

CANADIAN WATER AND WASTEWATER ASSOCIATION

NATIONAL POLLUTANT RELEASE INVENTORY AND MUNICIPAL WASTEWATER SERVICES

REPORTING GUIDANCE FOR SMALL TO MEDIUM WASTEWATER FACILITIES

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NATIONAL POLLUTANT RELEASE INVENTORY AND MUNICIPAL WASTEWATER SERVICES

Table of Contents

1. Introduction: Why it is Important to Report.....2

2. CWWA Objectives.....3

3. The Reporting Requirements – General.....3

4. Facility and Substance Definitions.....4

5. The Most Common Pollutants Associated with Small to Medium Facilities.....6

6. Estimating Releases and Transfers - Provide specific calculation examples.....7

7. What Should Be Done in the Future?.....10

Annexes

A. List of NPRI Substance Classes Processed, Used and Manufactured at Municipal Wastewater Treatment Facilities and Their Release Routes.....11

B. List of Industries that Transfer NPRI Substances to Municipal Wastewater Treatment Plants.....13

C. List of Concentrations of NPRI Substances in Wastewater Effluent and Biosolids.....20

D. List of Removal Efficiencies of Wastewater Treatment Processes for Certain NPRI Substances.....21

Bibliography:

NPRI website: <http://www.ec.gc.ca/pdb/npri/>

Environment Canada (2003) “National Pollutant Release Inventory Guidance Manual for the Wastewater Sector” (March, 2003).

NATIONAL POLLUTANT RELEASE INVENTORY AND MUNICIPAL WASTEWATER SERVICES

1. INTRODUCTION - WHY IT IS IMPORTANT TO REPORT

The National Pollutant Release Inventory (NPRI) is a database of annual reports from companies and organizations on their release of specified substances to air, water, and land, or their off-site transfers for disposal or recycling. For the 2002 reporting year there are 273 substances on the NPRI list with a range of reporting threshold requirements. The NPRI provides essential pollutant data to shape public policy and pollution abatement programs, and serves as a “right-to-know” tool for the Canadian public. CWWA used the NPRI data base to prepare the *Directory of Contaminant Sources in Municipal Wastewater Systems* in 2000 and will be preparing a revised edition in 2003. The *Directory* and the NPRI database are useful tools for municipal source control programs and to establish sewer use by-laws.

The NPRI is mandated under the *Canadian Environmental Protection Act, 1999* (CEPA 1999), which requires the federal government to collect data on the release of pollutants into the Canadian environment. Reporting to the NPRI is a legal requirement: failure to report or reporting incorrectly carries legal penalties.

Canada is also obligated by the North American Free Trade Agreement (Environmental Annex) and by the Organization for Economic Cooperation and Development to maintain an inventory of pollutant releases. Canada’s environmental performance, both nationally and internationally, is compared as part of the public access policies of the participating governments.

Full and correct reporting of the release and management of environmental pollutants is a priority. CWWA has prepared this Guide to assist you meet these obligations.

Municipal wastewater effluents contain significant quantities of some of the NPRI substances; others may be released to the environment through the disposal of sewage sludges and biosolids, and yet others are released as atmospheric emissions from treatment lagoons. However, many facilities have either not been reporting, or have been reporting incorrectly.

This Guide is intended to encourage and assist small and medium sized wastewater utilities report to the NPRI, and to improve over time, their reporting accuracy and detail.

A wastewater facility is defined for NPRI as wastewater collection systems that discharge treated or untreated wastewater into surface waters with an annual average flow rate of 10,000 cubic metres or more per day. For the purposes of this guide a small to medium sized wastewater facility is considered any facility with an annual average flow rate of 10,000 m³ per day to 100,000 m³ per day.

It is recognized that these utilities may not have the human or financial resources for full monitoring programs, yet for environmental due diligence reasons alone (let alone specific legislated requirements), wastewater utility managers should be working to understand the environmental effects and consequences of their activities. A full Guidance Manual for the

wastewater sector has been developed and can be consulted for more detailed guidance (see Bibliography).

2. CWWA OBJECTIVES

CWWA's objectives in preparing this Guide for small and medium municipalities on why and how they can report to NPRI are to inform them of their regulatory obligations and environmental responsibilities respecting the release of pollutants to the environment.

It is important for municipalities to report to the NPRI because:

1. The NPRI is a valuable public information tool that helps formulate sound environmental and public policies - comprehensive and reliable information is essential for this purpose.
2. Municipalities are required by the Canadian Environmental Protection Act, 1999 to submit reports if they meet the reporting criteria.
3. Although the reporting criteria exempt many municipalities either from reporting entirely or from reporting the discharge of some substances, CWWA believes that all municipalities should be cognizant of and monitoring the environmental effects of their operations - sustainability of the environment surrounding municipalities is a feature of national, provincial and municipal policies. Municipal discharges affect downstream water quality, downwind air quality and maybe the quality of the lands and soils around them.
4. The primary step in reporting is to report - first with reasonably accurate information based on reasonable estimates, and secondly, over time with more accurate information based on actual monitoring programs.

