LA-13655-PR
Progress Report

1998 Toxic Chemical Release Inventory Report for the Emergency Planning and Community Right-to-Know Act of 1986, Title III

Los Alamos
NATIONAL LABORATORY

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1998 Toxic Chemical Release Inventory Report for the Emergency Planning and Community Right-to-Know Act of 1986, Title III

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ABSTRACT

The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 [also known as the Superfund Amendment and Reauthorization Act (SARA), Title III], as modified by Executive Order 12856, requires that all federal facilities evaluate the need to submit an annual Toxic Chemical Release Inventory report as prescribed in Title III, Section 313 of this Act. This annual report is due every July for the preceding calendar year. Owners and operators who manufacture, process, or otherwise use certain toxic chemicals above listed threshold quantities are required to report their toxic chemical releases to all environmental mediums (air, water, soil, etc.). At Los Alamos National Laboratory (LANL), no EPCRA Section 313 chemicals were used in 1998 above the reportable threshold limits of 10,000 lb or 25,000 lb. Therefore LANL was not required to submit any Toxic Chemical Release Inventory reports ("Form Rs") for 1998. This document was prepared to provide a detailed description of the evaluation on chemical usage and EPCRA Section 313 threshold determinations for LANL for 1998.

1.0 INTRODUCTION

The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 [also known as the Superfund Amendment and Reauthorization Act (SARA), Title III], requires that owners and operators of certain manufacturing, processing, or production facilities that use more than a threshold amount of any listed "toxic chemicals" annually submit a Toxic Chemical Release Inventory report ("Form R") for those chemicals.

In addition, Executive Order 12856, dated August 3, 1993, requires that beginning in 1995, all federal facilities, regardless of their standard industrial classification code, must report their toxic chemical use and resulting emissions for the previous year as required by EPCRA Section 313. Under this order, Los Alamos National Laboratory (LANL), which is owned by the U.S. Department of Energy (DOE) and operated by its contractor, the University of California (UC), is required to report releases to the environment for listed toxic chemicals manufactured, processed, or otherwise used above threshold quantities. Toxic chemicals used in laboratory activities, in facility maintenance activities, or for personal use by employees are exempt from reporting requirements as activity exemptions.

This report summarizes the data evaluation, exemption analysis, activity determinations, and threshold determinations for 1998. On the basis of this evaluation, it was determined that listed toxic chemicals were not manufactured, processed, or otherwise used at LANL above threshold quantities during any time in 1998. Therefore there are no reporting requirements under EPCRA Section 313 for 1998. The remainder of this document describes the evaluation performed to determine that no reporting is required. Individual sections are included in the report for certain relatively high-volume toxic chemicals used at LANL. Appendix A includes a summary table, based on procurement records, of all EPCRA Section 313 chemicals used at LANL. Appendix B provides information about subcontractors' chemical usage. Although not required by regulation, Appendix C provides estimates of air emissions for five relatively high-volume toxic chemicals used at LANL. Appendix D provides a list of references used in this analysis.

2.0 FACILITY INFORMATION AND CONTACTS

LANL is located at latitude of 350°49'51" and longitude of 106°14'15" in Los Alamos County, New Mexico. LANL's Toxic Release Inventory (TRI) facility ID number is 87545LSLMSLOSAL. The TRI facility number for the Los Alamos DOE complex is 87544SDLSL52835. The 1998 EPCRA Section 313 contacts are Leland Maez, UC technical contact at (505) 665-1240; George Van Tiem, UC public contact at (505) 667-6214; