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EPCRA Section 313
Industry Guidance

RCRA SUBTITLE C TSD FACILITIES AND SOLVENT RECOVERY FACILITIES

TRI

Section 313 of the Emergency Planning and Community Right-to-Know Act

Toxic Chemical Release Inventory

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OVERVIEW

On May 1, 1997, the U.S. Environmental Protection Agency (EPA) promulgated a final rule (62 FR 23834) adding several new industrial sectors to the list of facilities subject to the Emergency Planning and Community Right-To-Know Act (EPCRA) Section 313 reporting requirements. Facilities affected by this rule are subject to the annual reporting requirements beginning with activities conducted during the 1998 calendar year, with their first reports due by July 1, 1999.

This document supersedes the document entitled *Section 313 Emergency Planning and Community Right-to-Know Act, Guidance for RCRA Subtitle C TSD Facilities and Solvent Recovery Facilities,* dated October 1997. It is intended to assist establishments and facilities designated by Standard Industrial Classification (SIC) codes 4953 (limited to facilities regulated under Resource Conservation and Recovery Act (RCRA), Subtitle C, 42 U.S.C. Section 6921 *et seq.*) and 7389 (limited to facilities primarily engaged in solvent recovery services on a contract or fee basis) in making compliance determinations under the EPCRA Section 313 reporting requirements and preparing Form R(s) or the Form A certification statement(s) as required. The EPCRA Section 313 program is commonly referred to as the Toxic Chemical Release Inventory (TRI) program.

The principal differences in the new document include the following:

- More detailed examples;
- Additional interpretive guidance prepared by EPA on various issues specific to RCRA Subtitle C TSD and solvent recovery facilities;
- Industry process issues not discussed in the earlier document; and
- General format changes for program consistency.

This document is designed to be a supplement to the *Toxic Chemical Release Inventory Reporting Forms and Instructions* (*TRI Forms and Instructions)*, issued annually. It is organized to provide a step-by-step guide to compliance with EPCRA Section 313, starting with how you determine if your facility must report through completion of the Form R or Form A. While certain information provided in this document may be used as a reference, specific information available to facilities, such as amounts of chemicals in mixtures and other trade name products used at the facility, may be more accurate and more appropriate for use in developing threshold determinations and releases and other waste management amounts. Under EPCRA Section 313, facilities are instructed to use the best "readily available data," or when such data are not available, use reasonable estimates in fulfilling their reporting requirements. This document is organized in the following manner.

Chapter 1 serves as an introduction to TRI reporting and provides a brief background on the Emergency Planning and Community Right-to-Know Act and information on where to obtain additional compliance assistance.

Chapter 2 begins with how to determine if your facility must report. This determination is based on your answers to a series of four questions:

1. Is your facility's primary SIC code on the EPCRA Section 313 list?

2. Does your facility employ ten or more full time equivalent employees?

3. Does your facility manufacture, process, or otherwise use any EPCRA Section 313 chemicals?

4. Does your facility exceed any of the activity thresholds for an EPCRA Section 313 chemical?

If the answer to ANY ONE of the four questions above is "No" you are not required to submit an EPCRA Section 313 report. If you answer "Yes" to ALL four questions, the next step is determining which form(s), Form R or Form A, your facility should file. Chapter 2 provides detailed information on the requirements for each kind of submission.

Chapter 2 concludes with a discussion on how you address trade secrets in your reporting and the kinds of records you should be keeping to support your reporting.

Chapter 3 discusses how you calculate the activity thresholds (manufacture, process, and otherwise use) for the EPCRA Section 313 chemicals. Information is provided on how you determine which EPCRA Section 313 chemicals your facility manufactures, processes, or otherwise uses and how you calculate the quantities of each. Detailed information is also provided on the various exemptions.

Chapter 3 concludes with a discussion of how to determine which EPCRA Section 313 chemicals exceed a reporting threshold, including focused discussions on issues specific to RCRA Subtitle C TSD and solvent recovery facilities.

Chapter 4 discusses how you calculate the release and other waste management amounts for those EPCRA Section 313 chemicals for which you must prepare a report. This chapter provides a step-by-step approach designed to minimize the risk of overlooking an activity involving an EPCRA Section 313 chemical and any potential sources or types of releases and other waste management activities that your facility may conduct. This procedure consists of the following steps:

- Identification of potential **sources** of EPCRA Section 313 chemicals released and otherwise managed as wastes;
- Preparation of a detailed **process flow diagram**;
- Identification of the potential **types** of releases and other waste management activities from each source; and

- Determination of the most appropriate methods for **estimating the quantities** of listed EPCRA Section 313 chemical releases and other waste management activities.

The main part of Chapter 4 is organized around activities common to RCRA Subtitle C TSD and solvent recovery facilities where EPCRA Section 313 chemicals are manufactured, processed, or otherwise used. A list of EPCRA Section 313 chemicals likely to be managed by RCRA Subtitle C TSD and solvent recovery facilities; process descriptions; guidance on thresholds determinations; release and other waste management estimation techniques; and problems these types of facilities are likely to face in complying with EPCRA Section 313 are also presented in this chapter.

This document includes examples of chemical management activities that RCRA Subtitle C TSD and solvent recovery facilities may conduct, illustrating how these activities should be considered for EPCRA Section 313 reporting purposes. This Chapter also notes areas where potential errors in reporting might be encountered generally by RCRA Subtitle C TSD and solvent recovery facilities, which are based on information from written comments received from industry representatives as well as from comments made by participants in EPA-sponsored EPCRA workshops.

ACKNOWLEDGMENT

EPA would like to recognize the valuable contributions made by staff at Waste Management, Inc., whose industry insight and understanding of EPCRA Section 313 requirements have greatly assisted in increasing the utility of this document. Special thanks go to Ed Skernolis, Director of Government Affairs and Kathy Doyle.

Chapter 1 - Introduction

1.0 PURPOSE

The purpose of this guidance document is to assist facilities in SIC code 4953 that are regulated under the Resource Conservation and Recovery Act (RCRA), Subtitle C and facilities in SIC code 7389 that are primarily engaged in solvent recovery services on a contract or fee basis to comply with the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) and of Section 6607 of the Pollution Prevention Act of 1990 (PPA), commonly referred to as the Toxic Release Inventory (TRI). On May 1, 1997, EPA promulgated a rule (62 FR 23834) to require RCRA Subtitle C TSD and solvent recovery facilities, along with other industry groups, to be included on the list of facilities subject to the EPCRA Section 313 reporting requirements. The new facilities are subject to annual reporting requirements beginning with activities occurring in the 1998 calendar year, with the first reports due by July 1, 1999.

This document explains the EPCRA Section 313 and PPA Section 6607 reporting requirements (collectively referred to as the EPCRA Section 313 reporting requirements), and discusses specific release and other waste management activities encountered at many facilities in these industries. Because each facility is unique, the recommendations presented may have to be adjusted to the specific nature of operations at your facility.

This document supersedes the document entitled *Section 313 Emergency Planning and Community Right-to-Know Act, Guidance for RCRA Subtitle C TSD Facilities and Solvent Recovery Facilities*, dated October 1997.

The document is intended to supplement the *Toxic Chemical Release Inventory Reporting Forms and Instructions (TRI Forms and Instructions)* document which is updated and published annually by the U.S. Environmental Protection Agency (EPA). It is essential that you use the most current version of the *TRI Forms and Instructions* to determine whether (and how) you should report. Changes or modifications to TRI reporting requirements are reflected in the annual *TRI Forms and Instructions* and should be reviewed before compiling information for the report.

The objectives of this manual are to:

- Clarify EPCRA Section 313 requirements for industry;
- Increase the accuracy and completeness of the data being reported by RCRA Subtitle C TSD and solvent recovery facilities; and
- Reduce the level of effort expended by those facilities that prepare an EPCRA Section 313 report.

While it is not possible to anticipate every potential issue or question that may apply to your facility, this document attempts to address those issues most prevalent or common to RCRA

Subtitle C TSD and solvent recovery facilities. Facilities should also rely on EPA's *Estimating Releases and Waste Treatment Efficiencies for the Toxic Chemical Release Inventory Form* document to assist in providing complete and accurate information for EPCRA Section 313 reporting. Additional discussion addressing specific issues can be found in EPA's current version of *EPCRA Section 313 Questions and Answers*. All of these documents are available on the EPA's TRI website (http://www.epa.gov/opptintr/tri) or by contacting the EPCRA Hotline at 1-800-424-9346. In the Washington, DC metropolitan area, call 703-412-9810. The EPCRA Hotline TDD number is 1-800-553-7672, or in the Washington, DC metropolitan area, call 703-412-3323.

1.1 Background on EPCRA

One of EPCRA's primary goals is to increase the public's knowledge of, and access to, information on both the presence and release and other waste management activities of EPCRA Section 313 chemicals in their communities. Under EPCRA Section 313, certain facilities (see SIC code discussion, Chapter 2.3) exceeding certain thresholds (see Chapter 2.5) are required to submit reports (commonly referred to as Form Rs or Form A certification statements) annually for over 600 EPCRA Section 313 chemicals and chemical categories and the amounts that enter an environmental medium or are otherwise managed as waste, even if there are no releases or other waste management quantities associated with these chemicals. Chemicals are considered by EPA for inclusion on the EPCRA Section 313 list based on their potential for acute health effects, chronic health effects, and environmental effects. Chemicals may be added or deleted from the list. Therefore, before completing your annual report, be sure to check the most current list included with the *TRI Forms and Instructions* when evaluating the chemicals managed at your facility. Copies of the reporting package can be requested from the EPCRA Hotline as indicated above, or from the Internet at http://www.epa.gov/opptintr/tri/report.htm.

All facilities meeting the EPCRA Section 313 reporting criteria must submit either a Form R or Form A. A separate submission is required for each EPCRA Section 313 chemical or chemical category that is manufactured (including imported), processed, or otherwise used above the reporting threshold. Reports must be submitted to EPA and State or Tribal governments, on or before July 1, for activities in the previous calendar year. The owner/operator of the facility on July 1 of the reporting deadline is primarily responsible for the report, even if the owner/operator did not own the facility during the reporting year. However, property owners with no business interest in the operation of the facility, for example, owners of an industrial park who only have a real estate interest, are not responsible for any reporting requirements.

EPCRA also mandates that EPA establish and maintain a publicly available database consisting of the information reported under Section 313, and applicable PPA information. This database, known as the Toxic Chemical Release Inventory (TRI), can be accessed through the following sources:

- National Library of Medicine (NLM) TOXNET on-line system;

- EPA's Internet site, http://www.epa.gov/opptintr/tri;
- Envirofacts Warehouse Internet site, http://www.epa.gov/enviro/tris-overview.html;
- CD-ROM from the Government Printing Office (GPO);
- Microfiche in public libraries;
- Magnetic tape and diskettes from the National Technical Information Service; and
- EPA's annual TRI data release materials (summary information).

In addition to being a resource for the public, TRI is also used in the research and development of regulations related to EPCRA Section 313 chemicals.

Alternative Submission (Form A)

To reduce the burden for facilities that must comply with EPCRA Section 313, EPA has established an alternate threshold of one million pounds manufactured, processed, or otherwise used for facilities with total annual reportable amounts of 500 pounds or less of the EPCRA Section 313 chemical. Provided the facility does not exceed either the reportable amount or the alternate threshold, the facility may file a certification form (Form A) rather than a Form R. By filing the Form A, the facility certifies that it did not exceed the reportable amount or exceed the alternate threshold. (See Chapter 2.9 for more detail.)

Note that the annual reportable amount includes the quantity of EPCRA Section 313 chemicals in all production-related waste management activities, not just releases (see the waste management discussion in Chapter 4 for more detail). Also, a covered facility must submit either a Form A or a Form R for each EPCRA Section 313 chemical exceeding an applicable reporting threshold, even if there are no releases and other waste management quantities.

Enforcement

Violation of Section 313 reporting provisions may result in federal civil penalties of up to $27,500 per day. State enforcement provisions may also be applicable depending on the state's adoption of any "EPCRA Section 313-like" reporting regulations.

Regulatory Assistance Resources

The *TRI Forms and Instructions* also contain a discussion of common problems in completing the Form R. You are encouraged to read this section before filling out the Form R (or Form A) for your facility. If, after reading both the *TRI Forms and Instructions* and this guidance document, you still have questions about EPCRA Section 313 reporting, please contact the EPCRA Hotline at 1-800-424-9346, or 703-412-9810 in the Washington, DC metropolitan area. The EPCRA Hotline TDD number is 1-800-553-7672, or in the Washington, DC metropolitan area, call 703-412-3323. Assistance is also available from the designated EPCRA Section 313 Coordinator in the EPA regional office and the EPCRA contact in your state (see the *TRI Forms*

and Instructions for a current list of these contacts). Appendix A contains a list of additional reference sources.

Chapter 2 - Reporting Requirements

2.0 PURPOSE

The purpose of this chapter is to help you determine whether you must prepare an EPCRA Section 313 submission(s) and, if so, what kind of a submission(s) you should prepare (Form R or Form A). This chapter presents the EPCRA Section 313 reporting requirements to help you determine whether these requirements apply to your facility. It also discusses the records that you must keep. The following terms and concepts are described in this chapter to help you understand the scope of Section 313 reporting and determine whether you need to report, including:

- Definition of facility;
- SIC code determination;
- Employee determination;
- Definitions of manufacture, process, and otherwise use; and
- Determination of whether you exceed one of the thresholds.

2.1 Must You Report?

How do you determine if your facility must prepare an EPCRA Section 313 report? This is decided by your answers to the following four questions (illustrated by Figure 2-1):

1) Is the primary SIC code(s) for your facility included in the list covered by EPCRA Section 313 reporting (see Chapter 2.3)?

2) Does your facility employ 10 or more full time employees or the equivalent (see Chapter 2.4)?

3) Does your facility manufacture (which includes importation), process, or otherwise use EPCRA Section 313 chemicals (see Chapter 2.5)?

4) Does your facility exceed any applicable thresholds of EPCRA Section 313 chemicals (25,000 pounds per year for manufacturing; 25,000 pounds per year for processing; or 10,000 pounds per year for otherwise use - see Chapter 3)?

If you answered "No" to any of the four questions above, you are not required to prepare any submissions under EPCRA Section 313. If you answered "Yes" to ALL of the first three

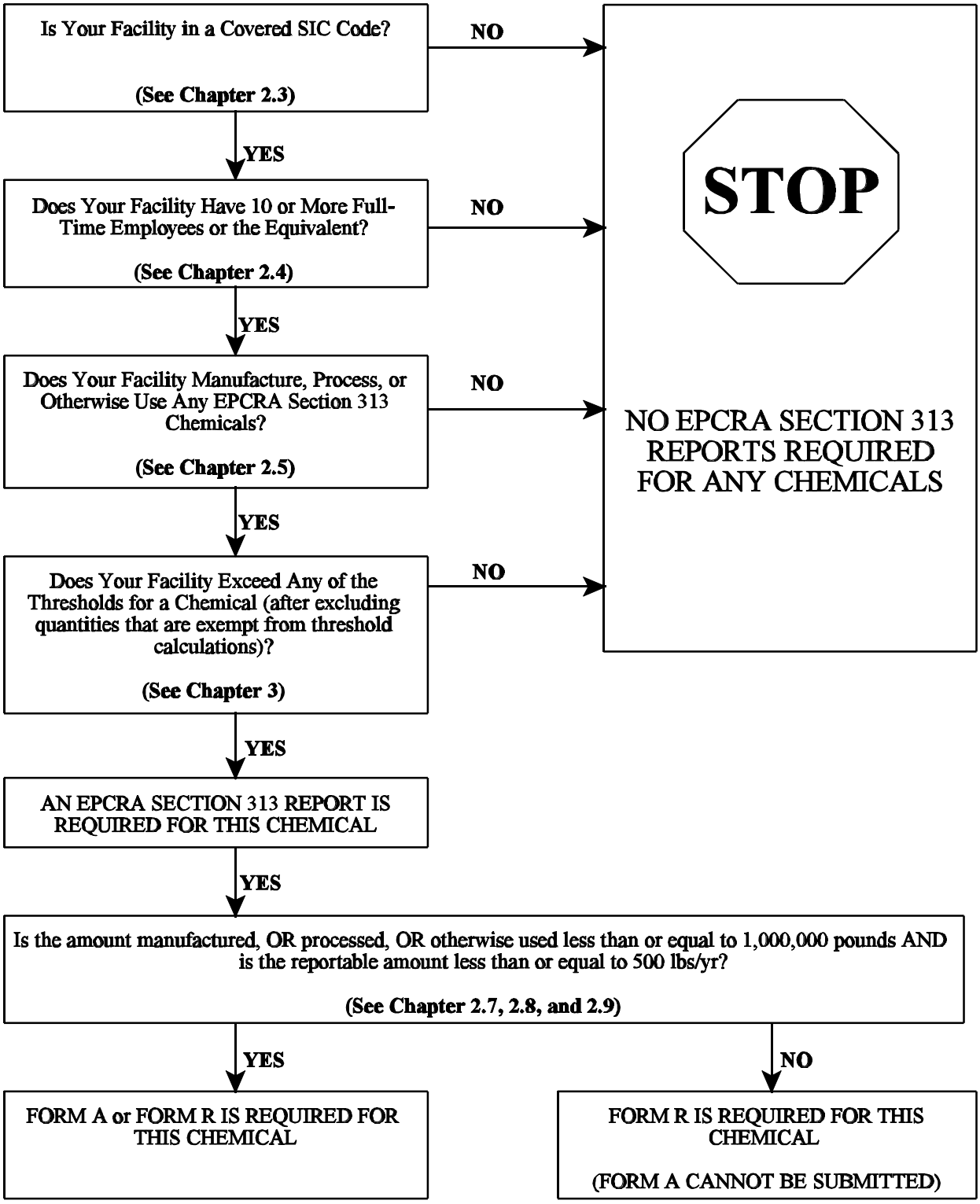

Figure 2-1. TRI Reporting Determination Diagram

questions, you must perform a threshold determination for each EPCRA Section 313 chemical at the facility, and submit a Form R **or** Form A for each chemical exceeding a threshold.

2.2 Definition of "Facility"

To understand the applicability of EPCRA Section 313, you must first understand how EPCRA defines a facility. The term "facility" is defined as "all buildings, equipment, structures, and other stationary items which are located on a single site or on contiguous or adjacent sites and which are owned or operated by the same person (or by any person which controls, is controlled by, or is under common control, with such person). A facility may contain more than one establishment" (40 CFR 372.3). An "establishment" is defined as "an economic unit, generally at a single physical location, where business is conducted, or services or industrial operations are performed" (40 CFR 372.3).

EPA recognizes that some facilities have unique and separate activities ("establishments") taking place at the same facility, and for some of these facilities it may be easier and more appropriate for individual establishments to manage their chemical usage and management information separately. EPA provides for these cases and allows individual establishments at the same facility to report separately. However, for threshold determinations, quantities of EPCRA Section 313 chemicals manufactured, processed, or otherwise used in all establishments in that facility must be combined and considered together. Also, the combined releases and other waste management activities reported separately for each establishment must equal those for the facility as a whole.

Example - Multiple Establishments

Your facility is composed of two different establishments with SIC codes covered by EPCRA Section 313. One establishment used 7,000 pounds of an EPCRA Section 313 chemical during the year to clean equipment. Another establishment treated for destruction 4,000 pounds of the same EPCRA Section 313 chemical in a waste received from off-site during the same year. Both activities constitute an "otherwise use" of the EPCRA Section 313 chemical (as presented in Chapter 2.5 and described in detail in Chapter 3) and together the total quantity otherwise used at the facility exceeded the 10,000 pound otherwise use threshold for the year. Thus, if your facility meets the employee threshold, you must file a Form R for that chemical from your facility. EPA allows multi-establishment facilities to submit multiple Form Rs, one from each establishment or group of establishments for a reportable chemical. Please note that Form A eligibility is also made at the facility-level, but only one Form A can be submitted per chemical for the entire facility.

Contiguous and/or Adjacent Facilities. In defining the parameters of your facility, you must consider all buildings and other stationary items located on multiple contiguous or adjacent sites that are owned or operated by the same person for EPCRA reporting purposes. For example, an industrial park could contain a manufacturing company and a solvent recovery operation, both operated independently, but owned by the same parent company. Since the two establishments are contiguous or adjacent to each other, they are considered one "facility." The amount of each EPCRA Section 313 chemical manufactured, processed, or otherwise used and

the number of employees must be aggregated for all of these contiguous or adjacent sites to determine whether the entire facility meets reporting thresholds. If a company's operations are carried out at two distinctly separate, physical sites that are not contiguous or adjacent, that company is operating two separate facilities for the purposes of EPCRA reporting. The company, therefore, must make SIC code, employee, threshold determinations, and if appropriate, release and other waste management estimates individually for each facility.

If two establishments owned or operated by the same company are connected to each other by a piece of property that is owned by one of the establishments or the same parent corporation, or if they are separated by an easement (e.g., railroad tracks, public road, public catchment basin), they are still considered to be contiguous or adjacent and are therefore part of the same facility. Both "establishments" may report together as the same facility or they may report separately provided threshold determinations are based on activities at the entire facility and that the sum of the releases of the establishments reflects the total releases of the whole facility. Facility operations that are not connected to each other by a piece of property, that is commonly owned, controlled or operated by the same person(s), are not considered contiguous and may be considered two separate facilities. However, if these operations are relatively near each other, they may be considered adjacent; in which case, they would be part of the same facility.

2.3 SIC Code Determination

Facilities with the SIC codes presented in Table 2-1 are covered by the EPCRA Section 313 reporting requirements. For assistance in determining which SIC code best suits your facility, refer to *Standard Industrial Classification Manual, 1987,* published by the Office of Management and Budget.

Table 2-1
SIC Codes Covered by EPCRA Section 313 Reporting

SIC Code Industry Sectors		
SIC Codes	**Industry**	**Qualifiers**
10	Metal Mining	Except SIC codes 1011, 1081, and 1094
12	Coal Mining	Except SIC code 1241
20 through 39	Manufacturing	None
4911, 4931, and 4939	Electric and Other Services and Combination Utilities	Limited to facilities that combust coal and/or oil for the purpose of generating electricity for distribution in commerce
4953	**Refuse Systems**	**Limited to facilities regulated under RCRA Subtitle C**
5169	Chemicals and Allied Products	None

5171	Petroleum Bulk Stations and Terminals	None
7389	**Business Services**	**Limited to facilities primarily engaged in solvent recovery services on a contract or fee basis**

Both SIC code 4953 and SIC code 7389 cover a broad number of businesses. Coverage for SIC code 4953 is limited to facilities that are also regulated under Subtitle C of RCRA (i.e., facilities which manage hazardous wastes). SIC code 7389 is limited to facilities primarily engaged in solvent recovery services on a contract or fee basis. There are many facilities within both SIC codes that will not have to report because they do not meet the "limiting" qualifier. For example, SIC code 4953 includes solid waste (e.g., RCRA Subtitle D) facilities. If these facilities are not also regulated under RCRA Subtitle C, they do not meet the qualifier for SIC code 4953 and the facility is not required to comply with EPCRA Section 313.

That a facility manages only waste generated by facilities within the same company is not relevant to the SIC code determination. For example, if company XYZ operates a RCRA Subtitle C permitted incinerator in Kansas, but only receives wastes from XYZ manufacturing plants in Texas and Louisiana, the incinerator facility would still be classified as SIC code 4953, and would still meet the qualifier (i.e., regulated under RCRA Subtitle C). A facility that solely manages wastes from facilities of the same company is not exempt from the SIC code determination.

While you are currently required to determine your facility's reporting eligibility based on the SIC code system described above, it is important to be aware that the SIC code system will be replaced by a new system in the future. On April 9, 1997 (62 FR 17287), the Office of Management and Budget promulgated the North American Industrial Classification System (NAICS). NAICS is a new economic classification system that replaces the SIC code system as a means of classifying economic activities for economic forecasting and statistical purposes. The transition to the new NAICS may require statutory and/or regulatory actions. As a result, the SIC code system is still required to be used as the mechanism to determine your facility's reporting eligibility. EPA will issue notice in the *Federal Register* to inform you and other EPCRA Section 313 facilities of its plans to adopt the NAICS and how facilities should make their NAICS code determination.

Primary SIC Code Determination. Assuming your facility has several establishments with different SIC codes that are owned or operated by the same entity, you will need to determine if your facility has a primary SIC code that is subject to EPCRA Section 313. Your facility is subject to EPCRA Section 313 reporting requirements if:

- All the establishments have SIC codes covered by EPCRA Section 313; OR
- The total value of the products shipped or services provided at establishments with covered SIC codes is greater than 50% of the value of the entire facility's products and services; OR

- Any one of the establishments with a covered SIC code ships and/or produces products or provides services whose value exceeds the value of services provided or products produced and/or shipped by all of the other establishments within the facility on an individual basis.

Example - SIC Code Determination

Facility A, a recycling and disposal facility, encompasses several RCRA Subtitle C hazardous waste and Subtitle D municipal solid waste management units. Facility B, a separate RCRA Subtitle C hazardous waste landfill facility in SIC code 4953, is planning to construct a RCRA Subtitle D disposal cell on-site. Are either of these facilities subject to EPCRA Section 313?

Yes. Both of the above-mentioned facilities are subject to EPCRA Section 313. The recycling and disposal facility (Facility A), which is located on a single site and is owned or operated by the same person, meets the EPCRA definition of a facility. The hazardous waste landfill facility (Facility B) is located on a single site and is owned or operated by the same person, therefore meets the definition of a facility as well. Because at least one unit at each of the facilities is regulated by RCRA Subtitle C and all of the facilities' operations are classified in SIC code 4953, for the purposes of EPCRA Section 313, each whole facility is considered to be in SIC code 4953 (regulated under RCRA Subtitle C). As such, each facility must consider all non-exempted activities at the facility for threshold determinations and release and other waste management calculations.

To determine the value of production or service attributable to a particular establishment, you can subtract the product or service value obtained from other establishments from the total product or service value of the facility. This procedure eliminates the potential for "double counting" production or service in situations where establishments are engaged in sequential production activities at a single facility.

Example - Primary SIC Code

A facility has two establishments. The first, a solvent recovery operation in SIC code 7389, performs solvent recovery on a contract basis. The second establishment, a wastewater treatment plant, is in SIC code 4953, but is not regulated under RCRA Subtitle C. The facility then determines that the solvent recycling operation's value is $1,000,000 per year whereas the value of the wastewater treatment operation is $500,000 per year. The value of the solvent recovery establishment is more than 50% of the facility's value; therefore, the primary SIC code of the facility is 7389 and the entire facility is subject to EPCRA Section 313 reporting.

Auxiliary Facilities. Some companies may own and/or operate a non-contiguous and non-adjacent facility that primarily supports a covered EPCRA Section 313 facility. These auxiliary facilities assume the SIC code of a covered facility that it directly supports. For example, an off-site warehouse that directly supports a covered TSD facility (SIC code 4953) must assume the SIC code 4953 itself. For the purposes of EPCRA Section 313, auxiliary facilities must be engaged in performing support services for another facility or establishment within a covered facility. Therefore, if an auxiliary facility's primary function is to support/service a covered TSD or solvent recovery facility, the auxiliary facility may assume the SIC code of the main facility and may then be covered by the EPCRA Section 313 reporting requirements for purposes of the facility's SIC code. Importantly for TSD or solvent recovery facilities, even if an auxiliary facility

supports one of the covered facilities and thereby assumes its SIC code, the auxiliary facility would STILL need to meet the SIC code qualifier of also being regulated under RCRA Subtitle C if assuming SIC code 4953, or engaged in solvent recovery services on a contract or fee basis if assuming SIC code 7389.

2.4 Number of Employees

Facilities must also meet or exceed the 10 or more full-time employees or equivalent criterion to be subject to EPCRA Section 313 reporting requirements. A full-time employee equivalent is defined as a work year of 2,000 hours. If your facility's staff (including contractors and certain other non-company personnel) work 20,000 or more hours in a calendar year, you meet the 10 or more full-time employee criterion. While many facilities may easily exceed this criterion, your facility may be small or highly automated and your on-site staff may be small. In these cases, in particular, you should carefully consider all personnel supporting your operations to determine if you meet the 10 or more full-time employee criterion.

The following personnel and time should be included in your employee calculations:

- Owners working at the facility;
- Operations staff;
- Clerical staff;
- Temporary employees;
- Sales personnel;
- Truck drivers (employed by the facility);
- Other off-site facility employees directly supporting the facility;
- Paid vacation and sick leave; and
- Contractor employees (excluding contract truck drivers).

In general, if an individual is employed or hired to work at the facility, all the hours worked by that individual must be counted in determining if the 20,000 hour criterion has been met.

Example - Calculating Employees

Your facility has six full-time employees working 2,000 hours/year in the plant recovering solvents. There are also two full-time salespersons and a delivery truck driver (employed by the facility) assigned to the plant, each working 2,000 hours/year but predominantly on the road. The wastewater treatment plant (WWTP) (on-site and owned by the facility) is operated by a contractor who spent 1,000 hours working at the plant during the year. The hours of the employees and the WWTP contractor are tracked by controlled-access card reader (scan in/out) system. Finally, you built an addition to the plant warehouse during the year, using four contractor personnel who were on site full time for six months (working on average of 1,000 hours each based on invoices). You would calculate the number of full-time employee equivalents as follows:

- Hours for your nine full-time employees (six plant personnel, two salespersons, and one delivery truck driver) for the year are:
  9 employees x 2,000 hours/year = 18,000 hours;

- Hours for the wastewater treatment plant operator are:
  4 hours/day x 5 days/week x 52 weeks/year = 1,040 hours; and

- Hours for the construction crew are:
  4 contractors x 1,000 hours = 4,000 hours.

This is a total of 23,040 hours for the year, which is above the 20,000 hours/year threshold; therefore, you meet the employee criterion.

POSSIBLE ERROR - Construction Workers

Remember to include construction contractors, even if involved in non-process related construction activities (e.g., office building renovations or construction) in your calculation.

2.5 Manufacturing, Processing, and Otherwise Use of EPCRA Section 313 Chemicals

If you have determined that your facility meets the SIC code and employee threshold determinations, you must determine what EPCRA Section 313 chemicals are manufactured, processed, or otherwise used at your facility during the reporting year and whether an activity threshold was exceeded. This section of the chapter will introduce the terms and concepts behind this determination; whereas, Chapter 3 will take you through a detailed step-by-step process to determine whether you need to report for any EPCRA Section 313 chemicals.

Identifying Chemicals. If you are in a covered SIC code and have 10 or more full-time employee equivalents, you must determine which EPCRA Section 313 chemicals are manufactured, processed, or otherwise used at your facility in excess of threshold quantities. To assist in doing this, you should prepare a list of all chemicals manufactured, processed, or otherwise used by all establishments at the facility, including the chemicals present in mixtures and other trade name products and managed in wastes received from off-site. This list should then be compared to the CURRENT list of EPCRA Section 313 chemicals found in the *TRI Forms and Instructions* document for that reporting year (available from the EPCRA Hotline, 1-800-424-

9346 or at the website: http://www.epa.gov/opptintr/tri). In addition to the individually listed chemicals, the list of EPCRA Section 313 chemicals includes several chemical categories (discussed in detail in Chapter 3). You must include chemical compounds that are members included in any of these categories when evaluating activities at the facility for threshold determinations and release and waste management calculations. Once you identify the EPCRA Section 313 chemicals and chemical categories at your facility, you must evaluate the activities involving each chemical or chemical category and determine whether any activity thresholds have been met.

Note that chemicals are periodically added, delisted, or modified. Therefore, it is imperative that you refer to the appropriate reporting year's list. Also, note that a list of synonyms for EPCRA Section 313 chemicals can be found in the EPA publication *Common Synonyms for Chemicals Listed Under Section 313 of the Emergency Planning and Community Right-To-Know Act* (updated March 1995). Table 2-2 lists EPCRA Section 313 chemicals that may be commonly managed by solvent recovery facilities. Table 2-3 lists EPCRA Section 313 chemicals commonly reported by manufacturers (SIC codes 2000-3999) as transferred off-site in wastes and so provides some guidance about which chemicals are expected to be managed at RCRA Subtitle C TSD and solvent recovery facilities.

Table 2-2
EPCRA Section 313 Chemicals Commonly Managed by Solvent Recovery Facilities

Aniline	1,2 Dichlorobenzene
Benzene	n-Hexane
Butyl acetate	Isobutyl acetate
n-Butyl alcohol	Isopropyl ether
Carbon disulfide	Methanol
Carbon tetrachloride	Methyl chloride
Chloroform	Methyl ethyl ketone
Chlorobenzene	Methyl isobutyl ketone
Cyclohexanone	Toluene
m-Cresol	111-Trichloroethane
Cyclohexane	Trichloroethylene
CFC compounds	Xylene (mixed isomers)

Table 2-3
Top 15 EPCRA Section 313 Chemicals Commonly Reported by Manufacturers (SIC Code 20-39) As Transferred Off-Site In Wastes

EPCRA Section 313 Chemicals with the Largest Off-site Transfers for Treatment	EPCRA Section 313 Chemicals with the Largest Off-site Transfers for Disposal
Hydrochloric acid (acid aerosols)	Zinc compounds
Methanol	Manganese compounds
1,2,4-trichlorobenzene	Lead compounds
Toluene	Copper
Ethylene glycol	Manganese
Sulfuric acid (acid aerosols)	Aluminum (fume or dust)
Dichloromethane	Hydrochloric acid (acid aerosols)
Nitric acid	Chromium and chromium compounds
Zinc compounds	Copper compounds
Xylene (mixed isomers)	Barium compounds
Ammonia	Nickel compounds
Methyl ethyl ketone	Creosote
Lead compounds	Styrene
Chromium compounds	
1,1,2-Trichloroethane	

2.6 Activity Thresholds

There are three activity thresholds for the EPCRA Section 313 chemicals defined in EPCRA Section 313: manufacturing (which includes importing), processing, and otherwise use. The activity thresholds are 25,000 pounds per year for manufacturing, 25,000 pounds per year for processing, and 10,000 pounds per year for otherwise use. These thresholds apply to each chemical individually. The determination is based solely on the quantity actually manufactured (including imported), processed, or otherwise used. Only the amounts of the listed EPCRA Section 313 chemical that meet activity definitions are considered towards threshold determinations. Any other amounts not considered to be manufactured, processed, or otherwise used are not considered toward threshold determinations. For example, EPCRA Section 313 chemicals that are brought on-site (excluding amounts imported) and stored for future use or disposal, but are not incorporated into a product for distribution or are not otherwise used on-site during the reporting year, are NOT considered towards any activity threshold for that reporting year.