CWWA encourages therefore, all municipalities to participate in this beneficial program, and to progressively improve their environmental monitoring and reporting.

3. THE REPORTING REQUIREMENTS - GENERAL

The NPRI defines the *Municipal Wastewater Sector* as “facilities serving communities, and includes, but is not limited to, wastewater facilities owned and/or operated by municipalities; wastewater facilities on federal lands serving communities (such as military bases); and, wastewater facilities on aboriginal lands serving aboriginal communities.” The facilities may be owned and/or operated by private individuals or corporations in public-private partnership situations. The North American Industry Classification System (NAICS) code associated with this sector is 221320 (sewage treatment facilities).

Reports are required on a wastewater *facility* basis. A *facility* includes both the wastewater collection and the wastewater treatment components of a system. It also includes wastewater collection systems where wastewater is directly discharged to a water body without treatment. The owner or operator of any facility that meets the NPRI reporting criteria must submit a report (using data from 2002) to Environment Canada by June 1, 2003. Reporting deadlines are strictly enforced and facilities required to report should ensure that they do so on time.

Do you need to file a Report?

There are three basic criteria answering this question:

- C **Does your facility have an annual average discharge of 10,000 cubic metres or more per day into surface water?** This includes **all** discharges to surface waters (effluents, bypass event flows, pumping station overflows, combined sewer overflows as well as sanitary sewer discharges) and is calculated by using the total of all discharges divided by the number of days in year. The NPRI applies the 10,000 cu.m./day flow threshold to the contiguous or adjacent wastewater collection systems at a community level and therefore owners and/or operators of individual wastewater discharge points may be required for reporting. . There are different scenarios provided in the *NPRI Guidance Manual for the Wastewater Sector* for a better understanding of this basic reporting criteria. If your facility does not meet the average discharge requirements you DO NOT have to file a report.
- C **Does your facility meet the substance specific reporting thresholds?** Reporting thresholds vary depending on specific substance. The list of 273 substances for the 2002 reporting year is divided into four parts (and two subparts) with different reporting thresholds and requirements.
- C **Does your facility have monitoring data which confirms the presence of any of these substances?** You are not required to commence new monitoring programs, but if you have data from existing monitoring programs, then you have to report it if the concentration found would trigger the threshold requirements.

CWWA recommends, as a matter of environmental due diligence, that operators of wastewater facilities should be conducting monitoring programs for the presence of environmental pollutants based on the conduct of a source risk assessment. The CWWA *Directory of Contaminant Sources in Municipal Wastewater Systems*, provides the basis for conducting such a risk assessment . A copy of the Directory can be purchased from CWWA at www.cwwa.ca.

4. FACILITY AND SUBSTANCE DEFINITIONS

Definition of Small to Medium Sized Facilities

A wastewater facility is defined as wastewater collection systems that discharge treated or untreated wastewater into surface waters with an annual average flow rate of 10,000 cubic metres or more per day. For the purposes of this guide a small to medium sized wastewater facility is considered any facility with an annual average flow rate of 10,000 m³ per day to 100,000 m³ per day. From CWWA data it is estimated that this could encompass 100 to 150 facilities across Canada. This volumetric criteria is frequently met by facilities serving between 15,000 to 170,000 people. However the effluent volume will depend on other factors including industrial base, sewer separation and rain fall.

A wastewater facility for NPRI purposes includes both the treatment and the collection components of the systems. Effluent volumes to include in the calculation of the annual average discharge from the collection system are:

- C direct discharge of sewage from a main outfall (even where no treatment exists),
- C sanitary sewer system overflows,
- C combined sewer system overflows,
- C pumping station overflows, and
- C bypass flows.

What are the substances and thresholds?

Part 1A substances. The majority of the substances (241) are subject to a MPO (manufactured, processed or otherwise used) threshold of an annual accumulated quantity of 10 tonnes or more. These constitute the CORE list of Substances known as Part 1A substances. If your facility manufactured, processed or otherwise used 10 tonnes or more of a core NPRI substance at a 1% concentration or greater, or any concentration as a by-product, then you may be required to submit a report. EC has interpreted that substances arriving in the influent from industrial, commercial, or residential sources are incidentally processed during wastewater treatment and are therefore considered as “by-products” of the process.

Part 1B substances. There are six substances in this Part: arsenic, lead and its compounds, hexavalent chromium compounds, and tetraethyl lead with an annual MPO threshold of 50 kg or more, and mercury and cadmium and their compounds with an annual MPO threshold of 5 kg or more.

