned} \text{Average daily dioxins/furans loading in sludge} &= (\text{total sludge generated}) \times (\text{average dioxins/furans concentration in sludge}) \\ &= \left(\frac{25\,000 \text{ kg sludge}}{\text{day}} \right) \times \left(\frac{3 \text{ ng TEQ dioxins/furans}}{\text{kg sludge}} \right) \times \left(\frac{1 \text{ g}}{10^9 \text{ ng}} \right) \\ &= 7.5 \times 10^{-5} \text{ g TEQ/day} \end{aligned}$$

Step 3. Calculate the annual release of dioxins/furans to land based on annual days of operation per year.

$$\begin{aligned} \text{Annual release of dioxins/furans to land} &= (\text{average daily dioxins/furans loading in sludge}) \times (\text{total operating days per year}) \\ &= \left(\frac{7.5 \times 10^{-5} \text{ g TEQ dioxins/furans}}{\text{day}} \right) \times \left(\frac{350 \text{ operating days}}{\text{yr}} \right) \\ &= 0.02625 \text{ g TEQ/yr} \end{aligned}$$

Note: If this facility met all NPRI reporting criteria for dioxins/furans, on-site releases of dioxins/furans to land would be reported to the NPRI in the following manner. The measured concentration of dioxins/furans was 3 ng TEQ/kg (or 3 pg TEQ/g), which is less than the LoQ for dioxins/furans in a solid medium of 9 pg TEQ/g. However, this facility has chosen to report the quantity of dioxins/furans released on site to land. The substance report for dioxins/furans released to land would indicate: *Basis of Estimate Code* - Monitoring or direct measurement (Code M); *Detail Code* - Below LoQ (Code BQ); *Quantity* - 0.026 g TEQ. The quantity reported is rounded to the nearest thousandth (i.e., 0.026 g TEQ), since the smallest unit that the NPRI reporting software will accept for dioxins/furans is 0.001 g TEQ.

7.2 Estimating Releases Using Emission Factors

Facilities may either develop their own facility-specific emission factors or use the emission factors provided by the NPRI to estimate annual releases and transfers of various substances. The following examples show how to calculate annual releases of dioxins/furans using either chosen emission factors or the emission factors compiled by Environment Canada (see Appendix 9). In either case, the procedures are the same.

If a facility develops its own emission factor for any alternate-threshold substance, it should indicate this in the “Comments” field when completing the NPRI report.

The units vary according to the units of measure of activity level, but usually are weight per unit weight of production, or weight per unit volume of production. Common units for dioxin/furan emission factors for various processes are:

- combustion processes - *nanograms TEQ of dioxins/furans per kilogram of material combusted, processed or produced*
- point-source effluent discharges into surface waters - *picograms TEQ of dioxins/furans per litre of wastewater discharged, and*
- waste generated that will be disposed - *picograms TEQ of dioxins/furans per kilogram of waste or sludge generated.*

Example 4: Estimating Air Releases of Dioxins/Furans from Stack Emissions

Dioxins/furans were released to air from an incineration unit. The emission factor that best fits your facility is 10 ng TEQ of dioxins/furans released from the stack per kilogram of materials processed. Each day your facility processed 25 000 kg of materials, and operated 350 days in the year. The emission factor is appropriate for your level of dioxins/furans control. Estimate the annual release of dioxins/furans from the stack of your facility.

Step 1: Calculate the annual release of dioxins/furans to air.

$$R_{air} = EF \times A$$

Where:

R_{air} - annual release of dioxins/furans to air (g TEQ/yr)

EF - dioxins/furans emission factor (ng TEQ/kg)

A - material processed annually (kg/yr)

$$R_{air} = EF \times A$$

$$= \left(\frac{10 \text{ ng TEQ dioxins/furans}}{\text{kg materials}} \right) \times \left(\frac{25\,000 \text{ kg materials}}{\text{day}} \right) \times \left(\frac{350 \text{ days}}{\text{yr}} \right) \times \left(\frac{\text{g}}{10^9 \text{ ng}} \right)$$

$$= 0.0875 \text{ g TEQ dioxins/furans/yr}$$

Note: If this facility met all NPRI reporting criteria for dioxins/furans, on-site releases of dioxins/furans to air would be reported to the NPRI in the following manner. The substance report for dioxins/furans released to air would indicate: *Basis of Estimate Code* - Emission factors (Code E); *Detail Code* - not applicable; *Quantity* - 0.088 g TEQ. The quantity reported is rounded to the nearest thousandth (i.e., 0.088 g TEQ), since the smallest unit that the NPRI reporting software will accept for dioxins/furans is 0.001 g TEQ.

Example 5: Estimating Water Releases of Dioxins/Furans to Surface Water

Your facility discharged 400 million litres per day of treated wastewater into surface water. The emission factor you have found to be most appropriate for your facility is 10 pg TEQ dioxins/furans per litre of wastewater discharged. The emission factor reflects the level of dioxins/furans control that is occurring at your facility. Your facility operated 365 days in the year. Estimate the annual release of dioxins/furans to surface water.

Step 1: Calculate the annual release of dioxins/furans to water.

$$R_{\text{water}} = EF \times A$$

Where:

R_{water} - annual release of dioxins/furans to water (g TEQ/yr)

EF - dioxins/furans emission factor (pg TEQ/L)

A - material processed annually (L/yr)

$$R_{\text{water}} = EF \times A$$

$$= \left(\frac{400 \times 10^6 \text{ L wastewater}}{\text{day}} \right) \times \left(\frac{365 \text{ days}}{\text{year}} \right) \times \left(\frac{10 \text{ pg TEQ}}{\text{L wastewater}} \right) \times \left(\frac{\text{g}}{10^{12} \text{ pg}} \right)$$

$$= 1.46 \text{ g TEQ/yr}$$

Note: If this facility met all NPRI reporting criteria for dioxins/furans, on-site releases of dioxins/furans to water would be reported to the NPRI in the following manner. The substance report for dioxins/furans released to water would indicate: *Basis of Estimate Code* - Emission factors (Code E); *Detail Code* - not applicable; *Quantity* - 1.46 g TEQ.

Example 6: Estimating Releases of Dioxins/Furans to Land from a Wastewater Treatment Plant

In Example 5, the wastewater treatment plant process generated 1 kg of dry sludge per 5000 L of wastewater treated. The wastewater treatment process removed 50% of the dioxins/furans from the wastewater prior to discharging wastewater into surface water. All of the sludge generated at your facility was placed in an on-site landfill. Calculate how much dioxins/furans were released to land at your facility.

Step 1. Determine the amount of sludge generated each day at your facility.

$\text{Sludge generated} = (\text{sludge generation rate/L wastewater}) \times (\text{wastewater throughput})$

$$= \left(\frac{1 \text{ kg sludge}}{5000 \text{ L wastewater}} \right) \times \left(\frac{400 \times 10^6 \text{ L wastewater}}{\text{day}} \right)$$

$$= 8.0 \times 10^4 \text{ kg/day}$$

Step 2. Estimate the emission factor for dioxins/furans in the sludge.

Assuming that all the dioxins/furans removed from the wastewater during the treatment process are contained in the sludge generated from the wastewater treatment process, the emission factor for sludge can be calculated as a function of dioxins/furans removal efficiency from the wastewater. Thus, the emission factor for dioxins/furans in wastewater multiplied by the removal efficiency gives an approximate indication of the dioxins/furans emission factor for sludge at your facility. In the following calculation, assume the density of sludge is 500 g/L.

$$EF_{\text{sludge}} = \left[(EF_{\text{wastewater}}) \times (1 - \text{fraction of dioxins/furans removed}) \right] \times \left(\frac{1}{\text{density of sludge}} \right)$$

$$EF_{\text{sludge}} = \left[\left(\frac{10 \text{ pg TEQ dioxins/furans}}{\text{L}} \right) \times (1 - 0.5) \right] \times \left(\frac{1 \text{ L sludge}}{500 \text{ g sludge}} \right) \times \left(\frac{10^3 \text{ g}}{\text{kg}} \right)$$

$$= 10 \text{ pg TEQ dioxins/furans/kg sludge}$$

Step 3. Calculate the annual release of dioxins/furans to land.

$$\begin{aligned}
 R_{land} &= \left(\frac{\text{quantity of sludge}}{\text{day}} \right) \times (EF_{sludge}) \times \left(\frac{\text{operating days}}{\text{yr}} \right) \\
 &= \left(\frac{8.0 \times 10^4 \text{ kg sludge}}{\text{day}} \right) \times \left(\frac{10 \text{ pg TEQ dioxins/furans}}{\text{kg sludge}} \right) \times \left(\frac{\text{g}}{10^{12} \text{ pg}} \right) \times \left(\frac{365 \text{ operating days}}{\text{yr}} \right) \\
 &= 0.000292 \text{ g TEQ dioxins/furans/yr}
 \end{aligned}$$

Note: If this facility met all NPRI reporting criteria for dioxins/furans, on-site releases of dioxins/furans to land would be reported to the NPRI in the following manner. The substance report for dioxins/furans released to land would indicate: *Basis of Estimate Code* - Emission factors (Code E); *Detail Code* - not applicable; *Quantity* - 0.000 g TEQ. The quantity reported is rounded to the nearest thousandth (i.e., 0.000 g TEQ), since the smallest unit that the NPRI reporting software will accept for dioxins/furans is 0.001 g TEQ. You would still be required to report the value of “zero”.

7.3 Reporting Scenarios

This section provides examples of possible reporting scenarios using the reporting criteria for the alternate-threshold substances.