More detailed explanations of each of the threshold activities (manufactured, processed, or otherwise used), with examples of each are found in Chapter 3, Tables 3-2, 3-3, and 3-4. These terms are briefly defined in Table 2-4, with a detailed discussion to follow:

Table 2-4

Activity Thresholds

Activity	Definition	Threshold (lbs/yr)
Manufacture	To produce, prepare, import, or compound an EPCRA Section 313 chemical. "Manufacture" applies to an EPCRA Section 313 chemical that is produced coincidentally during the manufacture, processing, otherwise use, or disposal of another chemical or mixture of chemicals as a byproduct or impurity. Examples would be the production of ammonia or nitrate compounds in a wastewater treatment system or the creation of metal compounds from the combustion of fuels.	25,000
Process	The preparation of an EPCRA Section 313 chemical, after its manufacture, for distribution in commerce: (1) In the same form or physical state as, or in a different form or physical state from, that in which it was received by the person so preparing such chemical; or (2) As part of an article containing the EPCRA Section 313 chemical. For example, if you receive a mixture containing an EPCRA Section 313 chemical, recover it and package it, including transferring from a storage tank to a tank truck, and then distribute it into commerce, this chemical has been processed by your facility.	25,000
Otherwise Use	Generally, use of an EPCRA Section 313 chemical that does not fall under the manufacture or process definitions is classified as otherwise use. An EPCRA Section 313 chemical that is otherwise used is not intentionally incorporated into a product that is distributed in commerce, but may be used instead as a manufacturing or processing aid (e.g., catalyst), in waste processing, or as a fuel (including waste fuel). For example, methanol used as a cleaning solvent is classified as otherwise used. Otherwise use means "any use of a toxic chemical contained in a mixture or other trade name product or waste, that is not covered by the terms "manufacture" or "process." Otherwise use of an EPCRA Section 313 chemical does not include disposal, stabilization (without subsequent distribution in commerce), or treatment for destruction unless the: 1) EPCRA Section 313 chemical that was disposed, stabilized, or treated for destruction was received from off-site for the purposes of further waste management; or 2) EPCRA Section 313 chemical that was disposed, stabilized, or treated for destruction that was manufactured as a result of waste management activities on materials received from off-site for the purposes of further waste management activities."	10,000

There are some activities which do not meet the definitions of manufacture, process, or otherwise use. For instance, storage, relabeling, or redistribution of an EPCRA Section 313 chemical where no repackaging occurs does not constitute manufacturing, processing, or otherwise use of that chemical. This type of activity should not be included in threshold calculations. In addition, transfers of EPCRA Section 313 chemicals in wastes for energy recovery, treatment, or disposal are not considered "distribution into commerce." For example, if you receive an EPCRA Section 313 chemical in waste from off-site and repackage the waste and send it to a landfill off-site, that activity should not be included in threshold determinations.

Also, note that the threshold determinations for the three threshold activities (manufacturing, processing, and otherwise use) are mutually exclusive. That is, you must conduct a separate threshold determination for each threshold activity and if you exceed any threshold, all releases and other waste management activities of EPCRA Section 313 chemicals at the facility must be considered for reporting.

Example - Repackaging

A facility receives a waste from off-site, samples the waste, and then sends the remaining waste off-site to be recycled without changing the packaging. Has the facility processed the EPCRA Section 313 chemical in the waste?

Provided that the EPCRA Section 313 chemical transferred to the off-site facility remains in the packaging in which it was received, it has not been repackaged. The facility has simply opened the original package for sampling and transferred the EPCRA Section 313 chemical to another facility. In this case, because no repackaging has occurred, the facility has not "processed" the EPCRA Section 313 chemical.

2.7 How Do You Report?

You must file a report (Form R) for each EPCRA Section 313 chemical that exceeds a threshold for manufacturing, OR processing, OR otherwise use (providing you meet the employee and SIC code criteria). As an alternative, you may file a Form A certification statement rather than a Form R if you meet certain criteria as explained in Chapter 2.9. The *TRI Forms and Instructions* contain detailed directions for the preparation and submittal of Form R and Form A for each EPCRA Section 313 chemical for the reporting year. The *TRI Forms and Instructions* are sent to all facilities which submitted Form Rs or Form As the preceding year. However, if you do not receive a courtesy copy or did not report in the preceding year, then copies of the *TRI Forms and Instructions* can be requested from the EPCRA Hotline (1-800-424-9346) or obtained from EPA's TRI website (http://www.epa.gov/opptintr/tri).

2.8 Form R

If you are submitting a Form R, it is essential that you use the *TRI Forms and Instructions* for the appropriate reporting year. EPA encourages the electronic submittal of the Form R, via the Automated TRI Reporting System (ATRS). Use of the ATRS saves time in data entry and photocopying and reduces errors by means of automated validation procedures. The ATRS produces a certification letter with each validated submission (set of EPCRA Section 313 reports) which provides for an original signature to certify that the submission is accurate and correct. The ATRS is available free of charge from EPA's TRI website at http://www.epa.gov/opptintr/afr.

The ATRS is available in both DOS and Windows versions. More information can be found in the *TRI Forms and Instructions*, EPA's TRI website, or by calling the ATRS User Support Hotline at (703) 816-4434.

Each Form R must consist of two parts:
Part I, Facility Identification Information. This part of the form provides general information to identify the facility, including the name and address of the facility, parent company information, and identification numbers used under reporting regulations. When submitting hard copies of Form R, this part may be photocopied and re-used for each Form R you submit, except for the signature which must be original for each Form R; and

Part II, Chemical Specific Information. This part of the form provides chemical-specific information on the reportable activities, releases, other waste management estimates, and source reduction activities for the reporting year. This must be completed separately for each EPCRA Section 313 chemical or chemical category and not reused year to year even if reporting has not changed.

Submission of incomplete Form Rs may result in an issuance of a Notice of Technical Error (NOTE), Notice of Significant Error (NOSE), or Notice of Non-compliance (NON). See the current *TRI Forms and Instructions* for more detailed information on completing and submitting the Form R. The ATRS has a validation program which helps to identify and eliminate many potential data entry errors.

2.9 Form A

EPA developed the Form A, also referred to as the "Certification Statement," to reduce the annual burden for facilities with lesser amounts of EPCRA Section 313 chemicals released and/or otherwise managed as a waste, applicable beginning reporting year 1995 and beyond (59 FR 61488; November 30, 1994). A facility must meet the following two criteria in order to use a Form A:

- First, the amount of the chemical manufactured, processed, OR otherwise used cannot exceed 1,000,000 pounds. It is important to note that the quantities for each activity are mutually exclusive and must be evaluated independently. If the

quantity for any one of the activities exceeds 1,000,000 pounds, a Form A cannot be submitted.

- Second, the total annual reportable amount of the EPCRA Section 313 chemical cannot exceed 500 pounds per year. The "reportable amount" is defined as the sum of the on-site amounts released (including disposal), treated, recycled, and combusted for energy recovery, combined with the sum of the amounts transferred off-site for recycling, energy recovery, treatment, and/or release (including disposal). This total corresponds to the total of data elements, 8.1 through 8.7 in Part II of the Form R (explained in Chapter 4).

Example - Form A Threshold

A covered hazardous waste treatment facility operates a wastewater treatment system that includes an air stripper used to remove volatile organic compounds (VOCs). To control biological growth in the air stripper, the facility adds chlorine to the wastewater. Over the course of the reporting year, the facility estimates that the quantity of chlorine otherwise used is 12,000 pounds and the total reportable quantity of chlorine (the sum of Sections 8.1 through 8.7 of the Form R) is 270 pounds. Because the facility did not exceed the one million pound threshold for manufacturing, processing, or otherwise use and the facility's total reportable quantity of chlorine does not exceed 500 pounds, the facility has the option of submitting a Form R or a Form A.

The Form A Certification Statement must be submitted for each eligible EPCRA Section 313 chemical. The information on the Form A is included in the publicly accessible TRI database, however these data are marked to indicate that they represent certification statements rather than Form Rs. Note that separate establishments at a facility cannot submit separate Form As for the same chemical; rather, only one Form A per EPCRA Section 313 chemical can be submitted per facility.

Like the Form R, Form A includes facility identification information. However, no release and other waste management estimations to any media are provided. You must simply certify that the total annual reportable quantity of the chemical or chemicals addressed in the Form A did not exceed 500 pounds and that amounts manufactured, or processed, or otherwise used did not exceed one million pounds. Once a facility has completed estimates to justify the submission of a Form A, there is a considerable time savings in using the Form A especially in subsequent years provided activities related with the chemical do not change significantly. It is strongly recommended that you document your initial rationale and reconfirm it every year to verify that you have not made any modifications to the process that would invalidate the initial rationale supporting submission of a Form A.

2.10 Trade Secrets

EPCRA's trade secrets provision only applies to the EPCRA Section 313 chemical identity. If you submit trade secret information, you must prepare two versions of the substantiation form as prescribed in 40 CFR Part 350, published in the Federal Register on July 29, 1988, (53 FR 28801) as well as two versions of the Form R. One set of forms should be "sanitized" (i.e., it should provide a generic name for the EPCRA Section 313 chemical identity). This version will be made available to the public. The second version, the "unsanitized" version, should provide the actual identity of the EPCRA Section 313 chemical and have the trade secret claim clearly marked in Part I, Section 2.1 of the Form R or Form A. All other parts of the Form R or Form A must be filled out accordingly.

Individual states may have additional criteria for confidential business information and the submittal of both sanitized and unsanitized reports for EPCRA Section 313 chemicals. Facilities may jeopardize the trade secret status of an EPCRA Section 313 chemical by submitting an unsanitized version to a state agency or Indian tribe that does not require an unsanitized version.

More information on trade secret claims, including contacts for individual state's submission requirements, can be found in the most current version of the *TRI Forms and Instructions*.

2.11 Recordkeeping

Complete and accurate records are absolutely essential to meaningful compliance with EPCRA Section 313 reporting requirements. Compiling and maintaining good records will help you to reduce the effort and cost in preparing future reports and to document how you arrived at the reported data in the event of an EPA compliance audit. EPA requires you to maintain records substantiating the Form R or Form A submission for a minimum of three years from the date of submission. Each facility must keep copies of the Form R or Form A along with all supporting documents, calculations, work sheets, and other forms that you use to prepare the Form R or Form A. EPA may request this supporting documentation during a regulatory audit.

Specifically, EPA requires that the following records be maintained for a period of three years from the date of the submission of a report (summarized from 40 CFR 372.10):

1) A copy of each report that is submitted;

2) All supporting materials and documentation used by the person to make the compliance determination that the facility or establishment is a covered facility;

3) Documentation supporting the report that is submitted, including documentation supporting:

- Threshold determinations;
- Employee threshold determinations (including time sheets);
- Claimed allowable exemptions;
- Calculations for each quantity reported as being released, either on or off site, or otherwise managed as waste;
- Activity use determinations, including dates of manufacturing, processing, or otherwise use;
- Basis of all estimates;
- Receipts or manifests associated with transfers of waste to off-site locations; and
- Waste treatment methods, estimates of treatment efficiencies, ranges of influent concentrations to treatment, sequential nature of treatment steps, and operating data to support efficiency claims.

4) All supporting materials used to make the compliance determination that the facility or establishment is eligible to submit a Form A;

5) Documentation supporting the Form A, including:

- Data supporting the determination that the alternate threshold applies;
- Calculations of annual reporting amounts; and
- Receipts or manifests associated with the transfer of each chemical in waste to off-site locations.

Because EPCRA Section 313 reporting does not require additional testing or monitoring, you must determine the best "readily available data" to make reporting determinations. Alternatively, you may use reasonable estimates to make reporting determinations. The amount and type of data and records will vary from facility to facility. Examples of records that you should keep, if applicable, include the following:

- Each Form R or Form A submitted;
- Section 313 Reporting Threshold Worksheets (sample worksheets can be found in Chapter 3 of this document as well as in the *TRI Forms and Instructions)*;
- Engineering calculations and other notes;
- Purchase records and MSDSs from suppliers;
- Inventory and receipt data;
- Analytical results and profiles for wastes received from off site;
- NPDES/SPDES permits and monitoring reports;
- EPCRA Section 312, Tier II reports;
- Monitoring records;
- Air permits;
- Flow measurement data;
- RCRA hazardous waste generator's reports;

- Pretreatment reports filed with local governments;
- Invoices from waste management firms;
- Manufacturer's estimates of treatment efficiencies;
- CERCLA Reportable Quantity (RQ) reports;
- EPCRA Section 304 follow-up release notifications;
- RCRA manifests; and
- Process flow diagrams (including emissions, releases and other waste management activities).

Chapter 3 - EPCRA Section 313 Threshold Determinations

3.0 PURPOSE

This chapter provides a step-by-step procedure for determining if any EPCRA Section 313 chemicals or chemical categories exceed a reporting threshold at your facility.

Step 1) Determine if you manufacture (including import), process, or otherwise use any EPCRA Section 313 chemicals.

Step 2) Determine the quantity of each EPCRA Section 313 chemical you manufacture (including import), process, or otherwise use.

Step 3) Determine which EPCRA Section 313 chemicals exceed a threshold.

3.1 Step 1 - Determining which EPCRA Section 313 chemicals are manufactured (including imported), processed, or otherwise used

Compiling Chemical Lists. Compile lists of all chemicals, mixtures and other trade name products, and wastes at your facility. For RCRA Subtitle C and solvent recovery facilities with many different chemicals found in many different wastes and mixtures and other trade name products, it may be useful to develop three separate lists: one with pure (single ingredient) chemicals , one with the mixtures and other trade name products, and a third list of all wastes generated on-site and received from off-site. On the second and third list, under the name of each mixture and other trade name product or waste name/code, write the names of all chemicals of which that product or waste is comprised. Next, compare the individual chemicals on all lists to the current list of EPCRA Section 313 chemicals and chemical categories found in the *TRI Forms and Instructions* (remember that chemicals may be periodically added and deleted and you should use the current instructions). Highlight the EPCRA Section 313 chemicals that are on your list. You must perform threshold determinations for these chemicals.

Review the list to be sure each chemical is shown by its correct EPCRA Section 313 name. For example, a common EPCRA Section 313 chemical found in wastes at a RCRA Subtitle C TSD and solvent recovery facility is nitric acid. Nitric acid (CAS No. 7697-37-2) has several synonyms, including: hydrogen nitrate and nitryl hydroxide. It must be reported on Form R (or Form A), Item 1.2, by its EPCRA Section 313 chemical name, nitric acid. Synonyms can be found in the EPA document *Common Synonyms for Chemicals Listed Under Section 313 of the EPCRA* (EPA 745-R-95-008) (updated March 1995). EPA's Automated TRI Reporting System (ATRS) has a pick list containing a complete list of EPCRA Section 313 chemical names and the corresponding CAS numbers.

While every chemical and chemical category on the EPCRA Section 313 list must be considered, certain chemicals are more likely than others to be encountered in RCRA Subtitle C TSD and solvent recovery facilities. As a starting point, refer to Tables 2-2 and 2-3 for a list of

the chemicals most frequently managed by solvent recovery facilities and most frequently sent by manufacturing facilities (i.e., SIC codes 2000-3999) off-site for waste management.

Information that is useful in performing threshold determinations and preparing your reports includes the following:

- Waste name and associated EPCRA Section 313 chemical names;
- Mixtures and other trade name products containing EPCRA Section 313 chemicals;
- Associated CAS numbers;
- Throughput quantities; and
- Whether the chemical is manufactured, processed, or otherwise used at the facility (be sure to include quantities that are coincidentally manufactured and imported, as appropriate).

Use of Spreadsheets or Databases. A computerized spreadsheet or database may be helpful in developing your facility's chemical list and performing threshold calculations. The type of information useful as input in a spreadsheet or database includes the chemical name, mixture or other trade name product, or waste name with corresponding chemical component, concentrations, the CAS number, and the yearly quantity manufactured, processed, or otherwise used. The spreadsheet or database could also be designed to identify the total quantity by activity threshold (amounts manufactured, processed, and otherwise used) for each EPCRA Section 313 chemical in every waste, mixture, and other trade name product.

Smaller facilities that do not have an established electronic method of tracking their waste managed should consider developing a spreadsheet to assist them in their chemical usage and waste management activities. Developing a spreadsheet will require an initial investment of time; however, the time and effort saved in threshold calculations in subsequent years can be significant. Such a system will also reduce the potential of inadvertently overlooking EPCRA Section 313 chemicals that are present in wastes received or mixtures purchased from off-site sources.

EPCRA Section 313 Chemicals in Wastes

A significant portion of the manufacturing, processing, and otherwise use activities at RCRA Subtitle C TSD and solvent recovery facilities will involve wastes received from off-site. To identify which EPCRA Section 313 chemicals are present in wastes, you will need to look to available information resources:

- Waste profiles;
- Waste analytical data;
- Manifests;
- Waste treatment unit permits;
- Landfill permits;
- Air and water discharge permits;
- Engineering and treatment process knowledge.

Both RCRA Subtitle C TSD and solvent recovery facilities manage wastes which are identified by RCRA waste codes. The list of EPCRA Section 313 chemicals in Appendix B presents information on the regulatory status of each EPCRA Section 313 chemical under certain sections of RCRA Subtitle C, including whether the chemical appears on the list of hazardous constituents at 40 CFR Part 261 Appendix VIII, the Land Disposal Restrictions Universal Treatment Standards Table at 40 CFR §268.48, or the toxic and acutely hazardous constituents at 40 CFR §261.33. Due to certain distinctions between the two statutes there is not a direct correlation between the EPCRA Section 313 list of reportable chemicals and the hazardous constituents and waste types regulated under the RCRA. Therefore, the list in Appendix B should be used as a starting point in determining which EPCRA Section 313 chemicals may exist in certain waste streams.

Perhaps the greatest challenge for RCRA Subtitle C TSD and solvent recovery facilities will be to collect information about EPCRA Section 313 chemicals in wastes that are not RCRA hazardous constituents, and thus are not required to be analyzed for RCRA regulation. Information may be available on these chemicals because they must be analyzed to account for treatment unit limitations, treatability problems, or management hazards.

In addition to identifying EPCRA Section 313 chemicals in wastes as they are generated or received from off-site, it is also important to identify whether different EPCRA Section 313 chemicals will be manufactured during the treatment of waste. For example, wastes containing sulfur or chlorine when incinerated manufacture sulfuric acid (acid aerosols) and hydrochloric acid (acid aerosols) respectively. Wastewaters containing nitrogen that are treated biologically manufacture nitrate compounds. The best sources for this type of information could be air monitoring systems (typically required under the Clean Air Act), permit ranges, or engineering calculations.

Use of Waste Profiles and Manifests for Information. Unique to RCRA Subtitle C TSD and solvent recovery facilities, waste profiles and manifests are likely to be a primary source for the type and composition of chemicals and chemical compounds in wastes managed at your facility. For RCRA Subtitle C TSD and solvent recovery facilities, waste profiles are required by RCRA as part of the waste analysis plan in the operating permit. Waste profiles are not required at most recycling facilities (since they do not require a permit under RCRA); however, solvent recovery facilities may obtain waste profiles to assure that the waste solvent received has optimal levels of constituents for the recovery process. The profiles contain detailed information about the composition and concentration of chemicals in the waste. Paired with information on the manifest, which supplies the amount of waste arriving at the facility, you should be able to identify the amounts of each chemical being managed in the waste at your facility.

While the waste analysis plan is developed on a facility-by-facility basis, a typical waste profile will contain information on the waste stream composition, including RCRA regulated chemicals requiring treatment. EPA's *Waste Analysis at Facilities That Generate, Treat, Store, and Dispose of Hazardous Wastes; A Guidance Manual* (EPA 530-R-94-024; April 15, 1994) suggests that facilities collect the following information:

- Physical/chemical description of the waste

- Analytical procedures and results or the process knowledge used to characterize the waste

- Hazardous waste codes

- Waste profile data, including:

    - 40 CFR §261, Appendix VII and VIII constituents
    - Metals (aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver, thallium)
    - Other chemicals (e.g., chlorine)
    - Physical parameters (BTU, total halogens)
    - Additional information as needed by the facility

In addition to waste profiles, RCRA Subtitle C TSD and solvent recovery facilities often conduct waste analyses themselves ("fingerprint analyses"). This may occur prior to acceptance of the first shipment of waste and may be used to prepare the waste profile. Additional waste analyses may occur at any time when waste is received to ensure that the waste continues to meet the profile parameters. RCRA Subtitle C TSD and solvent recovery facilities may choose to rely on actual waste analysis data, however, fingerprint analyses typically will not be sufficient to allow the facility to make a threshold determination. In such cases, the facility should use the best "readily available data".

It is important to note that under RCRA, metals are usually measured according to a parent metal (such as lead or mercury) using an extract of the waste in a test that is meant to simulate worst-case landfill leaching scenarios (the toxicity characteristic leaching procedure). Since threshold determinations require total concentrations of metals and metal compounds, the facility may need to make assumptions about the extract data to determine the total value of metals or metal compounds in their wastes. RCRA Subtitle C TSD and solvent recovery facilities should use the best "readily available data" to determine the form and concentration of the metal and metal compounds in their waste.

EPA is currently in the process of evaluating data submitted by certain RCRA large quantity generators and TSD facilities in response to the National Hazardous Waste Constituent Survey (NHWCS). This survey requested information on the identification and concentration of certain constituents in some RCRA hazardous wastes. Once completed, these results may be useful to facilities in assessing the possible components of waste they receive for further waste management activities in making threshold determinations and release and other waste management calculations. (Contact the EPCRA Hotline for further information at (800) 424-9346)

Example - Identification of Chemicals

A RCRA Subtitle C TSD facility receives a shipment of waste from off-site for incineration. The waste profile shows that the only EPCRA Section 313 chemical in the waste is chloroform. In the process of incineration, the chloroform converts to hydrochloric acid (acid aerosols), which is subsequently captured by the scrubber. Both chloroform and hydrochloric acid must be considered for threshold determinations. Amounts of chloroform received from off-site for the purpose of further waste management must be considered toward the otherwise use threshold of 10,000 pounds. The amount of hydrochloric acid aerosol that is manufactured must be considered toward the manufacturing threshold of 25,000 pounds, as well as the 10,000 pound otherwise use threshold because it was generated from waste received from off-site which was treated for destruction (conversion of the aerosol to liquid form constitutes treatment for destruction).

EPCRA Section 313 Chemicals in Purchased Chemicals

To develop the chemical list and identify the associated threshold activities for purchased chemicals you may want to consult the following:

- Material Safety Data Sheets (MSDS);
- Facility purchasing records;
- Inventory records;
- Individual manufacturing/operating functions; and
- Operation and process knowledge.

For purchased chemicals, MSDSs are generally considered to be good sources of information for the type and composition of chemicals in mixtures and other trade name products. RCRA Subtitle C TSD and solvent recovery facilities may receive MSDSs for any raw materials purchased for the purposes of ancillary cleaning operations, fuel blending, or other operations that require raw materials. As of 1989, chemical suppliers of facilities in SIC codes 2000 through 3999 are required to notify customers of any EPCRA Section 313 chemicals present in mixtures or other trade name products that are distributed to facilities. The notice must be provided to the receiving facility and may be attached or incorporated into that product's MSDS. If no MSDS is required, the notification must be in a letter that accompanies the first shipment of the product to your facility. This letter must contain the chemical name, CAS number, and the weight or volume percent of the chemical (or a range) in the mixture or other trade name product. Beginning with the 1998 reporting year, seven new industries will be covered by most of the EPCRA Section 313 reporting requirements and, therefore, facilities in SIC codes 2000 through 3999 will be required to provide these new industries with this supplier notification information. While the new industries are not required to prepare supplier notifications for materials that they distribute, they are encouraged to pass along the notification to customers receiving these materials who may be subject to EPCRA Section 313. For more information on supplier notification requirements, see *TRI Forms and Instructions, EPCRA Section 313 Question and Answers, Revised 1998 Version* - Appendix A, Directive 9 (EPA-745-B-98-004) or *Supplier Notification Requirements* (EPA-560/4-91-006).

Carefully review the entire MSDS for your purchased chemicals. Although MSDSs must list whether EPCRA Section 313 chemicals are present, the language and location of this

notification is not currently standardized. Depending on the supplier, this information can be found in different sections of the MSDS. The most likely sections of an MSDS to provide information on identity and concentration of EPCRA Section 313 chemicals in purchased chemicals are:

- Hazardous components section;
- Regulatory section;
- Physical properties/chemical composition section;
- Labeling section; and
- Additional information section.

EPCRA Section 313 Chemical List

In order to identify which chemicals are EPCRA Section 313 chemicals, and (in some cases) the form in which they are reportable, you need to compare your list of chemicals managed at your facility to the current Section 313 list of chemicals. Appendix B contains the list of EPCRA Section 313 chemicals (as of RY 1998), and correlates the list with various RCRA lists, such as the list of hazardous constituents (40 CFR Part 261, Appendix VIII and the list of underlying hazardous constituents from the Land Disposal Restriction program (40 CFR Section 268.48). The most current list of EPCRA Section 313 chemicals can be found in the *TRI Forms and Instructions* document for the current reporting year. The following discussion is a brief overview of the EPCRA Section 313 list of chemicals, including a description of possible chemical qualifiers.

The original list of EPCRA Section 313 chemicals and chemical categories was comprised from two lists developed by New Jersey and Maryland. EPA refined the list and anticipates changes to continue. The list can be modified by an EPA initiative or though a petition process. When evaluating a chemical for addition or deletion, EPA must consider potential acute and chronic human health effects and adverse environmental effects and the Agency publishes its findings and any regulatory action through the *Federal Register*.

The EPCRA Section 313 chemical list includes individually listed chemicals and several chemical categories. If you meet the SIC code criterion and exceed the employee threshold, you must file a Form R or Form A for each EPCRA Section 313 chemical or chemical category manufactured, processed, or otherwise used above threshold quantities. When conducting threshold determinations for individually listed chemicals, simply compare the amount of that chemical manufactured, processed, or otherwise used, to each threshold quantity. If you exceed the threshold, you must file a Form R or Form A for that chemical. When determining thresholds for chemical categories, you must total the weights of all members of the category, and compare this sum to each activity threshold. It is important that you compare the amount of compounds in a category separately to each individual activity threshold (manufacturing, processing, or otherwise use). If you exceed *any* of the three activity thresholds for a chemical category, you must file a Form R or Form A for that chemical category.

Many of the EPCRA Section 313 chemical categories are metal compound categories (e.g., chromium compounds). Metal compound categories include any unique chemical substance that contains the metal as part of that chemical's infrastructure. When calculating thresholds for metal compound categories, you must consider the entire weight of the metal compound, not just the weight of the parent metal. However, if you exceed an activity threshold for a metal compound category and you are filing a Form R for that metal compound category, you need only use the weight of the parent metal when calculating quantities released or otherwise managed as waste. Elemental forms of metals (e.g., chromium) are also individually listed on the EPCRA Section 313 chemical list. You must make separate threshold determinations for the elemental metal and the metal compound category (e.g., chromium and chromium compounds). If you exceed thresholds for both the metal and metal compound category, you may submit separate Form Rs, or one Form R for both the metal and metal compound category. However, if both the metal and the metal compound qualify for Form A reporting, you must submit separate Form A certifications for the metal and metal compound category.

Examples - Chemical Categories

Example 1 A facility otherwise uses 5,000 pounds of 1,3-bis(methylisocyanate)-cyclohexane, 3,000 pounds of 1,5-naphthalene diisocyanate, and 3,000 pounds of 2,2,4-trimethylhexamethylene diisocyanate. All three of these chemicals are members of the diisocyanates category, an EPCRA Section 313 chemical category. The facility otherwise uses 11,000 pounds of diisocyanates, which exceeds the 10,000 pound threshold for otherwise use. The facility must file a Form R or Form A for diisocyanates category.

Example 2 A facility otherwise uses 6,000 pounds of zinc oxide, manufactures 20,000 pounds of zinc sulfate, and processes 18,000 pounds of zinc sulfide. All three compounds are members of the zinc compounds category, an EPCRA Section 313 chemical category. Because the facility does not exceed the otherwise use, manufacturing, or processing thresholds, the facility is not required to file a Form R or Form A for the zinc compound category.

Example - Lead and Lead Compounds

A facility has determined that it needs to report under EPCRA Section 313 for both elemental lead and lead compounds. Can this facility file one Form R that takes into account both the releases and other waste management activities of lead and lead compounds, or is it required to report separately?

If a covered facility exceeds thresholds for both the parent metal and compounds of that same metal, it is allowed to file one joint report (e.g., one report for lead compounds and elemental lead). EPA allows this because the release and other waste management information reported in connection with metal compounds will be the total pounds of the parent metal released and otherwise managed as a waste. For data management purposes, EPA requires that the chemical category name and code be placed on the Form R (Sections 1.1 and 1.2).

Several chemicals on the EPCRA Section 313 chemical list include qualifiers related to use or form. A few chemicals are reportable ONLY if manufactured by a specified process or in a

specified activity threshold. For example, isopropyl alcohol is only reportable if it is manufactured using the strong acid process and saccharin is reportable only if it is manufactured. Some other chemicals are only reportable if present in certain forms. For example, only yellow or white phosphorus are reportable, while black or red phosphorus are not.

The qualifiers associated with these chemicals which may be applicable to the RCRA Subtitle C TSD and solvent recovery facilities are presented below. A detailed discussion of the qualifier criteria can be found in the *TRI Forms and Instructions*.

- **Fume or dust** - Three metals (aluminum, vanadium, and zinc) are qualified as "fume or dust forms only." This definition excludes "wet" forms such as solutions or slurries, but includes powder, particulate, or gaseous forms of these metals. For example, on-site disposal of a waste received from off-site containing elemental zinc metal needs to be considered in threshold determinations if the zinc is in the form of a fume or dust. However, if zinc (fume or dust) are found during treatment of a zinc-containing waste stream, then these amounts would need to be considered toward the facility's manufacturing threshold. Additionally, the entire weight of all zinc compounds should be included in the threshold determination for zinc compounds. Keep in mind that most metals in most wastes are expected to be in the compound form.

- **Ammonia** has the following qualifier: "ammonia (includes anhydrous ammonia and aqueous ammonia from water dissociable salts and other sources; 10% of total aqueous ammonia is reportable under this listing)." Aqueous ammonia is formed from the dissociation of ammonium salts (including ammonium sulfate, ammonium nitrate, and ammonium chloride) in water and is an EPCRA Section 313 chemical. You must determine the amount of aqueous ammonia generated from solubilizing these chemicals in water and apply it toward the threshold for ammonia. EPA has published guidance on reporting for ammonia, and ammonium salts in *EPCRA Section 313 Question and Answers, Revised 1997 Version - Appendix A, Directive 8*. Additionally, ammonium nitrate in aqueous solutions must be included in threshold determinations and release and other waste management calculations for the nitrate compounds category. (See below)

- **Nitrate Compounds (water dissociable; reportable only in aqueous solution)** - A nitrate compound is covered by this listing only when in water and if dissociated. Although the complete weight of the nitrate compound must be used for threshold determinations for the nitrate compounds category, only the nitrate ion portion of the compound must be considered for release and other waste management determinations. Nitrate compounds are manufactured during the neutralization of nitric acid and in biological treatment of wastewater. EPA has published guidance for these chemicals in *Water Dissociable Nitrate Compounds Category and Guidance for Reporting* (see Appendix A for more information).

- **Phosphorus (yellow or white)** - Only manufacturing, processing, or otherwise use of phosphorus in the yellow or white chemical forms require reporting. Black and red phosphorus are not subject to EPCRA Section 313 reporting.

- **Asbestos (friable)** - Asbestos only need be considered when it is handled in the friable form. Friable refers to the physical characteristic of being able to crumble, pulverize, or reduce to a powder with hand pressure.

- **Aluminum oxide (fibrous)** - Beginning with reports for calendar year 1989, aluminum oxide is only subject to threshold determination when it is handled in fibrous forms. EPA has characterized fibrous aluminum oxide for purposes of EPCRA Section 313 reporting as a man-made fiber that is commonly used in high-temperature insulation applications such as furnace linings, filtration, gaskets, joints, and seals.

- **Sulfuric acid and hydrochloric acid (acid aerosols)** - EPA delisted non-aerosol forms of sulfuric acid (CAS No. 7664-93-9) and hydrochloric acid (CAS No. 7647-01-0) from the EPCRA Section 313 chemical list beginning in the 1994 and 1995 reporting years, respectively. Threshold determinations and release and other waste management estimates now only apply to the aerosol forms. EPA considers the term aerosol to cover any generation of airborne acid (including mists, vapors, gas, or fog) without any particle size limitation. Sulfuric acid and hydrochloric acid (acid aerosols) are manufactured during the combustion of sulfur containing wastes (for sulfuric acid) and chlorine containing wastes (for hydrochloric acid). EPA has published guidance for sulfuric acid in *Guidance for Reporting Sulfuric Acid (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size)* (see Appendix A for more information).

3.2 Step 2. Determining the quantity of each EPCRA Section 313 chemical manufactured (including imported), processed, or otherwise used

The next step is to determine the quantities manufactured (including imported), processed, and otherwise used for each EPCRA Section 313 chemical on your list (developed in Step 1). Table 3-1 lists the annual reporting thresholds for each of these threshold activities (Tables 3-2 through 3-4 provide detailed definitions of subcategories for each Activity Threshold).

Table 3-1
Reporting Thresholds

Activity	Threshold
Manufacturing (including importing)	More than 25,000 pounds per EPCRA Section 313 chemical
Processing	More than 25,000 pounds per EPCRA Section 313 chemical
Otherwise used	More than 10,000 pounds per EPCRA Section 313 chemical

For each EPCRA Section 313 chemical or chemical category during the reporting year, each threshold must be individually calculated; they are mutually exclusive and are not additive.

Example -Threshold Determination

If your facility manufacturers 22,000 pounds of an EPCRA Section 313 chemical and you also otherwise use 8,000 pounds of the same chemical, you have not exceeded either activity threshold and an EPCRA Section 313 report for that chemical is not required. However, if your facility manufactures 28,000 pounds per year of an EPCRA Section 313 chemical and otherwise uses 8,000 pounds of the same chemical, you have exceeded the manufacturing threshold and all non-exempt releases and other waste management activities of that chemical must be reported on the Form R, including those from the "otherwise use" activity. Additionally, you must also indicate on the Form R in Part II, Section(s) 3.1, 3.2, and 3.3, all non-exempt activities involving the reportable EPCRA Section 313 chemical.

Example -Threshold Determination

The amount of the EPCRA Section 313 chemical that is actually manufactured (including the quantity imported), processed, or otherwise used, not the amount in storage or previously disposed, should be the amount applied to the threshold determination. For example, your facility disposes of nickel compounds in an on-site landfill. The landfill contains hundreds of thousands of pounds of nickel compounds. Over the course of the reporting year, you dispose of an additional 5,000 pounds of nickel compounds in wastes received from off-site. In this example, only the 5,000 pounds that were disposed of in the current year count toward the "otherwise use" threshold. Therefore, unless you "otherwise use" more than 5,000 pounds elsewhere at the facility, the "otherwise use" threshold has not been exceeded and you would not have to report for nickel compounds.

Each of the threshold activity is divided into subcategories. As discussed in the *TRI Forms and Instructions*, you are required to designate EACH activity and subcategory that applies to your facility not only those for which a threshold was exceeded.

Manufacturing

Manufacturing means producing, preparing, importing, or compounding an EPCRA Section 313 chemical. While RCRA Subtitle C TSD and solvent recovery facilities may not intend to manufacture an EPCRA Section 313 chemical during its operations, many of the activities could produce chemicals which may need to be considered towards the manufacturing threshold. You will need to consider if EPCRA Section 313 chemicals are produced coincidentally during any of your operations, which qualifies towards the manufacturing threshold, regardless of whether the chemical only exists for a short period of time, is destroyed by air control equipment, or is captured as the residual materials (such as distillation bottoms or incinerator ash). An example would be the production of ammonia or nitrate compounds in a wastewater treatment system.