Part 2 substances. There are 17 polycyclic-aromatic hydrocarbons (PAHs) named in this Part and the reporting threshold is based on total releases and transfers as a result of incidental manufacture, or any quantity for wood preservation using creosote. Facilities are required to report if they release a sum of 50 kg or more of all 17 PAHs. It is not likely that the average small to medium treatment plant would be subject to this Part.

Part 3 substances. The two substances in this part are dioxins and furans. This Part would only apply to wastewater collection and storage facilities that incinerate their sewage sludge or those that incinerate greater than 26 tonnes of non-hazardous solid waste on the ground.

Part 4 substances. There are 7 air contaminants named in this part, only one is likely to apply to wastewater treatment plants - volatile organic compounds (VOCs). With a release threshold of 10 tonnes, this substance is not likely to be relevant to small to medium treatment facilities. However stationary combustion equipment on site could release any of these Part 4 substances.

Are there easy guides to likely thresholds?

In respect of **Part 1A** substances, a substance present at:

- C 1 ppm (mg/L or g/m³) will accumulate to 10 tonnes with a daily flow rate of just over 27,300 m³/day
- C 2.7 ppm (mg/L or g/m³) will accumulate to 10 tonnes with a daily flow rate of just over 10,000 m³/day
- C 10 ppm (mg/L or g/m³) will accumulate to 10 tonnes with a daily flow rate of just over 2,700 m³/day
- C 25 ppm (mg/L or g/m³) will accumulate to 10 tonnes with a daily flow rate of about 1,100 m³/day

In respect of **Part 1B** substances, it is possible that medium-sized wastewater facilities may reach the reporting level of 5 kg of mercury based on the presence and number of dental services within the community or mercury-using industries. Some specialty industries may have cadmium, arsenic or lead wastes or the salts of these substances in their effluents.

In respect of **Part 2**, it is unlikely that even medium sized wastewater facilities would reach the reporting threshold of 50 kg for all 17 PAHs combined.

5. THE MOST COMMON POLLUTANTS ASSOCIATED WITH SMALL TO MEDIUM SIZED WASTEWATER FACILITIES

The *NPRI Guidance Manual for the Wastewater Sector*, published by Environment Canada, identifies 50 NPRI substances that are commonly found in wastewater streams (see Appendix A). However, it is recognized that generally, these substances are either not found in sufficient quantity to trigger NPRI reporting requirements or are not routinely monitored for in small to medium sized facilities. The one exception is likely to be total ammonia.

Within the 50 substances listed in Appendix A, the following 20 are considered most likely to be present in wastewater effluents. Small to medium sized facilities should first examine what substances they are currently monitoring for, and determine if they have data. Then they should conduct a contaminant source risk assessment using the CWWA *Directory of Contaminant Sources in Municipal Wastewater Systems* to identify which of these 20 or even 50 substances may be associated with institutional, commercial or industrial activities located within their community. Where regular monitoring programs do not cover these substances, depending on the risk assessment, it may be appropriate to consider instituting a monitoring program to determine their presence and concentration.

ammonia	chromium	manganese	silver
antimony	cobalt	mercury	toluene
cadmium	copper	nickel	vanadium
chlorine	cyanide	phenol	xylene
chloroform	ethylbenzene	selenium	zinc

Releases of NPRI substances to air and water can be estimated. In addition the fate of NPRI substances in sludge and biosolids should be reported in terms of on-site releases or transfers off site.

6. ESTIMATING RELEASES AND TRANSFERS

In order to make the most accurate report you may be required to use a combination of different estimation tools. There are four methods of estimating quantities of substances released or transferred. In declining order of expected accuracy, the four methods are:

- C monitoring or direct measurement,
- C mass balance calculations,
- C emission factors, or
- C engineering estimates.

Monitoring or Direct Measurement

Direct measurement is the most accurate and simplest way of determining the concentration of NPRI substances released by a wastewater facility. In many cases however, direct measurement is not available and other methods will be needed to determine the concentration.

Sample Calculation 1

Wastewater facility that measures has an ammonia concentration of 29 mg/L in the wastewater influent and measures an average of 5.2 mg/L of ammonia in it's wastewater effluent

Facility has an average daily flow of 25,000 m³/day.

This facility meets the flow threshold of >10,000 m³/day

1 cubic metre = 1,000 L

25,000 m³/day x 1000

=25,000,000 L/day

Ammonia (influent) 29 mg/L x 25,000,000 L/day x 365 days/yr = 265 t/yr

This substance meets the mass quantity threshold (> 10 t/yr)

Therefore, need to report ammonia

Aqueous release of ammonia 5.2 mg/L x 25,000,000 L/day

=130,000,000 mg/day x 365 day/year

=47,450,000,000 mg/year

=47.45 tonnes/year

Mass Balance Calculations

The mass balance method is an application of the law of mass conservation to a wastewater process or configuration. It is used to estimate release or transfer based on input-output difference corrected for quantities formed and transformed within a process or configuration.