Example 7: Reporting for a Hospital Waste Incinerator Using Stack Testing Data

At this facility, 200 tonnes of biomedical waste were incinerated during the year, with a waste feed rate of 100 kg/hr. The facility has stack testing data for dioxins/furans. The measured stack gas concentration of dioxins/furans in air was 2.1 ng TEQ/m³. The stack flow rate was 1.2 m³/s. The facility produced 20 tonnes of incinerator ash in the year and has measured an average dioxin/furan concentration of 1.52 mg TEQ/tonne of ash. The ash was shipped off site for disposal in a landfill.

Step 1. Determine if the facility must report to the NPRI for any alternate-threshold substances.

Reporting is required by facilities used for the “*biomedical or hospital waste incineration of 100 tonnes or more of waste per year*”, regardless of the number of hours worked by employees. This facility incinerated 200 tonnes of biomedical waste, so a report is required for any substance that met the reporting criterion.

Step 2. Determine which substances and information must be reported.**Dioxins/furans**

1. Determine if the measured concentration of dioxin/furan releases to air (2.1 ng TEQ/m³) was greater than the LoQ of 32 pg TEQ/m³.

$$\begin{aligned}
 \text{Concentration} &= \left(\frac{2.1 \text{ ng TEQ}}{\text{m}^3} \right) \times \left(\frac{1000 \text{ pg}}{1 \text{ ng}} \right) \\
 &= 2100 \text{ pg TEQ/m}^3
 \end{aligned}$$

This facility is required to report releases of dioxins/furans to air since the measured concentration of 2100 pg TEQ/m³ was greater than the LoQ of 32 pg TEQ/m³.

Calculate the hours of operation.

$$\begin{aligned} \text{Hours of operation} &= \left(\frac{200 \text{ tonnes waste}}{\text{yr}} \right) \times \left(\frac{\text{hr}}{100 \text{ kg waste}} \right) \times \left(\frac{1000 \text{ kg}}{\text{tonne}} \right) \\ &= 2000 \text{ hours/yr} \end{aligned}$$

Calculate the quantity of dioxins/furans released to the air.

$$\begin{aligned} Q &= \text{quantity of dioxins/furans released to air} \\ Q &= (\text{measured concentration}) \times (\text{flow rate}) \times (\text{hours of operation/yr}) \\ &= \left(\frac{2100 \text{ pg TEQ}}{\text{m}^3} \right) \times \left(\frac{1.2 \text{ m}^3}{\text{s}} \right) \times \left(\frac{2000 \text{ hr}}{\text{yr}} \right) \times \left(\frac{3600 \text{ s}}{\text{hr}} \right) \times \left(\frac{1 \text{ g}}{10^{12} \text{ pg}} \right) \\ &= 0.01814 \text{ g TEQ/yr} \end{aligned}$$

The substance report for dioxin/furan releases to air would indicate: *Basis of Estimate Code* - Monitoring or direct measurement (Code M); *Detail Code* - At or above LoQ (Code AL); *Quantity* - 0.018 g TEQ. The quantity is rounded to the nearest thousandth (i.e., 0.018 g TEQ), since the smallest unit that the NPRI reporting software will accept for dioxins/furans is 0.001 g TEQ.

2. Determine if the measured concentration of dioxins/furans in the incineration ash (1.52 mg TEQ/tonne ash) was greater than the LoQ of 22 pg TEQ/g ash.

$$\begin{aligned} \text{Concentration} &= \left(\frac{1.52 \text{ mg TEQ}}{\text{tonne ash}} \right) \times \left(\frac{1 \text{ g}}{1000 \text{ mg}} \right) \times \left(\frac{10^{12} \text{ pg}}{\text{g}} \right) \times \left(\frac{1 \text{ tonne}}{10^6 \text{ g}} \right) \\ &= 1520 \text{ pg TEQ/g ash} \end{aligned}$$

The measured concentration of 1520 pg TEQ/g ash was greater than the LoQ for dioxins/furans in ash of 22 pg TEQ/g ash, therefore the quantity of dioxins/furans in ash transferred off site for disposal must be reported.

3. Calculate the quantity of dioxins/furans contained in the incineration ash that was transferred off site for disposal.

$$\begin{aligned} &\text{Quantity of dioxins/furans transferred off site} \\ &= (\text{ash produced}) \times (\text{concentration of dioxins/furans in ash}) \\ &= \left(\frac{20 \text{ tonnes of ash}}{\text{yr}} \right) \times \left(\frac{1.52 \text{ mg TEQ}}{\text{tonnes of ash}} \right) \times \left(\frac{1 \text{ g}}{1000 \text{ mg}} \right) \\ &= 0.0304 \text{ g TEQ/yr} \end{aligned}$$

The substance report for dioxin/furan transfers off site would indicate: *Basis of Estimate Code* - Monitoring or direct measurement (Code M); *Detail Code* - At or above LoQ (Code AL); *Quantity* - 0.030 g TEQ. The quantity is rounded to the nearest thousandth (i.e., 0.030 g TEQ), since the smallest unit that the NPRI reporting software will accept for dioxins/furans is 0.001 g TEQ.

4. Based on process operations, it is known that there were no on-site releases of dioxins/furans to land, water or underground injection resulting from the incineration process. The substance report for dioxin/furan releases to land, water and underground injection would indicate: *Basis of Estimate Code* - Not applicable (Code NA); *Detail Code* - not applicable; *Quantity* - not applicable.

HCB

1. There were no direct measurements performed for HCB at this facility. Use the emission factors provided in the *NPRI Emission Factor Database for Alternate-Threshold Substances* (Environment Canada) to estimate the HCB releases to air.

$$\begin{aligned} \text{Quantity released to air} &= \left(\frac{0.857 \text{ g HCB}}{\text{tonne of waste incinerated}} \right) \times \left(\frac{200 \text{ tonnes waste incinerated}}{\text{yr}} \right) \\ &= 171.4 \text{ g HCB} \end{aligned}$$

The substance report for HCB releases to air would indicate: *Basis of Estimate Code* - Emission factors (Code E); *Detail Code* - not applicable; *Quantity* - 171.4 g.

2. There was no information available on the concentration of HCB in incinerator ash transferred off site for disposal. The substance report for HCB transferred off site for disposal would indicate: *Basis of Estimate Code* - No information available (Code NI); *Detail Code* - not applicable; *Quantity* - not applicable.
3. Based on unit operations, it is known that there were no on-site releases of HCB to land, water or underground injection resulting from the incineration process. The substance report for HCB releases to land, water and underground injection would indicate: *Basis of Estimate Code* - Not applicable (Code NA); *Detail Code* - not applicable; *Quantity* - not applicable.

Example 8: Reporting for a Cement Kiln

A facility operated a cement kiln and employed 25 full-time employees. Process throughput amounted to 2 500 000 tonnes of clinker produced during the year. The facility incidentally processed and released 9.4 kg of mercury to air from trace mercury contamination in the limestone processed in the kiln and from fossil fuels combusted. The concentration of dioxins/furans released to air was measured at 0.051 ng TEQ/m³, and the total quantity of dioxins/furans released to air from the stack was calculated to be 0.025 g TEQ. The average concentration of HCB released to air over the year was measured at 30.0 ng/m³, and the total quantity of HCB released to air from the stack was calculated to be 9 g.

Step 1. Determine if the facility must report to the NPRI for any alternate-threshold substances.

The facility met the 20 000-hour employee threshold and, as such, is required to report to the NPRI for substances which met the NPRI reporting criteria.

Step 2. Determine which substances and information must be reported.

Mercury (and its compounds)

The facility incidentally processed and released 9.4 kg of mercury to air. This quantity exceeded the 5-kg manufacture, process or other use threshold for mercury, so the facility must report for mercury (and its compounds).

PAHs

1. Determine if the facility met the NPRI reporting criteria for PAHs. PAHs are reported if the facility incidentally manufactured these substances and the quantity of the PAHs released on site or transferred off site totalled 50 kg or more.

2. In this example, the facility uses the emission factors provided in the *Emission Factor Database for Alternate-Threshold Substances* (Environment Canada), to calculate the quantities of the *individual* PAHs that were incidentally manufactured and released or transferred. The quantity of each individual PAH released is added to determine whether the total of the PAHs listed in Schedule 1, Part 3, of the 2000 *Canada Gazette* notice met or exceeded the 50-kg threshold for total PAHs incidentally manufactured and released or transferred. For a throughput of 2 500 000 tonnes of clinker, the following quantities of individual PAHs are released to air.

INDIVIDUAL PAHs IN SCHEDULE 1, PART 3, 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 kg

The quantity of the individual PAHs resulting from incidental manufacture totalled more than 50 kg, so the facility has met the reporting threshold for PAHs, and must report these substances.

3. The facility must submit a substance report to the NPRI for *each* of the three PAH substances for which there are data. The substance reports and quantity reported for on-site releases to air are: 6.05 kg of fluoranthene, 42.25 kg of phenanthrene and 3.65 kg of pyrene. No report is required for the individual PAHs for which there are no emission factors (i.e., benzo(a)anthracene, benzo(a)phenanthrene, etc.). The releases are not reported under the listing “PAHs, total Schedule 1, Part 3” because the facility has information for some of the individual PAHs listed in Schedule 1, Part 3.
4. There were no releases to water, land or underground injection of any incidentally manufactured PAHs, so the facility reports no releases to these media.
5. 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 transfers of the three PAHs.