In operations where waste is being heated (either for destruction or energy recovery purposes), RCRA Subtitle C TSD and solvent recovery facilities may need to account for any metals that oxidize or convert into other listed compounds. In an elevated temperature environment, chemical reactions can occur which convert a metal into a different metal compound (e.g., metal oxides). If that new compound is an EPCRA Section 313 chemical, your facility is responsible for counting that amount toward the manufacturing threshold.

RCRA Subtitle C TSD and solvent recovery facilities should take special note of the aerosol chemical qualifier in considering manufacturing thresholds. Hydrochloric acid and sulfuric acid are both only reportable in the aerosol form. The act of creating an aerosol from the liquid form of either chemical is considered manufacturing because the chemical is converting from a non-listed form of the EPCRA Section 313 chemical to the listed form. The following discussion describes the subsections of manufacturing for reporting purposes (see Table 3-2), and other manufacturing threshold issues that are relevant to RCRA Subtitle C TSD and solvent recovery facilities.

Table 3-2
Definitions and Examples of Manufactured Chemicals

Manufacturing Activity Subcategory	Examples
Produced or imported for on-site use/processing	-Metal precipitation from electroplating wastes forming a new EPCRA Section 313 chemical covered under the metal compound category, which is then stabilized in preparation for final disposal. -Importation of a stabilizing agent (e.g., 1,4-dioxane) for incorporation into recovered solvent.
Produced or imported for sale/distribution	-Any listed chemical that may be produced during waste management activities which is then separated for sale or sent off-site for recycling.
Produced as a by-product	-Hydrogen chloride (hydrochloric acid) gas produced in a thermal oxidizer during the treatment of chlorinated organic wastes. -Metal salts formed by precipitation from spent solvents undergoing reclamation.
Produced as an impurity	-Any listed chemical which is produced during recovery of another chemical that remains with the chemical and sent off-site for distribution in commerce.

* More complete discussions of the industry-specific examples can be found in Chapter 4 of this guidance manual.

Chemical Conversions. Perhaps the most overlooked form of manufacturing is chemical conversions. Both organics and metals can undergo chemical conversions during RCRA Subtitle C TSD and solvent recovery facilities. Any new EPCRA Section 313 chemicals produced as a result of these chemical conversions must be counted towards the manufacturing threshold. For example, the combustion of wastes in an incinerator can chemically convert the EPCRA Section 313 metals in the waste stream into different compounds (e.g., metal oxides). Wastewater treatment is also known to form new compounds, notably nitrate compounds. Combustion can also result in the manufacture of other EPCRA Section 313 chemicals, such hydrogen fluoride, hydrochloric acid (acid aerosols), and sulfuric acid (acid aerosols). Since solvent recovery facilities typically use a heat-based recovery system such as distillation, new compounds may also form during the recovery process.

Manufacturing Threshold as it Applies to Chemical Conversion

The conversion of one metal compound to another metal compound within the same metal compound category is considered the "manufacture" of a metal compound, which must be considered toward threshold calculations. This is identical to how threshold calculations are derived for EPCRA Section 313 chemicals in non-metal compound categories. The unique aspect for metal compounds, as compared to non-metal compounds within a listed compound category, is how amounts released and otherwise managed are reported. As stated in the final rule (62 FR 23850; May 1, 1997), "if a metal is converted to a metal compound or if a metal compound is converted to another metal compound, a metal compound has been "manufactured" as defined under EPCRA Section 313." However, provided that thresholds are exceeded, facilities are instructed to report only the amount of the parent metal contained in the metal compounds for amounts released or otherwise managed. Facilities have the option to submit one Form R that includes the amounts of the elemental metal from the parent metal along with amounts of the metal portion from the metal compounds on their report, if thresholds for both the elemental metal and its metal compounds have been exceeded.

Importing. The "manufacture" threshold includes importing an EPCRA Section 313 chemical if the facility has *caused* the chemical to be imported. If your facility orders or enters into an agreement to obtain or accept an EPCRA Section 313 chemical (or a mixture or other trade name product or waste containing an EPCRA Section 313 chemical) from a source outside the customs territory of the United States (the 50 states, the District of Columbia, and Puerto Rico) then your facility has imported a listed EPCRA Section 313 chemical and amounts must be considered toward the manufacturing threshold. Note that if an entity other than the facility, such as a third party not directly associated with the facility (e.g., a waste or chemical broker), ordered the waste or chemical without specific direction from the facility, then that third party has "caused" the chemical to be imported, and the facility does not need to consider the EPCRA Section 313 chemical toward the manufacturing threshold. Imported chemicals, as well as any others that undergo a manufacturing activity, may also be subsequently processed and/or otherwise used, and amounts associated with these activities need to be applied to all appropriate threshold determinations.

Example - Importing that Qualifies as Manufacturing

U.S. law requires that wastes produced in Mexico by an American owned company be sent back to the U.S. for further waste management (Maquiladora waste). When the facility operating within the U.S. receives the wastes, has it manufactured the EPCRA Section 313 chemicals contained in those waste? Because this law requires that these wastes be returned to the U.S. for further waste management, did the U.S. facility receiving these wastes cause the wastes to be imported?

Yes, the receiving facility either has a contract or agreement in place to receive "imported" waste and is functioning as the importing facility. Amounts of EPCRA Section 313 chemicals received in waste must be counted toward the "manufacturing" threshold. The receiving facility would also need to consider amounts received for the purpose of further waste management toward their "otherwise use" threshold, if they treat for destruction, stabilize, or dispose the EPCRA Section 313 chemical.

Processing

Processing means preparing an EPCRA Section 313 chemical, or a mixture or other trade name product containing an EPCRA Section 313 chemical for distribution in commerce (usually thought of as the intentional incorporation of an EPCRA Section 313 chemical into a product). Solvent recovery facilities should pay considerable attention to this activity threshold since much of their operations involve recovery of solvents for distribution into commerce. And while RCRA Subtitle C TSD and solvent recovery facilities typically do not prepare products with Section 313 chemicals for distribution into commerce, the processing threshold may apply to other operations at their facilities.

Perhaps the most pivotal element of the processing definition is that the Section 313 chemical must be prepared for *distribution into commerce*. If a material is produced or recovered for use on-site, the material has not been prepared for distribution into commerce, and thus is not counted towards the processing threshold (see the discussion of otherwise use for the applicability of chemicals used on-site). Distribution into commerce does not only mean that the material must be sold to a customer. Distributed in commerce includes any distributive activity in which benefit is gained by the transfer, even if there is no direct monetary gain (e.g., intra-company transfers).

Transfers Off-site for Recycling. Amounts of EPCRA Section 313 chemicals sent off-site for recycling also must be considered toward the processing threshold of 25,000 pounds. Amounts of materials containing EPCRA Section 313 chemicals sent off-site for recycling are prepared for distribution into commerce. Materials sent off-site for recycling must undergo a recovery step and are, therefore, considered a waste and not eligible for the *de minimis* exemption. Wastes destined for off-site recycling are considered wastes sent off-site for further waste management, which are not eligible for the *de minimis* exemption and must be reported on the Form R in Sections 6 and 8. For example, if you recover a waste solvent with a Section 313 chemical, package it, and then distribute it into commerce, this chemical has been processed by your facility.

Generally, recycling facilities that accept waste from off-site may need to consider both the processing threshold and the otherwise use threshold. Whether an EPCRA Section 313 chemical contained in a waste for recycling is counted towards otherwise use or processing is contingent on whether the EPCRA Section 313 chemical contained in a recycled product is sent off-site or used on-site. If you accept a waste containing an EPCRA Section 313 chemical from off-site that you recycle and send off-site again for use, you are processing the EPCRA Section 313 chemical. If you use the recovered product on-site rather than sending it off-site, then the EPCRA Section 313 chemical should be counted towards the otherwise use threshold. (See the next Section on “Otherwise Use” for more details.)

Example - Recovery as Processing

A facility feeds 50,000 pounds of solvent containing 90% MIBK (i.e., 45,000 pounds of MIBK) into a recycling process that is 85% efficient. The facility distributes the recovered MIBK in commerce. Should the facility count 45,000 pounds of MIBK (i.e., the entire amount that was inserted into the process) towards the processing threshold?

Yes. The facility considers the entire amount (45,000 pounds of MIBK) entering the recovery system toward the "processing" threshold regardless of the recovery efficiency of the process.

Transfers Off-site for Direct Reuse. Amounts of EPCRA Section 313 chemicals sent off-site for direct reuse must be considered toward the processing threshold of 25,000 pounds. Materials are considered to be sent off-site for direct reuse if the materials are distributed into commerce and are going to be directly used in an operation or application without any recovery steps including the extraction of contaminants. Materials sent off-site for direct reuse are not reported on the Form R in Sections 6 and 8 as recycled or released because the materials are not considered wastes. Because materials sent off-site for direct reuse are not considered wastes, these materials may qualify for the *de minimis* exemption if any EPCRA Section 313 chemical in the material is below the *de minimis* level (see Chapter 3.2.2.3). EPCRA Section 313 chemicals in waste that are sent off-site for further waste management (e.g., disposal) are not considered to be reused.

Repackaging. An EPCRA Section 313 chemical that is repackaged and distributed into commerce is considered processed for the purposes of EPCRA Section 313. Because EPA does not currently consider a transfer of waste off site for treatment, disposal, or energy recovery distribution in commerce, repackaged wastes only need to be considered processed if the waste is sent off-site for recycling. Furthermore, repackaging does not include relabeling or transfers of containers. For example, transfer of sealed lab packs from one drum to a larger drum is not considered repackaging if the integrity of the lab pack is not compromised. Importantly for RCRA Subtitle C TSD and solvent recovery facilities, simply sampling waste from a container does not constitute repackaging activity, and is therefore not sufficient to be considered "processed." For example, if a facility receives a 55-gallon drum of waste, samples the waste to develop a waste profile and then sends the waste to a recycling facility, that action does not constitute repackaging, and should not be attributed to the processing threshold.

Example - Repackaging

Facility #1 receives a spent solvent, repackages it to send off-site to a recycling facility (Facility #2). Facility #2 recovers the solvent and returns it to Facility #1 who then repackages it to be distributed into commerce. Does Facility #1 count the EPCRA Section 313 chemical in the solvent twice toward the processing threshold (i.e., when it is distributed off-site for recycling and again when they distribute the recovered solvent into commerce)?

Yes. Amounts of EPCRA Section 313 chemicals that are transferred off-site for recycling are considered "processed" and Facility #1 processed the EPCRA Section 313 chemical when the facility prepared it to be sent off-site for recycling. Facility #2 who recovers the EPCRA Section 313 chemical also "processed" amounts recovered, which were subsequently distributed back to Facility #1. Facility #1 then receives amounts of the EPCRA Section 313 chemical recovered by Facility #2 and repackages amounts of the EPCRA Section 313 chemical for purposes of further distribution in commerce. Therefore, Facility #1 must include these amounts toward their "processing" threshold. While this may seem to be a double counting of the same amounts of the EPCRA Section 313 chemical, because the activities are completed at each interval and each activity is independently performed, there is no double counting within the same activity sequence of steps.

Waste Fuel Blending. Some RCRA Subtitle C TSD and solvent recovery facilities may engage in fuel-blending activities to adjust the BTU value of the waste or the constituent levels for optimal recovery. Transferring a waste which contains an EPCRA Section 313 chemical off-site for energy recovery is not considered processing, even if the waste has been blended with other wastes and repackaged. Sending a commercial product fuel off site (for example, to a customer or distribution center) is considered processing assuming that the facility sending the commercial fuel off site has blended and/or repackaged the fuel. Table 3-3 describes the subsections of processing for reporting purposes.

Table 3-3
Definitions and Examples of Processed Chemicals

Processing Activity Subcategory	Examples
As a reactant	-Purchased materials used as feedstock in a recovery process.
As a formulation component	-1,4-Dioxane added as a stabilizer to recovered 1,1,1,-trichloroethylene solvent. -Recycled solvent (e.g., toluene) from distillation or recovery of spent solvent.
As an article component	-Chromium compounds that become incorporated into cement blocks that are sold as a product.
Repackaging for distribution into commerce	-Wastes containing EPCRA Section 313 chemicals that are removed from their original containers, placed in different containers, and shipped off site for recycling.

* More complete discussions of the industry-specific examples can be found in Chapter 4 of this guidance manual.

Otherwise Use

"Otherwise use" is any use of an EPCRA Section 313 chemical that does not fall under the definitions of "manufacture" or "process." Chemicals otherwise used are not incorporated into a product that is distributed into commerce and includes such uses as a processing or manufacturing aid and for such ancillary uses as treating wastes.

Otherwise use of an EPCRA Section 313 chemical also includes disposal, stabilization (without subsequent distribution in commerce), and treatment for destruction if the:

(1) EPCRA Section 313 chemical that was disposed, stabilized, or treated for destruction was received from off-site for the purposes of further waste management, or

(2) EPCRA Section 313 chemical that was disposed, stabilized, or treated for destruction was manufactured as a result of waste management activities of materials received from off-site for the purpose of further waste management.

The following discussion describes the subsections of the otherwise use threshold for reporting purposes (see Table 3-4).

Table 3-4
Definitions and Examples of Otherwise Used Chemicals

Otherwise Use Activity Subcategory	Examples
As a chemical processing aid	-EPCRA Section 313 chemicals in solvent employed in solvent extraction of organics from hazardous waste that is immiscible with and can be separated from the organic.
As a manufacturing aid	-EPCRA Section 313 chemicals in heat transfer fluids used as a heat source for distillation of spent solvents or for thermal desorption of hydrocarbons from contaminated media.
Ancillary or other use	-Auxiliary fuels such as No. 2 fuel oil or natural gas used to boost Btu values in hazardous waste incinerators. -Stabilization agents (e.g., formaldehyde in cement) added to treat solvent tank bottom wastes. - EPCRA Section 313 chemicals which are disposed, stabilized, incinerated, or treated for destruction through wastewater treatment.

* More complete discussions of the industry-specific examples can be found in Chapter 4 of this guidance manual.

Waste Management Activities. For purposes of the otherwise use definition, EPA interprets waste management activities to include recycling, combustion for energy recovery, treatment for destruction, waste stabilization, and release, including disposal. However, for

calculating thresholds, the only quantities that should be applied to the otherwise use threshold are those wastes that are treated for destruction, stabilized, or disposed on-site. Waste management does not include the storage, container transfer, or tank transfer of an EPCRA Section 313 chemical if no recycling, combustion for energy recovery, treatment for destruction, waste stabilization, or release of the chemical occurs at the facility (62 FR 23850; May 1, 1997).

Table 3-5
EPA Guidance Related to Waste Management Activities

Waste Management Activity	Description
Recycling	As referenced in the May 1, 1997, *Federal Register* and defined in the document, *Interpretations of Waste Management Activities: Recycling, Combustion for Energy Recovery, Treatment for Destruction, Waste Stabilization, and Release* (April 1997), recycling means (1) the recovery for reuse of an EPCRA Section 313 chemical from a gaseous, aerosol, aqueous, liquid, or solid stream; or (2) the reuse or the recovery for use of an EPCRA Section 313 chemical that is a RCRA hazardous waste as defined in 40 CFR Part 261. Recovery is the act of extracting or removing the EPCRA Section 313 chemical from a waste stream and includes: (1) the reclamation of the EPCRA Section 313 chemical from a stream that entered a waste treatment or pollution control device or process where destruction of the stream or destruction or removal of certain constituents of the stream occurs (including air pollution control devices or processes, wastewater treatment or control devices or processes, Federal or state permitted treatment or control devices or processes, and other types of treatment or control devices or processes); and (2) the reclamation for reuse of an "otherwise used" EPCRA Section 313 chemical that is spent or contaminated and that must be recovered for further use in either the original or any other operations.
Combustion for energy recovery	Combustion for energy recovery is interpreted by EPA to include the combustion of a Section 313 chemical that is (1) (a) a RCRA hazardous waste or waste fuel, (b) a constituent of a RCRA hazardous waste or waste fuel, or (c) a spent or contaminated "otherwise used" material; and that (2) has a significant heating value and is combusted in an energy or materials recovery device. Energy or materials recovery devices are boilers and industrial furnaces as defined in 40 CFR §372.3 (See 62 FR 23891). If a reported toxic chemical is incinerated but does not contribute energy to the process (e.g., metal, metal compounds, and chlorofluorocarbons), it must be considered treatment for destruction. In determining whether an EPCRA Section 313 listed chemical is combusted for energy recovery, the facility should consider the heating value of the Section 313 chemical and not the heating value of the chemical stream.

Treatment for destruction	Means the destruction of an EPCRA Section 313 chemical in waste such that the substance is no longer the EPCRA Section 313 chemical subject to reporting. Treatment for destruction does not include the destruction of an EPCRA Section 313 chemical in waste where the EPCRA Section 313 chemical has a heat value greater than 5,000 British Thermal Units (BTU) and is combusted in any device that is an industrial boiler or furnace. (See 40 CFR §372.3.) "Treatment for destruction" includes acid or alkaline neutralization if the EPCRA Section 313 chemical is the entity that reacts with the acid or base. "Treatment for destruction" does not include: (1) neutralization of a waste stream containing EPCRA Section 313 chemicals if the EPCRA Section 313 chemicals themselves do not react with the acid or base (See 40 CFR §372.3), (2) preparation of an EPCRA Section 313 chemical for disposal, (3) removal of EPCRA Section 313 chemicals from waste streams, and (4) activities intended to render a waste stream more suitable for further use or processing, such as distillation or sedimentation. (Note: Amounts of metals CAN NOT be destroyed and therefore should not be reported as treated for destruction.)
Waste stabilization	Means any physical or chemical process used to either reduce the mobility of hazardous constituents in a hazardous waste or eliminate free liquid as determined by a RCRA approved test method (e.g., Test Method 9095). A waste stabilization process includes mixing the hazardous waste with binders or other materials and curing the resulting hazardous waste and binder mixture. Other synonymous terms used to refer to this process are "stabilization," "waste fixation," or "waste solidification." (See 40 CFR §372.3.)
Release	***Release*** is defined by EPCRA Section 329(8) to mean any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles) of any EPCRA Section 313 chemical. (See 40 CFR §372.3.)
Disposal	***Disposal*** means any underground injection, placement in landfills/surface impoundments, land treatment, or other intentional land disposal. (See 40 CFR §372.3.)

(See EPA document, *Interpretations of Waste Management Activities: Recycling, Combustion for Energy Recovery, Waste Stabilization and Release* for further detail.*)*

Waste management activities conducted by a facility on EPCRA Section 313 chemicals in wastes generated on-site are not considered an otherwise use of that chemical. The otherwise use threshold applies to amounts disposed, stabilized (without subsequent distribution in commerce), or treated for destruction from wastes received from off-site or from chemicals generated from waste received from off-site. Simply receiving and storing a waste from off-site for waste management sometime in the future does not trigger an "otherwise use" of those EPCRA Section 313 chemicals in waste. However, subsequent activities involving the EPCRA Section 313 chemical in waste managed on-site may require you to consider those amounts toward other threshold activities. For example, recycling of an EPCRA Section 313 chemical for distribution into commerce would apply towards the processing threshold. Likewise, if an EPCRA Section 313 chemical taken from an on-site waste is burned for energy recovery, then amounts would be considered toward the otherwise use threshold.

Example - Otherwise Use

A facility captures leachate from a landfill, treats the leachate with an EPCRA Section 313 chemical, and then uses the treated leachate (which now contains the EPCRA Section 313 chemical) as on-site irrigation water. Is the facility "otherwise using" the EPCRA Section 313 chemical in the irrigation water, and should the facility report the EPCRA Section 313 chemical as a release to land in Section 5.5.4, Other Disposal?

Yes. Use of EPCRA Section 313 chemicals contained in the treated leachate for irrigation purposes is considered an "otherwise use" and amounts of these chemicals contained in the treated leachate must be counted toward the "otherwise use" threshold. Any EPCRA Section 313 chemicals manufactured during the treatment of the leachate would also need to be considered toward the "manufacturing" threshold. The treated leachate, and EPCRA Section 313 chemicals contained in the treated leachate, are also considered a waste and any "otherwise use" of EPCRA Section 313 chemicals contained in the treated leachate is not eligible for the *de minimis* exemption. The "otherwise use" of these chemicals for irrigation constitutes a release to land and would be reportable in Part II 5.5.4 Other Disposal.

Special "Otherwise-Use" Activities to Consider for RCRA Subtitle C TSD and Solvent Recovery Facilities

- When considering what EPCRA Section 313 chemicals are managed during the year, you should consider not only the amount of each of those chemicals in wastes that are treated or disposed during the year, but also the amount of virgin EPCRA Section 313 chemicals used at the facility (e.g., to facilitate the treatment processes or for cleaning operations). These chemicals must be included in calculations of the otherwise use threshold.

- EPCRA Section 313 chemicals used in support activities such as froth flotation, process-related equipment maintenance, and dewatering activities are also typically classified as "otherwise use" activities.

- Any EPCRA Section 313 chemicals that a facility uses as processing or manufacturing aids or for treating waste are "otherwise used."

- EPCRA Section 313 chemicals in materials purchased to be used as fuel or for maintaining equipment operations, other than for maintaining motor vehicles, should be included in the threshold determination for "otherwise use" activities.

- Any EPCRA Section 313 chemicals in materials purchased to be used in the waste management processes should also be included in the threshold determination for "otherwise use" activities. For example, any purchased material that is used as feedstock in a recovery process, as auxiliary fuel in incineration, as a chemical in the treatment process (e.g., flocculation agents, acids), or as an additive to reclaimed materials prior to customer delivery should be included in the threshold determinations.

Example - Timing

A facility receives waste containing an EPCRA Section 313 chemical from off-site and disposes the waste on-site. Should the facility count the EPCRA Section 313 chemicals in the waste towards the 'otherwise use' threshold upon receipt of the waste shipment (e.g., signing the hazardous waste manifest) or upon actual disposal?

The facility must count the amount of the EPCRA Section 313 chemical towards its otherwise use threshold upon actual disposal of the waste. EPCRA Section 313 chemicals are applied toward the otherwise use threshold upon the performance of those activities. The facility does not "otherwise use" the EPCRA Section 313 chemical in the waste received from off-site until the facility disposes the waste.

3.2.1 Concentration Ranges for Threshold Determination

You are required to use your best "readily available data" for estimating EPCRA Section 313 threshold determinations and release and other waste management calculations. In some cases, the exact concentration of an EPCRA Section 313 chemical in a mixture or other trade name product, or in a waste may not be known. In these cases, the waste profile, customer, supplier, or MSDS may only provide ranges, or upper or lower bound concentrations. EPA has developed the following guidance on how to determine concentrations from this type of information for use in threshold determinations:

- If exact concentration is provided, use it.

- If the concentration is provided as a lower and upper bound or as a range, you should use the mid-point in your calculations for the threshold determination. For example, the waste profile states methanol is present in a concentration of not less than 20% and not more than 40%, or it may be stated as present at a concentration between 20 to 40%. You should use 30% methanol in your threshold calculations.

- If only the upper bound concentration is provided you must use this value in your threshold calculation.

- If only the lower bound concentration of the EPCRA Section 313 chemical is specified and the concentration of other components are given, subtract the other component values from 100%. The remainder should be considered the upper bound for the EPCRA Section 313 chemical and you should use the given lower bound to calculate the mid-point as discussed above. For example, the waste profile states that a solvent contains at least 50% MEK and 20% non-hazardous surfactants. Subtracting the non-hazardous contents from 100% leaves 80% as the upper bound for MEK. The mid-point between upper (80%) and lower (50%) bounds is 65%, the value you should use in your threshold calculation.

- If only the lower bound is specified and no information on other components is given assume the upper bound is 100% and calculate the mid-point as above.

Even if the concentration of a chemical is known through engineering knowledge only, the facility is still required to consider the chemical for threshold determinations. For example, facility engineers may have knowledge that nitric acid is manufactured in an on-site incinerator. If there are no waste profiles or permit information specifically listing nitric acid, the facility must still consider the chemical for threshold determinations. This determination should be made based on their best "readily available data", be it process knowledge or other reasonable estimation techniques.

When determining concentration information for wastes, it is important to understand that the *de minimis* exemption does NOT apply to wastes. If your waste profiles (or other information) indicate that there are chemicals present that are below the detection limit, you may still need to include those chemicals in your threshold determinations and release and other waste management calculations. If you have no information to indicate that the chemical exists in the waste stream, you may assume that the concentration is zero. However, if the facility has reason to believe that the EPCRA Section 313 chemical is present in the waste, it may use half of the detection limit for that chemical when making threshold determinations and release and other waste management calculations.

Example - Average Concentration

Is it appropriate for a RCRA Subtitle C TSD facility to develop an average concentration for an EPCRA Section 313 chemical contained in thousands of different waste streams managed by the facility, and then use that average as a basis of threshold determination? If so, does EPA have a recommended approach for developing such an average?

EPCRA allows facilities to use "readily available data" to provide information required under EPCRA Section 313. When data are not readily available, EPCRA allows facilities to use "reasonable estimates"of the amounts involved. A facility must use its best judgment to determine whether data are "readily available." Thus, with regard to use of average concentration levels, a facility must use its best judgment to decide whether the raw data from which it might base any average concentration level are readily available. In any event, a facility should carefully document its decision making. For example, if a facility decides to use average concentration levels, it should document why the raw data from which the averages are based are not readily available, how it arrived at any average concentration level used, and why the average concentration level is a "reasonable estimate"of the amount of the EPCRA Section 313 chemical in the waste stream. EPA does not have a recommended approach for determining average concentration levels.

3.2.2 Evaluation of Exemptions

EPCRA Section 313 provides facilities with certain exemptions:

- Laboratory Activities Exemption;
- *De minimis* exemption;
- Article exemption;
- Exemptions that apply to the otherwise use of chemicals: routine janitorial/facility grounds maintenance; personal use exemption; structural component exemption; motor vehicle maintenance exemption; exemption for air or water drawn from the environment or municipal sources for certain uses.

3.2.2.1 Laboratory Activities Exemption

This exemption includes EPCRA Section 313 chemicals that are manufactured, processed, or otherwise used in a laboratory under the supervision of a technically qualified individual. This exemption may be applicable in such circumstances as laboratory sampling and analysis, research and development, and quality assurance and quality control activities. It does not include pilot plant scale or specialty chemical production. It also does not include laboratory support activities. For example, chemicals used to maintain laboratory equipment are not eligible for the laboratory activities exemption.

Example - Laboratory Activities Exemption

If a facility takes a sample from its process stream to be tested in a laboratory for quality control purposes, are releases of an EPCRA Section 313 chemical from the testing of the sample in the laboratory exempt under the laboratory activities exemption?

Yes, provided that the laboratory at the covered facility is under the direct supervision of a technically qualified individual as provided in 40 CFR 372.38(d). The laboratory exemption applies to the "manufacture," "process," or "otherwise use" of EPCRA Section 313 chemicals and any associated release and other waste management amounts that take place in a qualifying laboratory.

3.2.2.2 *De Minimis* Exemption

If the amount of EPCRA Section 313 chemical(s) present in a mixture or other trade name product processed or otherwise used is below its *de minimis* concentration level, that amount is considered to be exempt from threshold determinations and release and other waste management calculations. (Note that this exemption does not apply to manufacturing, except for importation or as an impurity as discussed below.) Because wastes are not considered mixtures or other trade name products, the *de minimis* exemption does not apply to wastes. The *de minimis* concentration for mixtures or other trade name products is 1%, except for OSHA-defined carcinogens, which have a 0.1% *de minimis* concentration. If a mixture or other trade name product contains more than one member of a compound category, the weight percent of all members must be summed. If the total meets or exceeds the category's *de minimis* level, the *de minimis* exemption does not apply. Information may only be available that lists the concentration of chemicals in mixtures as a range. EPA has developed guidance on how to determine quantities

that are applicable to threshold determinations, release, and other waste management calculations when this range straddles the *de minimis* value. EPA has published several detailed questions and answers and a directive in the *EPCRA Section 313 Q&A Document* that may be helpful if you have additional concerns about the *de minimis* exemption. The *TRI Forms and Instructions* list each EPCRA Section 313 chemical and compound category with the associated *de minimis* value.

The *de minimis* exemption also applies in limited circumstances to the manufacture of EPCRA Section 313 chemicals. In the specific case where EPCRA Section 313 chemicals are coincidentally manufactured in a product and remain in the product as an impurity which is then subsequently distributed in commerce, amounts of EPCRA Section 313 chemicals are eligible for the *de minimis* exemption. The *de minimis* exemption also applies to EPCRA Section 313 chemicals in an imported mixture or other trade name product.

The *de minimis* exemption, however, does not apply to EPCRA Section 313 chemicals that are coincidentally manufactured as byproducts that are separated from the product; nor does it apply to chemicals that are coincidentally manufactured as a result of waste treatment or other waste management activities, or to waste brought on site for waste management. For example, many facilities treat waste solvents by incinerating them. Combustion processes can result in the coincidental manufacture of such EPRCA Section 313 chemicals as sulfuric acid (acid aerosols), hydrochloric acid (acid aerosols), hydrofluoric acid, and metal compounds.

Since the *de minimis* exemption does not apply to the coincidental manufacture of chemicals as byproducts, the formation of these compounds in any concentration must be considered for threshold determinations and release and other waste management calculations. The *de minimis* exemption applies to recovered products in that if a waste solvent is received from off-site and recycled, then sent off site as a product, the *de minimis* exemption could apply to the recovered product.

Once the *de minimis* level has been met or exceeded, the exemption no longer applies to that process stream, even if the concentration of the EPCRA Section 313 chemical in a mixture or other trade name product later drops below the *de minimis* level. All releases and other waste management activities are subject to reporting after the *de minimis* concentration has been equaled or exceeded, provided an activity threshold has been exceeded.

Example - *De Minimis*

A facility receives a mixture with an EPCRA Section 313 chemical in a concentration below the *de minimis* concentration. During processing, the concentration of the EPCRA Section 313 chemical exceeds its *de minimis* level. This facility must consider amounts toward threshold determination and releases and other waste management activities that take place after the point in the process where the *de minimis* level is met or exceeded. The facility does not have to consider toward threshold determinations and release and other waste management estimates, activities that took place before the *de minimis* level was met or exceeded.

3.2.2.3 Article Exemption

An article is defined as a manufactured item if each of the three criteria below applies:

- Is formed to a specific shape or design during manufacture;
- Has end-use functions dependent in whole or in part upon its shape or design; and
- Does not release an EPCRA Section 313 chemical under normal conditions of processing or otherwise use of the item at the facility.

If you receive a manufactured item from another facility and process or otherwise use the item without changing the shape or design, and your processing or otherwise use results in the release of 0.5 pound or less of the EPCRA Section 313 chemical in a reporting year from all like articles, then the EPCRA Section 313 chemical in that item is exempt from threshold determinations and release and other waste management reporting. The article exemption does not apply to the manufacturing of items at your facility.

The shape and design of a manufactured item can change somewhat during processing and otherwise use activities as long as part of the item retains the original dimensions. That is, as a result of processing or otherwise use, if an item retains its initial thickness or diameter, in whole or in part, then it still meets the definition of article. If the item's basic dimensional characteristics are totally altered during processing or otherwise use, the item would not meet the definition, even if there were no releases of an EPCRA 313 chemical from these manufactured items. As an example, TSD and solvent recovery facilities receive waste in metal drums, which are then emptied, cleaned, and sent off-site for reuse. Amounts of the metals in the cleaned drums would be eligible for the article exemption as described above and would not have to be considered toward threshold determinations. In this example, no change is made in the diameter, shape or form of the metal drum, and more importantly, there are no releases of the EPCRA Section 313 chemical(s).

Any processing or otherwise use of an article that results in a release above 0.5 pound per year for each EPCRA Section 313 chemical for all like articles will negate the article exemption. Cutting, grinding, melting, or other processing of a manufactured item could result in a release of an EPCRA Section 313 chemical during normal conditions of use and, therefore, could negate the exemption as an article if the total release exceeds 0.5 pound in a year. However, if <u>all</u> of the resulting waste is recycled or reused, either on site or off site such that the release and other waste management of the EPCRA Section 313 chemical in all like articles does not exceed 0.5 pound, then the article exemption status is maintained. Also, if the processing or otherwise use of similar manufactured items results in a total release and other waste management of less than or equal to 0.5 pound of any individual EPCRA Section 313 chemical in a calendar year, EPA will allow this quantity to be rounded to zero and the manufactured items to maintain their article exemption. The 0.5 pound limit does not apply to each individual article; instead, it applies to the sum of releases and other waste management activities (except recycling) from processing or otherwise use of all like articles for each EPCRA Section 313 chemical contained in these articles.

The *EPCRA Section 313 Q&A* document presents several specific questions and answers/discussion pertaining to the article exemption.

3.2.2.4 Exemptions that Apply to the Otherwise Use of EPCRA Section 313 Chemicals

Some exemptions are limited to the "otherwise use" of an EPCRA Section 313 chemical. EPCRA Section 313 chemicals used in these activities do not need to be included in a facility's threshold determinations nor the associated release and other waste management calculations, provided thresholds are met elsewhere. The following otherwise use activities are considered exempt (see most current versions of *TRI Forms and Instructions* and *EPCRA Section 313 Questions and Answers* documents):

- **EPCRA Section 313 chemicals used in routine janitorial or facility grounds maintenance**. Examples are bathroom cleaners and fertilizers and garden pesticides in similar type or concentration distributed in consumer products. Materials used to clean process-related equipment do not qualify for this exemption.

- **EPCRA Section 313 chemicals for personal use**. Examples are foods, drugs, cosmetics, and other personal items including those items used in cafeterias and infirmaries.

Example - Personal Use Exemption

Ammonia used to clean a cafeteria grill is exempt from threshold determinations and release and other waste management calculations. Chlorine added to the water supply system to prepare potable water for consumption at the facility is also exempt under the personal use exemption.

- **EPCRA Section 313 chemicals in structural components of the facility**. This exemption applies to EPCRA Section 313 chemicals present in materials used to construct, repair, or maintain non-process related structural components of a facility. An example common to all facilities would be the solvents and pigments used to paint the administrative office buildings. Materials used to construct, repair, or maintain process-related equipment (e.g., storage tanks, reactors, and piping) are not exempt.

- **EPCRA Section 313 chemicals used to maintain facility motor vehicles**. This exemption includes the use of EPCRA Section 313 chemicals for the purpose of maintaining motor vehicles operated by the facility. Common examples include EPCRA Section 313 chemicals in gasoline, radiator coolant, windshield wiper fluid, brake and transmission fluid, oils and lubricants, batteries, cleaning solutions, and solvents in paint used to touch up the vehicle. Motor vehicles include cars, trucks, forklifts, locomotives, and aircraft. Note that this exemption applies only to the OTHERWISE USE of the chemical only. The coincidental manufacture of

EPCRA Section 313 chemicals resulting from combustion of gasoline is not considered part of the exemption and any amounts of EPCRA Section 313 chemicals coincidentally manufactured should be considered as part of the manufacturing threshold.

Example - Motor Vehicle Exemption

Methanol is purchased for use as a processing aid and as a windshield washer anti-freeze in company vehicles. The amount used for the latter purpose would be subtracted from the facility total BEFORE the facility total is compared to the activity threshold. Even if the facility still exceeds the otherwise use threshold, the amount in the anti-freeze is exempt from release and other waste management reporting.