A generic equation used for mass balance method is:

$$E = M_{\text{input}} - M_{\text{output}} + M_{\text{formation}} - M_{\text{transformation}}$$

E: annual release or transfer of a substance from a wastewater process or from a configuration, tonne/yr

M_{input} : total input quantities of a substance into a wastewater process or configuration, tonne/yr

M_{output} : total output quantities of a substance from a wastewater process or configuration excluding the release or transfer being estimated, tonne/yr

$M_{\text{formation}}$: total quantities of a substance formed within a wastewater process or configuration, tonne/yr

$M_{\text{transformation}}$: total quantities of a substance removed by chemical transformation within a wastewater process or configuration, tonne/yr

The above equation can be simplified as $E = M_{\text{input}} - M_{\text{output}}$ when there are no substances formed or transformed within a wastewater process or configuration. Metals (e.g. copper) are such substances that remain chemically unchanged.

Sample Calculation 2

Estimating Aqueous Release of Copper

Facility has an

C influent volume of 100,000 m³/day

C 0.3 g/m³ copper in the wastewater influent

C 8.76 tonne/yr copper land released - can be determined using engineering estimates as shown in sample calculation 4

$$\begin{aligned}
 E &= M_{\text{input}} - M_{\text{output}} \\
 &= C_i \times Q \times t_{\text{op}} \times 10^{-6} \text{ tonne/g} - E_{\text{sludge}} \\
 &= (0.3 \text{ g/m}^3 \times 100,000 \text{ m}^3/\text{d} \times 365 \text{ d/yr}) \times 10^{-6} \text{ tonne/g} - 8.76 \text{ tonne/yr} \\
 &= 2.19 \text{ tonne/yr}
 \end{aligned}$$

Estimating Releases to Water

Few emission factors exist for determining a wastewater facilities discharge into surface water. Most facilities will need to use direct monitoring data to estimate their releases.

CWWA has prepared a list of industries that report transfers of 50 identified NPRI substances most commonly found in municipal wastewater effluents. It can be found in Appendix B. Utilities should examine this list to determine if they have any industries that discharge NPRI substances to the sewer system. In addition, utilities should check municipal sewer use by-laws and industrial permits for additional information about the discharged substances. Appendix C provides a list of reported concentrations of NPRI substances from a survey of wastewater utilities. The reported values can be used as a baseline for utilities – if you have few industries that discharge a given substance, you may wish to use the minimum value. If you have a heavy industrial base emitting a given substance, you may wish to use the maximum value. If you have a highly sophisticated treatment plant, you may wish to use the lower level, if your treatment plant is primary only, then you may wish to use the higher concentration.

It should be realized that calculations of reporting thresholds and release estimates apply to the influent for most substances (Part 1 substances), plus those incidentally manufactured in the treatment process itself, and consequently the effluent concentration values given in Appendix C should be used with caution.

Sample Calculation 3

A wastewater treatment plant with an average daily flow of 50,000 m³/day, and a heavy base of industries and commercial enterprises that release zinc to the sewer system. Therefore, take the highest value given for zinc in effluent in Appendix C: 0.2 mg/L

50,000 m³/day x 1,000

= 50,000,000 L/day

Aqueous release of zinc is 0.2 mg/L x 50,000,000 L/day

= 10,000,000 mg/day x 365 day/year

= 3, 650,000,000 mg/year

= 3.65 tonne/yr

Estimating Transfers in Biosolids - Using Engineering Estimates

- Step 1: Identify all reported NPRI substances that are released to sludge in your facility
- Step 2: Estimate the total volume of biosolids produced annually.
- Step 3: Using the concentration of NPRI substances in the biosolids, estimate the transfer what will result when biosolids are moved offsite.
- Step 4: Identify removal efficiencies for NPRI substances. This can be based on facility data if there are any, or using the Table (see Appendix D) showing removal efficiencies for certain substances
- Step 5: Working from the removal efficiency of the substance to solids in the process, calculate the portion of substance remaining in effluent.
- Step 6: Based on effluent flows and the portion of substance partitioned to water, calculate the amount of substance released to water annually.

Sample Calculation 4

Copper is a common heavy metal removed by chemical flocculation. The removal efficiency of chemical flocculation for heavy metals is in the range of 60-100% (see Appendix D) An average efficiency of 80% is assumed for the process and used to calculate the amount of copper removed and captured in sludge. The transfer off-site through thickened solids is determined as follows:

$$E_{\text{sludge}} = C_i \times Q \times t_{\text{op}} \times f_{\text{removal}} \times 10^{-6} \text{ tonne/g (EQ F-2)}$$

$$= 0.3 \text{ g/m}^3 \times 100,000 \text{ m}^3/\text{d} \times 365 \text{ d/yr} \times 0.8 \times 10^{-6} \text{ tonne/g}$$

$$= 8.76 \text{ tonne/yr}$$

where:

E_{sludge} = annual land release, tonne/yr

C_i = 0.3 g/m³ (copper concentration in wastewater influent)

Q = 100,000 m³/d (daily volume of wastewater treated)

t_{op} = 365 d/yr (operation days during a reporting year)

f_{removal} = 80% (removal efficiency)

Information Sources for the Estimates of Releases and Transfers

There are several potential information sources you can use when gathering data on discharge quantities to the sewer systems:

- C measured data on effluent, biosolids, air emissions, raw wastewater,
- C measured data on industrial customer discharges,
- C reported information in the NPRI database,
- C a database of your connected industrial or commercial customers,
- C compliance agreements for sewer use,
- C emission factors for air releases for specific substances or processes (further information is detailed in *Appendix D of the NPRI Guidance Manual for the Wastewater Sector*) and;
- C data from Industrial Sewer Use Programs.

7. WHAT SHOULD BE DONE IN THE FUTURE

The reporting requirements (i.e., the list of substances) can be expected to increase and the threshold levels may become smaller in the future as concerns for the loading of pollutants into the environment grows. Wastewater utilities should stay abreast of the changes in reporting requirements and any new substances added to the NPRI list.

Small to medium sized utilities, who lack both staff and financial resources, should initially focus on making reports on key substances in their effluent, perhaps focussing on those substances for which direct monitoring data is available, but nevertheless including information based on estimates derived from known or likely substances in the effluent streams and some emission factors. . These utilities must exercise due diligence to report every possible substance; they could consult this Guide as well as *the NPRI Guidance Manual for the Wastewater Sector* for that purpose. Eventually they should improve their reporting accuracy by expanding the monitoring they do of pollutants in their effluent streams.

Appendix A: NPRI Substance Classes Processed, Used and Manufactured at Municipal Wastewater Treatment Facilities and Their Release Routes

(from National Pollutant Release Inventory Guidance Manual for the Wastewater Sector)

Class	Substance	Release Route				
		Air	Effluent	Sludge	Raw Solids	Bio-solids
Metals	Antimony	✗	✓	✓	?	✓
	Arsenic	✗	✓	✓	?	✓
	Cadmium	✗	✓	✓	?	✓
	Chromium (III)	✗	✓	✓	?	✓
	Chromium (VI)	✗	✓	✓	?	✓
	Cobalt	✗	✓	✓	?	✓
	Copper	✗	✓	✓	?	✓
	Lead	✗	✓	✓	?	✓
	Manganese	✗	✓	✓	?	✓
	Nickel	✗	✓	✓	?	✓
	Selenium	✗	✓	✓	?	✓
	Silver	✗	✓	✓	?	✓
	Vanadium	✗	✓	✓	?	✓
	Zinc	✗	✓	✓	?	✓
Volatile Organic Compounds (not to be confused with NPRI listing of VOCs for the required reporting)	Benzene	✓	✓	✓	?	?
	Bis(2-ethylhexyl) phthalate	✓	✓	✓	?	?
	2-Butoxyethanol	✓	✓	✓	?	?
	Carbon tetrachloride	✓	✓	✓	?	?
	Chlorobenzene	✓	✓	✓	?	?
	Chloroform	✓	✓	✓	?	?
	Dibutyl phthalate	✓	✓	✓	?	?
	o-Dichlorobenzene (1,2-Dichlorobenzene)	✓	✓	✓	?	?
	p-Dichlorobenzene (1,4-Dichlorobenzene)	✓	✓	✓	?	?
	1,2-Dichloropropane	✓	✓	✓	?	?
	Diethyl phthalate	✓	✓	✓	?	?
	N,N-Dimethylaniline	✓	✓	✓	?	?
	N,N-Dimethylformamide	✓	✓	✓	?	?
	Dimethylphthalate	✓	✓	✓	?	?
	Ethylbenzene	✓	✓	✓	?	?
	Ethylene glycol	✓	✓	✓	?	?
	Methanol	✓	✓	✓	?	?
	Naphthalene	✓	✓	✓	?	?
N-Nitrosodiphenylamine	✓	✓	✓	?	?	

Class	Substance	Release Route				
		Air	Effluent	Sludge	Raw Solids	Bio-solids
	Nonylphenol	✓	✓	✓	?	?
	Phenol	✓	✓	✓	?	?
	Phenanthrene (a PAH)	✓	✓	✓	?	?
	Tetrachloroethylene	✓	✓	✓	?	?
	Toluene	✓	✓	✓	?	?
	Total volatile organic compounds	✓	✓	✓	?	?
	1,2,4-Trichlorobenzene	✓	✓	✓	?	?
	Trichloroethylene	✓	✓	✓	?	?
	Xylene	✓	✓	✓	?	?
Volatile Inorganic Compounds	Ammonia	✓	✓	✓	?	✓
	Carbon disulphide	✓	✓	✓	?	?
	Chlorine (total residual) or chloroamines	✓	✓	✓	?	?
	Hydrogen sulphide	✓	✓	✓	?	?
	Nitrogen oxides	✓	✓	✓	?	?
Non-volatile Compounds	Molybdenum trioxide	✗	✓	✓	?	?
	Nitrilotriacetic acid	✗	✓	✓	?	?
	Nitrate ion	✗	✓	✓	?	?
	Phthalic anhydride	✗	✓	✓	?	?
Special Substances	Mercury	✓	✓	✓	?	✓

Appendix B: Industries that Transfer NPRI Substances to Municipal Wastewater Treatment Plants

Industry	NAICS *
Accounting Services	541212
Adhesive Manufacturing	32552
Administrative Support Services (All Other)	56199
Advertising (Other Related Services)	54189
Advertising Material Distribution Services	54187
Aerospace Product and Parts Manufacturing	336410
Airport Operations (Other)	488119
Alkali and Chlorine Manufacturing	325181
Aluminum Rolling, Drawing, Extruding and Alloying	331317
Aluminum- Primary Production	331313
Artists and Other Public Figures- Agents and Managers	71141
Artists, Writers, and Performers- Independent	71151
Asphalt Shingle and Coating Material Manufacturing	324122
Audio and Video Equipment Manufacturing	33431
Automobile and Light-Duty Motor Vehicle Manufacturing	336110
Automobile and Light-Duty Truck Wholesaler-Distributors	415110
Automotive Body, Paint and Interior Repair and Maintenance	811121
Automotive Maintenance Mechanical And Electrical (Other)	811119
Automotive Parts and Accessories Stores	441310
Automotive Repair (General)	811111
Automotive Repair and Maintenance (All Other)	811199
Bakeries (Commercial) Fresh and Frozen Manufacturing	311814
Book Publishers	51113
Box Manufacturing (Corrugated and Solid Fibre)	322211
Breweries	31212
Building Inspection Services	54135
Business Service Centres	561430
Business Support Services (Other)	561490
Car Dealers (New)	44111
Carpet and Upholstery Cleaning Services	56174
Chemical Fertilizer (except Potash) Manufacturing	325313
Chemical Manufacturing	325

Industry	NAICS *
Chemical Manufacturing (All Other Basic Inorganic)	325189
Chemical Manufacturing (Other Basic Organic)	325190
Chemical Product Manufacturing (All Other Miscellaneous)	325999
Chocolate and Confectionery Manufacturing	31132
Cold-Rolled Steel Shape Manufacturing	331221
Communications Broadcasting Equipment Manufacturing	33422
Computer and Peripheral Equipment Manufacturing	334110
Concrete Reinforcing Bar Manufacturing	332314
Construction - Highway and Street	23131
Convention and Trade Show Organizers	56192
Copper Rolling, Drawing, Extruding and Alloying	331420
Copper-Zinc Ore Mining	212233
Cutlery and Hand Tool Manufacturing	332210
Dairy Products (Dry and Condensed) Manufacturing	311515
Data Processing Services	51421
Database and Directory Publishers	51114
Dental Offices	621210
Design- Other Specialized Services	54149
Die-Casting Foundries (Non-Ferrous)	331523
Drafting Services	54134
Dry Cleaning and Laundry Services (except Coin-Operated)	81232
Dye and Pigment (Synthetic) Manufacturing	325130
Educational Services	611
Electrical Appliance Manufacturing (Small)	335210
Electricity- Fossil-Fuel Power Generation	221112
Employment Placement Agencies	56131
Explosives Manufacturing	325920
Film and Video Production	512110
Financial Transactions Processing Activities	52232
Flour Mixes and Dough Manufacturing from Purchased Flour	311822
Food Manufacturing (All Other)	311990
Food Services and Drinking Places	722
Forging	332113
Foundries (Non-Ferrous- except Die-Casting)	331529
Freight Rail Transportation (Mainline)	482113

Industry	NAICS *
Freight Rail Transportation (Short-Haul)	482112
Fruit and Vegetable Canning, Pickling and Drying	311420
Furniture Manufacturing (Institutional)	337127
Furniture Manufacturing (Upholstered Household)	337121
Gas Manufacturing (Industrial)	32512
Gasoline Stations (Other)	44719
Gasoline Stations with Convenience Stores	44711
Glass Manufacturing	327214
Glass Product Manufacturing from Purchased Glass	327215
Gold and Silver Ore Mining	212220
Graphic Design Services	54143
Hardware Manufacturing	33251
Heating and Refrigeration Commercial Equipment Manufacturing	333416
Hospitals General (except Paediatric)	622111
Hotels (except Casino Hotels) and Motels	721111
Industrial Design Services	54142
Industrial Machinery Wholesaler-Distributors	417230
Information Services (All Other)	514199
Insurance Carriers (Direct Life, Health and Medical)	52411
Insurance Carriers (Direct Property)	524124
Insurance Carriers: Other (except Life, Health, and Medical)	524129
Insurance- Other Related Activities	52429
Interior Design Services	54141
Iron and Steel Mills and Ferro-Alloy Manufacturing	33111
Iron Foundries	331511
Iron Ore Mining	21221
Janitorial- Buildings and Dwellings (Other)	56179
Jewellery and Silverware Manufacturing	339910
Laboratories (Testing)	541380
Laundries (Coin-Operated) and Dry Cleaners	812310
Leather and Hide Tanning and Finishing	31611
Legal Services (All Other)	541190
Lighting Fixture Manufacturing	335120
Linen and Uniform Supply	812330

Industry	NAICS *
Machinery Manufacturing- Commercial and Service Industry	333310
Magnetic and Optical Media Reproductions Manufacturing	334610
Manufacturing (All Other Miscellaneous)	339990
Marine Cargo Handling	488320
Material Recovery Facilities	562920
Mattress Manufacturing	33791
Medical and Diagnostic Laboratories	621510
Medical Equipment and Supplies Manufacturing	339110
Metal Container Manufacturing (Other)	332439
Metal Ore Mining (All Other)	212299
Metal Processing and Alloying (except Fe, Cu and Al)	331490
Metal Product Manufacturing (All Other Miscellaneous)	332999
Metal Smelting and Refining (Non-Ferrous- except Aluminum)	331410
Metal Tank (Heavy Gauge) Manufacturing	33242
Metal Valve Manufacturing	332910
Metal Window and Door Manufacturing	332321
Metals- Coating and Allied Activities	332810
Milk Manufacturing (Fluid)	311511
Mineral Product Manufacturing (All Other Non-Metallic)	327990
Motor Vehicle Body Manufacturing	336211
Motor Vehicle Brake System Manufacturing	33634
Motor Vehicle Chassis Components (except Spring) Manufacturing	33633
Motor Vehicle Electronic Equipment Manufacturing	336320
Motor Vehicle Gasoline Manufacturing	336310
Motor Vehicle Metal Stamping	33637
Motor Vehicle Parts Manufacturing (Other)	336390
Motor Vehicle Parts Wholesaler-Distributors (Other New)	415290
Motor Vehicle Power Train Parts Manufacturing	33635
Motor Vehicle Seating and Interior Trim Manufacturing	33636
Music Publishers	51223
Newspaper Publishers	51111
Nickel-Copper Ore Mining	212232
Oil and Gas- Conventional Extraction	211113
Ornamental Metal Products Manufacturing (Other)	332329
Packaging and Labeling Services	56191

Industry	NAICS *
Paint and Coating Manufacturing	32551
Paper (except Newsprint) Mills	322121
Paper Bag and Coated and Treated Paper Manufacturing	322225
Paperboard Mills	32213
Parking Lots and Garages	812930
Passenger Rail Transportation	482114
Periodical Publishers	51112
Personal Services (Other)	81299
Pesticide and Other Agricultural Chemical Manufacturing	325320
Petrochemical Manufacturing	32511
Petroleum and Coal Products Manufacturing (Other)	324190
Petroleum Refineries	32411
Pharmaceutical and Medicine Manufacturing	325410
Photo Finishing Services	81292
Plastics Pipe and Pipe Fitting Manufacturing	326122
Plastics Product Manufacturing (All Other)	326198
Postal Service	49111
Printing	32311
Printing (Other)	323119
Printing (Support Activities)	323120
Printing Ink Manufacturing	32591
Publishers (All Other)	511190
Recyclable Material Wholesaler-Distributors	4181
Refrigerated Warehousing and Storage	49312
Reinsurance Carriers	52413
Remediation Services	562910
Rental (Formal Wear and Costume)	53222
Rental- Other Commercial and Industrial Equipment	53249
Research and Development in Engineering and Sciences	54171
Resin and Synthetic Rubber Manufacturing	325210
Road Transportation- Other Support Activities	48849
Rubber and Plastic Hose and Belting Manufacturing	326220
Rubber Product Manufacturing (Other)	326290
Sanitary Paper Product Manufacturing	322291

Industry	NAICS *
Scientific and All Other Professional Services	54199
Seasoning and Dressing Manufacturing	311940
Semiconductor Manufacturing	334410
Shelving, Showcase, Partition and Locker Manufacturing	337215
Shingle and Shake Mills	321112
Ship Building and Repairing	336611
Soap and Cleaning Compound Manufacturing	325610
Soft Drink and Ice Manufacturing	312110
Sound Recording Industries (Other)	51229
Sound Recording Studios	51224
Spring (Heavy Gauge) Manufacturing	332611
Stamping	332118
Steam and Air (Conditioning and Supply)	221330
Steel Foundries	331514
Steel Wire Drawing	331222
Surveying and Mapping (except Geophysical) Services	54137
Telephone Call Centres	561420
Teleproduction and Other Postproduction Services	512190
Textile and Fabric Finishing	31331
Textile Mills	313
Textile Product Mills (All Other)	314990
Tire Manufacturing	326210
Tortilla Manufacturing	31183
Toy and Game Manufacturing	339930
Transformers Manufacturing (Distribution and Specialty)	335311
Translation and Interpretation Services	54193
Travel Arrangement and Reservation Services (Other)	561590
Turned Product and Screw, Nut and Bolt Manufacturing	332720
Urban Transit Systems	485110
Veterinary Services	541940
Waferboard Mills	321217
Waste Management Services (All Other)	562990
Waste Treatment and Disposal	562210
Water Supply and Irrigation Systems	221310
Water Transportation (Other Support Activities)	48839

Industry	NAICS *
Wholesaler-Distributors (Miscellaneous)	418990
Wire Product Manufacturing (All Other)	332619
Wood Preservation	321114

* NAICS - the North American Industry Classification System provides common industry definitions for Canada, the United States and Mexico.

All information is taken from the CWWA Directory of Sources of Contaminants in Municipal Sewer Systems, which can be purchased from CWWA. For more information, go to the CWWA website at: www.cwwa.ca

Appendix C: Concentration of NPRI Substances in Wastewater Effluent and Biosolids
(as reported in 2001 survey of wastewater treatment facilities)

	Effluent (mg/L)			Biosolids (mg/L)		
	Max	Ave	Min	Max	Ave	Min
Aluminum	0.6	0.3	0.1	8,858.0	7,318.6	7,614.0
Ammonia	15.0	5.2	0.2	4,815.	3,740.0	3,080.
Antimony	0.0	0.0	0.2	2.0	1.2	2.0
Arsenic	0.0	0.0	0.0	1.7	2.2	0.9
Cadmium	0.0	0.0	0.0	1.8	1.1	0.8
Chloride	296.6	290.1	252.8			
Chloroform	0.6	0.3	0.6			
Chromium	0.2	0.0	0.0	69.8	25.7	11.4
Cobalt	0.1	0.0	0.0	2.7	1.9	1.1
Copper	0.1	0.0	0.0	462.0	343.7	247.0
Cyanide	0.0	0.0	0.0	2.2	2.0	1.8
Ethylbenzene	0.4	0.4	0.4	0.0	0.0	0.0
Manganese	0.1	0.1	0.0	275.0	414.8	185.0
Mercury	0.1	0.0	0.0	12.5	3.7	0.7
Nickel	0.1	0.0	0.0	21.7	11.8	7.0
Phenolics	0.9	0.4	0.2			
Selenium	0.1	0.0	0.0	1.3	1.3	0.7
Silver	0.0	0.0	0.0	11.0	7.1	10.0
Toluene	0.7	0.4	0.4	0.0	0.0	0.0
Vanadium	0.1	0.0	0.0	11.0	6.0	2.0
Zinc	0.2	0.1	0.0	434.6	227.3	164.7

Appendix D: Removal Efficiencies of Wastewater Treatment Processes for Certain NPRI Substances

Treatment Process	Ammonia Nitrogen	Inorganic Nitrogen	Sulphides	Volatile Organic Compounds (VOCs)	Heavy Metals
Coagulation, flocculation, sedimentation	NA	NA	NA	NA	60-100%
Primary Sedimentation	NA	NA	NA	NA	0 - 6 %
Sedimentation following biological treatment	NA	NA	NA	NA	60 - 100 %
Sedimentation following biological treatment with chemical addition to influent	NA	NA	NA	NA	60-100%
Conventional aerobic treatment	1-20%	0-20%	90-100%	60-100%	NA
Biological denitrification	60-100%	60-100%	90-100%	60-100%	NA
Low loading trickling filter	60-100%	0-20%	90-100%	60-100%	NA
High loading trickling filters	0-20%	0-20%	60-100%	60-100%	NA
Anaerobic Treatment	0-20%	0-20%	NA	60-100%	NA
Disinfection	20-90%	NA	60-100%	NA	NA
Air stripping	60-100%	NA	60-100%	60-100%	NA
Carbon Adsorption	20-90%	0-20%	60-100%	NA	60-100%