Note: “PAHs, total Schedule 1, Part 3” may only be reported if no information is available for the individual PAH substances listed in Schedule 1, Part 3. Such would be the case if the only emission factor available is for a group of PAH substances or if a monitoring or direct measurement only determined the quantity of a group of PAHs without any data for the individual PAH substances.

Dioxins/furans

1. A direct measurement was used to determine the quantity of dioxins/furans released to air. Compare the measured concentration value to the LoQ for air. The LoQ for releases to air is 32 pg TEQ/m³.

$$\begin{aligned} \text{Concentration measured} &= \left(\frac{0.051 \text{ ng TEQ dioxins/furans}}{\text{m}^3 \text{ air}} \right) \times \left(\frac{10^3 \text{ pg}}{\text{ng}} \right) \\ &= 51.0 \text{ pg TEQ/m}^3 \end{aligned}$$

The concentration of 51 pg TEQ/m³ was above the LoQ for dioxins/furans for air of 32 pg TEQ/m³, therefore the facility is required to report the quantity of dioxins/furans released. The substance report for dioxins/furans released to air would indicate: *Basis of Estimate Code* - Monitoring or direct measurement (Code M); *Detail Code* - At or above LoQ (Code AL); *Quantity* - 0.025 g TEQ.

- There were no releases of dioxins/furans to water, land or underground injection, nor any transfers off site for disposal. The substance report for dioxin/furan releases to land, water and underground injection would indicate: *Basis of Estimate Code* - Not applicable (Code NA); *Detail Code* - not applicable; *Quantity* - not applicable.

HCB

- Direct measurement was used to determine releases to air. Compare the measured concentration value to the LoQ for air. The measured concentration of 30 ng/m³ was larger than the LoQ for HCB for air of 6 ng/m³, so the facility is required to report the quantity released. The substance report for HCB released to air would indicate: *Basis of Estimate Code* - Monitoring or direct measurement (Code M); *Detail Code* - At or above LoQ (Code AL); *Quantity* - 9 g.
- There were no on-site releases of HCB to water, land or underground injection, nor any transfers off site, so the facility reports no releases to these media or transfers. The substance report for HCB releases to land, water and underground injection would indicate: *Basis of Estimate Code* - Not applicable (Code NA); *Detail Code* - not applicable; *Quantity* - not applicable.

Example 9: Using the Manufacture, Process or Other Use Threshold for Reporting Mercury (and its compounds)

The following example illustrates the calculation of the 5-kg manufacture, process or other use reporting threshold applicable to mercury (and its compounds). This facility used several processes in which mercury (and its compounds) were manufactured, processed or otherwise used. There is no 1% concentration exemption for mercury (and its compounds). Mercury (and its compounds), at any concentration, must be considered when calculating the reporting threshold and subsequently when reporting.

The facility met the 20 000-hour employee threshold and the processes used were:

- In the first process, mercury was present in a mixture at a 1% concentration.*
- The facility received a raw material which contained 0.005% mercury, which was processed in stream 2.*
- In process stream 3, mercury was present at a concentration of 0.01%.*

MATERIAL CONTAINING MERCURY	TOTAL WEIGHT OF MATERIAL CONTAINING MERCURY (tonnes)	CONCENTRATION OF MERCURY IN THE MATERIAL	NET WEIGHT OF MERCURY (tonnes)
Process stream 1	1	1.0%	0.01
Process stream 2 (raw material)	50	0.005%	0.0025
Process stream 3	20	0.01%	0.02
Total weight of mercury			0.0325 tonnes (32.5 kg)

In this example, the facility would be required to submit a report to the NPRI for mercury (and its compounds) because the total quantity manufactured, processed or otherwise used at the facility exceeded the 5-kg reporting threshold. The facility must report the quantity released on site and transferred off site.

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Publications of the U.S. Environmental Protection Agency (U.S. EPA)

The Office of Pollution Prevention and Toxics of the U.S. EPA has developed many individual guidance manuals on how to estimate releases for different industries reporting to its Toxics Release Inventory (TRI). These manuals could also be used for reporting to the NPRI. A full list of these documents is available in the *Guide for Reporting*.

Locating and Estimating (L&E) Documents

To assist groups interested in preparing inventories of air emissions of various potentially toxic substances, the U.S. EPA Office of Air Quality and Planning Standards has prepared a series of L&E documents that compile available information on sources and emissions of these substances. A full list of documents in this series is listed in the *Guide for Reporting*. The documents that are relevant to the substances and activities discussed in this *Supplementary Guide* are listed below. These documents can be downloaded from the U.S. EPA Web site at www.epa.gov/ttn/chief/ap42etc.html#LE

EPA DOCUMENT NUMBER	SUBSTANCE / TITLE	PUBLICATION DATE
454/R-97-003	Dioxins and Furans	May 1997
454/R-97-012	Mercury (Part A, B, C)	December 1997

Other Guidance Documents

The U.S. EPA has prepared a document to assist facilities in reporting dioxin and dioxin-like compounds to the TRI, entitled *Emergency Planning and Community Right-to-Know Act – Section 313: Guidance for Reporting Toxic Chemicals within the Dioxin and Dioxin-like Compounds Category, Draft May, 2000*. The guide can be downloaded from the TRI Web site at www.epa.gov/tri/. Note that the reporting of dioxins and dioxin-like compounds to the TRI is **not** in units of TEQ.

Compilation of Air Pollutant Emission Factors (AP-42)

The *Compilation of Air Pollutant Emission Factors*, AP-42, Volume 1, 5th Edition, contains information on more than 200 stationary source categories. This information includes brief descriptions of processes used, potential sources of air emissions from the processes and, in many cases, common methods used to control these air emissions. Methodologies for estimating the quantity of pollutant emissions to air are presented in the form of emission factors. The sections of Chapter 2 that are relevant to the activities discussed in this *Supplementary Guide* are listed below. These sections can be downloaded from the U.S. EPA Web site at www.epa.gov/ttn/chief/ap42.html.

SECTION	TITLE OF SECTION IN CHAPTER 2	DATE PUBLISHED
–	AP-42 Introduction	January 1995
2.0	Introduction to Solid Waste Disposal	January 1995
2.1	Refuse Combustion (Supplement B)	October 1996
2.2	Sewage Sludge Incineration	January 1995
2.3	Medical Waste Incineration	July 1993
2.4	Municipal Solid Waste Landfills (Supplement E - minor editorial revision 11/6/98)	November 1998

Appendix 1 – Acronyms and Abbreviations

2000 <i>Canada Gazette</i> notice	“Notice with Respect to Substances in the National Pollutant Release Inventory for 2000” published in the <i>Canada Gazette</i> , Part I, December 25, 1999, and its amendment published December 23, 2000.
ARET	Accelerated Reduction/Elimination of Toxics
CAS	Chemical Abstracts Service
CEPA	<i>Canadian Environmental Protection Act</i>
CEC	Commission for Environmental Cooperation
CCME	Canadian Council of Ministers of the Environment
CWS	Canada-Wide Standard
<i>Guide for Reporting</i>	<i>Guide for Reporting to the National Pollutant Release Inventory – 2000</i>
HCB	Hexachlorobenzene
LoQ	Level of quantification
mg	Milligram
NATO/CCMS	North Atlantic Treaty Organization/Committee on the Challenges of Modern Society
ng	Nanogram
NAFTA	North American Free Trade Agreement
NPRI	National Pollutant Release Inventory
PAH	Polycyclic aromatic hydrocarbon
pg	Picogram
POPs	Persistent organic pollutants
<i>Supplementary Guide</i>	<i>Supplementary Guide for Reporting to the National Pollutant Release Inventory – Alternate Thresholds – 2000</i>
TEF	Toxic equivalency factor
TEQ	Toxic equivalent
TSMP	Toxic Substances Management Policy
UN ECE	United Nations Economic Commission for Europe
U.S. TRI	United States Toxics Release Inventory
U.S. EPA	United States Environmental Protection Agency

Appendix 1 – Acronyms and Abbreviations

Appendix 2 – Measurement Factors

MULTIPLICATION FACTORS		PREFIX	SI SYMBOL
1 000 000 000	= 10 ⁹	giga	G
1 000 000	= 10 ⁶	mega	M
1 000	= 10 ³	kilo	k
100	= 10 ²	hecto	h
10	= 10 ¹	deka	da
0.1	= 10 ⁻¹	deci	d
0.01	= 10 ⁻²	centi	c
0.001	= 10 ⁻³	milli	m
0.000 001	= 10 ⁻⁶	micro	μ
0.000 000 001	= 10 ⁻⁹	nano	n
0.000 000 000 001	= 10 ⁻¹²	pico	p

Mass

$$1 \text{ tonne} = 1\,000 \text{ kg}$$

$$1 \text{ kg} = 1\,000 \text{ g}$$

$$1 \text{ g} = 10^9 \text{ ng}$$

$$1 \text{ g} = 10^{12} \text{ pg}$$

$$1 \text{ ng} = 10^{-9} \text{ g}$$

$$1 \text{ pg} = 10^{-12} \text{ g}$$

Appendix 2 – Measurement Factors

Appendix 3 – Alphabetical Listing of NPRI Substances for 2000

The substances are listed in four parts as they appear in the 2000 *Canada Gazette* notice. **The 23 substances added to the NPRI for 2000 are in bold lettering.** The reporting criteria for substances listed in Part 1 are discussed in the *Guide for Reporting*. The reporting criteria for alternate-threshold substances, listed in Parts 2-4, are discussed in this *Supplementary Guide*.