This exemption does NOT apply to stationary equipment. The use of lubricants and fuels for stationary process equipment (e.g., pumps and compressors) and stationary energy sources (e.g., furnaces, boilers, heaters), are NOT exempt.

Example - Use of Lubricants

Lubricants containing EPCRA Section 313 chemicals used on facility vehicles or on-site structural maintenance activities that are not integral to the process are exempt activities. However, lubricants used to maintain pumps and compressors, which aid in facility process-related operations, are not exempt and the amount of the chemical in that lubricant should be applied to the otherwise use threshold.

- **EPCRA Section 313 chemicals in certain air and water drawn from the environment or municipal sources**. Included are EPCRA Section 313 chemicals present in process water and non-contact cooling water drawn from the environment or a municipal source, or chemicals present in compressed air or air used in combustion.

Example - Chemicals in Process Water

A facility uses river water in its cooling tower. The facility draws out of and ultimately returns to the river water that contains 100 pounds of an EPCRA Section 313 chemical. Any amount of the EPCRA Section 313 chemicals that may be contained in the river water does not have to be considered for threshold determinations and release and other waste management calculations because the EPCRA Section 313 chemicals were present in the water as it was drawn from the environment.

3.2.3 Additional Guidance on Threshold Calculations for Certain Activities

This section covers two specific situations in which the threshold determination may vary from normal facility operations: reuse and remediation activities of EPCRA Section 313 chemicals.

3.2.3.1 On-Site Reuse Activities

Threshold determinations of EPCRA Section 313 chemicals that are reused at the facility are based only on the amount of the EPCRA Section 313 chemical that is added during the year, and not the total volume in the system or the amounts reused.

Example - Reuse Activities

A facility operates a heat transfer unit that contains 15,000 pounds of ethylene glycol at the beginning of the year that was in use in prior years. The system is charged with 2,000 pounds of ethylene glycol during the reporting year. The facility has therefore "otherwise used" only 2,000 pounds of the covered EPCRA Section 313 chemical within that particular reporting year. A facility reporting for the first time would consider only the amount of EPCRA Section 313 chemical that is added during its first reporting year towards its "otherwise use" threshold for that year. If, however, the entire heat transfer unit was recharged with 15,000 pounds of ethylene glycol during the year, the facility would consider the 15,000 pounds toward its otherwise use threshold and, exceeding the otherwise use threshold, be required to report.

3.2.3.2 Remediation Activities

EPCRA Section 313 chemicals that are being managed at a remediation site (e.g., Superfund) are not considered manufactured, processed, or otherwise used, and therefore, these amounts are not included in the threshold determinations. However, if during remediation activities an EPCRA Section 313 chemical is manufactured, then these amounts would have to be considered toward the manufacturing threshold. Additionally, if you are conducting remediation for an EPCRA Section 313 chemical for which you have exceeded a threshold elsewhere at the facility, you must consider this activity in your release and other waste management calculations. In that case, you must report any release and other waste management of an EPCRA Section 313 chemical due to remediation in Part II, Sections 5 through 8, accordingly, of the Form R. Those quantities, however, would not be considered as part of the reportable amount for determining Form A eligibility because they are not considered part of normal production-related activities.

3.3 Step 3. Determine which EPCRA Section 313 chemicals exceed a threshold

The final step is to determine which chemicals exceed a threshold. At this point you should have:

1. Determined each EPCRA Section 313 chemical at your facility;

2. Determined the threshold activity for each EPCRA Section 313 chemical (manufactured, processed, or otherwise used) and calculated the quantity for each activity.

Now, you must sum the usage for each chemical by threshold activity, subtract all exempt quantities, and compare the totals to the applicable thresholds. Each EPCRA Section 313 chemical exceeding any one of the activity thresholds requires the submission of a Form R. Provided you meet certain criteria you may be eligible to file a Form A rather than a Form R.

POSSIBLE ERROR - What if Your Facility Has No Releases and Other Waste Management Quantities of EPCRA Section 313 Chemicals for Which a Threshold was Exceeded?

If you meet all reporting criteria and exceed any threshold for an EPCRA Section 313 chemical, you must file a Form R **or** Form A for that chemical, even if you have zero releases and no other waste management activities. Exceeding the chemical activity threshold, not the quantity released and otherwise managed as waste, determines whether you must report. Note that if the total annual reportable amount is 500 pounds or less, and you do not exceed one million pounds manufactured, processed, or otherwise used for that chemical, then you are eligible to submit a Form A rather than a Form R (see Chapter 2.9).

Calculating the Manufacturing Threshold for Section 313 Chemicals in Wastes

TSD and solvent recovery facilities typically do not manufacture chemicals or products intentionally. However, these facilities may coincidently manufacture Section 313 chemicals during incineration, wastewater treatment, and other waste management operations. You will also need to consider whether EPCRA Section 313 chemicals are produced coincidentally, even if the chemical exists for only a short period of time, and later is destroyed by air control equipment. Most commonly, incineration may result in the manufacture of metal compounds (usually as a result of oxidation), acid aerosols, and other organic compounds, or convert metal compounds to the parent metal (e.g., mercury compounds in coal convert to elemental mercury). The following discussion describes how to calculate the manufacturing threshold for these situations.

To calculate the amount of EPCRA Section 313 metal compounds manufactured during combustion of wastes, you will need to determine the concentration of each metal present in the waste being combusted. The best "readily available data" should be used to estimate the approximate concentration of the metal(s) in the waste. If you have data regarding chemical concentrations in the wastes (e.g., analytical data) and believe that is the best "readily available data", then you should use this information. If specific concentration data of the metals in the

waste do not exist, you can assume that the metals will convert to the lowest weight metal oxide possible.

During combustion, other EPCRA Section 313 chemicals could be manufactured, particularly acid aerosols. For instance, sulfuric acid aerosols could be produced depending on a variety of factors such as sulfur content of the waste. If you have specific data on the manufacture of acid aerosols, then use it. If data are not available, EPA has published guidance on calculating the amount of sulfuric acid aerosols manufactured during combustion, which could be applied to the combustion of wastes; *Guidance for Reporting Sulfuric Acid (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size)*, EPA, March 1998, available on EPA's TRI website at http://www.epa.gov/opptintr/tri.

To estimate the amount of EPCRA Section 313 chemicals manufactured during wastewater treatment, the Clean Water Act typically requires facilities to monitor some Section 313 chemicals. In particular, the facility's wastewater permit application may have more detailed, chemical-specific monitoring data. However, it is important to note how the chemical is monitored in relation to the EPCRA Section 313 chemical being evaluated. For example, wastewater permits may require monitoring for the nitrate ion, but the nitrogen compound category is calculated by the total weight of the nitrate compound.

Calculating the Otherwise Use and Processing Thresholds for Section 313 Chemicals in Wastes

To determine if a chemical exceeds the processing or otherwise use threshold, you must calculate the annual activity for that chemical. For EPCRA Section 313 chemicals in wastes, start with the amount of chemical in stored waste as of January 1, add the amount of the chemical in waste both received from off-site and generated on-site and any amounts that are manufactured during the year, and subtract the amount remaining in storage on December 31. The waste manifests received from your customers will be an invaluable source for determining the quantities of different types of wastes managed by your facility, particularly in terms of classifying how various types and quantities undergo a treatment step, or are disposed by your facility, for example when determining if the otherwise use threshold has been exceeded.

Calculating Thresholds for Section 313 Chemicals in Purchases

For purchased chemicals, start with the amount of chemical at the facility as of January 1, add any purchases during the year and the amount manufactured (including imported), and subtract the amount remaining in the inventory on December 31. If necessary, adjust the total to account for exempt activities (see Chapter 3.2.2 for a discussion of exemptions). You should then compare the result to the appropriate threshold to determine if you are required to submit an EPCRA Section 313 report for that chemical.

Keep in mind that the threshold calculations are independent for each threshold activity: manufactured, processed, and otherwise used. If more than one activity threshold applies, the amount associated with each threshold is determined separately.

Table 3-6 presents a worksheet that may be helpful when conducting your threshold determinations and Table 3-7 illustrates an example of how the work sheet can be used for the following example:

Example - Threshold Worksheet

Assume your facility must report on xylene in the applicable reporting year. You received 200,000 pounds of wastestream A (which is 1-5% xylene per the waste profile) and you use 14,000 pounds of cleaning solvent X (which contains 25% xylene) to clean equipment. Wastestream A is incinerated. You would also have otherwise used a total of 11,000 pounds (7,500 pounds from wastestream A and 3,500 pounds from the cleaning solvent). Therefore, you would have exceeded the 10,000 pound threshold for otherwise use and would be required to submit a Form R or Form A.

Table 3-6 Section 313 Reporting Threshold Worksheet

Facility Name: _____ **Date Worksheet Prepared:** _____
Toxic Chemical or Chemical Category: _____ **Prepared By:** _____
CAS Number: _____
Reporting Year: _____

Amounts of the toxic chemical manufactured, processed, or otherwise used.

Mixture Name, Waste Name, or Other Identifier	Information Source	Total Weight (lb)	Percent TRI Chemical by Weight	TRI Chemical Weight (in lbs)	Amount of the Listed Toxic Chemical by Activity (in lbs.):		
					Manufactured	Processed	Otherwise Used
1.							
2.							
3.							
4.							
Subtotal:					(A)_____lbs.	(B)_____lbs.	(C)_____lbs.

Exempt quantity of the toxic chemical that should be excluded.

Mixture Name or Waste Name as Listed Above	Applicable Exemption (de minimis, article, facility, activity)	Fraction or Percent Exempt (if Applicable)	Amount of the Toxic Chemical Exempt from Above (in lbs.):		
			Manufactured	Processed	Otherwise Used
1.					
2.					
3.					
4.					
Subtotal:			(A_1)_____lbs.	(B_1)_____lbs.	(C_1)_____lbs.

Amount subject to threshold: ($A-A_1$)_____ lbs. ($B-B_1$)_____ lbs. ($C-C_1$)_____ lbs.
Compare to threshold for Section 313 reporting. 25,000 lbs. 25,000 lbs. 10,000 lbs.

If any threshold is exceeded, reporting is required for all activities. Do not submit this worksheet with Form R, retain it for your records.

Table 3-7. Sample Section 313 Reporting Threshold Worksheet

Facility Name: ABC Transfer, Storage and Disposal Company
Toxic Chemical or Chemical Category: Xylene (mixed isomers)
CAS Number: 1330-20-7
Reporting Year: 1998

Date Worksheet Prepared: May 1, 1999
Prepared By: _____

Amounts of the toxic chemical manufactured, processed, or otherwise used.

Mixture Name, Waste Name, or Other Identifier	Information Source	Total Weight (lb)	Percent TRI Chemical by Weight	TRI Chemical Weight (in lbs)	Amount of the Listed Toxic Chemical by Activity (in lbs.):		
					Manufactured	Processed	Otherwise Used
1. Wastestream A	Waste Profile	200,000	3%	7,500	---	---	7,500
2. Cleaning Solvent X	MSDS	14,000	25%	3,500	---	---	3,500
3.							
4.							
Subtotal:				11,000	(A) 0 lbs.	(B) 0 lbs.	(C) 11,000 lbs.

Exempt quantity of the toxic chemical that should be excluded.

Mixture Name or Waste Name as Listed Above	Applicable Exemption (de minimis, article, facility, activity)	Fraction or Percent Exempt (if Applicable)	Amount of the Toxic Chemical Exempt from Above (in lbs.):		
			Manufactured	Processed	Otherwise Used
1. None					
2.					
3.					
4.					
Subtotal:			(A_1) 0 lbs.	(B_1) 0 lbs.	(C_1) 0 lbs.
Amount subject to threshold:			(A-A_1) 0 lbs.	(B-B_1) 23,500 lbs.	(C-C_1) 11,000 lbs.
Compare to threshold for Section 313 reporting.			25,000 lbs.	25,000 lbs.	10,000 lbs.

If any threshold is exceeded, reporting is required for all activities. Do not submit this worksheet with Form R, retain it for your records.

Chapter 4 - Estimating Releases and Other Waste Management Quantities

4.0 PURPOSE

Once you have determined which EPCRA Section 313 chemicals have exceeded thresholds at your facility, as described in Chapter 3, you must then estimate amounts of these chemicals in waste by particular waste management type (e.g., release to air, transfer off-site, etc.) To aid your facility in making these calculations, this chapter is intended to help you in developing a systematic approach for conducting release and other waste management calculations specific to RCRA Subtitle C TSD and solvent recovery facilities. This chapter has been divided into two parts. The first part provides a general approach to identifying sources of potential releases and other waste management activities, collecting data, and determining the most appropriate method(s) to develop estimates. Chapter 4.1 also provides insights into the requirements, recommended approaches, and other nuances associated with developing comprehensive and accurate estimates for reportable EPCRA Section 313 chemicals. To illustrate this approach, a diagram of a recommended steps for estimating quantities of reportable EPCRA Section 313 chemicals released or otherwise managed as wastes is provided in Figure 4-1.

Chapter 4.2 of this chapter provides a focused discussion with examples of methods and tools to use in calculating estimates of releases and other waste management activities specific to many RCRA Subtitle C TSD and solvent recovery facilities. In particular, Chapter 4.2 is organized to address the life cycle of wastes received from off-site for the purposes of treatment, storage, disposal, and/or recovery operations. More broadly, this section divides the wastes managed into two categories: liquid and solid wastes. These two categories will determine the type of releases and waste management activities likely to occur for the reportable EPCRA Section 313 chemical.

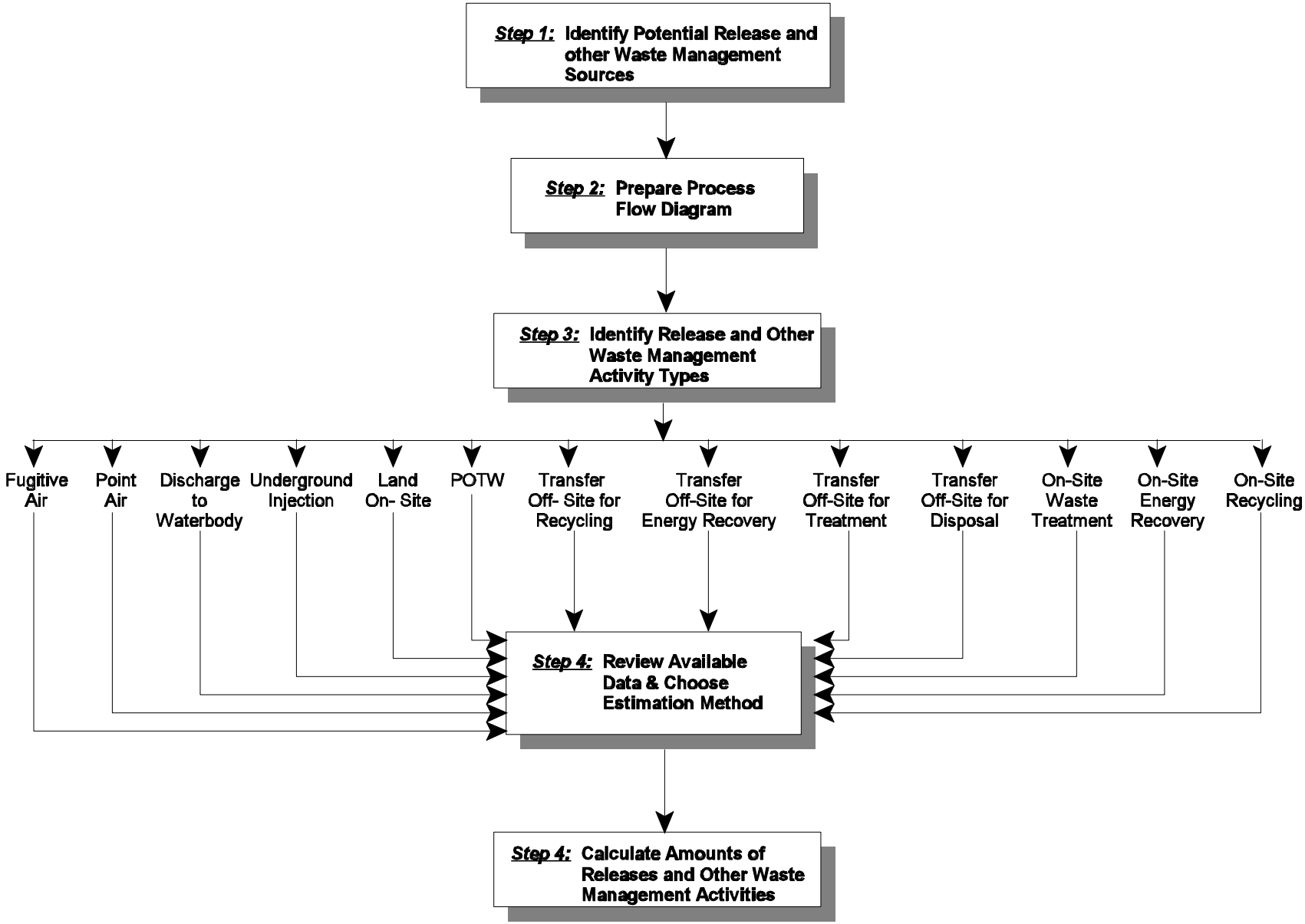

Figure 4-1 Release and Other Waste Management Calculation Approach

4.1 General Steps for Determining Releases and Other Waste Management Activities

You can develop release and other waste management estimates by completing these four basic steps. See Figure 4-1 for illustration of this four-step process.

Step 1) Identify potential sources of chemicals released or otherwise managed as waste.

Step 2) Prepare a process flow diagram.

Step 3) Identify on-site releases, off-site transfers, and other on-site waste management activity types.

Step 4) Determine the most appropriate method(s) to develop the estimates for releases and other waste management activity quantities and calculate the estimates.

These steps are described in detail in the following sections.

4.1.1 Step 1: Identify Potential Sources of Chemical Release and Other Waste Management Activities

The first step in release calculations is to identify all areas at your facility that could potentially release reportable Section 313 chemicals. Consider all potential sources at which reportable EPCRA Section 313 chemicals may be released and otherwise managed from each unit operation and process. Remember to include upsets and routine maintenance activities. Potential sources include the following:

- Relief valves;
- Pumps;
- Stacks;
- Volatilization from process or treatment;
- Fittings;
- Transfer operations;
- Flanges;
- Storage tanks;
- Stock pile losses;
- Waste treatment discharges;
- Process discharge stream;
- Container residues;
- Recycling and energy recovery byproducts;
- Accidental spills and releases;
- Storm water runoff;
- Clean up and housekeeping practices;

- Treatment sludge; and
- Combustion byproducts.

Next, you must identify the reportable EPCRA Section 313 chemicals that are released and otherwise managed from each source. A thorough knowledge of the facility's operations and processes will be required to make an accurate determination of which chemicals are involved, including those EPCRA Section 313 chemicals that are coincidentally manufactured during these processes.

4.1.2 Step 2: Prepare a Process Flow Diagram

Preparing a process flow diagram will help you calculate your releases by illustrating the life-cycle of the reportable EPCRA Section 313 chemical(s), as well as help you identify any sources of chemicals that are released and otherwise managed as waste at your facility that you might have missed in step 1. Depending on the complexity of your facility, you may want to diagram individual processes or operations rather than the entire facility. The diagram should illustrate how materials flow through the processes and identify material input, generation, and output points. By reviewing each operation separately, you can determine where EPCRA Section 313 chemicals are manufactured, processed, or otherwise used and the medium to which they will be released on-site, transferred off-site for further waste management, or otherwise managed as wastes on-site.

Example - Process Flow Chart for Steam Stripping

Steam stripping is a form of distillation applicable to the treatment of wastewater containing organics that are volatile enough to be removed by the application of heat using steam as the heat source. Typically, steam stripping is applied where there is less than one percent volatile organics in the waste. The figure below presents the steam stripping process and possible waste streams that may result from the process.

A steam stripping unit consists of a boiler, a stripping column, a condenser and a collection tank. The principle of operation is the volatilization of hazardous constituents through the application of heat. Constituents are then condensed and then either reused or further treated by another process such as incineration. Water or solvent may be added to make the waste more fluid to promote pumping.

The following flowchart illustrates some possible waste streams that may result from a steam stripping operation.

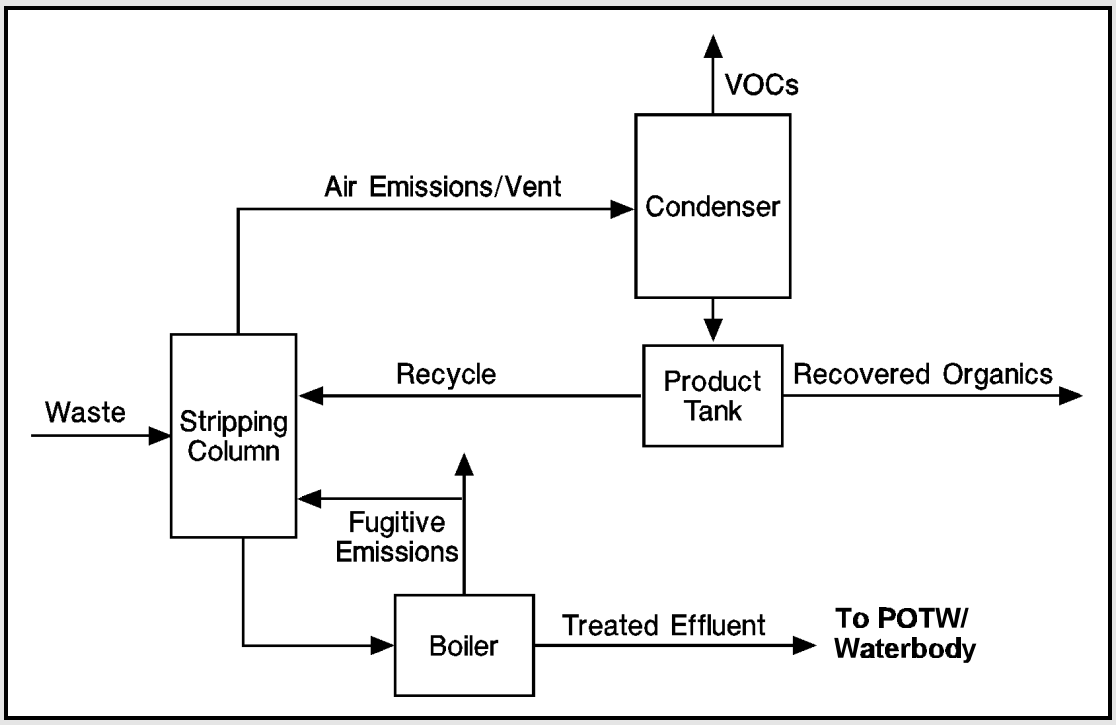

Figure 4-2. Possible Waste Streams from a Steam Stripping Process

4.1.3 Step 3: Identify On-Site Releases, Off-Site Transfers and On-Site Waste Management Activity Types

For each identified source of an EPCRA Section 313 chemical, you must examine all possible releases and other waste management activities. Figure 4-3 is a schematic of releases and other waste management activities as they correspond to individual data elements on the Form R. Remember to include both routine operations and accidents when identifying types of chemical management activities. This diagram, along with the following descriptions, can be used as a checklist to make sure all possible types of releases and other waste management activities have been considered.

a. **Fugitive or Non-Point Air Emissions (Part II, Section 5.1 of Form R)** - Emissions to the air that are not released through stacks, vents, ducts, pipes, or any confined air stream. Examples include:

- Equipment leaks from valves, pump seals, flanges, compressors, sampling connections, open-ended lines, etc.;
- Releases from building ventilation systems, such as a roof fan in an open room;
- Evaporative losses from solvent cleaning tanks, surface impoundments, and spills; and
- Emissions from any other fugitive or non-point sources.

b. **Stack or Point Air Emissions (Part II, Section 5.2 of Form R)** - All emissions to the air which occur through stacks, vents, ducts, pipes, or any confined air stream, including storage tank emissions and emissions from air pollution control equipment. Emissions released from general room air through a ventilation system are not considered stack or point releases for the purpose of EPCRA Section 313 reporting unless they are channeled through an air pollution control device. Instead, they are considered fugitive releases. You should note that some state air quality agencies consider ventilation systems without an attached pollution control device to be a stack or point source, and other agencies consider releases from storage tanks to be fugitive emissions.

c. **Discharges to Receiving Streams or Water Bodies (Part II, Section 5.3 of Form R)** - Direct wastewater discharges to a receiving stream or surface water body. Discharges usually occur under a National Pollutant Discharge Elimination System (NPDES) permit.

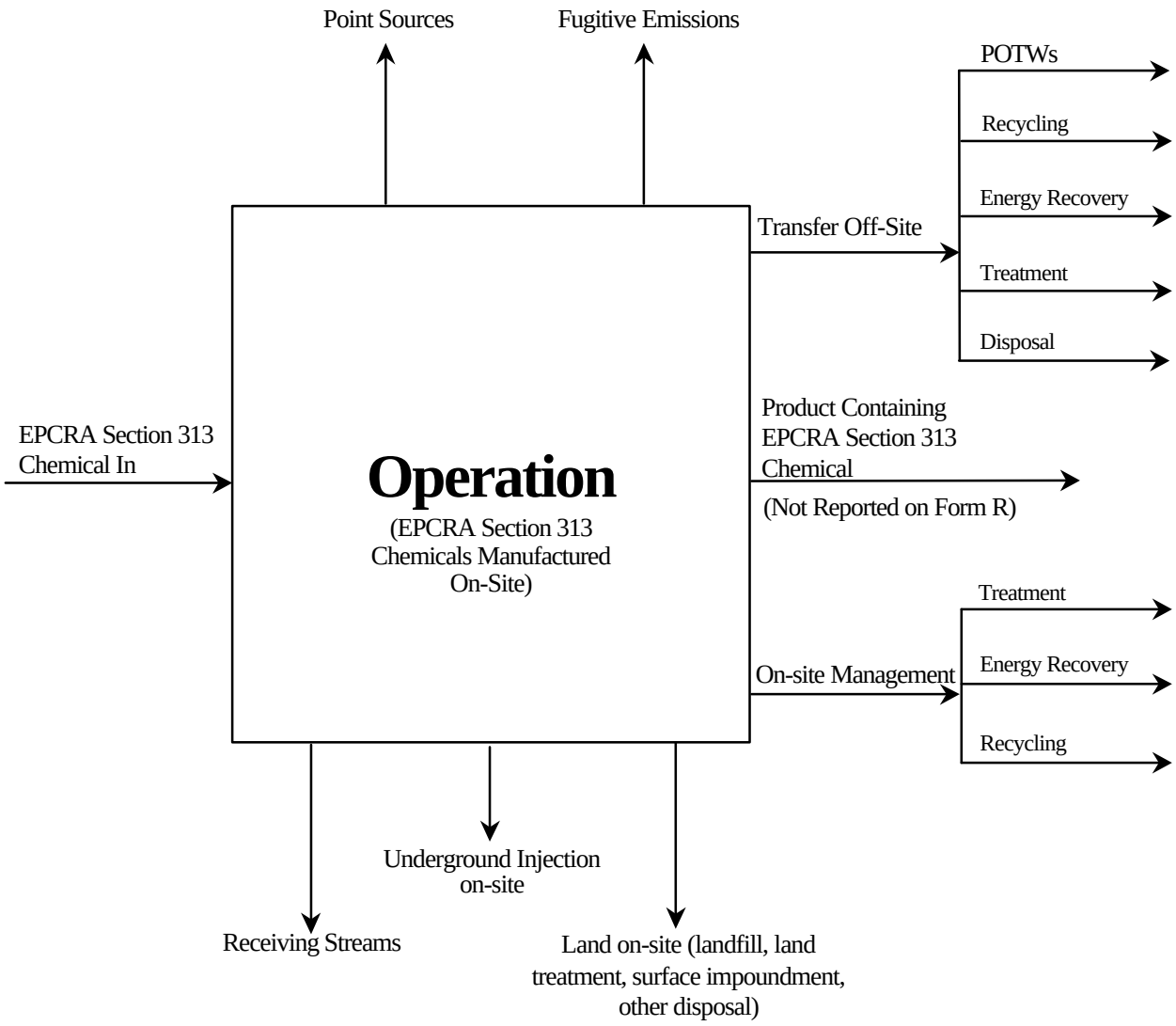

Figure 4-3. Possible Release and Other Waste Management Types for EPCRA Section 313 Chemicals

d. Underground Injection On site to Class I Wells (Part II, Section 5.4.1 of Form R) and to Class II through V Wells (Part II, Section 5.4.2 of Form R) Disposal into an underground well at the facility. These wells may be monitored under an Underground Injection Control (UIC) Program permit. RCRA Hazardous Waste Generator Reports may be a good source of information for wastes injected into a Class I well. Injection rate meters combined with waste profiles may provide the necessary information for all classes of wells.

e. Releases to Land On Site (Part II, Section 5.5 of Form R) - All releases to land on site, both planned (i.e., disposal) and unplanned (i.e., accidental release or spill). The four predefined subcategories for reporting quantities released to land within the boundaries of the facility are:

e(1). Landfill - The landfill may be either a RCRA permitted or a non-hazardous waste landfill. Both types are included if they are located on site.

e(2). Land treatment/application farming - Land treatment is a disposal method in which a waste containing an EPCRA Section 313 chemical is applied to or incorporated into soil. Volatilization of an EPCRA Section 313 chemical due to the disposal operation must be included in the total fugitive air releases and/or should be excluded from land treatment/application farming to accurately represent the disposition of the EPCRA Section 313 chemical and to avoid double counting.

Sludge and/or aqueous solutions that contain biomass and other organic materials are often collected and applied to farm land. This procedure supplies a nitrogen source for plants and supplies metabolites for microorganisms. EPA considers this operation to be land treatment/farming if it occurs on site. If a facility sends this material off site for the same purpose, it is considered to be a "transfer to an off site location, disposal" and should be reported under Part II, Sections 6.2 and 8.1 of the Form R.

The ultimate disposition of the chemical after application to the land does not change the required reporting. For example, even if the chemical is eventually biodegraded by microorganisms or plants, it is not considered recycled, reused, or treated.

e(3). Surface impoundment - A surface impoundment is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials that is designed to hold an accumulation of wastes containing free liquids. Examples include: holding, settling, storage, and elevation pits; ponds; and lagoons.

You do not have to report quantities of an EPCRA Section 313 chemical that are released to a surface impoundment as part of a wastewater treatment operation in this section. However, if the sludge from the surface impoundment contains the EPCRA Section 313 chemical, then the EPCRA Section 313 chemical in the sludge must be estimated in this section unless the sludge is removed and subjected to another waste management activity. In that case, it should be reported for that activity, as appropriate.

e(4). Other disposal - Releases to land that do not fit the categories of landfills, land treatment, or surface impoundment are classified as other disposal. This category also includes any spills or leaks of the EPCRA Section 313 chemical to land.

f. Transfers Off Site to a Publicly Owned Treatment Works (POTW) (Part II, Section 6.1 of Form R) The amount of EPCRA Section 313 chemical in water transferred to an off site POTW.

g. Transfers to Other Off-Site Locations (Part II, Section 6.2 of Form R) All amounts of the EPCRA Section 313 chemical transferred off-site for the purposes of waste treatment, disposal, recycling, or energy recovery. Be sure to include quantities of the EPCRA Section 313 chemical in non-hazardous wastes (such as sanitary waste and facility trash) transferred off-site and metals in waste transferred off site for recycling.

Any residual chemicals in "empty" containers transferred off-site would also be reported in Section 6.2. EPA expects that all containers (bags, totes, drums, tank trucks, etc.) will have a small amount of residual solids and/or liquid. On-site cleaning of containers must be considered for EPCRA Section 313 reporting. If the cleaning occurs with a solvent (organic or aqueous), you must report the disposition of the waste solvent as appropriate. If the containers are sent off site for disposal or reclamation, you should report the EPCRA Section 313 chemical in this section.

Actual data and a knowledge of the unloading methods at your facility can be used to estimate the quantity of residual chemicals in containers. However, EPA has developed guidance to assist facilities if there is no site-specific information. Table 4-1 provides results from experimentation on residue quantities for a sample of waste types if left in drums and tanks when emptied. These results are presented as the mass percent of the vessel capacity and are categorized based on unloading method, vessel material, and bulk fluid material properties such as viscosity and surface tension.

Table 4-1
Summary of Residue Quantities From Pilot-Scale Experimental Study[a,b]
(weight percent of drum capacity)

Unloading Method	Vessel Type	Value	Material			
			Kerosene[c]	Water[d]	Motor Oil[e]	Surfactant Solution[f]
Pumping	Steel drum	Range Mean	1.93 - 3.08 2.48	1.84 - 2.61 2.29	1.97 - 2.23 2.06	3.06 3.06
Pumping	Plastic drum	Range Mean	1.69 - 4.08 2.61	2.54 - 4.67 3.28	1.70 - 3.48 2.30	Not Available
Pouring	Bung-top steel drum	Range Mean	0.244 - 0.472 0.404	0.266 - 0.458 0.403	0.677 - 0.787 0.737	0.485 0.485
Pouring	Open-top steel drum	Range Mean	0.032 - 0.080 0.054	0.026 - 0.039 0.034	0.328 - 0.368 0.350	0.089 0.089
Gravity Drain	Slope-bottom steel tank	Range Mean	0.020 - 0.039 0.033	0.016 - 0.024 0.019	0.100 - 0.121 0.111	0.048 0.048
Gravity Drain	Dish-bottom steel tank	Range Mean	0.031 - 0.042 0.038	0.033 - 0.034 0.034	0.133 - 0.191 0.161	0.058 0.058
Gravity Drain	Dish-bottom glass-lined tank	Range Mean	0.024 - 0.049 0.040	0.020 - 0.040 0.033	0.112 - 0.134 0.127	0.040 0.040

[a]From "Releases During Cleaning of Equipment." Prepared by PEI Associates, Inc., for the U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances, Washington, D.C. Contract No. 68-02-4248. June 30, 1986.

[b]The values listed in this table should only be applied to similar vessel types, unloading methods, and bulk fluid materials. At viscosities greater than 200 centipoise, the residue quantities can rise dramatically and the information on this table is not applicable.

[c]For kerosene, viscosity = 5 centipoise, surface tension = 29.3 dynes/cm^2

[d]For water, viscosity = 4 centipoise, surface tension = 77.3 dynes/cm^2

[e]For motor oil, viscosity = 97 centipoise, surface tension = 34.5 dynes/cm^2

[f]For surfactant solution viscosity = 3 centipoise, surface tension = 31.4 dynes/cm^2

The following example describes how the information in the table can be used to estimate the quantity of an EPCRA Section 313 chemical in water that was used to clean drums on site.

Example - Container Residue

You have determined that a Form R for an EPCRA Section 313 chemical must be submitted. The facility receives and treats 1,000 steel drums that contain 55 gallons of an aqueous waste that contains 10% of the chemical. Further, it is assumed that the physical properties of the solution are similar to water. The solution is pumped from the drums directly into a mixing vessel and the "empty" drums are triple-rinsed with an aqueous cleaning solution. The rinse water is indirectly discharged to an on-site wastewater treatment system and the cleaned drums are returned to the supplier.

In this example, it can be assumed that all of the residual solution in the drums was transferred to the rinse water. Therefore, the quantity transferred to the drum reclaimer should be reported as "zero."

The quantity of residual solution that is transferred to the rinse water can be estimated by multiplying the mean weight percent of residual water from pumping a steel drum by the weight of solution in the drum (density of solution multiplied by drum volume). If the density is not known, it may be appropriate to use the density of water (8.34 pounds per gallon):

(2.29%*) (8.34 pounds/gallon) (55 gallons/drum) (1,000 drums) = 10,504 pounds solution

The concentration of the EPCRA Section 313 chemical in the solution is only 10%.

(10,504 pounds solution) (10%) = 1,050 pounds

Therefore, 1,050 pounds of the chemical are transferred to the on-site wastewater treatment system
.

*Mean value taken from Table 4-1

h. On-Site Waste Treatment (Part II, Section 7A of Form R) All on-site waste treatment of reported EPCRA Section 313 chemicals. The information reported in Section 7A focuses on the treatment of the waste stream. The information includes: type of waste stream (gaseous, aqueous or non-aqueous liquid, or solid); treatment methods or sequence; influent concentrations of the EPCRA Section 313 chemical; treatment efficiency of each method or sequence; and whether efficiency data are based on actual operating data. Metal compounds in waste subjected to a combustion process are not destroyed but should still be reported as going through the treatment process, with a treatment efficiency of zero.

Example - On-Site Waste Treatment

A process at the facility generates a wastewater stream containing an EPCRA Section 313 chemical (chemical A). A second process generates a wastewater stream containing two EPCRA Section 313 chemicals, a metal (chemical B) and a mineral acid (chemical C). Thresholds for all three EPCRA Section 313 chemicals have been exceeded and you are in the process of completing separate Form Rs for each chemical.

All wastewater streams are combined and sent to an on-site wastewater treatment system before being released to a POTW. This system consists of an oil/water separator which removes 99% of chemical A; a neutralization tank where the pH is adjusted to 7.5, thereby destroying 100% of the mineral acid (chemical C), and a settling tank where 95% of the metal (chemical B) is removed from the water (and eventually landfilled off site).

Section 7A should be completed slightly differently for each chemical for which a Form R must be filed. The table accompanying this example shows how Section 7A should be completed for each chemical. First, on each Form R you should identify the type of waste stream in Section 7A.1a as wastewater (aqueous waste, code W). Next, on each Form R you should list the code for each of the treatment steps that are applied to the entire waste stream, regardless of whether the operation affects the chemical for which you are completing the Form R (for instance, the first four blocks of Section 7A.1b of all three Form Rs should show: P19 (liquid phase separation), C11 (neutralization), P11 (settling/clarification), and NA (to signify the end of the treatment system). Note that Section 7A.1b is the only section of the Form R that is not chemical specific. It applies to the entire waste stream being treated. Section 7A.1c of each Form R should show the concentration of the specific chemical in the influent to the first step of the process (oil/water separation). For this example, assume chemicals A, B, and C are all present at concentrations greater than 1%. Therefore, code "1" should be entered. Section 7A.1d is also chemical specific. It applies to the efficiency of the entire system in destroying and/or removing the chemical for the Form R you are currently completing. 99% should be entered when filing for chemical A, 95% for chemical B, and 100% for chemical C. Finally, you should report whether the influent concentration and efficiency estimates are based on operating data for each chemical, as appropriate.

Chemical A

7A.1a	7A.1b		7A.1c	7A.1d	7A.1e	
	1. P19	2. C11				
W	3. P11	4. NA	5.	1	99 %	Yes / No
	6.	7.	8.			X /

Chemical B

7A.1a	7A.1b		7A.1c	7A.1d	7A.1e	
	1. P19	2. C11				
W	3. P11	4. NA	5.	1	95 %	Yes / No
	6.	7.	8.			X /

Example - On-Site Waste Treatment (cont.)

Chemical C

7A.1a	7A.1b	1. P19 2. C11	7A.1c	7A.1d	7A.1e
W	3. NA	4. _____ 5. _____	1	100 %	Yes No
	6. _____	7. _____ 8. _____			X _____

Note that the quantity removed and/or destroyed is not reported in Section 7 and that the efficiency reported in Section 7A.1d refers to the amount of EPCRA Section 313 chemical destroyed and/or removed from the applicable waste stream. The amount actually destroyed should be reported in Section 8.6 (quantity treated on site). For example, when completing the Form R for chemical B you should report "0" pounds in Section 8.6 because the metal has been removed from the wastewater stream, but not actually destroyed. The quantity of chemical B that is ultimately land filled off site should be reported in Section 6.2 and 8.1. However, when completing the Form R for chemical C you should report the entire quantity in Section 8.6 because raising the pH to 7.5 will completely destroy the mineral acid.

i. On-Site Energy Recovery (Part II, Section 7B of Form R) All on-site energy recovery of reported EPCRA Section 313 chemicals must be reported. EPA's view is that chemicals that do not contribute significant heat energy during combustion processes should not be considered for energy recovery. Therefore, only chemicals with a significant heating value (e.g., heating value high enough to sustain combustion) that are combusted in an energy recovery unit, such as an industrial furnace, kiln, or boiler can be reported for energy recovery. If an EPCRA Section 313 chemical is incinerated on-site but does not significantly contribute energy to the process (e.g., chlorofluorocarbons), it must be considered on-site waste treatment (see Chapter 4.1.3(h). above). Metal and metal compounds in a waste that is combusted cannot be considered combusted for energy recovery because metals do not have any heat value.

j. On-Site Recycling (Part II, Section 7C of Form R) All on-site recycling methods used on EPCRA Section 313 chemicals must be reported.

k. Source Reduction and Recycling Activities (Part II, Section 8 of Form R)[1] Provide information about source reduction and recycling activities related to the

[1]The subsection 8.1 through 8.8 designation are those for the 1997 Form R. Please refer to the current reporting year's *TRI Forms and Instructions* for any changes.

EPCRA Section 313 chemical for which releases and other waste management activities are being reported. Section 8 uses some data collected to complete Part II, Sections 5 through 7. For this reason, Section 8 should be completed last. The relationship between Sections 5, 6, and 8.8 to Sections 8.1, 8.3, 8.5, and 8.7 are provided in equation forms below.

k(1). Quantity Released (Part II, Section 8.1 of Form R) - The quantity reported in Section 8.1 is the quantity reported in all of Section 5 plus the quantity of metals and metal compounds reported as discharged off site to POTWs in Section 6.1 plus the quantity reported as sent off site for disposal in Section 6.2 minus the quantity reported in Section 8.8 that was released on-site or transferred off-site for disposal:

Section 8.1 = Section 5 + Section 6.1 (metals and metal compounds) + Section 6.2 (disposal) - Section 8.8 (release or off-site disposal only)

k(2). Quantity Used for Energy Recovery On-Site (Part II, Section 8.2 of Form R) - Estimate a quantity of the EPCRA Section 313 chemical in wastes combusted for energy recovery on-site. This estimate should be the quantity of the chemical combusted in the process for which codes were reported in Section 7B (unless the 7B code is related to a Section 8.8 activity). Test data from trial burns or other monitoring data may be used to estimate the quantity of the EPCRA Section 313 chemical combusted for energy recovery purposes. If monitoring data are not available, vendor specifications regarding combustion efficiency may be used as they relate to the reportable EPCRA Section 313 chemical. A quantity should be reported in Section 8.2 when a method is reported in Section 7B (unless the 7B code is related to a Section 8.8 activity). Combustion for energy recovery is interpreted by EPA to include the combustion of an EPCRA Section 313 chemical that is (1) (a) a RCRA hazardous waste or waste fuel, (b) a constituent of a RCRA hazardous waste or waste fuel, or (c) a spent or contaminated "otherwise used" material; and that (2) has a significant heating value and is combusted in an energy or materials recovery device. Energy or materials recovery devices are boilers and industrial furnaces as defined in 40 CFR 372.3 (see 62 FR 23891, May 1, 1997). If a reported EPCRA Section 313 chemical is incinerated but does not contribute energy to the process (e.g., metal, metal compounds, and chlorofluorocarbons), it must be considered treatment for destruction. In determining whether an EPCRA Section 313 listed chemical is combusted for energy recovery, the facility should consider the heating value of the EPCRA Section 313 chemical and not of the chemical stream. Note that "NA" should be reported for EPCRA Section 313 chemicals which are halogens, CFCs, halons, and metals.

k(3). Quantity Used for Energy Recovery Off-Site (Part II, Section 8.3 of Form R) - The quantity reported in Section 8.3 is the quantity reported in Section 6.2 for which energy recovery codes are reported. If a quantity is reported in Section 8.8, subtract any associated off-site transfers for energy recovery:

Section 8.3 = Section 6.2 (energy recovery) - Section 8.8 (off-site energy recovery)

Combustion for energy recovery is interpreted by EPA to include the combustion of an EPCRA Section 313 chemical that is (1) (a) a RCRA hazardous waste or waste fuel, (b) a constituent of a RCRA hazardous waste or waste fuel, or (c) a spent or contaminated "otherwise used" material; and that (2) has a significant heating value and is combusted in an energy or materials recovery device. Energy or materials recovery devices are boilers and industrial furnaces as defined in 40 CFR 372.3 (see 62 FR 23891, May 1, 1997). If a reported EPCRA Section 313 chemical is incinerated but does not contribute energy to the process (e.g., metal, metal compounds, and chlorofluorocarbons), it must be considered treatment for destruction. In determining whether an EPCRA Section 313 listed chemical is combusted for energy recovery, the facility should consider the heating value of the EPCRA Section 313 chemical and not of the chemical stream. Note that "NA" should be reported for EPCRA Section 313 chemicals which are halogens, CFCs, halons, and metals.

k(4). Quantity Recycled On-Site (Part II, Section 8.4 of Form R) - Estimate a quantity of the EPCRA Section 313 chemical recycled in wastes on-site. This estimate should be the quantity of the chemical recycled in the operation for which codes were reported in Section 7C (unless the 7C code is related to a Section 8.8 activity). A quantity should be reported in Section 8.4 when a method of on-site recycling is reported in Section 7C (unless the 7C code is related to a Section 8.8 activity). To estimate this quantity, you should determine if operating data exist which indicate a recovery efficiency and use that efficiency value combined with throughput data to calculate an estimate. If operating data are unavailable, use available vendor specifications.

k(5). Quantity Recycled Off-Site (Part II, Section 8.5 of Form R) - The quantity reported in Section 8.5 will generally be the same as the quantity reported in Section 6.2 for which recycling codes are reported. If a quantity is reported in Section 8.8, subtract any associated off-site transfers for recycling:

§8.5 = §6.2 (recycling) - §8.8 (off-site recycling)

k(6). Quantity Treated On-Site (Part II, Section 8.6 of Form R) - Waste treatment in Section 8 is limited to the destruction or chemical conversion of the EPCRA Section 313 chemical in wastes. The quantities reported in Section 8.6 will be those treated in a subset of the operations for which codes were reported in Section 7A, where treatment can include physical removal of the EPCRA Section 313 chemical(s) from a waste stream. To estimate the quantity, you should determine if operating data exist which indicate a treatment (e.g., destruction or chemical conversion of EPCRA Section 313 chemical) efficiency and use that efficiency value combined with throughput data to calculate an estimate. Because metals cannot be destroyed or chemically converted into something other than the metal or metal compound, metals cannot be reported as treated in Sections 8.6 or 8.7. Note that conversion of a metal from one oxidation state to another (e.g., Cr(VI) to Cr(III) is not considered treatment in Section 8.6. If operating data are unavailable, use available vendor specifications. Section 7A must be completed if a quantity is entered into Section 8.6.

k(7). Quantity Treated Off-Site (Part II, Section 8.7 of Form R) - This quantity reported in Section 8.7 must be the same as the quantity reported in Section 6.2 for which treatment codes are reported and quantities sent to a POTW as reported in Section 6.1 except for metal and metal compounds. If a quantity is reported in Section 8.8, subtract any associated off-site transfers for treatment:

Section 8.7 = Section 6.1 (except metals and metal compounds) + Section 6.2 (treatment) - Section 8.8 (off-site treatment)

Because metals cannot be destroyed or chemically converted into something other than the metal or metal compound, metals cannot be reported as treated in Sections 8.6 or 8.7. Quantities of metals reported in Section 6.1 and 6.2 as being treated should be reported in Section 8.1 (Quantity Released) unless the facility has knowledge that the metal is being recovered.

k(8). Quantity Released to the Environment as a Result of Remedial Actions, Catastrophic Events, or One-Time Events Not Associated with Production Processes (Part II, Section 8.8 of Form R) - The purpose of this section is to separate quantities recycled, used for energy recovery, treated, or released (including disposal) that are associated with normal or routine production from those that are not. The quantity reported in Section 8.8 is the quantity of the EPCRA Section 313 chemical released directly into the environment or sent off-site for recycling, waste treatment, energy recovery, or disposal during the reporting year due to any of the following events:

(1) Remedial actions;
(2) Catastrophic events such as earthquakes, fires, or floods; or
(3) One-time events not associated with normal or routine production processes.

The quantity reported in Section 8.8 should not be included with quantities reported in Part II, Sections 8.1 through 8.7 of Form R, but should be included in Part II, Sections 5 and 6 of Form R as appropriate. The on-site waste management activities should also be reported in Section 7.

Spills that occur as a routine part of production operations and could be reduced or eliminated by improved handling, loading, or unloading procedures are included in the quantities reported in Sections 8.1 through 8.7 as appropriate. On-site releases and off-site transfers for further waste management resulting from remediation of an EPCRA Section 313 chemical or an unpreventable accident unrelated to production (such as a hurricane) are reportable in Section 8.8.

On-site treatment, energy recovery, or recycling of EPCRA Section 313 chemicals in wastes generated as a result of remedial actions, catastrophic events, or one-time events not associated with production processes are not reported in Part II, Section 8.8 nor Sections 8.1 through 8.7 of Form R.

k(9) Prior Year Estimates (for Part II, Sections 8.1 – 8.7 of Form R) -. In several instances, the Form R prompts the facility for information from prior reporting years. In Section 8, Source Reduction and Recycling Activities, Column A of Sections 8.1-8.7 requests release and other waste management information from the prior reporting year. Because 1998 is the first year that RCRA Subtitle C TSD and solvent recovery facilities were required to collect data for EPCRA Section 313 reporting, you may enter "NA" in column A for Form Rs for RY 1998 only. In Section 8.9, you are required to provide a production ratio or activity index to reflect

either the ratio of current year's production to prior year's production or an index of the current year's activity to prior year's activity with respect to the reportable EPCRA Section 313 chemical. Because you were not required to collect data prior to 1998, recently added facilities as a result of the industry expansion rulemaking may also enter "NA" in Section 8.9 for Form Rs for RY 1998 only.

POSSIBLE ERROR - Double Counting

Releases and other waste management activities should not be inadvertently "double counted." A single wastewater discharge should not be listed as both a release to water (on site) and a discharge to POTW (off site). Similarly, a release to land should not be listed as both a release to land (on site) and a transfer to an off-site landfill. Estimates of releases and other waste management activities should be prepared for Sections 5 through 7 of the Form R. For the most part, Section 8 relies on the data collected to complete these previous sections. Therefore, Section 8 should be completed last. However, the data elements of Section 8 (8.1 through 8.7) are mutually exclusive and care should be taken to avoid double counting.

4.1.4 Step 4: Determine the Most Appropriate Method(s) to Develop the Estimates for Releases and Other Waste Management Activity Quantities and Calculate the Estimates

After you have identified all of the potential sources for release and other waste management activity types, you must next estimate the quantities of each reportable chemical released and otherwise managed as waste. EPA has identified four basic methods that may be used to develop estimates (each estimate has been assigned a code that must be identified when reporting). The methods and corresponding codes are:

- Monitoring Data or Direct Measurement (M);
- Mass Balance (C);
- Emission Factors (E); and,
- Engineering Calculations (O).

Descriptions of these techniques are provided in *Estimating Releases and Waste Treatment Efficiencies for the Toxic Chemical Release Inventory Form*. They are also briefly described below. EPA does not require you to conduct additional sampling or testing for Section 313 reporting; however, you are required to use the best "readily available data" or prepare reasonable estimates. For example, emission factors or engineering calculations may not be the best "readily available data" when other data, such as stack testing, are available. For each reported amount, you are required to identify only the primary method used for each estimate.

Based on site-specific knowledge and potential data sources available, you should be able to determine the best method for calculating quantities for each release and other waste

management activity. Many potential sources of data exist for these (and other) methods of developing estimates. Table 4-2 presents potential data sources and the estimation methodology in which they are most likely to be used.

Table 4-2
Potential Data Sources for Release and Other Waste Management Calculations

DATA SOURCES	
Monitoring Data (M)	**Mass Balance (C)**
• Stack monitoring data • Outfall monitoring data • Air permits • Industrial hygiene monitoring data • NPDES permits • POTW pretreatment standards • Effluent limitations • RCRA permit • Hazardous waste analysis • pH for acids • Continuous emission monitoring	• Supply records • Hazardous material inventory • Air emissions inventory • Pollution prevention reports • Hazardous waste manifests • Spill event records
Emission Factors (E)	**Engineering Calculations (O)**
• AP-42 or other EPA emission factors • Published facility or trade association chemical-specific emission factors	• Volatilization rates • Raoult's Law • Henry's Law • Solubilities • Non-published emission factors • Facility or trade association non chemical specific emission factors (e.g., SOCMI factors)

Once estimation methods have been determined for all potential sources, releases and other waste management activities, an estimate for each reportable EPCRA Section 313 chemical can be developed corresponding to the data elements on Form R.

4.1.4.1 Monitoring Data or Direct Measurement (code M)

Using monitoring data or direct measurements is usually the best method for developing estimates for chemical releases and other waste management activity quantities estimates. Your facility may be required to perform monitoring under provisions of the Clean Air Act (CAA), Clean Water Act (CWA), Resource Conservation and Recovery Act (RCRA), or other regulations. If so, these data should be available for developing estimates. Data may have also been collected for your facility through an occupational health and safety assessment. If only a small amount of direct measurement data are available or if you believe the monitoring data are

not representative, you must determine if another estimation method would give a more accurate result.

Example - Monitoring Data

Data from the on-site wastewater treatment facility indicate that the annual average concentration of copper in the POTW discharge is 2 mg/L. The wastewater treatment facility processed 1.5 million gallons of water in 1998. The treated wastewater is discharged to an off-site POTW. The amount of copper transferred off site to the POTW (for Part II, Section 6.1 of the Form R) is estimated as follows:

Amount of copper transferred

$$= (2mg/L) * \left(\frac{1g}{1{,}000mg}\right) * \left(\frac{1lb}{453.59g}\right) * \left(\frac{1L}{0.2642gal}\right) * (1{,}500{,}000gal/yr)$$

$$= 25lbs/yr$$

POSSIBLE ERROR - Treatment Efficiencies

Vendor data on treatment efficiencies often represent ideal operating conditions. Thus, you should adjust such data to account for downtime and process upsets during the actual reporting year that would result in lower efficiencies. Remember that efficiencies reported by vendors are often general and may not apply to specific chemicals or uses of the equipment. For example, an incinerator or flare may be 99.99% efficient in combusting organic chemicals, but will have a zero percent efficiency in combusting metals.

4.1.4.2 Mass Balance (code C)

A mass balance involves determining the amount of an EPCRA Section 313 chemical entering and leaving an operation. The mass balance is written as follows:

Input + Generation = Output + Consumption

where:

- Input refers to the materials (chemicals) entering an operation. For example, chlorine added to process water as a disinfectant would be considered an input to the water treatment operation.

- Generation identifies those chemicals that are created during an operation (manufactured, including coincidental manufacturing). For example, additional ammonia, sodium nitrite, or nitrate compounds may be coincidentally manufactured in biological wastewater treatment systems.

- Output means any avenue by which the EPCRA Section 313 chemical leaves the operation. Output may include on-site releases and other on-site waste management activities; transfers for treatment, disposal, energy recovery, or recycling; or the amount of chemical that leaves with the final product. In a solvent recovery operation, for example, the recovered solvent product and wastes generated from the process are outputs.

- Consumption refers to the amount of chemical that is converted to another substance during the operation (i.e., reacted). For example, phosphoric acid would be consumed by neutralization during wastewater treatment.

The mass balance technique may be used for manufactured, processed, or otherwise used chemicals. It is typically useful for chemicals that are "otherwise used" and do not become part of the final product, such as catalysts, solvents, acids, and bases. For large inputs and outputs, a mass balance may not be the best estimation method, because slight uncertainties in mass calculations can yield significant errors in the release and other waste management estimates.

Example - Estimating Releases to Air Using Mass Balance

A facility uses an EPCRA Section 313 chemical as a refrigerant in condensers to control air emissions and adds 20,000 pounds to the refrigeration system in 1998 (to make up for system losses). The chemical is released to the air from relief vents, during system filling operations and from leaks in valves and fittings. During system maintenance, the lines are bled directly into water and the system is vented to the air. Monitoring data of the wastewater, including chemical concentrations and wastewater throughput, indicate that 1,200 pounds of the chemical were discharged to the wastewater in 1998. The remaining losses are assumed to be fugitive air releases and are estimated as follows:

Fugitive air releases of the EPCRA Section 313 chemical

= Amount input (lbs/yr) - Amount released to wastewater (lbs/yr)

= 20,000 lbs/yr - 1,200 lbs/yr

= 18,800 lbs/yr

POSSIBLE ERROR - Mass Balances for Otherwise Used Chemicals

If you are performing mass balance to estimate the quantity for a particular data element, make sure you include all inputs and outputs as precisely as possible. If, for example, you identify all inputs properly, but you fail to include all outputs, your estimate could be inaccurately inflated. Furthermore, if all inputs and outputs are identified, but are not precise, the estimate of the release in question could also be inaccurate.

4.1.4.3 Emissions Factors (code E)

An emission factor is a representative value that attempts to relate the quantity of a chemical released with an associated activity. These factors are usually expressed as the weight of chemical released divided by a unit weight, volume, distance, or duration of the activity releasing the chemical (e.g., pounds of chemical released per pounds of product produced). Emission factors, commonly used to estimate air emissions, have been developed for many different industries and activities. You should carefully evaluate the source of the emission factor and the conditions for its use to determine if it is applicable to the situation at your facility.

Many emission factors are available in EPA's *Compilation of Air Pollutant Emission Factors* (AP-42). The use of AP-42 emission factors is appropriate in developing estimates for emissions from boilers and process heaters. Equations are presented in AP-42 to calculate chemical specific emission factors for liquid material loading/unloading of transportation vehicles and storage tanks. AP-42 can be accessed at EPA's Technology Transfer Network (TTN) website: http://www.epa.gov/ttn/chief/ap42.html.

It should be noted that, for purposes of EPCRA Section 313 reporting, the only estimates that can be reported as "emission factors (code E)" are published chemical-specific emission factors.

Example - Emission Factors

Emission factors have been developed for air releases of fuel constituents and combustion products from boiler operations. AP-42 lists a range of formaldehyde emission factors when No. 6 fuel oil is consumed:

0.024 to 0.061 lbs formaldehyde generated/10^3 gallons No. 6 fuel oil fired.

A facility operating a boiler using No. 6 fuel oil could use the above emission factor to determine the amount of formaldehyde generated and subsequently released to the air. If 1,000,000 gallons of No. 6 fuel oil is used during a reporting year, the amount of formaldehyde generated would be between:

(0.024 lbs/10^3 gal) x (1,000,000 gallons) and (0.061 lbs/10^3 gal) x (1,000,000 gallons) = 24 and 61 lbs of formaldehyde

The mid-point of these two values, 42.5 pounds, should be use in developing release estimates assuming that a threshold has been exceeded for formaldehyde.

NOTE: In addition to combustion by-products, there are other EPCRA Section 313 chemicals in No. 6 fuel oil that should be considered for EPCRA Section 313 reporting.

4.1.4.4 Engineering Calculations (code O)

Engineering calculations are assumptions and/or judgements used to estimate quantities of EPCRA Section 313 chemicals released or otherwise managed. The quantities are estimated by using physical and chemical properties and relationships (e.g., ideal gas law, Raoult's law) or by modifying an emission factor to reflect the chemical properties of the EPCRA Section 313

chemical in question. Engineering calculations rely on the process parameters; you must have a thorough knowledge of the processes at your facility to complete these calculations.

Engineering calculations can also include computer models. Several computer models are available for estimating emissions from landfills, wastewater treatment, water treatment, and other processes.

Non-chemical-specific emission factors (e.g., SOCMI emission factors) and non-published emission factors also can be used as discussed in Section 4.1.4.3, but must be classified as "engineering calculations" for EPCRA Section 313 reporting.

Example - Engineering Calculations

Stack monitoring data are available for xylene but you have exceeded a threshold for toluene and must determine amount released or otherwise managed. Toluene is used in the same application as xylene at your facility. You can estimate the emissions of toluene by adjusting the monitoring data of xylene by a ratio of the vapor pressure for xylene to toluene. This example is an engineering calculation based on physical properties and process operation information:

From facility stack monitoring data, an estimated 200 lbs. of xylene is released as air emissions during the reporting year. Toluene is also present in the air emissions, but not monitored. The stack operates at approximately 125^{N}C. Based on literature data, the vapor pressures at 125^{N}C for toluene is 1.44 atmospheres and for xylene is 0.93 atmospheres. Using a ratio of the vapor pressures, the amount of toluene released as air emissions from the stack can be calculated:

$$\frac{\text{X lbs/yr toluene}}{\text{200 lbs/yr xylene}} = \frac{\text{1.44 atm (vapor pressure of toluene)}}{\text{0.93 atm (vapor pressure of xylene)}}$$

$$\text{X lbs/yr toluene} = \frac{\text{(200 lbs/yr xylene) x (1.44 atm toluene)}}{\text{(0.93 atm xylene)}}$$

Completing the calculation, the facility determines that 310 pounds of toluene were released as stack air emissions during the reporting year.

4.1.4.5 Estimating Releases and Other Waste Management Quantities

Once all sources, types, and appropriate estimation methodologies have been identified, you can estimate the release and other waste management activity quantities for each data element of the Form R. The recommended approach is that you estimate the amounts released from all sources at your facility by the data element on the form R (i.e., first estimate all fugitive emissions for a Section 313 chemical (Part II, Section 5.1), then estimate all stack air releases for a Section 313 chemical (Part II, Section 5.2), etc.). Table 4-3 presents a work sheet that may be helpful in compiling this information.

If you submit a Form R, you must also enter on-site waste treatment information in Section 7A, including the code for each treatment method used, the treatment efficiency for the chemical in the treated waste stream, and the concentration of the chemical in the influent sent to

treatment. You should report treatment methods that do not actually destroy or remove the chemical by entering "0" for removal efficiency. Similarly, on-site energy recovery methods and on-site recycling methods must be reported in Section 7B and 7C, respectively.

Table 4-3 Release and Other Waste Management Quantity Estimation Worksheet

Facility Name: _____ Date Worksheet Prepared: _____
Toxic Chemical or Chemical Category: _____ Prepared by: _____
CAS Number: _____
Reporting Year: _____

ON-SITE			
Release or Other Waste Management Activity Type	**Amount (lbs)**	**Basis of Estimate**	**Form R Element**
FUGITIVE AIR			
Equipment Leaks			5.1, (8.1 or 8.8)
Process Areas			5.1, (8.1 or 8.8)
Evaporative Losses (spills, surface impoundments)			5.1, (8.1 or 8.8)
Total =			5.1, (8.1 or 8.8)
STACK AIR			
Process Vents			5.2, (8.1 or 8.8)
Storage Tanks			5.2, (8.1 or 8.8)
Control Device Stacks			5.2, (8.1 or 8.8)
Other			5.2, (8.1 or 8.8)
Total =			5.2, (8.1 or 8.8)
RECEIVING STREAM/WATER BODY DISCHARGE			
Stormwater Discharge			5.3, (8.1 or 8.8)
On-Site Treatment Plant Discharge			
Total =			
ON-SITE UNDERGROUND INJECTION			
Underground Injection to Class I Wells			5.4, (8.1 or 8.8)
Underground Injection to Class II -V Wells			5.4, (8.1 or 8.8)
ON-SITE LAND			
Landfill			5.5, (8.1 or 8.8)
Land Treatment/Application Farming			5.5,(8.1,8.6, or 8.8)
Surface Impoundment			5.5,(8.1 or 8.8)
Other			
Total =			5.5,(8.1 or 8.8)
ON-SITE ENERGY RECOVERY			8.2
ON-SITE RECYCLING			8.4
ON-SITE TREATMENT			8.6

OFF-SITE				
Release or Other Waste Management Activity Type	**Amount (lbs)**	**Basis of Estimate**	**Form R Data Element**	**Off-Site Location (name)**
OFF-SITE DISPOSAL				
Solidification/Stabilization (metals and metal compounds only)			6.2, (8.1 or 8.8)	
Amount of metal and metal compounds to POTW			6.1, (8.1 or 8.8)	
Wastewater Treatment (excluding POTWs) metals and metal compounds only			6.2, (8.1 or 8.8)	
Underground Injection			6.2, (8.1 or 8.8)	
Landfill/Surface Impoundment			6.2, (8.1 or 8.8)	
Land Treatment			6.2, (8.1 or 8.8)	
Other Land Disposal			6.2, (8.1 or 8.8)	
Other Off-site Management			6.2, (8.1 or 8.8)	
OTHER AMOUNTS SENT OFF-SITE				
Amounts sent for storage			6.2, (8.1 or 8.8)	
Amounts sent for unknown waste management practice			6.2, (8.1 or 8.8)	
OFF-SITE TREATMENT				
Solidification/Stabilization			6.2,(8.7 or 8.8)	
Incineration/Thermal Treatment			6.2, (8.7 or 8.8)	
Incineration/Insignificant Fuel Value			6.2, (8.7 or 8.8)	
Wastewater Treatment (to POTW excluding metals and metal compounds)			6.1, (8.7 or 8.8)	
Wastewater Treatment (Excluding POTW and metal and metal compounds)			6.2, (8.7 or 8.8)	
Transfer to Waste Treatment Broker			6.2, (8.7 or 8.8)	
OFF-SITE ENERGY RECOVERY				
Off-site Energy Recovery			6.2, (8.3 or 8.8)	
Transfer to Energy Recovery Broker			6.2, (8.3 or 8.8)	
OFF-SITE RECYCLING				
Solvents/Organics Recovery			6.2, (8.5 or 8.8)	
Metals Recovery			6.2, (8.5 or 8.8)	
Other Reuse or Recovery			6.2, (8.5 or 8.8)	
Acid Regeneration			6.2, (8.5 or 8.8)	
Transfer to Recycling Waste Broker			6.2, (8.5 or 8.8)	

4.1.5 OTHER FORM R ELEMENTS

4.1.5.1 Maximum Amount On-Site (Part II, Section 4.1 of Form R)

In this section of the Form R, you are required to report the code that indicates the maximum quantity of the EPCRA Section 313 chemical present at your facility at any time during the reporting year. This estimate includes any amount of the chemical on-site in storage, in process vessels, in treatment units, and in shipping containers. This calculation includes quantities of the EPCRA Section 313 chemical present in purchased chemicals and in wastes. When performing the calculation, use only the total amount of the chemical present at your site at **any one time**. For example, assume you have a facility that incinerates waste and sends the remaining ash to an off-site landfill. In February, you receive waste with 500 pounds of benzene which you process completely within the month. In September, you receive waste with 600 pounds of benzene which you also process in a similar time frame. If you have no other sources of benzene on-site, your maximum amount estimation would be 600 pounds (range code 02).

Example - Maximum Amount On-Site for Landfills

How do facilities that operate landfills report the maximum amount of a chemical on-site? Does this data element take into account amounts of a chemical that have been disposed of in prior years.

No. Facilities do not have to count amounts of the EPCRA Section 313 chemical that it disposed of on-site in previous years. Wastes that are released to such management units as surface impoundments and landfills should be counted for the purposes of data element 4.1, Part II, of the Form R during the reporting year that they are disposed.

4.1.5.2 Production Ratio or Activity Index (Part II, Section 8.9 of Form R)

For this data element, you are required to provide a ratio of reporting year production to prior year production or provide an "activity index" based on a variable other than production that is the primary influence on the quantity of the reported EPCRA Section 313 chemical recycled, used for energy recovery, treated, or disposed. The ratio or index must be reported to the nearest tenths or hundredth place (e.g., one or two digits to the right of the decimal point). Because the facilities added by the facility expansion rulemaking were not required to collect data until RY 1998, these facilities may enter "NA" in this data element regardless of whether the chemical existed at your facility in the previous year (i.e., RY 1997). In future years, however, RCRA Subtitle C TSD and solvent recovery facilities may only enter "NA" in the production ratio or activity index data element if the EPCRA Section 313 chemical was not manufactured, processed, or otherwise used in the year prior to the reporting year for which a Form R is being submitted.

You may choose either the production ratio or activity index depending on the chemical and how the chemical is used at your facility. The major factor in selecting whether to use a production ratio or activity index is typically a measure of which threshold activity applies. Typically, production ratio would apply to EPCRA Section 313 chemicals manufactured and processed by a facility, while otherwise use activities would be best measured using an activity index. A key consideration in developing a methodology for determining a production

ratio/activity index is that you should choose a methodology that will be least likely to be affected by potential source reduction activities. In most cases, the production ratio or activity index should be based on some variable of production or activity rather than on EPCRA Section 313 chemical or material usage.

For example, suppose you use an EPCRA Section 313 chemical as a cleaning solvent to perform tank washouts. Using a production ratio based on the amount of the product produced in the tanks between the prior and current reporting years may seem logical but may not take into consideration potential source reduction activities. As a result, an activity index may be more appropriate. In this instance, an activity index may be more appropriate, such as the number of tank washouts conducted, which would be more accurate in reflecting the potential source reduction activities that could be implemented for that chemical and/or activity. For example, a source reduction activity might include the facility deciding to modify the production process such that they would need to clean the tanks less often and, therefore, use less cleaning solvent. The use of an activity index based on tank washouts would better reflect the factors that influence the amount of solvent managed as a waste than would a production ratio based on the amount of product produced in the tanks.

While solvent recovery operations produce a product, TSD facilities are typically providing a waste management service and do not create a product. Therefore, solvent recovery facilities have the flexibility of using the production ratio (based on the amount of solvent recovered from year to year) or the activity index. RCRA Subtitle C TSD and solvent recovery facilities generally do not produce any products at their facility, so these facilities must rely primarily on activity indexes. For your treatment operation, such as an incinerator or wastewater treatment unit, you could use waste feed or the number of hours operated as an activity index measure. For example, if you accepted 600,000 gallons of waste chloroform for incineration in the previous reporting year, then you received 800,000 gallons of waste chloroform for incineration in the current reporting year, the activity index could be 800,000 divided by 600,000 or 1.33. However, if you are attempting to measure the activity index of an ancillary activity such as wiping off machinery with solvent rags, the waste feed index will be inaccurate. A more accurate index for this type of activity may be the number of rags used or the number of times the machinery is cleaned.