Schedule 1, Part 1, Substances

NAME	CAS No. ¹	NAME	CAS No. ¹
Acetaldehyde	75-07-0	C.I. Acid Green 3	4680-78-8
Acetonitrile	75-05-8	C.I. Basic Green 4	569-64-2
Acetophenone	98-86-2	C.I. Basic Red 1	989-38-8
Acrolein	107-02-8	C.I. Direct Blue 218	28407-37-6
Acrylamide	79-06-1	C.I. Disperse Yellow 3	2832-40-8
Acrylic acid ²	79-10-7	C.I. Food Red 15	81-88-9
Acrylonitrile	107-13-1	C.I. Solvent Orange 7	3118-97-6
Alkanes, C ₆₋₁₈ , chloro	68920-70-7	C.I. Solvent Yellow 14	842-07-9
Alkanes, C ₁₀₋₁₃ , chloro	85535-84-8	Cadmium ⁶	*
Allyl alcohol	107-18-6	Calcium cyanamide	156-62-7
Allyl chloride	107-05-1	Calcium fluoride	7789-75-5
Aluminum ³	7429-90-5	Carbon disulphide	75-15-0
Aluminum oxide ⁴	1344-28-1	Carbon tetrachloride	56-23-5
Ammonia (total) ⁵	*	Catechol	120-80-9
Aniline ²	62-53-3	CFC-11	75-69-4
Anthracene	120-12-7	CFC-12	75-71-8
Antimony ⁶	*	CFC-13	75-72-9
Arsenic ⁶	*	CFC-114	76-14-2
Asbestos ⁷	1332-21-4	CFC-115	76-15-3
Benzene	71-43-2	Chlorendic acid	115-28-6
Benzoyl chloride	98-88-4	Chlorine	7782-50-5
Benzoyl peroxide	94-36-0	Chlorine dioxide	10049-04-4
Benzyl chloride	100-44-7	Chloroacetic acid ²	79-11-8
Biphenyl	92-52-4	Chlorobenzene	108-90-7
<i>Bis</i> (2-ethylhexyl) adipate	103-23-1	Chloroethane	75-00-3
<i>Bis</i> (2-ethylhexyl) phthalate	117-81-7	Chloroform	67-66-3
Boron trifluoride	7637-07-2	Chloromethane	74-87-3
Bromine	7726-95-6	3-Chloro-2-methyl-1-propene	563-47-3
1-Bromo-2-chloroethane	107-04-0	3-Chloropropionitrile	542-76-7
Bromomethane	74-83-9	Chromium ⁶	*
1,3-Butadiene	106-99-0	Cobalt ⁶	*
2-Butoxyethanol	111-76-2	Copper ⁶	*
Butyl acrylate	141-32-2	Cresol ^{2,8}	1319-77-3
<i>i</i> -Butyl alcohol	78-83-1	<i>m</i> -Cresol ²	108-39-4
<i>n</i> -Butyl alcohol	71-36-3	<i>o</i> -Cresol ²	95-48-7
<i>sec</i> -Butyl alcohol	78-92-2	<i>p</i> -Cresol ²	106-44-5
<i>tert</i> -Butyl alcohol	75-65-0	Crotonaldehyde	4170-30-3
Butyl benzyl phthalate	85-68-7	Cumene	98-82-8
1,2-Butylene oxide	106-88-7	Cumene hydroperoxide	80-15-9
Butyraldehyde	123-72-8	Cyanides ⁹	*

Appendix 3 – Alphabetical Listing of NPRI Substances for 2000

NAME	CAS No. ¹	NAME	CAS No. ¹
Cyclohexane	110-82-7	Hydrazine ²	302-01-2
Cyclohexanol	108-93-0	Hydrochloric acid	7647-01-0
Decabromodiphenyl oxide	1163-19-5	Hydrogen cyanide	74-90-8
2,4-Diaminotoluene ²	95-80-7	Hydrogen fluoride	7664-39-3
2,6-Di- <i>t</i> -butyl-4-methylphenol	128-37-0	Hydrogen sulphide	7783-06-4
Dibutyl phthalate	84-74-2	Hydroquinone ²	123-31-9
<i>o</i> -Dichlorobenzene	95-50-1	Iron pentacarbonyl	13463-40-6
<i>p</i> -Dichlorobenzene	106-46-7	Isobutyraldehyde	78-84-2
3,3'-Dichlorobenzidine dihydrochloride	612-83-9	Isophorone diisocyanate	4098-71-9
1,2-Dichloroethane	107-06-2	Isoprene	78-79-5
Dichloromethane	75-09-2	Isopropyl alcohol	67-63-0
2,4-Dichlorophenol ²	120-83-2	<i>p,p'</i> -Isopropylidenediphenol	80-05-7
1,2-Dichloropropane	78-87-5	Isosafrole	120-58-1
Dicyclopentadiene	77-73-6	Lead ⁶	*
Diethanolamine ²	111-42-2	Lithium carbonate	554-13-2
Diethyl phthalate	84-66-2	Maleic anhydride	108-31-6
Diethyl sulphate	64-67-5	Manganese ⁶	*
Dimethylamine	124-40-3	2-Mercaptobenzothiazole	149-30-4
N,N-Dimethylaniline ²	121-69-7	Methanol	67-56-1
Dimethyl phenol	1300-71-6	2-Methoxyethanol	109-86-4
Dimethyl phthalate	131-11-3	2-Methoxyethyl acetate	110-49-6
Dimethyl sulphate	77-78-1	Methyl acrylate	96-33-3
4,6-Dinitro- <i>o</i> -cresol ²	534-52-1	Methyl <i>tert</i> -butyl ether	1634-04-4
2,4-Dinitrotoluene	121-14-2	<i>p,p'</i> -Methylenebis(2-chloroaniline)	101-14-4
2,6-Dinitrotoluene	606-20-2	1,1-Methylenebis(4-isocyanatocyclohexane)	5124-30-1
Dinitrotoluene ⁸	25321-14-6	Methylenebis(phenylisocyanate)	101-68-8
Di- <i>n</i> -octyl phthalate	117-84-0	<i>p,p'</i> -Methylenedianiline	101-77-9
1,4-Dioxane	123-91-1	Methyl ethyl ketone	78-93-3
Diphenylamine	122-39-4	Methyl iodide	74-88-4
Epichlorohydrin	106-89-8	Methyl isobutyl ketone	108-10-1
2-Ethoxyethanol	110-80-5	Methyl methacrylate	80-62-6
2-Ethoxyethyl acetate	111-15-9	N-Methylolacrylamide	924-42-5
Ethoxynonyl benzene	28679-13-2	2-Methylpyridine	109-06-8
Ethyl acrylate	140-88-5	N-Methyl-2-pyrrolidone	872-50-4
Ethylbenzene	100-41-4	Michler's ketone ²	90-94-8
Ethyl chloroformate	541-41-3	Molybdenum trioxide	1313-27-5
Ethylene	74-85-1	Naphthalene	91-20-3
Ethylene glycol	107-21-1	Nickel ⁶	*
Ethylene oxide	75-21-8	Nitrate ion ¹³	*
Ethylene thiourea	96-45-7	Nitric acid	7697-37-2
Fluorine	7782-41-4	Nitrilotriacetic acid ²	139-13-9
Formaldehyde	50-00-0	<i>p</i> -Nitroaniline	100-01-6
Formic acid	64-18-6	Nitrobenzene	98-95-3
Halon 1211	353-59-3	Nitroglycerin	55-63-0
Halon 1301	75-63-8	<i>p</i> -Nitrophenol ²	100-02-7
HCFC-22	75-45-6	2-Nitropropane	79-46-9
HCFC-122 and all isomers ¹⁰	41834-16-6	N-Nitrosodiphenylamine	86-30-6
HCFC-123 and all isomers ¹¹	34077-87-7	Nonylphenol	104-40-5
HCFC 124 and all isomers ¹²	63938-10-3	Nonylphenol hepta(oxyethylene) ethanol	27177-05-5
HCFC-141b	1717-00-6	Nonylphenol, industrial	84852-15-3
HCFC-142b	75-68-3	Nonylphenol nona(oxyethylene) ethanol	27177-08-8
Hexachlorocyclopentadiene	77-47-4	<i>n</i> -Nonylphenol ⁸	25154-52-3
Hexachloroethane	67-72-1		
Hexachlorophene	70-30-4		
<i>n</i> -Hexane	110-54-3		

NAME	CAS No. ¹	NAME	CAS No. ¹
Nonylphenol polyethylene glycol ether	9016-45-9	Silver ⁶	*
<i>p</i> -Nonylphenol polyethylene glycol ether	26027-38-3	Sodium fluoride	7681-49-4
Nonylphenoxy ethanol	27986-36-3	Sodium nitrite	7632-00-0
2-(<i>p</i> -Nonylphenoxy) ethanol	104-35-8	Styrene	100-42-5
2-(2-(<i>p</i> -Nonylphenoxy)ethoxy) ethanol	20427-84-3	Styrene oxide	96-09-3
2-(2-(2-(2-(<i>p</i> -Nonylphenoxy)ethoxy)ethoxy)ethoxy) ethanol	7311-27-5	Sulphur hexafluoride	2551-62-4
4-<i>tert</i>-octylphenol	140-66-9	Sulphuric acid	7664-93-9
Oxirane, methyl-, polymer with oxirane, mono(nonylphenyl) ether	37251-69-7	1,1,1,2-Tetrachloroethane	630-20-6
Paraldehyde	123-63-7	1,1,2,2-Tetrachloroethane	79-34-5
Pentachloroethane	76-01-7	Tetrachloroethylene	127-18-4
Peracetic acid ²	79-21-0	Tetracycline hydrochloride	64-75-5
Phenol ²	108-95-2	Tetraethyl lead	78-00-2
<i>p</i> -Phenylenediamine ²	106-50-3	Thiourea	62-56-6
<i>o</i> -Phenylphenol ²	90-43-7	Thorium dioxide	1314-20-1
Phosgene	75-44-5	Titanium tetrachloride	7550-45-0
Phosphoric acid	7664-38-2	Toluene	108-88-3
Phosphorus ¹⁴	7723-14-0	Toluene-2,4-diisocyanate	584-84-9
Phthalic anhydride	85-44-9	Toluene-2,6-diisocyanate	91-08-7
Polymeric diphenylmethane diisocyanate	9016-87-9	Toluenediisocyanate ⁸	26471-62-5
Potassium bromate	7758-01-2	1,2,4-Trichlorobenzene	120-82-1
Propargyl alcohol	107-19-7	1,1,2-Trichloroethane	79-00-5
Propionaldehyde	123-38-6	Trichloroethylene	79-01-6
Propylene	115-07-1	Triethylamine	121-44-8
Propylene oxide	75-56-9	1,2,4-Trimethylbenzene	95-63-6
Pyridine ²	110-86-1	2,2,4-Trimethylhexamethylene diisocyanate	16938-22-0
Quinoline ²	91-22-5	2,4,4-Trimethylhexamethylene diisocyanate	15646-96-5
<i>p</i> -Quinone	106-51-4	Vanadium ³	7440-62-2
Safrole	94-59-7	Vinyl acetate	108-05-4
Selenium ⁶	*	Vinyl chloride	75-01-4
		Vinylidene chloride	75-35-4
		Xylene ^{8,15}	1330-20-7
		Zinc ⁶	*

* No single CAS number applies to this NPRI listing.

1 CAS Registry Number denotes the Chemical Abstracts Service Registry Number, as appropriate.

2 "and its salts" – The CAS number corresponds to the weak acid or base. However, the NPRI listing includes the salts of these weak acids and bases. When calculating the weight of these substances and their salts, use the molecular weight of the acid or base, not the total weight of the salt.

3 "fume or dust"

4 "fibrous forms"

5 "Ammonia (total)" means the total of both of ammonia (NH₃ – CAS No. 7664-41-7) and the ammonium ion (NH₄⁺) in solution.

6 "and its compounds"

7 "friable form"

8 "mixed isomers"

9 "ionic"

10 The isomers include, but are not necessarily limited to, HCFC-122 (CAS No. 354-21-2).

11 The isomers include, but are not necessarily limited to, HCFC-123 (CAS No. 306-83-2) and HCFC 123a (CAS No. 90454-18-5).

12 The isomers include, but are not necessarily limited to, HCFC 124 (CAS No. 2837-89-0), and HCFC 124a (CAS No. 354-25-6).

13 "in solution at a pH of 6.0 or greater"

14 "yellow or white"

15 This listing includes the individual isomers of xylene: *m*-xylene (CAS No. 108-38-3), *o*-xylene (CAS No. 95-47-6) and *p*-xylene (CAS No. 106-42-3).

Schedule 1, Part 2, Substances

NAME	CAS No. ¹
Mercury ^{6,16}	*

¹⁶ The reporting requirements for mercury have changed for the 2000 reporting year.

Schedule 1, Part 3, Substances

NAME	CAS No. ¹	NAME	CAS No. ¹
Benzo(a)anthracene	56-55-3	Dibenzo(a,h)anthracene	53-70-3
Benzo(a)phenanthrene	218-01-9	Dibenzo(a,i)pyrene	189-55-9
Benzo(a)pyrene	50-32-8	7H-Dibenzo(c,g)carbazole	194-59-2
Benzo(b)fluoranthene	205-99-2	Fluoranthene	206-44-0
Benzo(e)pyrene	192-97-2	Indeno(1,2,3-c,d)pyrene	193-39-5
Benzo(g,h,i)perylene	191-24-2	Perylene	198-55-0
Benzo(j)fluoranthene	205-82-3	Phenanthrene	85-01-8
Benzo(k)fluoranthene	207-08-9	Pyrene	129-00-0
Dibenz(a,j)acridine	224-42-0		

Schedule 1, Part 4, Substances

NAME	CAS No. ¹	NAME	CAS No. ¹
Hexachlorobenzene	118-74-1	Polychlorinated dibenzo- <i>p</i> -dioxins and polychlorinated dibenzofurans ¹⁷	*

¹⁷ This class of substances is restricted to the following congeners:

2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (1746-01-6);
 1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin (40321-76-4);
 1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin (39227-28-6);
 1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin (19408-74-3);
 1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin (57653-85-7);
 1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin (35822-46-9);
 Octachlorodibenzo-*p*-dioxin (3268-87-9);
 2,3,7,8-Tetrachlorodibenzofuran (51207-31-9);
 2,3,4,7,8-Pentachlorodibenzofuran (57117-31-4);
 1,2,3,7,8-Pentachlorodibenzofuran (57117-41-6);
 1,2,3,4,7,8-Hexachlorodibenzofuran (70648-26-9);
 1,2,3,7,8,9-Hexachlorodibenzofuran (72918-21-9);
 1,2,3,6,7,8-Hexachlorodibenzofuran (57117-44-9);
 2,3,4,6,7,8-Hexachlorodibenzofuran (60851-34-5);
 1,2,3,4,6,7,8-Heptachlorodibenzofuran (67562-39-4);
 1,2,3,4,7,8,9-Heptachlorodibenzofuran (55673-89-7); and
 Octachlorodibenzofuran (39001-02-0).

Appendix 4 – Definition of Biomedical Waste

The following definition has been taken from the 1992 Canadian Council of Ministers of the Environment's *Guidelines for the Management of Biomedical Waste in Canada*.

Definition

This definition does not apply to microbiology laboratory waste, human blood and body fluid waste or waste sharps after these wastes have been disinfected or decontaminated.

Biomedical waste refers to waste that is generated by:

- human or animal health-care facilities
- medical or veterinary research and teaching establishments
- health-care teaching establishments
- clinical testing or research laboratories, and
- facilities involved in the production or testing of vaccines.

The following are the types of biomedical waste:

- a) **Human Anatomical Waste**
This consists of human tissues, organs and body parts, but does not include teeth, hair and nails.
- b) **Animal Waste**
This consists of all animal tissues, organs, body parts, carcasses, bedding, fluid blood and blood products, items saturated or dripping with blood, body fluids contaminated with blood, and body fluids removed for diagnosis or removed during surgery, treatment or autopsy, unless a trained person has certified that the waste does not contain the viruses and agents listed in Risk Group 4 of the *Guidelines*. This excludes teeth, hair, nails, hooves and feathers.
- c) **Microbiology Laboratory Waste**
This consists of laboratory cultures, stocks or specimens of microorganisms, live or attenuated vaccines, human or animal cell cultures used in research, and laboratory material that has come into contact with any of these.
- d) **Human Blood and Body Fluid Waste**
This consists of human fluid blood and blood products, items saturated or dripping with blood, body fluids contaminated with blood and body fluids removed for diagnosis during surgery, treatment or autopsy. This does not include urine or feces.
- e) **Waste Sharps**
Waste sharps are clinical and laboratory materials consisting of needles, syringes, blades or laboratory glass capable of causing punctures or cuts.

Appendix 4 – Definition of Biomedical Waste

Biomedical waste does not include waste that is:

- from animal husbandry
- household in origin
- controlled in accordance with the *Health of Animals Act* (Canada), formerly the *Animal Disease Protection Act* (Canada), or
- generated in the food production, general building maintenance and office administration activities of those facilities to which this definition applies.

Appendix 5 – Definition of Hazardous Wastes

Cooperative efforts by federal and provincial environment departments and members of industry have led to the development of the following working definition of hazardous wastes:

Hazardous wastes are those wastes that are potentially hazardous to human health and/or the environment due to their nature and quantity, and that require special handling techniques.

In the *Transportation of Dangerous Goods (TDG) Regulations*, hazardous wastes are any dangerous goods that meet the definition of waste. For international shipments subject to the *Export and Import of Hazardous Wastes (EIHWS) Regulations*, hazardous wastes can include all wastes controlled by the *TDG Regulations* as well as those listed in Schedule II, Part III of the *CEPA* (1988).

A new definition of waste was added to Part I of the *TDG Regulations* in 1989. This definition covers dangerous goods that are no longer used for their original purpose and that are recyclable materials or intended for treatment or disposal.

The following materials are excluded from the definition – household waste, explosives, radioactive waste (other than low-level) and wastes that are returned directly to the manufacturer or supplier for reprocessing, repackaging or resale.

Since it is a part of the definition of waste, the definition of recyclable material in Part I of the *TDG Regulations* is also important in determining if a given substance is a hazardous waste. This definition was amended to maintain compatibility with the *EIHW Regulations*.

The following materials are considered hazardous wastes:

- all discarded **specified** dangerous goods listed in Schedule II, List II of the *TDG Regulations* that are wastes
- all **not fully specified** waste mixtures/solutions listed in Schedule II, List II, that have hazardous properties described by the criteria in Part III of the *TDG Regulations*
- all industrial waste streams listed in Schedule II, List II of the *TDG Regulations*, and
- all recycled material that is a waste dangerous good according to the *TDG Regulations*.

If, after reading the above, you have determined that your facility's waste is "hazardous waste", there is further classification to be done. "Hazardous Waste" can be classified further into two streams:

Specified Wastes are listed in Schedule II, List II of the *TDG Regulations* <www.tc.gc.ca/actsregs/TDG/english/part-i.html> and Schedule III, Parts I - IV of the *EIHW Regulations* <www.ec.gc.ca/tmd/regs.htm>.

Characteristic Wastes' criteria are found in Part III of the *TDG Regulations* <www.tc.gc.ca/actsregs/TDG/english/part-i.html>.

Appendix 5 – Definition of Hazardous Wastes

Appendix 6 – NPRI Consultations

A6.1 Introduction and History

In the latter half of 1997, Environment Canada held consultations with stakeholders to gather input on priority issues for the development and improvement of the NPRI. As part of its response to the input received, Environment Canada established the NPRI Multistakeholder Ad Hoc Work Group on Substances. The Work Group was comprised of industry, government and environmental representatives. One of its mandates was to examine candidate substances for addition to the NPRI at alternate reporting thresholds (other than the 10-tonne manufacture, process or otherwise use threshold).

Together, Environment Canada and the Work Group developed a list of candidate substances for addition to the NPRI at alternate thresholds. In identifying these candidate substances, the Work Group considered several lists of substances. The substances identified to have the highest priority for addition to the NPRI were dioxins, furans, HCB and PAHs, for reasons discussed below. The need to lower the 10-tonne reporting threshold for mercury was also identified as a priority.

Environment Canada presented background information to the Work Group on these substances so that Work Group members could make recommendations to Environment Canada on appropriate reporting criteria for these substances. Details of the Work Group recommendations and Environment Canada's response are available on the NPRI Web site or from NPRI offices. Some of this information is covered in Sections 3.1, 4.1 and 5.1 of this *Supplementary Guide*.

A6.2 CEPA List of Toxic Substances

Mercury, PAHs, HCB, dioxins and furans are listed on the *CEPA* (1999) List of Toxic Substances. Dioxins, furans and HCB are *CEPA* Track 1 substances that are slated for virtual elimination. Virtual elimination of a toxic substance released into the environment as a result of human activity is defined in subsection 65(1) of the *CEPA* (1999) as “the ultimate reduction in the quantity or concentration of the substance in the release below the level of quantification”.

A6.3 Toxic Substances Management Policy

Twelve substances were identified for virtual elimination under Environment Canada's Toxic Substances Management Policy (TSMP) Track 1. Eight of these substances are pesticides not currently registered for use in Canada, and the other four are dioxins, furans, HCB and polychlorinated biphenyls (PCBs). The TSMP provides a framework based on two key objectives:

- virtual elimination from the environment of toxic substances that are persistent, bioaccumulative and result primarily from human activity (Track 1), and
- life-cycle management of other toxic substances and substances of concern to prevent or minimize their release into the environment (Track 2).

Appendix 6 – NPRI Consultations

A6.4 Persistent Organic Pollutants Protocol

Canada has signed a protocol on persistent organic pollutants (POPs), negotiated under the United Nations Economic Commission for Europe (UN ECE) Convention on Long-range Transboundary Air Pollution. Included on the list are the 12 TSMP Track 1 substances, and PAHs. The criteria for selecting these substances included a potential for, or evidence of, long-range transboundary atmospheric transport, a toxicity criterion (potential to adversely affect human health and/or the environment), and established persistence and bioaccumulation levels.

A6.5 Canada-Wide Standards

Canada-Wide Standards (CWSs) are based on a framework in which federal, provincial and territorial Environment Ministers work together to address key environmental protection and health risk-reduction issues that require common standards across the country. CWSs can include qualitative or quantitative standards, guidelines, objectives and criteria for protecting the environment and reducing the risk to human health. CWSs will include a numeric limit (e.g., ambient, discharge, or product standard), a commitment and timetable for attainment, a list of preliminary actions to attain the standard and a framework for reporting to the public. CWSs have been developed for mercury emissions and dioxins/furans.

A6.6 U.S. Environmental Protection Agency

Pollutant Release and Transfer Registries (PRTRs) such as the NPRI have also been established in other countries. The U.S. Environmental Protection Agency (U.S. EPA) administers the Toxics Release Inventory (TRI), which is a publicly-accessible database similar to the NPRI. Since the Commission for Environmental Cooperation under the NAFTA reports PRTR data from both programs together, it is preferable to have similar reporting criteria in the NPRI and the TRI, where possible.

In previous years, the U.S. EPA required reporting by certain facilities of their releases, transfers and other waste-management practices for certain toxic chemicals if they were manufactured, processed or otherwise used at certain thresholds. The reporting thresholds are 25 000 pounds (11 364 kg) for chemicals that are manufactured or processed, and 10 000 pounds (4 545 kg) for chemicals that are otherwise used. For the 2000 reporting year, the U.S. EPA revised the reporting thresholds for certain substances that persist and bioaccumulate in the environment, modified other reporting criteria for persistent, bioaccumulative and toxic chemicals, and added several other chemicals. Further information can be obtained from the U.S. EPA Web site at <www.epa.gov>.

Appendix 7 – Potential Sources of PAHs and Mercury (and its compounds)

PAHs and mercury (and its compounds) are released from a variety of sectors and activities. The following table is a starting point for identifying sources of emissions for PAHs and mercury, but should not be considered a comprehensive list.

The **potential** release type (air, water, solid waste) of PAHs and mercury (and its compounds) is identified in the table for each sector or activity. Releases for a given sector can occur by activities such as material processing operations, fuel combustion, on-site waste treatment, effluent discharges or off-site waste transfer. Any facility that met the reporting criteria must report the substance releases to the NPRI, even if its sector or activity is not specifically identified in the table.

The last two columns of the table outline whether a facility in that sector or activity is **likely** to meet the reporting criteria for PAHs or mercury (and its compounds), based on available emission factor data. The classifications used to describe potential releases to air from the various sectors and activities are:

- A - Reporting Sources* - might meet specified reporting threshold; emission factor available/tabulated. At least one facility within the sector might be expected to report releases based on estimated process-level emission factors and facility-level throughputs.
- B - Potential Reporting Sources* - might meet specified reporting threshold; no emission factor available. At least one facility within the sector might be expected to report releases based on estimated process-level emission factors and facility-level throughputs.
- C - Other Identified Sources* - might not meet threshold; emission factor available/tabulated. Although a sector contribution is probable, the individual facility throughput or activity level is likely to be too small to require reporting at the designated substance threshold.
- D - Undefined/Possible Sources* - possible but uncertain contribution; no emission factor available. A possible but uncertain contribution since emission factor data are not available (e.g., as the result of a lack of source measurement data).

Appendix 7 – Potential Sources of PAHs and Mercury (and its compounds)

Potential Sources That May Meet the NPRI Reporting Criteria for PAHs and Mercury (and its compounds) Based on Available Emission Factors

NAICS CODE	POTENTIAL CONTRIBUTING SECTOR	POTENTIAL RELEASE TYPE			RELEASES TO AIR	
		AIR	WATER	SOLID WASTE	PAHs	MERCURY
<i>Industrial</i>						
3241	Asphalt Production	•			C	C
3359	Battery Manufacturing	•				A
3251	Carbon Black Production	•			C	C
3273	Cement Manufacturing	•			A	A
3251	Chlor Alkali Production	•	•			C
3271	Clay Product Manufacturing	•				C
3311	Coke Ovens & By-Products	•			A	C
3315	Ferrous Foundries	•			C	D
3311	Ferro Alloy Production	•			A	C
3272	Glass Manufacturing	•				C
2122	Gold Manufacturing	•	•			B
3351, 3353	Instrument & Electrical Equipment Manufacturing	•				A
3311, 3312	Iron & Steel Production	•	•	•	D	A
3311	Iron Ore Sintering	•	•	•	C	C
3274	Lime Manufacturing	•				C
3251	Organic/Inorganic Chemical Production	•	•	•	D	D
3279	Other Mineral Processing	•				D
3251	Paint Manufacturing	•				D
3253	Pesticide Manufacturing	•	•	•		D
3241	Petroleum Refineries	•	•	•	C	C
3252, 3261	Plastics & Resin Manufacturing	•				D
3313	Primary Aluminum Production	•	•		A	
3314	Primary Copper & Nickel Smelting/Refining	•	•	•		A
3314	Primary Lead & Zinc Production	•	•	•		B
3221	Pulp & Paper Production	•	•	•	A	C
3271	Refractory Manufacturing	•				D
3262	Rubber Manufacturing	•			D	
3211, 3212	Sawmills/Plywood/ Hardboard Manufacturing	•			C	
3313	Secondary Aluminum	•				C
3314	Secondary Copper	•				D
3314	Secondary Lead & Zinc	•			C	D
3131, 3132, 3133	Textile & Dye Manufacturing	•			D	D
2111	Upstream Oil & Gas Production	•	•		C	
3211	Wood Preservation	•	•	•	A	

NAICS CODE	POTENTIAL CONTRIBUTING SECTOR	POTENTIAL RELEASE TYPE			RELEASES TO AIR	
		AIR	WATER	SOLID WASTE	PAHs	MERCURY
<i>Stationary Fuel Combustion</i>						
2211	Electric Power Generation	•	•	•	A	A
n/a	Industrial Fossil Fuel Combustion	•			C	C
n/a	Industrial Wood Combustion	•			C	
<i>Waste Handling/Treatment</i>						
5622	Biomedical Waste Incineration	•			D	A
8122	Crematoria	•			C	C
5622	Federal Waste Incineration	•			D	D
5622	Industrial Wastewater Treatment	•	•	•	D	D
5622	Industrial/Hazardous Waste Incineration	•	•	•	C	A
5622	Landfills	•	•	•		D
5622	Municipal Incineration	•	•	•	C	A
5622	Municipal Wastewater Treatment	•	•	•		D
5622	Sewage Sludge Incineration	•	•	•	C	A
5622	Woodwaste Burners	•			B	
<i>Miscellaneous Sources</i>						
n/a	Chemical Spills	•	•	•	D	D
n/a	Dental Preparation	•	•			C
n/a	Fluorescent Lamp Recycling/ Breakage	•		•		C
5413	Laboratories	•				D
5622	Sludge Application to Land	•	•	•		D
5629	Solvent Recovery/Usage	•	•			D
n/a	Tailings Ponds	•	•	•		D

n/a - not available

Appendix 8 – Reported Mercury Content of Various Products and Materials

The following table provides information on the mercury content of various products and materials. The table serves as a quick reference for sources of mercury. However, where possible, facilities should confirm with their suppliers the quantity of mercury contained in various products or materials. If only a range of concentrations is available for a substance present in a mixture, use the average of the range for threshold determinations. If no other information is available, use the information provided in this table to estimate the mercury content of the product or material. An item retains its article status if it is a manufactured item that does not release mercury under normal conditions of processing or other use. References are cited beneath this table.

PRODUCT/MATERIAL TYPE	MERCURY CONTENT			COMMENTS	REFERENCE
	MEAN	RANGE	UNITS		
<i>Chemical/Preservative Materials</i>					
Catalyst	-	-	-	Unknown current use of mercuric chloride catalyst for producing vinyl chloride monomer and phenyl-mercuric compound catalysts for producing polyurethane foams. Methyl mercury hydroxide has been used as an epoxidation catalyst and ethyl mercury chloride used as a polymerization catalyst.	U.S. EPA 1994, U.S. EPA 1997, U.S. NTP 2000
Caustic Soda Solution (50%)	< 0.25 ppm			Mercury is present as an impurity in a concentration of less than 0.25 ppm in the caustic soda solution (50%). In the chlorine-alkali process for industrial fabrication of caustic soda and gaseous chlorine, mercury is used in direct contact with the solution as a cathode, which explains the presence of mercury as an impurity in the caustic soda.	Environment Canada, personal communication
Explosive Detonator	-	-	-	Mercury fulminate was widely used as a detonator for explosives with unknown current use.	Spectrum 2000
Miscellaneous	-	-	-	Mercuric chloride has been used as an agent for browning and etching steel and iron, intensifier in photography, electroplating aluminum, photocopy toners.	U.S. NTP 2000, Scorecard 2000

Appendix 8 – Reported Mercury Content of Various Products and Materials

PRODUCT/MATERIAL TYPE	MERCURY CONTENT			COMMENTS	REFERENCE
	MEAN	RANGE	UNITS		
Paint Preservative	-	-	-	Mercury compounds were previously, but no longer, used as an interior and exterior paint preservative (e.g., phenylmercuric acetate, N-phenylmercury 2-ethylhexyl maleate, phenylmercuric oleate, etc.).	Poll. Probe 1996, U.S. EPA 1997
Pesticide	-	-	-	Various mercury compounds have been used as bactericides and fungicides (e.g., methyl mercury(II) chloride, methyl mercury hydroxide, ethylmercury chloride, phenylmercuric acetate, phenylmercuric nitrate, mercuric chloride, mercury ((o-carboxyphenyl)thio) ethyl sodium salt). Registration of all material fungicides was discontinued in December 1995.	U.S. NTP 2000, Env. Can. 1998
Pigment/Colouring Agent	-	-	-	Although mostly phased out, mercury (cadmium mercury sulphides) has been used to produce dark red pigments for inks, dyes and impregnation to plastic and rubber products.	Poll. Probe 1996, Env. Can. 1998
Preservative	-	-	-	Mercuric chloride has been used as a preservative for materials such as wood, leather tanning, white reserve in fabric printing and embalming anatomical specimens.	U.S. NTP 2000
Sulphuric Acid	-	-	-	Sulphuric acid is known to contain mercury. Please refer to the MSDS to determine the mercury content.	—
Electrical Equipment/Instruments					
Batteries					
- Alkaline	~ 0.1	-	g/unit	0.025% unit mass, type AAA – 9V dry cell	Env. Can. 1998, U.S. EPA 1998
- Alkaline (no mercury design)	-	-	-	type AAA – 9V dry cell	Env. Can. 1998
- Mercuric Oxide	1.35	-	g/unit	33.3% unit mass, button cell	Env. Can. 1998
- Silver Oxide	0.008	-	g/unit	0.6% unit mass, button cell	Env. Can. 1998

PRODUCT/MATERIAL TYPE	MERCURY CONTENT			COMMENTS	REFERENCE
	MEAN	RANGE	UNITS		
- Zinc Air	0.009	-	g/unit	1.0% unit mass, button cell	Env. Can. 1998, U.S. EPA 1998
- Zinc Carbon	-	-	-	1% unit mass, type AAA – 9V dry cell	U.S. EPA 1998
- Zinc Carbon (no mercury design)	-	-	-	type AAA – 9V dry cell	Env. Can. 1998
Fluorescent Lamps					
- Compact	0.010	-	g/unit		Poll. Probe 1996
- 4 ft. Lamp	0.023	-	g/unit	targetted reduction	Poll. Probe 1996
- 8 ft. Lamp	0.046	-	g/unit	targetted reduction	Poll. Probe 1996
- Various	-	-	-	fluorescent lamps contain 0.05% mercury	U.S. EPA 1994
- 40 Watt	-	< 0.01	g/unit	contained 0.027g in 1995, target < 0.012 by 2000	Env. Can. 1998
High Powered Lamps					
- High Pressure Sodium	-	< 0.01	g/unit		Env. Can. 1998
- Metal Halide	0.051	-	g/unit		Env. Can. 1998
- Mercury Vapour	0.075	-	g/unit	used in early 1990s	Env. Can. 1998
MCT Semiconductors	-	-	-	alloy of mercury-cadmium-telluride	U.S. EPA 1994
Other Electrical Equipment	-	-	-	mercury in rectifiers, oscillators, motor switches, cathode tubes	U.S. EPA 1994
Switches & Gauges					
- Accustat	1	-	g/unit	precise temperature control	Env. Can. 1998
- Float Control Tilt	-	0.5-1	g/unit	sump pump, septic tank	Env. Can. 1998

PRODUCT/MATERIAL TYPE	MERCURY CONTENT			COMMENTS	REFERENCE
	MEAN	RANGE	UNITS		
- Plunger/Displacement Relay	-	up to 160	g/unit	high current lighting and heating	Env. Can. 1998
- Reed	-	0.14-3	g/unit	high precision analytical	Env. Can. 1998
- Silent	2.6	-	g/unit	light switch prior to 1991	Env. Can. 1998
- Tilt	2	-	g/unit	freezer light, washing machine	Env. Can. 1998
Thermometers					
- Household	0.5	-	g/unit	typical fever thermometer	Env. Can. 1998
- Laboratory	2.25	-	g/unit	basal air temperature thermometer (5% usage)	U.S. EPA 1997
- Lab/Weather	-	up to 3	g/unit	typical lab or weather thermometer	Env. Can. 1998
- Medical	0.61	-	g/unit	oral, rectal, baby thermometers (95% usage)	U.S. EPA 1994
Thermostats					
- Mercury Switch	~ 3	-	g/unit		Env. Can. 1998
- Thermostat Probes	~ 2.5	-	g/unit	gas appliances	Env. Can. 1998
Various Instrumentation	-	-	-	barometers, manometers, pressure sensors, valves, calomel electrodes	U.S. EPA 1994
<i>Extracted and Refined Fuels</i>					
U.S. Coals					
- Clean Coal	-	0.08-0.34	ppm	mercury content in clean coal (U.S. Geol. Survey)	Poll. Probe 1996
- Raw Coal	-	0.09-0.44	ppm	mercury content in raw coal (U.S. Geol. Survey)	Poll. Probe 1996
- Minnesota Coal	-	0.02-0.09	ppm		Poll. Probe 1996
- Anthracite	0.23	0.16-0.3	ppm	by weight	U.S. EPA 1997

PRODUCT/MATERIAL TYPE	MERCURY CONTENT			COMMENTS	REFERENCE
	MEAN	RANGE	UNITS		
- Bituminous	0.21	< 0.01-3.3	ppm	by weight	U.S. EPA 1997
- Lignite	0.15	0.03-1.0	ppm	by weight	U.S. EPA 1997
- Subbituminous	0.10	0.01-8.0	ppm	by weight	U.S. EPA 1997
U.S. Oils					
- Residual Oil	0.13	-	ppm		Poll. Probe 1996
- Residual Oil	-	0.007-0.17	ppm	mercury content of typical #6 oil	U.S. EPA 1997
- Distillate Oil	0.07	-	ppm		Poll. Probe 1996
- Distillate Oil	-	< 0.12	ppm	mercury content of typical #2 oil	U.S. EPA 1997
Crude Oil	-	0.023-30	ppm		Poll. Probe 1996
Crude Oil	3.5	0.007-30	ppm		U.S. EPA 1997
Crude Oil	-	0.02-2	ppm		Spectrum 2000
Crude Oil	6	-	ppm	crude oil used in U.S. carbon black (oil furnace process)	U.S. EPA 1998
Bitumens, Asphalt, Solid Hydrocarbons	-	2-900	ppm		Spectrum 2000
Medical/Dental Materials					
Dental Amalgams	0.2	-	g/ amalgam	average mercury content per amalgam contains 50% metallic mercury in silver-copper-tin amalgam	Env. Can. 1998 Poll. Probe 1996
Various Medical Reagents	-	-	-	mercury used in various disinfectants, diagnostic reagents, antiseptics, pharmaceutical diuretics, stains, etc. (e.g., mercurous chloride, mercuric chloride, mercuric sulphide, thimerosal, Zenkers solution, immu-sal, carbosal, carbol-fushin)	Poll. Probe 1996