Example - Activity Index

A facility accepts hazardous waste with 10% dichlorobenzene from off-site for incineration, and subsequent disposal. In the previous year, the facility received 300,000 pounds of the waste stream. For the current reporting year, the facility received 200,000 pounds of the waste stream. One method that the facility may use to generate the activity index would be to divide 200,000 pounds from this year by 300,000 pounds from last year.

$$\frac{\text{200,00 lbs waste (current reporting year)}}{\text{300,000 lbs waste (previous reporting year)}}$$

Activity Index = 0.67

4.1.5.3 Source Reduction (Part II, Sections 8.10 and 8.11 of Form R)

The final two sections of the Form R are used for reporting any source reduction activities conducted at the facility. Section 8.10 asks whether there has been any source reduction at the facility **during the current reporting year**. If so, *TRI Forms and Instructions* provides a list of three-digit codes that the facility must choose from to describe these source reduction activities. Source reduction activities do not include recycling, treating, using for energy recovery, or disposing of an EPCRA Section 313 chemical. Report in this section only the source reduction activities implemented to reduce or eliminate the quantities reported in Section 8.1 through 8.7.

Under Section 8.11, check "yes" if you would like to attach any optional information on source reduction, recycling, or pollution control activities for the EPCRA Section 313 chemical at your facility. This information can be reported for the current reporting year, or for prior year activities. The Agency asks that you limit this information to one page that summarizes the source reduction, recycling, or pollution control activities implemented by your facility.

4.2 CALCULATING RELEASE AND OTHER WASTE MANAGEMENT ESTIMATES AT RCRA SUBTITLE C TSD AND SOLVENT RECOVERY FACILITIES

This section describes the sources of, and methods for calculating, releases and other waste management activities associated with typical storage, treatment, recovery, and disposal operations found at RCRA Subtitle C TSD and solvent recovery facilities. This discussion is organized by the life cycle of wastes managed by these facilities from the point of arrival and storage on-site to their ultimate treatment for destruction, disposal, or recovery.

To further simplify the use of this part of the chapter, releases and other waste management calculations associated with these waste management operations have been divided by the basic nature of the waste: liquid or solid wastes. These two categories will determine the type of releases and waste management activities likely to occur for the reportable EPCRA Section 313 chemical. Chapter 4.2.1 discusses liquid storage and transfer operations and includes discussions of releases and waste management calculations associated with tank storage and transfer, piping and equipment leaks, and container storage and transfer. Chapter 4.2.2 discusses solvent recovery and treatment processes and includes discussion of solvent pretreatment processes, distillation, incineration, and wastewater treatment. Since treated wastes must be in solid form prior to disposal, solid releases are addressed in Chapter 4.2.3, which discusses solids storage, transfers and landfill disposal. Each sub-chapter provides an overview of the processes, describes methods for estimating quantities of chemicals released and otherwise managed as waste and provides examples of release calculations.

4.2.1 Liquid Storage and Transfer Operations of Wastes Received From Off-Site

When liquid wastes are received from off-site, they are either placed in storage or directly into pretreatment units. This section discusses release and other waste management calculations related to tank and container storage and transfers. Typically, pretreatment units consist of tanks or containers, and release and other waste management activities can be addressed similarly to storage tanks and containers.

The receipt and storage of EPCRA Section 313 chemicals in wastes and purchased chemicals from off-site in itself are not considered in threshold determinations, except if you caused the waste or mixture or other trade name product to be imported. While storage is not considered for threshold determinations, the releases and other waste management activities that may result are reportable provided a threshold for the same EPCRA Section 313 chemical(s) has been exceeded elsewhere at your facility. (See Chapter 3.2 for more information.)

4.2.1.1 Tank System Releases

Storage tanks consist of essentially three parts: primary tanks, secondary containment, and associated equipment (e.g., piping, flanges, and valves). All elements of the tank system need to be analyzed for release and waste management calculations to the extent that the system contains an EPCRA Section 313 chemical during the reporting year. Release and other waste management activities related to each element of the tank system need to be addressed separately because each have different issues. The following discussion addresses the primary tank and the associated piping. Because secondary containment is not used unless there are spills, discussion of releases and other waste management activities associated with secondary containment has been consolidated in the discussion on spills found later in this chapter.

Primary/Storage Tanks

Process Description. Emissions from primary/storage tanks are a result of evaporative losses during storage (known as breathing losses) and evaporative losses during filling and emptying operations (known as working losses). Breathing losses are a result of changes in pressure and temperature.

Working losses are a primary source of evaporative emissions. Working losses occur as organic vapors in an "empty" tank or that portion of the tank that does not contain liquid product are displaced to the atmosphere by the liquid being loaded into the tank. Working losses are composed of vapors formed in the empty portion of the tank by evaporation of residual product from previous contents, vapors transferred to the tank as product is being unloaded, and vapors generated in the tank as the new product is being loaded. The quantity of evaporative losses from unloading operations depends on parameters such as the physical and chemical characteristics of the previous and new material and the method of unloading.

The use of vapor equalization or vapor recovery equipment can reduce working loss emissions. Vapor equalization equipment uses the gas being displaced by the tank being filled to provide the gas needed in the vessel being emptied. Vapor recovery equipment captures organic vapors that are displaced during loading operations and routes the recovered product via pipe to either a storage unit or to a thermal oxidation unit where the vapor is combusted.

Estimating Releases And Other Waste Management Quantities. *Air Releases From Tanks. Compilation of Air Pollutant Emission Factors (AP-42)* provides detailed information on the calculation of air emissions during the storage and transfer of liquids. A number of equations used to calculate air emissions from storage tanks can be found in *AP-42*, Chapter 7. Total air emissions from storage tanks are equal to the sum of the standing storage loss and working loss. Variables such as tank design, liquid temperature, and wind velocity are taken into account when determining standing storage loss and working loss. The emission equations for fixed-roof tanks in AP-42 were developed for vertical tanks; however, the equations can also be used for horizontal tanks by modifying the tank parameters as specified in AP-42. Many of these equations have been incorporated into computer models such as TANKS 3 which greatly simplify their use in developing emission estimates (See box on TANKS 3 for more information).

TANKS 3

The TANKS 3 program is designed to estimate emissions of organic chemicals from several types of storage tanks. The calculations are performed according to EPA's AP-42, Chapter 7. After the user provides specific information concerning a storage tank, its liquid contents, and other parameters, the system produces a report which estimates the chemical emissions for the tank on an annual or partial year basis. The user can also determine individual component losses by using one of the specification options available in the program.

The TANKS 3 program relies on a chemical database of over 100 organic liquids and a meteorological database which includes over 250 cities in the United States; users may add new chemicals and cities to these databases by providing specific information through system utilities. On-line help provides documentation and user assistance for each screen of the program. The TANKS 3 program and manual can be downloaded from the world wide web at http://www.epa.gov/ttn/chief/tanks.html.

Once the total volatile organic compound (VOC) loss is calculated, you can then determine the emission rate of each constituent in the vapor. In general, the emission rate for individual components can be estimated by multiplying the weight fraction of the constituent in the vapor by the amount of total VOC loss. The weight fraction of the constituent in the vapor can be calculated using the mole fraction and the vapor pressure of the constituent (equations found in AP-42). The weight percent can also be obtained from the SPECIATE database. The SPECIATE data base contains organic compound and particulate matter speciation profiles for more than 300 source types. The profiles attempt to break down the total VOC or particulate emissions from a particular source into the individual compounds. The SPECIATE database can be downloaded from the world wide web at http://www.epa.gov/ttn/chief/software.html#speciate.

Releases From Transportation Vehicles

A facility is responsible for reporting releases and other waste management activities for an EPCRA Section 313 chemical that occur during loading or unloading of a transportation vehicle provided an activity threshold has been exceeded for that chemical. Releases of an EPCRA Section 313 chemical from a transportation vehicle that occur while the material is still under "active shipping" is considered to be in transportation and is not subject to Section 313 requirements (EPCRA Section 327). However, once the facility takes possession of the waste (e.g., shipping papers have been signed), the facility becomes responsible for reporting releases of EPCRA Section 313 chemicals, including those that occur during storage of the chemicals in the transportation vehicle while the vehicle is at the facility.

Other Waste Management Calculations Associated with Tanks. Water may condense inside the tank and may form a separate layer from the waste. This water may be drained from the tank periodically and managed as wastewater. This wastewater may contain a number of EPCRA Section 313 chemicals. See the discussion of wastewater management later in this chapter for information on releases from wastewater.

Releases can also occur during tank cleaning, changes in service (e.g., from one type of waste to another), tank modifications/upgrades, and during tank maintenance activities. Accumulated contaminants and heavy compounds settle in tank bottoms during normal storage resulting in sludge formation. The disposition of EPCRA Section 313 chemicals in the removed tank bottoms sludge must be reported on the Form R provided a threshold has been exceeded for the listed EPCRA Section 313 chemical. In addition, you may need to consider fugitive air emissions that occur during any of these operations, accounting for not only the EPCRA Section 313 chemicals that may be in the tank, but also any EPCRA Section 313 chemicals in solvents that may be used to clean the tank.

Tank failures should also be considered. Since many tanks are required to be outfitted with secondary containment, it is important to estimate releases that escape from tanks due to failure based on the ultimate disposition of the chemical, rather than the amount released from the primary vessel. For example, 100 pounds of toluene may spill from a tank, but if 80 pounds are recovered from the secondary containment and directly placed back into storage or in process operations, and 20 pounds remain in the soil, then 20 pounds is counted towards the "release to the land" estimate in Part II, Section 5.5.4 of Form R. Furthermore, if the released chemical is volatile, the ultimate disposition of the chemical may be mostly fugitive air emissions. In the above example, if 15 of the 20 pounds of toluene originally spilled into the soil volatilizes into the atmosphere during the reporting year, then unvolatilized five pounds of toluene is counted towards the "release to land" estimate in Part II, Section 5.5.4, and 15 pounds is counted towards the "fugitive air emissions" estimate in Part II, Section 5.1. See the "Spills" box later in this chapter for more information concerning this issue.

Piping and Equipment Leaks

Process Description - In general, equipment such as valves and flanges leak. These leaks tend to be so small and slow that they are unnoticeable to a casual observer. When considered on a facility-wide basis, these leaks can account for a significant quantity of emissions. These emissions occur whenever the equipment contains waste or other materials (e.g., even though waste may no longer be flowing through a pipe, the valves and flanges associated with the pipe will still be producing emissions unless the pipe has been drained and cleaned). Methods to develop these emission estimates are discussed in the following section.

Estimating Releases and Other Waste Management Quantities. *Protocol For Equipment Leak Emission Estimates* (EPA-453/R-95-017) presents a comprehensive discussion of how to estimate equipment leaks. This document is available at http://www.epa.gov/ttnchie1/fyi.html. Four approaches for estimating equipment leak emissions, in order of increasing refinement, are presented:

- Average emission factor approach;
- Screening ranges approach;
- EPA correlation approach; and
- Unit-specific correlation approach.

In general, the more refined approaches require more data and provide more accurate emission estimates for a process unit. It is important to recognize in calculating estimates for these sources that you may already have calculated these estimates as a result of separate requirements under the Clean Air Act, particularly the Title V requirements.

In the average emission factor approach and the screening ranges approach, emission factors are combined with equipment counts to estimate emissions. The average emissions factor approach allows the use of average emission factors developed by EPA, as shown in Table 4-4, SOCMI Average Emission Factors. These average factors must be multiplied by the number of pieces of equipment being considered and the length of time each piece of equipment is in service. The average emission factors vary depending on the service category (e.g., gas, light liquid, or heavy liquid), and the total organic compound (TOC) concentration of the stream. To estimate emissions with the EPA correlation approach, measured concentrations (screening values) for all equipment are individually entered into general correlations developed by the EPA. In the unit-specific correlation approach, screening and leak rate data are measured for a select set of individual equipment components and then used to develop unit-specific correlations. Screening values for all components are then entered into these unit-specific correlations to estimate emissions.

Table 4-4
SOCMI AVERAGE EMISSION FACTORS*

Equipment type	Service	Emission factors[a] (lbs/hr/source)
Valves	Gas Light liquid Heavy liquid	0.0132 0.00888 0.00051
Pump seals[b]	Light liquid Heavy liquid	0.0439 0.0190
Compressor seals	Gas	0.503
Pressure relief valves	Gas	0.229
Connectors	All	0.00403
Open-ended lines	All	0.0037
Sampling connections	All	0.0331

**Protocol for Equipment Leak Emission Estimates* (EPA, EPA-453/R-95-017)
a These factors are for total organic compound emissions
b The light liquid pump seal factor can be used to estimate the leak rate from agitator seals

The general equation for estimating TOC mass emissions from an equipment leak using average emission factors is:

$$E_{TOC} = F_A * WF_{TOC} * N$$

where:

E_{TOC} = emission range of TOC from all equipment in the stream of a given equipment type (lb/hr)
F_A = average emission factor for the equipment type (lb/hr/source)
WF_{TOC} = average weight fraction of TOC in the stream
N = number of pieces of equipment

And the equation for determining the emissions of a specific VOC in a mixture or other trade name product from equipment is:

$$E_x = E_{TOC} * (WP_x/WP_{TOC})$$

where:

E_x = The mass emissions of organic chemical "x" (lb/hr)
E_{TOC} = The TOC mass emissions from the equipment (lb/hr)
WP_x = The concentration of organic chemical "x" in the equipment in weight percent
WP_{TOC} = The TOC concentration in the equipment in weight percent.

Calculation of Equipment Leak Emissions

At a RCRA Subtitle C TSD facility, a waste requiring treatment passes through a system containing 100 connectors. The waste contains 85 weight percent TOC. The waste is in contact with the connectors in the system for 8,000 hours during the year. The weight percent of toluene in the waste is 5.6%. The emissions of TOC would be calculated as:

E_{TOC} = F_A * WF_{TOC} * N * (Number of hours in contact during the year)
= (0.00403 lb/hr/connector) (0.85) (100) (8000 hrs/year)
= 2,740 lb/year of TOC from connectors

The emissions of toluene from the connectors would be calculated as:

E_x = E_{TOC} * (WP_x/WP_{TOC})
= 2,740 lb/year * (0.056/0.85)
= 181 lb/year of toluene from connectors

This average emission factor approach is presented as an option for facilities with no data concerning equipment leaks. It is the facility's responsibility to choose the best method for estimating releases from equipment leaks.

4.2.1.2 Container Storage and Transfer

RCRA Subtitle C TSD and solvent recovery facilities receive and store wastes and other materials in drums and other containers. These containers may be stored as received, or the contents may be transferred into holding tanks. Once the containers are no longer in use, they may be washed and triple rinsed to attain "RCRA-empty" status and then shipped off-site. The drums may be sent to generators for reuse or to a drum reconditioner. In certain treatment processes (e.g., certain incinerators), both the drum and its contents are fed to the treatment device. From an EPCRA Section 313 reporting perspective, even though "RCRA-empty" these containers still may contain EPCRA Section 313 chemicals that may still contain chemicals that must be considered for release or other waste management calculations. In addition, the process of rinsing these containers will also generate wastewaters and other waste streams that may contain EPCRA Section 313 chemicals.

Estimating Releases And Other Waste Management Quantities.

Air Emissions. Generally, containers are not air tight and will leak during storage (similar to valves and flanges). These leaks tend to be so small and slow that they are unnoticeable to a casual observer, but when considered on a facility-wide basis, these leaks can account for a significant quantity of emissions and must be considered in release or other waste management

calculations, provided thresholds have been exceeded.. In addition, significant air emissions can occur while containers are being filled and emptied. Currently, little guidance is available to estimate emissions from filling and emptying activities. Provided that the facility does not have better information, EPA recommends that facilities estimate drum filling emissions by modeling each drum as a small tank. Therefore, emissions could be calculated using techniques described above in the discussion of tank systems in the preceding section.

If a container is holding a volatile EPCRA Section 313 chemical, one possible way to estimate a small, slow leak that occurs when a closed container is stored is to model the container closure as a connector (flange). Since there are no established industry standards for measuring air emissions from containers while the material is in storage, the facility should be careful to document its method of developing the estimate.

Empty containers may also contain volatiles capable of air releases. Please see page 4-9, Chapter 4.1.3(g) for detail methods for estimating emissions from empty containers.

Estimating Transfers Off-Site. Facilities commonly transfer EPCRA Section 313 chemicals off-site for release or further waste management. Manifests will provide the useful information about many wastes being sent off-site. However, container residues can be overlooked, and can lead to off-site transfers of EPCRA Section 313 chemicals if the drum is sent off as "RCRA empty" without cleaning. Also, facilities could overlook drums that are cleaned on site where the cleaning process leads to generation of wastewater that contains EPCRA Section 313 chemicals. See Chapter 4.1.3(g) for guidance on estimating amounts of EPCRA Section 313 chemicals transferred off-site in wastewater from empty containers.

Spills. Spills are another pathway for chemicals managed in both containers and tanks to result in reportable releases and other waste management quantities. The total amount of the listed EPCRA Section 313 chemical that leaks or spills should not automatically be reported as released to land. Amounts that may volatilize should be considered a release to air, as well as amounts cleaned up and disposed also need to be considered. However, amounts spilled into containment areas that are directly reused within the same reporting year without requiring

treatment prior to reuse are not subject to release reporting. More guidance on calculating releases from spills can be found in EPA's *Estimating Releases and Waste Treatment Efficiencies for the Toxic Chemical Release Inventory Form.*

Storm water. A facility must report the amount of EPCRA Section 313 chemicals in storm water runoff (including unchanneled runoff) if the facility already monitors for these releases. If a facility does not have periodic measurements of storm water releases, but has submitted chemical-specific monitoring data in its storm water permit application, then it must use these data to calculate the percent contribution from storm water. This information would be reported in Part II, Section 5.3 of the Form R. If a facility did not detect any EPCRA Section 313 chemical in the storm water or does not monitor for these releases, zero (0) or "NA" would be reported on the Form R, respectively.

EXAMPLE - Estimating Releases for Accidental Losses

A facility incinerates more than 10,000 pounds of glycol ether in an incinerator. While unloading on a windless overcast day, a 55 gallon drum containing glycol ether is spilled. Most of the spill remains on the pad, however, an estimated ten percent flows off the pad and onto the soil. Absorbent material used to remove the glycol ether from the concrete pad is subsequently incinerated. How would these releases be reported on the Form R? The density of glycol ether is 8.6 pounds per gallon, and the vapor pressure is 0.10 mm Hg at 68° F.

Quantity spilled = 55 gal x 8.6 lbs./gal = 473 lbs.
Quantity spilled onto pad = 473 x 90% = 425.7 lbs.
Quantity spilled onto soil = 473 x 10% = 47.3 lbs.

Air emissions of glycol ether are expected to be negligible due to the low vapor pressure and environmental conditions, provided response and cleanup are immediate. Therefore, the quantity spilled onto the soil (50 pounds) should be reported in Section 5.5.4, other disposal. The quantity spilled onto the concrete pad (430 pounds) will need to be added to the quantity of glycol ether directly fed to the incinerator. After accounting for releases of glycol ether to the air from the incinerator (as well as other potential releases - some may be released to water if the facility operates a wet scrubber), the remainder would be reported as treated on site (Section 8.6).

Storm water runoff rate of flow can be estimated by multiplying the annual amount of rain fall by the land area of the facility and then multiplying that figure by the runoff coefficient. The runoff coefficient represents the fraction of rainfall that does not seep into the ground but runs off as storm water and is directly related to how the land in the drainage area is used. The runoff coefficient can be found in Section 5 of the *TRI Forms and Instructions* or a facility can calculate a weighted run-off coefficient that will take into account the different types of land uses at a particular facility.

Example - Storm Water Runoff

A facility is located in a semi-arid region of the United States which has annual precipitation (including snowfall) of 12 inches of rain. (Snowfall should be converted to the equivalent inches of rain; assume one foot of snow is equivalent to one inch of rain.) The total area covered by the facility is 42 acres (about 170,000 square meters or 1,829,520 square feet) of which 50 percent is unimproved area, 10 percent is asphalt streets, and 40 percent is concrete pavement.

The total Storm water runoff from the facility is therefore calculated as follows:

Land Use	% Total Area	Runoff Coefficient
Unimproved area	50	0.20
Asphaltic streets	10	0.85
Concrete pavement	40	0.90

Weighted runoff coefficient = (50%) x (0.20) + (10%) x (0.85) + (40%) x (0.90) = 0.545

(Rainfall) x (land area) x (conversion factor) x (runoff coefficient) = Storm water runoff

(1 foot) x (1,829,520 ft^2) x (7.48 gal/ft^3) x (0.545) = 7,458,220 gallons/year

Total storm water runoff = 7.46 million gallons/year

The storm water monitoring data shows that the average concentration of cumene in the storm water runoff from a facility is 1.0 milligrams per liter. The total amount of cumene discharged to surface water through the plant wastewater discharge (non-storm water) is 250 pounds per year. The total amount of cumene discharged with storm water is:

(7,458,220 gallons Storm water) x (3.785 liters/gallon) = 28,229,360 liters Storm water

(28,229,360 liters Storm water) x (1 mg. cumene/liter) x (1×10^{-6}) = 28.2 kg cumene= 62 pounds cumene.

The total amount of cumene discharged from all sources at this facility is:

250 pounds cumene from wastewater discharged
+62 pounds cumene from storm water runoff
312 pounds cumene total water discharged

312 pounds of cumene is reported in Section 5.3.A on Form R

The percentage of cumene discharge through storm water reported in Section 5.3.C on Form is:

62 ÷ 312 x 100 = 20%

4.2.1.3 Incineration Activities

Hazardous waste incinerators thermally decompose organic constituents through cracking and oxidation that will also generate combustion by-products which are subject to the manufacturing threshold. Incineration activities will result in air releases, both fugitive and stack, along with generating other waste streams for further waste management. Incineration efficiencies will be used to derive treatment estimates.

EPCRA Section 313 Chemicals. A wide variety of chemicals can be in wastes that are fed to incinerators. During the incineration of these wastes, several listed 313 chemicals may be manufactured, including hydrochloric acid (aerosol), sulfuric acid (aerosol), metal oxides, hydrogen fluoride, and nitrate compounds (water dissociable; in aqueous solution).

Process Description. The four most common types of incineration are liquid injection, rotary kiln, fluidized bed, and fixed hearth. Figure 4.1 presents a generic process flow diagram of a rotary kiln. Most of the inert material in the waste feed stream travels through the primary combustion chamber and exits as bottom ash. These solids from the primary combustion chamber may be contaminated with heavy metals and organic compounds. Off-gas from the primary combustion chamber is fed to a secondary combustion chamber where additional combustion takes place. Off-gas from the secondary combustion chamber then is passed through an air pollution control (APC) treatment train that may contain a fabric filters (baghouse), scrubber (wet or dry), and/or an electrostatic precipitator (ESP).

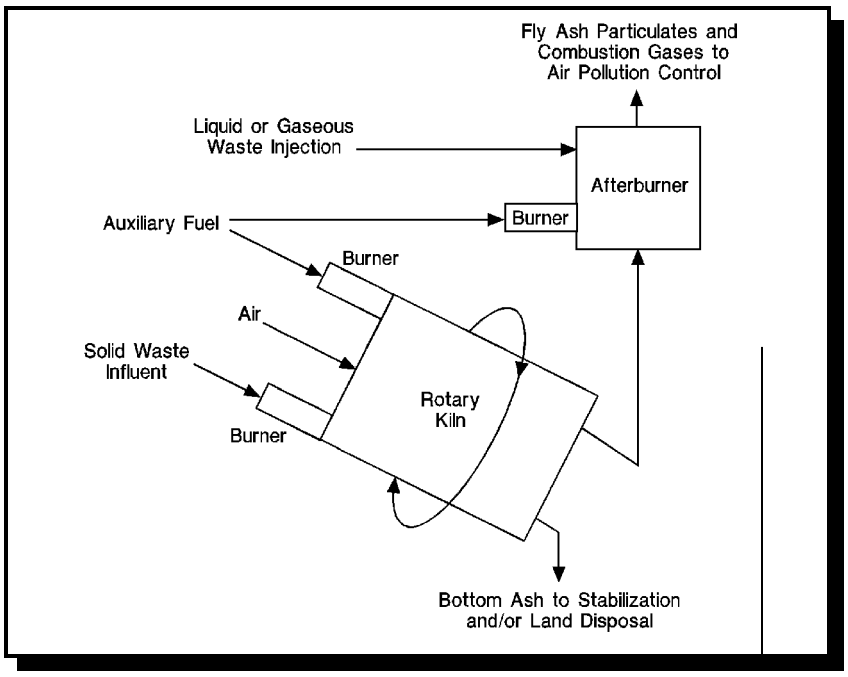

Figure 4-4. Rotary Kiln Incineration

Estimating Releases and Other Waste Management Quantities. *Metals.* As opposed to organics, wastes with metals and metal compounds cannot be destroyed by incineration. Because no metals entering incineration will be destroyed, you should double check that you have identified all metal releases by making sure that the amount of metal in waste fed into the incinerator equals the amount of metal released or otherwise managed as waste. Waste profiles

and available analytical data can be used in conjunction with waste feed quantities to estimate the quantity of metals fed.

To estimate the quantity of metals/metal compounds released from an incinerator, you can use available composition information and waste quantities to estimate the quantity of metals in the various wastes generated (e.g., bottom ash, fly ash, scrubber wastewater). Emissions of metals could be estimated using available data, such as trial burn results. In addition, because of the conservation of metal in the incineration reaction, you can use mass balance to calculate a release or waste management activities if you have estimates for all other releases and waste management activities. For example, if you have monitoring data for the stack release and wastewater discharges, you could calculate the amount of metal destined for disposal by subtracting the stack and wastewater releases from the amount of metal fed into the incinerator (assuming there are no other releases).

Organics. A high percentage of the organic chemicals fed to an incinerator will be combusted. However, it may not be correct to estimate the quantities released or otherwise managed as waste based on a destruction and removal efficiency (DRE) measured during a trial burn for two reasons: (1) the measured efficiency probably does not refer to the destruction and removal of the chemical being reported in the Form R. Chemicals chosen for use in trial burns as principal organic hazardous constituents (POHCs) are usually chosen based on the fact that the chemical is difficult to combust, while the EPCRA Section 313 organic chemical may combust much more easily; and (2) the proven DRE also includes removal and the EPCRA Section 313 chemical could potentially be in the bottom ash, fly ash, and/or scrubber wastewater. Ash will generally be stabilized and disposed of in a landfill on-site and so would be reported in Section 5.5.1.A (RCRA Subtitle C landfill). Wastewater would generally be treated in an on-site wastewater treatment system, which is discussed later in this section.

The best "readily available data" needs to be used to estimate releases of EPCRA Section 313 organic chemicals. It would be best to use chemical-specific data to estimate air emissions. If this is not available, the next best alternative may be to use the DRE estimate measured in a trial burn. As stated above, the DRE gives no information concerning the quantity of the EPCRA Section 313 organic chemical in the wastes generated, but can be useful because it provides some guidance about the final destination for each EPCRA Section 313 chemical. For these estimates, available analytical data and the quantity of wastes should be used. Tables E, F and G in EPA's *Air/Superfund National Technology Guidance Study Series* summarize DRE efficiencies along with other operating parameters for various types of incinerators, industrial boilers, and cement kilns which can be used if actual stack test data are not available.

Manufactured Chemicals. Incinerators are designed to produce severe oxidizing conditions. Under these conditions, numerous reactions are taking place generating a number of chemicals, principally carbon dioxide and water. You must use the best "readily available data" to estimate the quantity of EPCRA Section 313 chemicals produced. If you have no data concerning the manufacture of these chemicals, the facility should make the following assumptions:

Acids

During combustion of wastes containing chlorine and fluorine, essentially all of the halogen (chlorine or fluorine) is converted into the corresponding reportable acid (hydrogen chloride aerosol or hydrogen fluoride). Hydrogen fluoride is a Section 313 chemical and hydrogen chloride, also known as hydrochloric acid (HCl) is a Section 313 chemical when it is in the "aerosol" form which includes "mists, vapors, gas, fog, and other airborne forms of any particle size." All HCl produced from combustion is, at least momentarily, in the "aerosol" state because of the heat from combustion.

Facilities should use their best "readily available data" to estimate the quantities of these two listed acids manufactured. In the absence of better information, a facility should assume all of the chlorine and/or fluorine in the waste was converted to the corresponding acid. This assumption can supplement limited information that may be available. For example, if a facility knows the quantity of diatomic chlorine emitted from the stack of an incinerator, that quantity of chlorine should be subtracted from the quantity of chlorine in the waste feed to determine the quantity of chlorine that is converted to hydrochloric acid aerosol (i.e., the quantity of hydrochloric acid could then be estimated by mass balance).

Example - Calculating Emissions and the Quantity Treated of Hydrochloric Acid (HCl) and Chlorine From Stack Test Results

Stack test data for an incineration system (incinerator, baghouse, and scrubber) indicates the following:

	Rate (lbs/hr)
Chlorine Fed to Incinerator	1,000.00
HCl Emitted From Stack	0.01
Chlorine Emitted From Stack	4.00

For the reporting year, waste profiles (composition) and waste feed rates indicate 5,000,000 pounds of chlorine were fed to the incinerator. Estimated air emissions of chlorine and HCl from the incineration system's stack are shown below.

Air emissions of HCl = 5,000,000 lbs chlorine fed (.01 lb/hr HCl emitted/1,000 lbs/hr chlorine fed) = 50 lbs HCl emitted*

Air emissions of Chlorine = 5,000,000 lbs Chlorine fed (4.00 lbs/hr Chlorine emitted/1,000 lbs/hr Chlorine fed)= 20,000 lbs Chlorine emitted*

The quantity of HCl treated in the scrubber can be estimated by mass balance if we assume that the scrubber has no diatomic chlorine removal efficiency and all chlorine atoms fed into the incinerator do not form diatomic chlorine from HCl.

*Quantity of HCl treated = HCl manuf. - HCl released = (Cl fed - Cl_2 emitted) * MW_{HCl}/MW_{Cl} - HCl released = (5,000,000 lb. - 20,000 lb.)*36.5/35.5 - 50 lb = 5,120,232 lb. HCl treated*

During combustion of wastes containing sulfur, the vast majority of the sulfur is converted to sulfur dioxide. The quantity of sulfuric acid manufactured is only a fraction of the sulfur in the waste. Sulfuric acid "aerosol" is an EPCRA Section 313 chemical. All sulfuric acid produced from combustion is in the "aerosol" state, at least momentarily, due to the high operational temperatures.

Facilities should use their best available data to estimate the quantity of sulfuric acid manufactured. In the absence of better information, a facility can estimate the quantity of sulfuric acid manufactured with the equation that EPA developed for fuel oil (based on EPA's *Guidance for Reporting Sulfuric Acid (acid aerosols including mists, vapors, gas fog, and other airborne forms of any size)*, March, 1998):

$$H = 0.00245 \times S \times F$$

Where: H = pounds of sulfuric acid manufactured
S = the weight percent sulfur in the waste
F = gallons of waste combusted

For example, if 1,000,000 gallons of waste were burned and the fuel oil contained 3.0% sulfur, then:

$$H = 0.00245 \times 3.0 \times 1{,}000{,}000 = 7{,}350 \text{ pounds of } H_2SO_4$$

Note that the values for the variables F and S have been chosen as an illustration. For this example, values must be chosen based on the best available data on the wastes being combusted at your facility.

Metals

For estimating the amount of Section 313 metals or metal compound categories manufactured during combustion, your Clean Air Act permit may require you to monitor for many of these chemicals and/or compounds. However, there may be new metal compounds that you are not required to monitor. To calculate the amount of Section 313 metal compounds manufactured during combustion, facilities must estimate the concentration of each metal present in the waste feed. These metals are likely to exist as metal compounds in the waste and, if no other information is available, facilities can assume that most of these metal compounds convert to the lowest weight metal oxide. The best "readily available data" should be used to estimate the approximate concentration of the metal in the waste. If you have data regarding chemical concentrations in the waste used by the facility, and the facility believes that this is the best "readily available data", then the facility should use this information.

One exception to using metal oxides for determining threshold quantities of metals manufactured may be mercury. Like other metals, mercury is likely to exist in waste as a compound. However, unlike other metals, mercury is not likely to convert to an oxide when subjected to extreme temperatures such as during incineration, but instead may convert to elemental mercury (gaseous). In this case, mercury (elemental) has been manufactured. Unless facilities have information to indicate otherwise, they should assume that they manufacture elemental mercury during combustion, and apply the weight of the metal, rather than that of the metal oxide, towards the manufacture activity threshold for mercury. Unless you have information indicating otherwise, assume that 100% of the mercury compounds in the waste convert to elemental mercury.

Auxiliary Fuels. Combustion of auxiliary fuels can also lead to releases and other wastes. If your facility is combusting gas, oil, or coal as a supplemental fuel, please refer to the *Emergency Planning and Community Right-to-Know Act Section 313 Guidance for Electricity Generating Facilities* for guidance on how to calculate releases from the combustion of coal or oil.

Waste Feeding. Waste feed and handling processes generate fugitive air emissions. The magnitude of emissions from solids handling will vary with operating conditions. Fugitive volatile organic chemical emissions from these activities can be estimated from algorithms developed by EPA. These algorithms also estimate fugitive VOC emissions from all the operations within a combustion facility. Fugitive particulate emissions can be estimated from the EPA publication, *Air/Superfund National Technology Guidance Study Series* (EPA-450/1-89-003).

4.2.1.4 Wastewater Treatment Activities

Process Description. The treatment, storage, or disposal of wastes will generate wastewaters at the facility which must be treated. Wastewater can be generated during various treatment or pretreatment processes. Additionally, tank washing and other maintenance, draining of secondary containment, spills, oil/water separators, and tank failures will produce wastewaters. In the vast majority of cases, these water streams will be treated prior to release. EPCRA Section 313 chemicals may be removed from the wastewater stream or destroyed during the treatment process.

Example - Calculation of Yearly Wastewater Discharge

A facility has monitoring data on discharges to water of xylene, a listed EPCRA Section 313 chemical, and a Form R report is required. In this example, monitoring data on this chemical are only available for two days in the year. The daily quantities of pounds of xylene released for those two dates would then be divided by the number of sample dates to determine the daily average for the whole reporting year, which would be used to estimate the annual discharge of xylene in wastewater:

Date	Conc. (mg/l)	Flow (MGD)	Daily Discharge (lb)
3/1	1.0	1.0	8.33
9/8	0.2	0.2	0.332

Annual Calculation:
8.33 lbs. + 0.332 lbs./2 days x 365 days/year = 1580.82 lbs/yr

Wastewater treatment can involve any or all of the following steps: chromium reduction, equalization, metals precipitation, flocculation, filtration or settling, neutralization, wastewater air stripping, and biological treatment.

Aerobic biological treatment can be used for wastewaters containing organic constituents that are biodegradable. The most common aerobic biological treatment technologies are activated sludge, powdered activated carbon treatment, aerated lagoon, trickling filter, and rotating biological contactor.

Estimating Releases and Other Waste Management Quantities. *Wastewater Discharges.* Wastewater discharges are generally estimated with monitoring data and measured flow rates. Even if few or old monitoring data are available, this often represents the best "readily available data."

Air Emissions. Air emissions from wastewater treatment plants could be estimated using one of several programs. One program is WATER8 (described in the box). Other programs are available commercially. Some wastewater treatment may take place in covered tanks. If this is the case, the TANKS 3 program may be appropriate to use.

Treatment for Destruction. "Treatment for destruction" includes acid or alkaline neutralization if the EPCRA Section 313 chemical is the entity that reacts with the acid or base. "Treatment for destruction" does not include: (1) neutralization of a waste stream containing EPCRA Section 313 chemicals if the chemicals themselves do not react with the acid or base (See 40 CFR §372.3), (2) preparation of a EPCRA Section 313 chemical for disposal, (3) removal of EPCRA Section 313 chemicals from waste streams, or (4) activities intended to render a waste stream more suitable for further use or processing, such as distillation or sedimentation. For example, neutralization of nitric acid is considered treatment for destruction.

Biological Treatment. In addition to the releases discussed above, several chemicals can be both treated for destruction and/or manufactured during biological treatment: nitrate compounds (water dissociable; in aqueous solution), ammonia, and sodium nitrate. If you have monitoring data concerning these chemicals at multiple points in the biological treatment process, you could estimate the quantity treated by the measured drop in concentration. Similarly, the quantity manufactured can be calculated based on an observed increase in concentration.

4.2.2 Solvent Recovery and Treatment Processes

Solvent recovery and waste treatment activities typically involve liquid waste streams. Depending on the specific type of waste stream received, the waste stream is directed for either waste treatment or some type of solvent recovery operation. Regardless of the specific type of waste stream, most waste streams will undergo some form of pretreatment step. Following the pretreatment step, these materials will then be directed to a recovery (e.g., distillation), incineration, or other treatment activity.

WATER8

A computer program, WATER8, is available for estimating the fate of organic compounds in various wastewater treatment units, including collection systems, aerated basins, and other units. WATER8 is written to run under DOS without the need to purchase other programs. WATER8 contains useful features such as the ability to link treatment units to form a treatment system, the ability for recycle among units, and the ability to generate and save site-specific compound properties. The WATER8 program and users manual can be downloaded from the world wide web at **http://www.epa.gov/ttn/chief/software.html#water8**.

4.2.2.1 Pretreatment Activities

As received for treatment or recovery, wastes may require pretreatment

to remove debris, adjust the pH, adjust BTU values, or remove excess waste prior to recovery. Potentially any solvent containing EPCRA Section 313 chemical(s) may undergo pretreatment prior to solvent recovery. A list of common EPCRA Section 313 chemicals commonly managed at solvent recovery facilities is found in Table 2-2. A number of pretreatment solvent recovery processes can cause releases. The general types of pretreatment and methods of estimating releases are summarized below.

Process Descriptions. Typical pretreatment processes include blending, neutralization, filtration/separation, decantation, and drying. Each of these processes is discussed below.

Blending - Prior to solvent recovery, solvents may be blended to modify the solvent viscosity or stabilize the solvent. Solvents are pumped to blend tanks where emulsifiers, surfactants, binders, and/or thickeners are added. From the blend tank, the product is pumped into either storage tanks or drums for shipment or solvent recovery. After each solvent batch, the blend tanks may be flushed to remove settling tank sludge and other residuals.

Neutralization - Some solvents may require pH adjustment prior to blending or insertion directly into the reclamation unit or prior to shipment of recovered product from the generator site. The waste solvent may be transferred to an accumulation tank and neutralized prior to being pumped into either storage tanks or drums for shipment from the generator site or placed into a recovery unit. After each solvent batch, the accumulation tanks typically need to be flushed to remove settling tank sludge and other residuals. The settled material may then be disposed on-site or transferred off-site for disposal.

Filtration/Separation - Solvent is sent through a semi-permeable membrane to separate debris and other organic compounds. Remaining solvent is pumped into either storage tanks or drums for shipment or solvent recovery. The filter and filtered material must be disposed on-site or transferred offsite for disposal.

Decantation - Decantation is the separation of desirable and undesirable phases in a liquid form. Depending upon the specific gravity of the desirable material (e.g., recovered solvent), the product may be drawn off the top of or withdrawn from the bottom of a tank.

Thermal Drying and Steam Drying - Thermal drying is a pretreatment technology applicable to solvent wastes having filterable solids content of approximately 40 percent or greater. Thermal drying removes both water and volatile organics from a solvent waste through evaporation. Several types of batch and continuous thermal dryers are available for this activity.

Estimating Releases And Other Waste Management Quantities. Most of the pretreatment processes described above are tank-based operations. Therefore, the methods discussed in Chapter 4.2.1 for estimating releases can be used. Three types of releases from pretreatment tanks are most common: air emissions, wastewater discharges (which are typically destined for wastewater treatment), and residuals disposal (typically destined for on- or off-site disposal).

Air Emissions. Unless your facility is monitoring air emissions on a regular basis, air emissions of EPCRA Section 313 chemicals are best measured with emissions estimates. As discussed in Chapter 4.2.1, the TANKS 3 program can be used to estimate air emissions from most of these processes. AP-42 also has information concerning air emissions from other units.

Wastewater Discharges. Pretreatment operations may have wastewaters discharges that are commonly treated in an on-site wastewater system. Depending on the type of discharge, the Clean Water Act usually requires monitoring of the wastewater. This information, if available, is the best source for estimating the quantity of EPCRA Section 313 chemicals in these wastes.

Residuals. Pretreatment processes must be periodically cleaned, often generating a residual or sludge that must be disposed. If the residual is the result of hazardous waste treatment, the RCRA program typically requires management of the residual as a hazardous waste. If this is the case, many facilities are required to obtain analytical data in compliance with their waste analysis plan, and this is likely to be their best source of information. If analysis data are unavailable, engineering calculations can be performed to identify the concentration of an EPCRA Section 313 chemical based on the operating efficiency of the pretreatment process.

4.2.2.2 Distillation Activities

Distillation is a form of separation or recovery that is applied to liquid solvent wastes where the desired product has a different boiling point than the other materials in the waste.

EPCRA Section 313 Chemicals. Below is a list of EPCRA Section 313 chemicals that are commonly processed in distillation activities.

aniline
benzene
n-butyl alcohol
carbon tetrachloride
chloroform
chlorobenzene
m-cresol
cyclohexane
CFC compounds
hexane
isobutyl acetate
methyl ethyl ketone
toluene
1,1,1-trichloroethane
trichloroethylene
xylene

Process Description. In the distillation operation heat is applied to liquid solvent wastes generating a vapor phase. Differences in volatility lead to separation. However, if the desired product has a similar boiling point to other contaminants, this recovery technology is not as effective. The treatment process may also manufacture some EPCRA Section 313 chemicals by converting compounds from the heat used in the process. The resultant recovered materials are typically methyl ethyl ketone, trichloroethylene, 1,1,1-trichloroethane, or toluene. Once recovered, these materials are typically sent to other facilities and considered processed, since the EPCRA Section 313 chemicals are essentially repackaged and distributed in commerce.

Estimating Releases And Other Waste Management Quantities. Distillation columns typically produce three different types of waste releases: stack air emissions through the vents, fugitive emissions from equipment leaks, and semi-solid residuals from still bottoms and distillation column cleaning.

Air Emissions. To estimate the quantity of EPCRA Section 313 chemicals released through air emissions from the vents, you should determine if your facility may have monitoring data available or prepared emission factors that are being used to comply with the Clean Air Act. If this information is not available, the distillation column could be modeled using one of a number of commercially available process simulation software programs. These programs typically use mass and energy balances in combination with vapor-liquid equilibrium data to determine the fate of chemicals fed to the column. If equipment leaks are not being monitored for fugitive emissions, releases can be estimated using published, chemical-specific emission factors, such as those in *AP-42*, as discussed in Chapter 4.2.1.

Residuals. The still bottoms generated will require further waste management. The non-condensible lights stream could be discharged to air. If this occurs, this light stream will be fed to an air pollution control device and the EPCRA Section 313 chemicals should be reported as a point-source emission (Part II, Section 5.2 of Form R). Another residual is formed when the distillation columns undergo periodic cleaning. This process generates sludges and wastewaters that require further waste management. If the cleaning residuals are hazardous, waste analysis data may be available. Otherwise, your facility may be required to calculate the concentration of the chemical using the parameters and efficiency of the distillation unit.

4.2.3 Solids Storage, Transfer and Disposal Operations

4.2.3.1 Disposal

In most circumstances involving the disposal of many EPCRA Section 313 chemicals, land disposal is regulated by RCRA and state regulations. In part II, Section 5.5, TRI is concerned with the total amount of the specified reportable EPCRA Section 313 chemical released to land, regardless of the potential for the chemical to leach from the disposed waste.

On-site disposal includes disposal in class I underground injection wells (Part II, Section 5.4.1 of Form R), class II-V underground injection wells (Part II, Section 5.4.2 of Form R), disposal in on-site RCRA Subtitle C landfills (Part II, Section 5.5.1A of Form R), disposal in other on-site landfills (Part II, Section 5.5.1B of Form R), disposal in a land treatment/application farming units (Part II, Section 5.5.2 of Form R), and disposal in a surface impoundments (Part II, Section 5.5.3 of Form R). Data concerning these types of "intentional" on-site disposal are usually available because facilities are required to monitor the quantity of waste and will have waste profiles that describes typical concentration ranges for waste constituents. In some cases, concentrations of constituents in waste are required to be measured at the facilities prior to disposal. If on-site waste treatment occurs prior to on-site land disposal, the treatment efficiency and a mass balance can be conducted to determine the quantity of a chemical that is land disposed. For example, if a facility can determine the amount of an EPCRA Section 313 chemical present in the untreated waste, determine the efficiency of treatment in removing or destroying the chemical in the waste, and account for other releases (i.e., fugitive emissions, leaks, spills, accidental releases, losses to air pollution control devices, etc.), then the facility can assume that the

remainder is the quantity of the chemical land disposed.

Releases to land on-site/other disposal (Part II, Section 5.5.4 of Form R) includes the amount of chemical released to land on site not covered by any of the above categories and include spills, leaks, or "unintentional" disposal, such as metal dust that is deposited onto soil. Incident logs or spill reports can provide useful information.

CHEMDAT8

Analytical models have been developed to estimate emissions of organic compounds via various pathways from wastewater and waste management units. Some of these models have been assembled into a spreadsheet called CHEMDAT8 for use on a PC. A user's guide for CHEMDAT8 is also available. Area emission sources for which models are included in the spreadsheet are as follows: nonaerated impoundments, which include surface impoundments and open top wastewater treatment tanks; aerated impoundments, which include aerated surface impoundments and aerated WWT tanks; disposal impoundments, which include nonaerated disposal impoundments; land treatment; and landfills. These models can be used to estimate the magnitude of site air emissions for regulatory purposes. The CHEMDAT8 program and manual can be downloaded from the world wide web at http://www.epa.gov/ttn/chief/software.html#water8.

4.2.3.2 Solids

A waste stabilization process includes mixing the hazardous waste with binders or other materials and curing the resulting hazardous waste and binder mixture. Other synonymous terms used to refer to this process are "stabilization," "waste fixation," or "waste solidification." (See 40 CFR §372.3.)

Process Description. RCRA Subtitle C TSDs receive solid wastes from off-site; however both TSDs and solvent recovery facilities operate processes that generate solid waste. Examples of solid wastes requiring management include wastes from off-site, ash from incineration (or any waste destruction treatment), sludges from wastewater treatment units, or sludges from solvent recovery units. These wastes may be stored, transferred, dewatered, stabilized, and disposed. Stabilization and solidification involve immobilizing leachable metals in a waste through the addition of stabilizing agents and other chemicals. Sludge dewatering, commonly applied to waste sludges such as clarifier solids, is the separation of particles from a mixture on a filter medium. The process generates a relatively dry dewatered solid and removes liquids that typically require further treatment.

Any non-exempt releases to the land must be accounted on Form R. In most circumstances involving the disposal of EPCRA Section 313 chemicals, land disposal is regulated by RCRA and state regulations. In Part II, Section 5.5 of Form R, the total quantity of the specified EPCRA Section 313 chemical released to land must be reported, regardless of the potential for the chemical to leach from the disposed waste.

Note that you must report the ultimate disposition of an EPCRA Section 313 chemical in the reporting year. In other words, you may need to consider any cross-media transfers that may result from land disposal. If a waste has been disposed in a land disposal unit, but a portion of that waste volatilizes into the air during the reporting year, or a portion of that waste discharges to a surface water, those releases must be reported separately from the release to land. For

example, if you dispose 2,000,000 pounds of benzene in a RCRA Subtitle C landfill, but 1,500,000 pounds volatilizes into the air within the reporting year, you would report on the Form R that 500,000 pounds of benzene was released to a RCRA Subtitle C landfill (Part II, Section 5.5.1A) and 1,500,000 pounds of benzene was released as an fugitive air emission (Part II, Section 5.1).

Estimating Releases and Waste Management Quantities.

Air Emissions. Volatile chemicals can evaporate from solid waste and non-volatile chemicals can be released to the air via particulate emissions. One tool that can be used to estimate emissions is CHEMDAT8 (See box.)

Land disposal of waste will result in air emissions over the course of the reporting year. Additionally, waste previously disposed of in landfills will also generate emissions. However, only those amount released to air estimated within the reporting year for waste disposed within the reporting year need to be partitioned by media. The facility is not responsible for cross-media transfer that may result in subsequent years for materials that have been previously disposed and are not disturbed. For municipal landfills, certain regulations such as the Clean Air Act New Source Performance Standards may require facilities to maintain monitoring for certain chemicals. However, there are no air standards for hazardous waste landfills at this time, so monitoring for different EPCRA Section 313 chemicals to the air will depend on individual state and local standards. The document *RCRA Facility Assessment Guidance,* Volume 3 provides guidance on how to assess releases to air (or water) from hazardous waste landfills. Facilities should be aware that only those releases that take place as a result of disposal during the reporting year should be considered, rather than quantities that may be released as a result of prior year activities.

Wastewater. Wastewater containing EPCRA Section 313 chemicals can be generated from several solid waste management operations:

- Landfills and waste storage generate leachate.
- Dewatering; and
- Storm water.

These wastewaters will generally be treated in an on-site waste treatment system, which is discussed in Chapter 4.2.2 of this document.

Discharges to Surface Water. If there are any releases of an EPCRA Section 313 chemical to the surface water in the same reporting year as the original disposal, those releases must be partitioned to surface water estimates. However, a release of leachate from a landfill to surrounding soil or groundwater is not considered a cross-media transfer because the action does not constitute a shift in media (i.e., it remains in land). RCRA regulations require groundwater monitoring and release detection. While this information will not provide quantities for releases to surface water, it will be an indicator that a release has occurred. The document *RCRA Facility Assessment Guidance,* Volume 3 provides guidance on how to assess releases to water (or air)

from hazardous waste landfills.

Example - Release from Land Disposal

A manufacturing facility otherwise used benzene in excess of a reporting threshold during each of reporting years 1995 and 1996. In 1995, the facility generated wastes containing benzene and placed these wastes in an on-site lagoon. The benzene in this waste was reported as a release to land on the Form R for reporting year 1995. In 1996, benzene from the sludge from an on-site lagoon was transferred to an on-site landfill. During both the original placement in the lagoon and the subsequent transfer to the landfill, benzene was released to air as a result of the transfer of the sludge from the lagoon to the landfill. For the purpose of reporting under EPCRA Section 313, does the owner/operator need to report releases to an on-site landfill and/or fugitive air emissions of benzene on the Form R?

The facility should not have reported all of the benzene which was transferred to the on-site lagoon as a release to land. The majority of the benzene will evaporate. The purpose of sending a waste to a lagoon is so that the volatiles (in this case benzene) will evaporate and the solids will settle. The facility should have determined, to the best of its ability, what percentage of the benzene would evaporate during that reporting year. It should have reported this amount as a fugitive air emission. The balance should have been reported as a release to land. Both the amount reported as a fugitive air emission and the amount reported as a release to land should have been reported for 1995, the year when the wastes containing the benzene were placed in the on-site lagoon. When completing the Form R for benzene for reporting year 1996, the facility would not report as a release to land any benzene in sludge that was transferred from the on-site lagoon to the on-site landfill as this material was already reported as a release to land on the Form R for the previous year. However, the facility must report on the Form R for benzene for reporting year 1996 any air emission of benzene that occurred as a result of transferring the sludge from the on-site lagoon to the on-site landfill if the facility met the threshold for benzene.

APPENDIX A
REPORTING GUIDANCE DOCUMENTS

General Guidance

Air/Superfund National Technology Guidance Study Series, no date.
Internet Availability: None
Hardcopy Availability: NTIS
Order Number: PB96-162-490

Chemicals in Your Community: A Guide to the Emergency Planning and Community Right-To-Know Act, 1993.
Internet Availability: http://www.epa.gov/swercepp/gen-pubs.html
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-550-K-93-003

Common Synonyms for Chemicals Listed Under Section 313 of the Emergency Planning and Community Right-To-Know Act, March 1995.
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-R-95-008

Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act and Section 112(r) of the Clean Air Act, as amended (Title III List of Lists), November 1998.
Internet Availability: http://www.epa.gov/swercepp/gen-pubs.html
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-550-B-98-017

The Emergency Planning and Community Right-to-Know Act: Section 313 Release Reporting Requirements, December 1997 (brochure).
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-K-97-002

EPCRA Section 313 Questions & Answers, Revised 1998 Version, December 1998.
Internet Availability: http://www.epa.gov/opptintr/tri
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-B-99-004

Executive Order 12856 - Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements: Questions and Answers.
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-R-95-011

Interpretations of Waste Management Activities: Recycling, Combustion for Energy Recovery, Treatment for Destruction, Waste Stabilization and Release, April 1997.
Internet Availability: None
Hardcopy Availability: EPCRA Hotline
Order Number: No order number

Standard Industrial Classification Manual, 1987.
Internet Availability: None (see http://www.epa.gov/tdbnrmrl/help/l_help7.htm for codes)
Hardcopy Availability: NTIS
Order Number: PB-87-100-012

Supplier Notification Requirements
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-560-4-91-006

Toxic Chemical Release Inventory Reporting Forms and Instructions (TRI Forms and Reporting Requirements), March 23, 1998
Internet Availability: http://www.epa.gov/opptintr/tri
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-K-98-001

Toxic Chemical Release Reporting; Community Right-to-Know; Final Rule, February 16, 1988 (53 FR 4500).
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: None

Trade Secrets Rule and Form, July 29, 1988 (53 FR 28772).
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: None

Waste Analysis at Facilities That Generate, Treat, Store, and Dispose of Hazardous Wastes; A Guidance Manual, April 26, 1994.
Internet Availability: http://es.epa.gov/oeca/ore/red/wap330.pdf
Hardcopy Availability: NTIS
Order Number: PB94-963-603

Chemical-Specific Guidance

Emergency Planning and Community Right-to-Know Section 313: Guidance for Reporting Aqueous Ammonia, July 1995.
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-R-95-012

Emergency Planning and Community Right-to-Know Section 313: List of Toxic Chemicals Within the Chlorophenols Category, November 1994.
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-B-95-004

Emergency Planning and Community Right-to-Know Section 313: List of Toxic Chemicals, September 1996.
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-B-96-002

Guidance for Reporting Sulfuric Acid Aerosols (acid aerosols, including mists, vapors, gas, fog, and other airborne forms of any particle size), March 1998 Revision
Internet Availability: http://www.epa.gov/opptintr/tri
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-R-97-007

List of Toxic Chemicals within the Water Dissociable Nitrate Compounds Category and Guidance for Reporting, May 1996.
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-R-96-004

Toxics Release Inventory: List of Toxic Chemicals Within the Glycol Ethers Category and Guidance for Reporting, May 1995.
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-R-95-006

Toxics Release Inventory: List of Toxic Chemicals Within the Nicotine and Salts Category and Guidance for Reporting, February 1995.
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-R-95-004

Toxics Release Inventory: List of Toxic Chemicals Within the Polychlorinatd Alkanes Category and Guidance for Reporting, February 1995.
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-R-95-001

Toxics Release Inventory: List of Toxic Chemicals Within the Polycyclic Aromatics Compounds Category, February 1995.
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-R-95-003

Toxics Release Inventory: List of Toxic Chemicals Within the Strychnine and Salts Category and Guidance for Reporting, February 1995.
Internet Availability: None
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-R-95-005

Release Estimation Guidance

General

Data Quality Checks to Prevent Common Reporting Errors on Form R/Form A, August 1998.
Internet Availability: http://www.epa.gov/opptintr/tri
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-745-R-98-012

Estimating Releases and Waste Treatment Efficiencies for the Toxic Chemical Release Inventory Form, December 1987.
Internet Availability: http://www.epa.gov/opptintr/tri
Hardcopy Availability: NCEPI or EPCRA Hotline
Order Number: EPA-560-4-88-002

Releases During Cleaning of Equipment, June 30, 1986.
Internet Availability: None
Hardcopy Availability: Prepared by PEI Associates, Inc. for the U.S. Environmental Protection Agency, Office of Prevention, Pesticides & Toxic Substances, Washington, DC, Contract Bo.
Order Number: 68-02-4248

Air

Chemdat 8/Water 8: Air Emission Models for Waste and Wastewater (for Microcomputers), 1994
Internet Availability: http://www.epa.gov/ttn/chief/software.html#water8
Hardcopy Availability: NTIS
Order Number: PB95-503595

Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, 5th Edition (AP-42).
Internet Availability: http://www.epa.gov/ttn/chief/ap42.html
Hardcopy Availability: NCEPI
Order Number: EPA-450-AP-425ED

Protocol for Equipment Leak Emission Estimates, 1987.
Internet Availability: http://www.epa.gov/ttnchie1/fyi.html
Hardcopy Availability: NCEPI
Order Number: EPA-423-R-95-017

Tanks 3: Tanks: Storage Tank Emission Estimation Software, Version 3.0 (for Microcomputers), March 1996
Internet Availability: http://www.epa.gov/ttn/chief/tanks.html
Hardcopy Availability: NTIS
Order Number: PB97-500-755

Water

Chemdat 8/Water 8: Air Emission Models for Waste and Wastewater (for Microcomputers), 1994
Internet Availability: http://www.epa.gov/ttn/chief/software.html#water8
Hardcopy Availability: NTIS
Order Number: PB95-503595

Information and Document Distribution Centers

Enviroene Information Network
BBS modem: (703) 908-2092
User Support: (703) 908-2007
Internet Home Page: http://es.epa/gov/index.html

National Center for Environmental Publications and Information (NCEPI)
P.O. Box 42419
Cincinnati, OH 45242
(800) 490-9198
(513) 489-8695 (fax)
Internet Home Page: http://www.epa.gov/ncepihom/index.html

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22151
(800) 553-6847
(703) 605-6900 (fax)
Internet Home Page: http://www.ntis.gov

OPPT Pollution Prevention (P2)
Internet Home Page: http://www.epa.gov/opptintr/p2home/index.html

Pollution Prevention Information Clearinghouse (PPIC)
Mail Code 3404
401 M Street, SW
Washington, DC
(202) 260-1023
(202) 260-0178 (fax)

RCRA, Superfund & EPCRA Hotline
(800) 424-9346 (outside the Washington, DC Area)
(703) 412-9810 (inside the Washington, DC Area)
TDD: (800) 553-7672 (outside the Washington, DC Area)
(703) 412-3323 (inside the Washington, DC Area)

RTK-Net
1742 Connecticut Avenue, NW
Washington, DC 20009-1146
(202) 797-7200
Internet Home Page: http://www.rtknet.org

Technology Transfer Network (TTN)

(919) 541-5384 (Help Desk)
Internet Home Page: http://www.epa.gov/ttn

EPA Toxic Release Inventory General Information and Guidance
Internet Home Page: http://www.epa.gov/opptintr/tri

U.S. Government Printing Office (GPO)
(202) 512-1800
(202) 512-2250 (fax)
Internet Availability: http://www.gpo.gov

*For the latest list of industry-specific and other technical guidance documents, please refer to the latest version of the *Toxic Chemical Release Inventory Reporting Forms and Instructions, Appendix H.*

APPENDIX B
ALPHABETICAL LIST OF TOXIC CHEMICALS

CAS No.	CHEMICAL NAME	De Minimis Conc	Appx VIII	RCRA UTS	RCRA Code
4080-31-3	1-(3-Chloroallyl)-3,5,7-triaza-1-azoniaadamantane chloride	1.0			
354-11-0	1,1,1,2-Tetrachloro-2-fluoroethane (HCFC-121a)	1.0			
630-20-6	1,1,1,2-tetrachloroethane	1.0	X	X	U208
71-55-6	1,1,1-Trichloroethane (Methyl chloroform)	1.0	X	X	U226
354-14-3	1,1,2,2-Tetrachloro-1-fluoroethane (HCFC-121)	1.0			
79-34-5	1,1,2,2-Tetrachloroethane	1.0	X	X	U209
79-00-5	1,1,2-Trichloroethane	1.0	X	X	U227
13474-88-9	1,1-Dichloro-1,2,2,3,3-pentafluoropropane (HCFC-225cc)	1.0			
812-04-4	1,1-Dichloro-1,2,2-trifluoroethane (HCFC-123b)	1.0			
111512-56-2	1,1-Dichloro-1,2,3,3,3-pentafluoropropane (HCFC-225eb)	1.0			
1717-00-6	1,1-Dichloro-1-fluoroethane (HCFC-141b)	1.0			
57-14-7	1,1-Dimethyl hydrazine	0.1	X		U098
96-18-4	1,2,3-Trichloropropane	0.1	X	X	
120-82-1	1,2,4-Trichlorobenzene	1.0	X	X	
95-63-6	1,2,4-Trimethylbenzene	1.0			
106-88-7	1,2-Butylene oxide	1.0			
96-12-8	1,2-Dibromo-3-chloropropane (DBCP)	0.1	X	X	U066
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.1	X	X	U067
422-44-6	1,2-Dichloro-1,1,2,3,3-pentafluoropropane (HCFC-225bb)	1.0			
354-23-4	1,2-Dichloro-1,1,2-trifluoroethane (HCFC-123a)	1.0			
431-86-7	1,2-Dichloro-1,1,3,3,3-pentafluoropropane (HCFC-225da)	1.0			
1649-08-7	1,2-Dichloro-1,1-difluoroethane (HCFC-132b)	1.0			
95-50-1	1,2-Dichlorobenzene	1.0	X	X	U070
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	0.1	X	X	U077
540-59-0	1,2-Dichloroethylene	1.0			
78-87-5	1,2-Dichloropropane	1.0	X	X	U083
122-66-7	1,2-Diphenylhydrazine (Hydrazobenzene)	0.1	X	X	U109
95-54-5	1,2-Phenylenediamine	1.0		X	
615-28-1	1,2-Phenylenediamine dihydrochloride	1.0			
106-99-0	1,3-Butadiene	0.1			
507-55-1	1,3-Dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb)	1.0			
136013-79-1	1,3-Dichloro-1,1,2,3,3-pentafluoropropane (HCFC-225ea)	1.0			
541-73-1	1,3-Dichlorobenzene	1.0	X	X	U071
542-75-6	1,3-Dichloropropylene	0.1	X		U084
108-45-2	1,3-Phenylenediamine	1.0			
764-41-0	1,4-Dichloro-2-butene	1.0	X		U074
106-46-7	1,4-Dichlorobenzene	0.1	X	X	U072
123-91-1	1,4-Dioxane	0.1	X	X	U108
624-18-0	1,4-Phenylenediamine dihydrochloride	1.0			
82-28-0	1-Amino-2-methylanthraquinone	0.1			
35691-65-7	1-Bromo-1-(bromomethyl)-1,3-propanedicarbonitrile	1.0			
354-25-6	1-Chloro-1,1,2,2-tetrafluoroethane (HCFC-124a)	1.0			
75-68-3	1-Chloro-1,1-difluoroethane (HCFC-142b)	1			

CAS No.	CHEMICAL NAME	De Minimis Conc	Appx VIII	RCRA UTS	RCRA Code
128903-21-9	2,2-Dichloro-1,1,1,3,3-pentafluoropropane (HCFC-225aa)	1.0			
306-83-2	2,2-Dichloro-1,1,1-trifluoroethane (HCFC-123)	1.0			
2655-15-4	2,3,5-Trimethylphenyl methylcarbamate	1.0			
422-48-0	2,3-Dichloro-1,1,1,2,3-pentafluoropropane (HCFC-225ba)	1.0			
78-88-6	2,3-Dichloropropene	1.0			
95-95-4	2,4,5-Trichlorophenol	1.0	X	X	
88-06-2	2,4,6-Trichlorophenol	0.1	X	X	
94-75-7	2,4-D [Acetic acid, (2,4-dichloro-phenoxy)-]	1.0	X	X	U240
53404-37-8	2,4-D 2-ethyl-4-methylpentyl ester	0.1			
1928-43-4	2,4-D 2-ethylhexyl ester	0.1			
1929-73-3	2,4-D butoxyethyl ester	0.1			
94-80-4	2,4-D butyl ester	0.1			
2971-38-2	2,4-D chlorocrotyl ester	0.1			
94-11-1	2,4-D isopropyl ester	0.1			
1320-18-9	2,4-D propylene glycol butyl ether ester	0.1			
2702-72-9	2,4-D sodium salt	0.1			
94-82-6	2,4-DB	1.0			
615-05-4	2,4-Diaminoanisole	0.1			
39156-41-7	2,4-Diaminoanisole sulfate	0.1			
95-80-7	2,4-Diaminotoluene	0.1	X		
120-83-2	2,4-Dichlorophenol	1.0	X	X	U081
105-67-9	2,4-Dimethylphenol	1.0	X	X	U101
51-28-5	2,4-Dinitrophenol	1.0	X	X	P048
121-14-2	2,4-Dinitrotoluene	1.0	X	X	U105
541-53-7	2,4-Dithiobiuret	1.0	X		P049
120-36-5	2,4-DP	0.1			
606-20-2	2,6-Dinitrotoluene	1.0	X	X	U106
87-62-7	2,6-Xylidine	0.1			
53-96-3	2-Acetylaminofluorene	0.1	X	X	U005
117-79-3	2-Aminoanthraquinone	0.1			
2837-89-0	2-Chloro-1,1,1,2-tetrafluoroethane (HCFC-124)	0.1			
75-88-7	2-Chloro-1,1,1-trifluoroethane (HCFC-133a)	1.0			
532-27-4	2-Chloroacetophenone	1.0			
110-80-5	2-Ethoxyethanol	1.0	X		U359
149-30-4	2-Mercaptobenzothiazole (MBT)	1.0			
109-86-4	2-Methoxyethanol	1.0			
75-86-5	2-Methyllactonitrile	1.0	X		P069
109-06-8	2-Methylpyridine	1.0	X		U191
88-75-5	2-Nitrophenol	1.0		X	
79-46-9	2-Nitropropane	0.1	X		U171
90-43-7	2-Phenylphenol	1.0			
422-56-0	3,3-Dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca)	1.0			
91-94-1	3,3'-Dichlorobenzidine	0.1	X		U073
612-83-9	3,3'-Dichlorobenzidine dihydrochloride	0.1			
64969-34-2	3,3'-Dichlorobenzidine sulfate	0.1			
119-90-4	3,3'-Dimethoxybenzidine	0.1	X		U091
20325-40-0	3,3'-Dimethoxybenzidine dihydrochloride (o-Dianisidine dihydrochloride)	0.1			
111984-09-9	3,3'-Dimethoxybenzidine hydrochloride (o-Dianisidine hydrochloride)	0.1			
119-93-7	3,3'-Dimethylbenzidine (o-Tolidine)	0.1	X		U095

CAS No.	CHEMICAL NAME	De Minimis Conc	Appx VIII	RCRA UTS	RCRA Code
612-82-8	3,3'-Dimethylbenzidine dihydrochloride (o-Tolidine dihydrochloride)	0.1			
41766-75-0	3,3'-Dimethylbenzidine dihydrofluoride (o-Tolidine dihydrofluoride)	0.1			
460-35-5	3-Chloro-1,1,1-trifluoropropane (HCFC-253fb)	1.0			
563-47-3	3-Chloro-2-methyl-1-propene	0.1			
542-76-7	3-Chloropropionitrile	1.0	X		P027
55406-53-6	3-Iodo-2-propynyl butylcarbamate	1.0	X	X	
101-80-4	4,4'-Diaminodiphenyl ether	0.1			
80-05-7	4,4'-Isopropylidenediphenol	1.0			
101-14-4	4,4'-Methylenebis(2-chloroaniline) (MBOCA)	0.1	X	X	U158
101-61-1	4,4'-Methylenebis(N,N-dimethyl)benzenamine	0.1			
101-77-9	4,4'-Methylenedianiline	0.1			
139-65-1	4,4'-Thiodianiline	0.1			
534-52-1	4,6-Dinitro-o-cresol	1.0	X	X	P047
60-09-3	4-Aminoazobenzene	0.1			
92-67-1	4-Aminobiphenyl	0.1	X	X	
60-11-7	4-Dimethylaminoazobenzene	0.1	X	X	U093
92-93-3	4-Nitrobiphenyl	0.1			
100-02-7	4-Nitrophenol	1	X	X	U170
99-59-2	5-Nitro-o-anisidine	1.0			
99-55-8	5-Nitro-o-toluidine	1.0	X	X	U181
71751-41-2	Abamectin [Avermectin B1]	1.0			
30560-19-1	Acephate (Acetylphosphoramidothioic acid O,S-dimethyl ester)	1.0			
75-07-0	Acetaldehyde	0.1			U001
60-35-5	Acetamide	0.1			
75-05-8	Acetonitrile	1.0	X	X	U003
98-86-2	Acetophenone	1.0	X		U004
62476-59-9	Acifluorfen, sodium salt [5-(2-Chloro-4-(trifluoromethyl)phenoxy)-2-nitrobenzoic acid, sodium salt]	1.0			
107-02-8	Acrolein	1.0	X	X	P003
79-06-1	Acrylamide	0.1	X	X	U007
79-10-7	Acrylic acid	1.0			U008
107-13-1	Acrylonitrile	0.1	X	X	U009
15972-60-8	Alachlor	1.0			
116-06-3	Aldicarb	1.0	X		P070
309-00-2	Aldrin [1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-(1.alpha.,4.alpha.,4a.beta.,5.alpha.,8.alpha.,8a.beta.)-]	1.0	X		P004
107-18-6	Allyl alcohol	1.0	X		P005
107-05-1	Allyl chloride	1.0	X	X	
107-11-9	Allylamine	1.0			
319-84-6	alpha-Hexachlorocyclohexane	1.0		X	
134-32-7	alpha-Naphthylamine	0.1	X		U167
7429-90-5	Aluminum (fume or dust)	1.0			
1344-28-1	Aluminum oxide (fibrous form)	1.0			
20859-73-8	Aluminum phosphide	1.0	X		P006
834-12-8	Ametryn (N-Ethyl-N'-(1-methylethyl)-6-(methylthio)-1,3,5,-triazine-2,4-diamine)	1.0			
33089-61-1	Amitraz	1.0			
61-82-5	Amitrole	0.1	X		U011
7664-41-7	Ammonia	1.0			

CAS No.	CHEMICAL NAME	De Minimis Conc	Appx VIII	RCRA UTS	RCRA Code
101-05-3	Anilazine [4,6-Dichloro-N-(2-chlorophenyl)-1,3,5-triazin-2-amine]	1.0			
62-53-3	Aniline	1.0	X	X	U012
120-12-7	Anthracene	1.0		X	
7440-36-0	Antimony	1.0	X	X	
7440-38-2	Arsenic	0.1	X	X	
1332-21-4	Asbestos (friable)	0.1			
1912-24-9	Atrazine (6-Chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine)	0.1			
7440-39-3	Barium	1.0	X	X	
22781-23-3	Bendiocarb [2,2-Dimethyl-1,3-benzodioxol-4-ol methylcarbamate]	1.0	X	X	
1861-40-1	Benfluralin (N-Butyl-N-ethyl-2,6-dinitro-4-(trifluoromethyl) benzenamine)	1.0			
17804-35-2	Benomyl	1.0	X	X	
56-55-3	Benz(a)anthracene				U018
98-87-3	Benzal chloride	1.0	X	X	U017
55-21-0	Benzamide	1.0			
71-43-2	Benzene	0.1	X	X	U019
92-87-5	Benzidine	0.1	X		U021
218-01-9	Benzo(a)phenanthrene				
50-32-8	Benzo(a)pyrene				U022
205-99-2	Benzo(b)fluoranthene				
205-82-3	Benzo(j)fluoranthene				
207-08-9	Benzo(k)fluoranthene				
189-55-9	Benzo(rst)pentaphene				U064
98-07-7	Benzoic trichloride (Benzotrichloride)		X		U023
98-88-4	Benzoyl chloride	1.0			
94-36-0	Benzoyl peroxide	1.0			
100-44-7	Benzyl chloride	1.0	X		P028
7440-41-7	Beryllium	0.1	X	X	P015
91-59-8	beta-Naphthylamine	0.1	X	X	U168
57-57-8	beta-Propiolactone	0.1			
82657-04-3	Bifenthrin	1.0			
92-52-4	Biphenyl	1.0			
108-60-1	Bis(2-chloro-1-methylethyl)ether	1.0	X		U027
111-91-1	Bis(2-chloroethoxy) methane	1.0	X	X	U024
111-44-4	Bis(2-chloroethyl) ether	1.0	X	X	U025
103-23-1	Bis(2-ethylhexyl) adipate				
542-88-1	Bis(chloromethyl) ether	0.1	X		P016
56-35-9	Bis(tributyltin) oxide	1.0			
10294-34-5	Boron trichloride	1.0			
7637-07-2	Boron trifluoride	1.0			
314-40-9	Bromacil (5-Bromo-6-methyl-3-(1-methylpropyl)-2,4-(1H,3H)-pyrimidinedione)	1.0			
53404-19-6	Bromacil, lithium salt (2,4-(1H,3H)-Pyrimidinedione, 5-bromo-6-methyl-3 (1-methylpropyl), lithium salt)	1.0			
7726-95-6	Bromine	1.0			
353-59-3	Bromochlorodifluoromethane (Halon 1211)	1.0			
75-25-2	Bromoform (Tribromomethane)	1.0	X	X	U225
74-83-9	Bromomethane (Methyl bromide)	1.0	X	X	U029
75-63-8	Bromotrifluoromethane (Halon 1301)	1.0			
1689-84-5	Bromoxynil (3,5-Dibromo-4-hydroxybenzonitrile)	1.0			

CAS No.	CHEMICAL NAME	De Minimis Conc	Appx VIII	RCRA UTS	RCRA Code
1689-99-2	Bromoxynil octanoate (Octanoic acid, 2,6-dibromo-4-cyanophenyl ester)	1.0			
357-57-3	Brucine	1.0	X		P018
141-32-2	Butyl acrylate	1.0			
123-72-8	Butyraldehyde	1.0			
4680-78-8	C.I. Acid Green 3	1.0			
6459-94-5	C.I. Acid Red 114	0.1			
569-64-2	C.I. Basic Green 4	1.0			
989-38-8	C.I. Basic Red 1	1.0			
1937-37-7	C.I. Direct Black 38	0.1			
28407-37-6	C.I. Direct Blue 218	0.1			
2602-46-2	C.I. Direct Blue 6	0.1			
16071-86-6	C.I. Direct Brown 95	0.1			
2832-40-8	C.I. Disperse Yellow 3	1.0			
81-88-9	C.I. Food Red 15	1.0			
3761-53-3	C.I. Food Red 5	0.1			
3118-97-6	C.I. Solvent Orange 7	1.0			
842-07-9	C.I. Solvent Yellow 14	1.0			
97-56-3	C.I. Solvent Yellow 3	1.0			
492-80-8	C.I. Solvent Yellow 34 (Auramine)	0.1	X		U014
128-66-5	C.I. Vat Yellow 4	1.0			
7440-43-9	Cadmium	0.1	X	X	
156-62-7	Calcium cyanamide	1.0			
133-06-2	Captan [1H-Isoindole-1,3(2H)-dione, 3a,4,7,7a-tetrahydro-2-[(trichloromethyl)thio]-]	1.0			
63-25-2	Carbaryl [1-Naphthalenol, methylcarbamate]	1.0	X	X	
1563-66-2	Carbofuran	1.0	X	X	
75-15-0	Carbon disulfide	1.0	X	X	P022
56-23-5	Carbon tetrachloride	0.1	X	X	U211
463-58-1	Carbonyl sulfide	1.0			
5234-68-4	Carboxin (5,6-Dihydro-2-methyl-N-phenyl-1,4-oxathiin-3-carboxamide)	1.0			
120-80-9	Catechol	1.0			
2439-01-2	Chinomethionat (6-Methyl-1,3-dithiolo[4,5-b]quinoxalin-2-one)	1.0			
133-90-4	Chloramben [Benzoic acid, 3-amino-2,5-dichloro-]	1.0			
57-74-9	Chlordane [4,7-Methanoindan, 1,2,3,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-]	0.1	X	X	U036
115-28-6	Chlorendic acid	0.1			
90982-32-4	Chlorimuron ethyl (Ethyl-2-[[[(4-chloro-6-methoxyprimidin-2-yl)-carbonyl]-amino]sulfonyl]benzoate)	1.0			
7782-50-5	Chlorine	1.0			
10049-04-4	Chlorine dioxide	1.0			
79-11-8	Chloroacetic acid	1.0			
108-90-7	Chlorobenzene	1.0	X	X	U037
510-15-6	Chlorobenzilate [Benzeneacetic acid,4-chloro-.alpha.-(4-chlorophenyl)-.alpha.-hydroxy-, ethyl ester]	1.0	X	X	
75-45-6	Chlorodifluoromethane (HCFC-22)	1.0			
75-00-3	Chloroethane (Ethyl chloride)	1.0		X	
67-66-3	Chloroform	0.1	X	X	U044
74-87-3	Chloromethane (Methyl chloride)	1.0	X	X	U045
107-30-2	Chloromethyl methyl ether	0.1	X		U046
76-06-2	Chloropicrin	1.0			

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126-99-8	Chloroprene	1.0	X	X	U210
63938-10-3	Chlorotetrafluoroethane	1.0			
1897-45-6	Chlorothalonil [1,3-Benzenedicarbonitrile, 2,4,5,6-tetrachloro-]	1.0			
75-72-9	Chlorotrifluoromethane (CFC-13)	1.0			
5598-13-0	Chlorpyrifos methyl (O,O-Dimethyl-O-(3,5,6-trichloro-2-pyridyl)phosphorothioate)	1.0			
64902-72-3	Chlorsulfuron (2-Chloro-N-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]benzenesulfonamide)	1.0			
7440-47-3	Chromium	0.1	X	X	
7440-48-4	Cobalt	0.1			
7440-50-8	Copper	1.0			
8001-58-9	Creosote	0.1			U051
1319-77-3	Cresol (mixed isomers)	1.0	X		U052
4170-30-3	Crotonaldehyde	1.0	X		U053
98-82-8	Cumene	1.0			U055
80-15-9	Cumene hydroperoxide	1.0			U096
135-20-6	Cupferron [Benzeneamine, N-hydroxy-N-nitroso, ammonium salt]	0.1			
21725-46-2	Cyanazine	1.0			
1134-23-2	Cycloate	1.0	X	X	
110-82-7	Cyclohexane	1.0			U056
108-93-0	Cyclohexanol	1.0			
68359-37-5	Cyfluthrin (3-(2,2-Dichloroethenyl)-2,2-dimethylcyclopropanecarboxylic acid, cyano(4-fluoro-3-phenoxyphenyl)methyl ester)	1.0			
68085-85-8	Cyhalothrin (3-(2-Chloro-3,3,3-trifluoro-1-propenyl)-2,2-Dimethylcyclopropanecarboxylic acid cyano(3-phenoxyphenyl) methyl ester)	1.0			
28057-48-9	d-trans-Allethrin [d-trans-Chrysanthemic acid of d-allethrone]	1.0			
533-74-4	Dazomet (Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione)	1.0	X		
53404-60-7	Dazomet, sodium salt (Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione, ion(1-), sodium)	1.0			
1163-19-5	Decabromodiphenyl oxide	1.0			
13684-56-5	Desmedipham	1.0			
117-81-7	Di(2-ethylhexyl) phthalate (DEHP)	0.1	X	X	U028
2303-16-4	Diallate [Carbamothioic acid, bis(1-methylethyl)-S-(2,3-dichloro-2-propenyl)ester]	1.0	X		U062
25376-45-8	Diaminotoluene (mixed isomers)	0.1	X		U221
333-41-5	Diazinon	1.0			
334-88-3	Diazomethane	1.0			
226-36-8	Dibenz(a,h)acridine				
224-42-0	Dibenz(a,j)acridine				
5385-75-1	Dibenzo(a,e)fluoranthene	1.0			
192-65-4	Dibenzo(a,e)pyrene				
53-70-3	Dibenzo(a,h)anthracene				U063
189-64-0	Dibenzo(a,h)pyrene				
191-30-0	Dibenzo(a,l)pyrene				
132-64-9	Dibenzofuran	1.0			
124-73-2	Dibromotetrafluoroethane (Halon 2402)	1.0			
84-74-2	Dibutyl phthalate	1.0	X	X	U069
1918-00-9	Dicamba (3,6-Dichloro-2-methyoxybenzoic acid)	1.0			

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99-30-9	Dichloran (2,6-Dichloro-4-nitroaniline)	1.0			
90454-18-5	Dichloro-1,1,2-trifluoroethane	1.0			
25321-22-6	Dichlorobenzene (mixed isomers)	0.1	X		
75-27-4	Dichlorobromomethane	1.0		X	
75-71-8	Dichlorodifluoromethane (CFC-12)	1.0	X	X	U075
75-43-4	Dichlorofluoromethane (HCFC-21)	1.0			
75-09-2	Dichloromethane (Methylene chloride)	0.1	X	X	U080
127564-92-5	Dichloropentafluoropropane	1.0			
97-23-4	Dichlorophene (2,2'-Methylenebis(4-chlorophenol)	1.0			
76-14-2	Dichlorotetrafluoroethane (CFC-114)	1.0			
34077-87-7	Dichlorotrifluoroethane	1.0			
62-73-7	Dichlorvos [Phosphoric acid, 2-dichloroethenyl dimethyl ester]	0.1			
51338-27-3	Diclofop methyl (2-[4-(2,4-Dichlorophenoxy) phenoxy]propanoic acid, methyl ester)	1.0			
115-32-2	Dicofol [Benzenemethanol, 4-chloro-.alpha.-4-chlorophenyl)-.alpha.-(trichloromethyl)-]	1.0			
77-73-6	Dicyclopentadiene	1.0			
1464-53-5	Diepoxybutane	0.1	X		U085
111-42-2	Diethanolamine	1.0			
38727-55-8	Diethatyl ethyl	1.0			
84-66-2	Diethyl phthalate	0.1			U088
64-67-5	Diethyl sulfate	0.1			
35367-38-5	Diflubenzuron	1.0			
101-90-6	Diglycidyl resorcinol ether	0.1			
94-58-6	Dihydrosafrole	0.1	X		U090
55290-64-7	Dimethipin (2,3,-Dihydro-5,6-dimethyl-1,4-dithiin 1,1,4,4-tetraoxide)	1.0			
60-51-5	Dimethoate	1.0	X		P044
2524-03-0	Dimethyl chlorothiophosphate	1.0			
131-11-3	Dimethyl phthalate	1.0	X	X	U102
77-78-1	Dimethyl sulfate	0.1	X		U103
124-40-3	Dimethylamine	1.0			U092
2300-66-5	Dimethylamine dicamba	1.0			
79-44-7	Dimethylcarbamyl chloride	0.1	X		U097
88-85-7	Dinitrobutyl phenol (Dinoseb)	1.0			P020
25321-14-6	Dinitrotoluene (mixed isomers)	1.0			
39300-45-3	Dinocap	1.0			
957-51-7	Diphenamid	1.0			
122-39-4	Diphenylamine	1.0	X		
2164-07-0	Dipotassium endothall (7-Oxabicyclo(2.2.1)heptane-2,3-dicarboxylic acid, dipotassium salt)	1.0			
136-45-8	Dipropyl isocinchomeronate	1.0			
138-93-2	Disodium cyanodithioimidocarbonate	1.0			
330-54-1	Diuron	1.0			
2439-10-3	Dodine (Dodecylguanidine monoacetate)	1.0			
106-89-8	Epichlorohydrin	0.1	X		U041
13194-48-4	Ethoprop (Phosphorodithioic acid O-ethyl S,S-dipropyl ester)	1.0			
140-88-5	Ethyl acrylate	0.1			U113
541-41-3	Ethyl chloroformate	1.0			
759-94-4	Ethyl dipropylthiocarbamate (EPTC)	1.0	X	X	
100-41-4	Ethylbenzene	1.0		X	
74-85-1	Ethylene	1.0			

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107-21-1	Ethylene glycol	1.0			
75-21-8	Ethylene oxide	0.1	X	X	U115
96-45-7	Ethylene thiourea	0.1	X		U116
151-56-4	Ethyleneimine (Aziridine)	0.1	X		P054
75-34-3	Ethylidene dichloride	1.0	X	X	U076
52-85-7	Famphur	1.0	X	X	P097
60168-88-9	Fenarimol (.alpha.-(2-Chlorophenyl)-.alpha.-4-chlorophenyl)-5-pyrimidinemethanol)	1.0			
13356-08-6	Fenbutatin oxide (Hexakis(2-methyl-2-phenylpropyl)distannoxane)	1.0			
66441-23-4	Fenoxaprop ethyl (2-(4-((6-Chloro-2-benzoxazolylen)oxy)phenoxy)propanoic acid, ethyl ester)	1.0			
72490-01-8	Fenoxycarb (2-(4-Phenoxy-phenoxy)-ethyl]carbamic acid ethyl ester)	1.0			
39515-41-8	Fenpropathrin (2,2,3,3-Tetramethylcyclopropane carboxylic acid cyano(3-phenoxyphenyl)methyl ester)	1.0			
55-38-9	Fenthion (O,O-Dimethyl O-[3-methyl-4-(methylthio) phenyl] ester, phosphorothioic acid)	1.0			
51630-58-1	Fenvalerate (4-Chloro-alpha-(1-methylethyl)benzeneacetic acid cyano(3-phenoxyphenyl)methyl ester)	1.0			
14484-64-1	Ferbam (Tris(dimethylcarbamodithioato-S,S')iron)	1.0	X		
69806-50-4	Fluazifop butyl (2-[4-[[5-(Trifluoromethyl)-2-pyridinyl]oxy]-phenoxy]propanoic acid, butyl ester)	1.0			
2164-17-2	Fluometuron [Urea, N,N-dimethyl-N'-[3-(trifluoromethyl)phenyl]-]	1.0			
7782-41-4	Fluorine	1.0	X		P056
51-21-8	Fluorouracil (5-Fluorouracil)	1.0			
69409-94-5	Fluvalinate (N-[2-Chloro-4-(trifluoromethyl)phenyl]-DL-valine(+)-cyano(3-phenoxyphenyl)methyl ester)	1.0			
133-07-3	Folpet	1.0			
72178-02-0	Fomesafen (5-(2-Chloro-4-(trifluoromethyl)phenoxy)-N methylsulfonyl)-2-nitrobenzamide)	1.0			
50-00-0	Formaldehyde	0.1	X		U122
64-18-6	Formic acid	1.0	X		U123
76-13-1	Freon 113 [Ethane, 1,1,2-trichloro-1,2,2,-trifluoro-]	1.0		X	
76-44-8	Heptachlor [1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene]		X	X	P059
87-68-3	Hexachloro-1,3-butadiene	1.0	X	X	U128
118-74-1	Hexachlorobenzene	0.1	X	X	U127
77-47-4	Hexachlorocyclopentadiene	1.0	X	X	U130
67-72-1	Hexachloroethane	1.0	X	X	U131
1335-87-1	Hexachloronaphthalene	1.0			
70-30-4	Hexachlorophene	1.0	X		U132
680-31-9	Hexamethylphosphoramide	0.1			
51235-04-2	Hexazinone	1.0			
67485-29-4	Hydramethylnon (Tetrahydro-5,5-dimethyl-2(1H)-pyrimidinone[3-[4-(trifluoromethyl)phenyl]-1-[2-[4-(trifluoromethyl)phenyl]ethenyl]-2-propenylidene]hydrazone)	1.0			
302-01-2	Hydrazine	0.1	X		U133
10034-93-2	Hydrazine sulfate	0.1			
7647-01-0	Hydrochloric acid	1.0			
74-90-8	Hydrogen cyanide	1.0	X		P063

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7664-39-3	Hydrogen fluoride	1.0	X		U134
123-31-9	Hydroquinone	1.0			
35554-44-0	Imazalil (1-[2-(2,4-Dichlorophenyl)-2-(2-propenyloxy)ethyl]-1H-imidazole)	1.0			
193-39-5	Indeno[1,2,3-cd]pyrene				U137
13463-40-6	Iron pentacarbonyl	1.0			
78-84-2	Isobutyraldehyde	1.0			
465-73-6	Isodrin	1.0	X	X	P060
25311-71-1	Isofenphos (2-[[Ethoxyl[(1-methylethyl)amino] phosphinothioyl]oxy] benzoic acid 1-methylethyl ester)	1.0			
67-63-0	Isopropyl alcohol (mfg-strong acid process)	1.0			
120-58-1	Isosafrole	1.0	X	X	U141
77501-63-4	Lactofen (5-(2-Chloro-4-(trifluoromethyl)phenoxy)-2-nitro-2-ethoxy-1-methyl-2-oxoethyl ester)	1.0			
7439-92-1	Lead	0.1	X	X	
58-89-9	Lindane [Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1.alpha.,2.alpha.,3.beta.,4.alpha.,5.alpha.,6.beta.)-]	0.1	X	X	U129
330-55-2	Linuron	1.0			
554-13-2	Lithium carbonate	1.0			
108-39-4	m-Cresol	1.0		X*	U052
99-65-0	m-Dinitrobenzene	1.0			
108-38-3	m-Xylene	1.0		X*	U239
121-75-5	Malathion	1.0			
108-31-6	Maleic anhydride	1.0	X		U147
109-77-3	Malononitrile	1.0	X		U149
12427-38-2	Maneb [Carbamodithioic acid, 1,2-ethanediylbis-, manganese complex]	1.0			
7439-96-5	Manganese	1.0			
93-65-2	Mecoprop	0.1			
7439-97-6	Mercury	1.0	X	X	U151
150-50-5	Merphos	1.0			
126-98-7	Methacrylonitrile	1.0	X	X	
137-42-8	Metham sodium (Sodium methyldithiocarbamate)	1.0	X		
67-56-1	Methanol	1.0		X	U154
20354-26-1	Methazole (2-(3,4-Dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione)	1.0			
2032-65-7	Methiocarb	1.0	X	X	
94-74-6	Methoxone ((4-Chloro-2-methylphenoxy) acetic acid) (MCPA)	0.1			
3653-48-3	Methoxone sodium salt ((4-Chloro-2-methylphenoxy) acetate sodium salt)	0.1			
72-43-5	Methoxychlor [Benzene, 1,1'-(2,2,2-trichloroethylidene)bis [4-methoxy-]	1.0	X	X	U247
96-33-3	Methyl acrylate	1.0			
79-22-1	Methyl chlorocarbonate	1.0	X		U156
78-93-3	Methyl ethyl ketone	1.0	X	X	U159
60-34-4	Methyl hydrazine	1.0	X		P068
74-88-4	Methyl iodide	1.0	X	X	U138
108-10-1	Methyl isobutyl ketone	1.0		X	U161
624-83-9	Methyl isocyanate	1.0	X		P064
556-61-6	Methyl isothiocyanate (Isothiocyanatomethane)	1.0			
80-62-6	Methyl methacrylate	1.0	X	X	U162
298-00-0	Methyl parathion	1.0	X	X	P071
1634-04-4	Methyl tert-butyl ether	1.0			

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74-95-3	Methylene bromide	1.0	X	X	U068
101-68-8	Methylenebis(phenylisocyanate) (MBI)				
101-68-8	Methylenebis(phenylisocyanate) (MDI)				
9006-42-2	Metiram	1.0			
21087-64-5	Metribuzin	1.0			
7786-34-7	Mevinphos	1.0			
90-94-8	Michler's ketone	0.1			
2212-67-1	Molinate (1H-Azepine-1 carbothioic acid, hexahydro-S-ethyl ester)	1.0	X	X	
1313-27-5	Molybdenum trioxide	1.0			
76-15-3	Monochloropentafluoroethane (CFC-115)	1.0			
150-68-5	Monuron	1.0			
505-60-2	Mustard gas [Ethane, 1,1'-thiobis[2-chloro-]	0.1	X		
88671-89-0	Myclobutanil (.alpha.-Butyl-.alpha.-(4-chlorophenyl)-1H-1,2,4-triazole-1-propanenitrile)	1.0			
121-69-7	N,N-Dimethylaniline	1.0			
68-12-2	N,N-Dimethylformamide	0.1			
71-36-3	n-Butyl alcohol	1.0		X	U031
110-54-3	n-Hexane	1.0			
872-50-4	N-Methyl-2-pyrrolidone	1.0			
924-42-5	N-Methylolacrylamide	1.0			
759-73-9	N-Nitroso-N-ethylurea	0.1	X		U176
684-93-5	N-Nitroso-N-methylurea	0.1	X		U177
924-16-3	N-Nitrosodi-n-butylamine	0.1	X	X	U172
621-64-7	N-Nitrosodi-n-propylamine	0.1	X	X	U111
55-18-5	N-Nitrosodiethylamine	0.1	X	X	U174
62-75-9	N-Nitrosodimethylamine	0.1	X		P082
86-30-6	N-Nitrosodiphenylamine	1.0		X	
4549-40-0	N-Nitrosomethylvinylamine	0.1	X		P084
59-89-2	N-Nitrosomorpholine	0.1	X	X	
16543-55-8	N-Nitrosonornicotine	0.1	X		
100-75-4	N-Nitrosopiperidine	0.1	X	X	U179
142-59-6	Nabam	1.0			
300-76-5	Naled	1.0			
91-20-3	Naphthalene	1.0	X	X	U165
7440-02-0	Nickel	0.1	X	X	
1929-82-4	Nitrapyrin (2-Chloro-6-(trichloromethyl)pyridine)	1.0			
7697-37-2	Nitric acid	1.0			
139-13-9	Nitrilotriacetic acid	0.1			
98-95-3	Nitrobenzene	1.0	X	X	U169
1836-75-5	Nitrofen [Benzene, 2,4-dichloro-1-(4-nitrophenoxy)-]	0.1			
51-75-2	Nitrogen mustard [2-Chloro-N-(2-chloroethyl)-N-methylethanamine]	0.1	X		
55-63-0	Nitroglycerin	1.0	X		P081
27314-13-2	Norflurazon (4-Chloro-5-(methylamino)-2-[3-(trifluoromethyl)phenyl]-3(2H)-pyridazinone)	1.0			
90-04-0	o-Anisidine	0.1			
134-29-2	o-Anisidine hydrochloride	0.1			
95-48-7	o-Cresol	1.0		X	U052
528-29-0	o-Dinitrobenzene	1.0			
95-53-4	o-Toluidine	0.1	X		U328
636-21-5	o-Toluidine hydrochloride	0.1	X		U222
95-47-6	o-Xylene	1.0		X	U239
2234-13-1	Octachloronaphthalene	1.0			

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19044-88-3	Oryzalin (4-(Dipropylamino)-3,5-dinitrobenzenesulfonamide)	1.0			
20816-12-0	Osmium tetroxide	1.0	X		P087
301-12-2	Oxydemeton methyl (S-(2-(Ethylsulfinyl)ethyl) O,O-dimethyl ester phosphorothioic acid)	1.0			
19666-30-9	Oxydiazon (3-[2,4-Dichloro-5-(1-methylethoxy)phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2(3H)-one)	1.0			
42874-03-3	Oxyfluorfen	1.0			
10028-15-6	Ozone	1.0			
104-94-9	p-Anisidine	1.0			
95-69-2	p-Chloro-o-toluidine	0.1			
106-47-8	p-Chloroaniline	0.1	X	X	P024
104-12-1	p-Chlorophenyl isocyanate	1.0			
120-71-8	p-Cresidine	0.1			
106-44-5	p-Cresol	1.0		X*	U239
100-25-4	p-Dinitrobenzene	1.0		X	
100-01-6	p-Nitroaniline	1.0	X	X	P077
156-10-5	p-Nitrosodiphenylamine	1.0			
106-50-3	p-Phenylenediamine	1.0			
106-42-3	p-Xylene	1.0		X*	U239
123-63-7	Paraldehyde	1.0	X		U182
1910-42-5	Paraquat dichloride	1.0			
56-38-2	Parathion [Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester]	1.0	X	X	P089
1114-71-2	Pebulate (Butylethylcarbamothioic acid S-propyl ester)	1.0	X	X	
40487-42-1	Pendimethalin (N-(1-Ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine)	1.0			
76-01-7	Pentachloroethane	1.0	X	X	U184
87-86-5	Pentachlorophenol (PCP)	0.1	X	X	
57-33-0	Pentobarbital sodium	1.0			
79-21-0	Peracetic acid	1.0			
594-42-3	Perchloromethyl mercaptan	1.0			
52645-53-1	Permethrin (3-(2,2-Dichloroethenyl)-2,2-dimethylcyclopropane carboxylic acid, (3-phenoxyphenyl)methyl ester)	1.0			
85-01-8	Phenanthrene	1.0		X	
108-95-2	Phenol	1.0	X		U188
26002-80-2	Phenothrin (2,2-Dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxylic acid (3-phenoxyphenyl)methyl ester)	1.0			
57-41-0	Phenytoin	0.1			
75-44-5	Phosgene	1.0	X		P095
7803-51-2	Phosphine	1.0	X		P096
7664-38-2	Phosphoric acid	1.0			
7723-14-0	Phosphorus (yellow or white)	1.0			
85-44-9	Phthalic anhydride	1.0	X	X	U190
1918-02-1	Picloram	1.0			
88-89-1	Picric acid	1.0			
51-03-6	Piperonyl butoxide	1.0			
29232-93-7	Pirimiphos methyl (O-(2-(Diethylamino)-6-methyl-4-pyrimidinyl)-O,O-dimethyl phosphorothioate)	1.0			
1336-36-3	Polychlorinated biphenyls (PCBs)	0.1		X	
7758-01-2	Potassium bromate	0.1			
128-03-0	Potassium dimethyldithiocarbamate	1.0	X		

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137-41-7	Potassium N-methyldithiocarbamate	1.0	X		
41198-08-7	Profenofos (O-(4-Bromo-2-chlorophenyl)-O-ethyl-S-propylphosphorothioate)	1.0			
7287-19-6	Prometryn (N,N'-Bis(1-methylethyl)-6-methylthio-1,3,5-triazine-2,4-diamine)	1.0			
23950-58-5	Pronamide	1.0	X	X	U192
1918-16-7	Propachlor (2-Chloro-N-(1-methylethyl)-N-phenylacetamide)	1.0			
1120-71-4	Propane sultone	0.1	X		U193
709-98-8	Propanil (N-(3,4-Dichlorophenyl)propanamide)	1.0			
2312-35-8	Propargite	1.0			
107-19-7	Propargyl alcohol	1.0	X		P102
31218-83-4	Propetamphos (3-[(Ethylamino)methoxyphosphinothioyl]oxy]-2-butenoic acid, 1-methylethyl ester)	1.0			
60207-90-1	Propiconazole (1-[2-(2,4-Dichlorophenyl)-4-propyl-1,3-dioxolan-2-yl]-methyl-1H-1,2,4,-triazole)	1.0			
123-38-6	Propionaldehyde	1.0			
114-26-1	Propoxur [Phenol, 2-(1-methylethoxy)-, methylcarbamate]	1.0	X	X	
115-07-1	Propylene (Propene)	1.0			
75-56-9	Propylene oxide	0.1			
75-55-8	Propyleneimine	0.1	X		P067
110-86-1	Pyridine	1.0	X	X	U196
91-22-5	Quinoline	1.0			
106-51-4	Quinone	1.0	X		U197
82-68-8	Quintozene (Pentachloronitrobenzene)	1.0	X	X	U185
76578-14-8	Quizalofop-ethyl (2-[4-[(6-Chloro-2-quinoxalinyl)oxy]phenoxy] propanoic acid ethyl ester)	1.0			
10453-86-8	Resmethrin ([5-(Phenylmethyl)-3-furanyl]methyl 2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxylate])	1.0			
78-48-8	S,S,S-Tributyltrithiophosphate (DEF)	1.0			
81-07-2	Saccharin (manufacturing)	0.1	X		U202
94-59-7	Safrole	0.1	X	X	U203
78-92-2	sec-Butyl alcohol	1.0			
7782-49-2	Selenium	1.0	X	X	
74051-80-2	Sethoxydim (2-[1-(Ethoxyimino) butyl]-5-[2-(ethylthio)propyl]-3-hydroxyl-2-cyclohexen-1-one)	1.0			
7440-22-4	Silver	1.0	X	X	
122-34-9	Simazine	1.0			
26628-22-8	Sodium azide	1.0			P105
1982-69-0	Sodium dicamba (3,6-Dichloro-2-methoxybenzoic acid, sodium salt)	1.0			
128-04-1	Sodium dimethyldithiocarbamate	1.0	X		
62-74-8	Sodium fluoroacetate	1.0	X		P058
7632-00-0	Sodium nitrite	1.0			
132-27-4	Sodium o-phenylphenoxide	0.1			
131-52-2	Sodium pentachlorophenate	1.0			
100-42-5	Styrene	0.1			
96-09-3	Styrene oxide	0.1			
7664-93-9	Sulfuric acid	1.0			
2699-79-8	Sulfuryl fluoride (Vikane)	1.0			

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35400-43-2	Sulprofos (O-Ethyl O-[4-(methylthio)phenyl]phosphorodithioic acid S-propyl ester)	1.0			
34014-18-1	Tebuthiuron (N-[5-(1,1-Dimethylethyl)-1,3,4-thiadiazol-2-yl)-N,N'-dimethylurea)	1.0			
3383-96-8	Temephos	1.0			
5902-51-2	Terbacil (5-Chloro-3-(1,1-dimethylethyl)-6-methyl- 2,4 (1H,3H)-pyrimidinedione)	1.0			
75-65-0	tert-Butyl alcohol	1.0			
127-18-4	Tetrachloroethylene (Perchloroethylene)	0.1	X	X	
961-11-5	Tetrachlorvinphos [Phosphoric acid, 2-chloro-1-(2,3,5-trichlorophenyl) ethenyl dimethyl ester]	1.0			
64-75-5	Tetracycline hydrochloride	1.0			
7696-12-0	Tetramethrin (2,2-Dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxylic acid (1,3,4,5,6,7-hexahydro-1,3-dioxo-2H-isoindol-2-yl)methyl ester)	1.0			
7440-28-0	Thallium	1.0	X	X	
148-79-8	Thiabendazole (2-(4-Thiazolyl)-1H-benzimidazole)	1.0			
62-55-5	Thioacetamide	0.1	X		U218
28249-77-6	Thiobencarb (Carbamic acid, diethylthio-, S-(p-chlorobenzyl))	1.0			
59669-26-0	Thiodicarb	1.0	X	X	
23564-05-8	Thiophanate-methyl	1.0	X	X	
23564-06-9	Thiophanate ethyl ([1,2-Phenylenebis (iminocarbonothioyl)] biscarbamic acid diethyl ester)	1.0			
79-19-6	Thiosemicarbazide	1.0	X		P116
62-56-6	Thiourea	0.1	X		U219
137-26-8	Thiram	1.0	X		U244
1314-20-1	Thorium dioxide	1.0			
7550-45-0	Titanium tetrachloride	1.0			
108-88-3	Toluene	1.0	X	X	U220
584-84-9	Toluene-2,4-diisocyanate	0.1			
91-08-7	Toluene-2,6-diisocyanate	0.1			
26471-62-5	Toluene diisocyanate (mixed isomers)	0.1	X		U223
8001-35-2	Toxaphene	0.1	X	X	P123
10061-02-6	trans-1,3-Dichloropropene	0.1		X	
110-57-6	trans-1,4-Dichloro-2-butene	1.0			
43121-43-3	Triadimefon (1-(4-Chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-1-yl)-2-butanone)	1.0			
2303-17-5	Triallate	1.0	X	X	
68-76-8	Triaziquone [2,5-Cyclohexadiene-1,4-dione, 2,3,5-tris(1-aziridinyl)-]	1.0			
101200-48-0	Tribenuron methyl (2-(4-Methoxy-6-methyl-1,3,5-triazin-2-yl)-methylamino)carbonyl)amino)sulfonyl)-, methyl ester)	1.0			
1983-10-4	Tributyltin fluoride	1.0			
2155-70-6	Tributyltin methacrylate	1.0			
52-68-6	Trichlorfon [Phosphonic acid, (2,2,2-trichloro-1-hydroxyethyl)-,dimethyl ester]	1.0			
76-02-8	Trichloroacetyl chloride	1.0			
79-01-6	Trichloroethylene	0.1	X	X	U228
75-69-4	Trichlorofluoromethane (CFC-11)	1.0	X	X	U121
57213-69-1	Triclopyr triethylammonium salt	1.0			
121-44-8	Triethylamine	1.0	X		

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1582-09-8	Trifluralin [Benezeneamine, 2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)-]	1.0			
26644-46-2	Triforine (N,N'-[1,4-Piperazinediylbis(2,2,2-trichloroethylidene)] bisformamide)	1.0			
639-58-7	Triphenyltin chloride	1.0			
76-87-9	Triphenyltin hydroxide	1.0			
126-72-7	Tris(2,3-dibromopropyl) phosphate	0.1	X	X	U235
72-57-1	Trypan blue	0.1	X		U236
51-79-6	Urethane (Ethyl carbamate)	0.1	X		U238
7440-62-2	Vanadium (fume or dust)	1.0		X	
50471-44-8	Vinclozolin (3-(3,5-Dichlorophenyl)-5-ethenyl-5-methyl-2,4-oxazolidinedione)	1.0			
108-05-4	Vinyl acetate	0.1			
593-60-2	Vinyl bromide	0.1			
75-01-4	Vinyl chloride	0.1	X	X	U043
75-35-4	Vinylidene chloride	1.0	X	X	U078
1330-20-7	Xylene (mixed isomers)	1.0		X	U239
7440-66-6	Zinc (fume or dust)	1.0		X	
12122-67-7	Zineb [Carbamodithioic acid, 1,2-ethanediylbis-, zinc complex]	1.0			

* as mixed isomers (sum)

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