PRODUCT/MATERIAL TYPE	MERCURY CONTENT			COMMENTS	REFERENCE
	MEAN	RANGE	UNITS		
Miscellaneous Materials					
Cement Materials					
- Clinker Product	-	< 0.01	ppm	mercury content in U.S. cement production	U.S. EPA 1998
- Kiln Dust	-	< 0.5	ppm	mercury content in U.S. cement production	U.S. EPA 1998
- Raw Mix	-	< 0.01	ppm	mercury content in U.S. cement production	U.S. EPA 1998
- Waste Fuels	-	< 1.5	ppm	mercury content in U.S. cement production	U.S. EPA 1998
Lead Smelter Acid Plant	0.2	-	ppm	mercury content in Canadian smelter H ₂ SO ₄ acid plant	Env. Can. 1998
Metals and Alloys	-	-	-	may exist as trace component due to surface amalgamation	
Sewage Sludge	1.8	-	ppm	average from Minnesota study	Env. Can. 1998
Sewage Sludge	5.2	-	ppm	dry solids by weight	U.S. EPA 1997
Various Acids and Alkalis	-	-	-	may exist as trace component	
Raw Materials/Ores					
U.S. Metal Mine					
- Copper Ores	-	0.01-1	ppm	0.5 ppm mercury average	U.S. EPA 1998
- Gold Ores	-	0.1-1000	ppm		U.S. EPA 1998
- Lead Ores	0.004	-	lb Hg/ton		U.S. EPA 1998
- Lead (Missouri) Ore	-	< 2	ppm	lead smelter in Missouri	U.S. EPA 1997
- Miscellaneous Ores	-	-	-	unknown for silver, ferroalloy ores, etc.	U.S. EPA 1998
- Zinc Ores	-	0.1-10	ppm		U.S. EPA 1998

PRODUCT/MATERIAL TYPE	MERCURY CONTENT			COMMENTS	REFERENCE
	MEAN	RANGE	UNITS		
Various Mineral/Gangue Components					
- Aragonite	3.7	-	%	mercury content in CaCO ₃	Spectrum 2000
- Barite	0.5	-	%	mercury content in BaSO ₄	Spectrum 2000
- Calcite	0.03	-	%	mercury content in CaCO ₃	Spectrum 2000
- Cerussite	0.1	-	%	mercury content in PbCO ₃	Spectrum 2000
- Fluorite	0.01	-	%	mercury content in CaF ₂	Spectrum 2000
- Galena	0.02	-	%	mercury content in PbS	Spectrum 2000
- Graphite	0.01	-	%	mercury content in graphitic carbon	Spectrum 2000
- Grey Copper Ores	14	-	%	mercury content in (Cu,As,SB)X ₂ sy	Spectrum 2000
- Hydrated Iron Oxides	0.2	-	%	mercury content in Fe ₂ O ₃ nH ₂ O	Spectrum 2000
- Marcasite	0.07	-	%	mercury content in FeS ₂	Spectrum 2000
- Pyrite	2	-	%	mercury content in FeS ₂	Spectrum 2000
- Pyrolusite	2	-	%	mercury content in MnO ₂	Spectrum 2000
- Realgar	2.2	-	%	mercury content in AsS	Spectrum 2000
- Siderite	0.01	-	%	mercury content in FeCO ₃	Spectrum 2000
- Sphalerite	1	-	%	mercury content in ZnS	Spectrum 2000
- Stibnite	1.3	-	%	mercury content in Sb ₂ S ₃	Spectrum 2000
- Tetrahedrite	-	17.6-21	%	mercury content in Cu ₁₂ Sb ₄ S ₁₃	Spectrum 2000
- Wurtzite	0.03	-	%	mercury content in ZnS	Spectrum 2000

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Appendix 9 – NPRI Emission Factor Database for Alternate-Threshold Substances

A database of emission factors has been developed to assist facilities reporting to the NPRI for substances with alternate thresholds. The electronic emission factor database is included in the NPRI Reporting Software CD-ROM for 2000 or can be downloaded from the NPRI Web site at <www.ec.gc.ca/pdb/npri>. A full paper copy of the database can also be printed from the Reporting Software CD-ROM. The following table provides a list of the sectors included in the database. The database is not a comprehensive compilation of relevant emission factors, but instead is designed to provide reporters with a quick reference. The emission factors were compiled from a number of sources, including the U.S. EPA's Factor Information Retrieval (FIRE) data system and its Locating and Estimating documents. Also included in the database is a table of the mercury content of various products and materials (Appendix 8) and a list of substances known to contain mercury.

Reports can be generated from the electronic database by searching the database by NAICS code, Canadian SIC code, sector description or by substance or CAS number. Details of how to use the database are included with the database on the NPRI Reporting Software CD-ROM. If you are aware of published emission factors that you feel should be added to the database, please advise your regional NPRI office, or send an e-mail to <NPRI@ec.gc.ca>.

Sectors Included in the Emission Factor Database

NAICS CODE	SIC CODE	PRIMARY SECTOR	SECTOR DESCRIPTION
-	-	Industrial Fuel Combustion	Industrial Fuel Combustion
2111	7	Natural Gas Processing	Natural Gas Processing
2131	7	Natural Gas Processing	Natural Gas Processing
2211	49	Thermal Generating Stations	Electric Power Generation / Utilities
321	25	Lumber and Wood Product Industry	Industrial Wood Waste Combustion
3211	25	Wood Product Manufacturing	Wood Preservation
3221	27	Pulp and Paper Mills	Industrial Wood Waste Combustion
3221	27	Pulp and Paper Mills	Kraft (Sulphate) Pulping
3221	27	Pulp and Paper Mills	Kraft Pulping
3241	35	Asphalt Production	Batch Mix (Hot Mix) Asphalt Heater
3241	35	Asphalt Production	Batch Mix Asphalt Plant
3241	35	Asphalt Production	Hot Mix Asphalt Plants
3241	36	Petroleum Refining	Petroleum Refining
3251	37	Chemical Manufacturing	Carbon Black Production
3251	37	Chemical Manufacturing	Chlor-alkali Production
3271	35	Mineral Manufacturing	Clay Product / Brick Manufacture
3272	35	Mineral Manufacturing	Glass Manufacture
3273	35	Cement Manufacturing	Portland Cement Manufacture
3274	35	Mineral Manufacturing	Lime Manufacture

Appendix 9 – NPRI Emission Factor Database for Alternate-Threshold Substances

NAICS CODE	SIC CODE	PRIMARY SECTOR	SECTOR DESCRIPTION
3311	29	Primary Iron and Steel Production	Metallurgical By-Product Coke Manufacture
3311	29	Primary Iron and Steel Production	Primary Iron Production – Iron Ore Sintering
3311	29	Primary Iron and Steel Production	Primary Steel Production and Ferrous Foundries
3311	29	Primary Metal Manufacturing	Ferroalloy Production
3313	29	Primary Aluminum Production	Primary Aluminum Smelting
3313	29	Secondary Aluminum Production	Secondary Aluminum Production
3313	29	Secondary Aluminum Production	Secondary Aluminum Smelting
3314	29	Primary Copper Smelting	Primary Copper Smelting
3314	29	Secondary Copper Production	Secondary Copper Smelting / Refining
3314	29	Secondary Lead Production	Secondary Lead Smelting / Refining
3314	29	Secondary Zinc Production	Secondary Zinc Production
3315	29	Ferrous Foundries	Grey Iron Foundries
3315	29	Primary Iron and Steel Production	Primary Steel Production and Ferrous Foundries
3345	39	Instrument Manufacturing	Thermometer Manufacturing
3351	33	Electrical Equipment Manufacturing	Fluorescent Lamp Manufacturing
3351	33	Electrical Equipment Manufacturing / Recycling	Fluorescent Lamp Recycling
3359	33	Electrical Equipment Manufacturing	Battery Manufacturing
3359	33	Electrical Equipment Manufacturing	Electric Switch Manufacturing
5622	49	Industrial / Hazardous Waste Incineration	Industrial / Hazardous Waste Incineration
5622	49	Medical / Biomedical / Pathological Waste Incineration	Medical / Biomedical / Pathological Waste Incineration
5622	49	Municipal Waste Incineration	Municipal Solid Waste Combustion / Incineration
5622	49	Municipal Water Treatment Plants	Municipal Water Treatment Plant
5622	49	Sewage Sludge Incineration	Sewage Sludge Incineration
5622	49	Small Waste Incinerators	Small Municipal / Industrial / Federal Waste Incineration Facilities
6212	86	Health Sciences	Dental Amalgam Preparation
6221	86	Medical / Biomedical / Pathological Waste Incineration	Medical / Biomedical / Pathological Waste Incineration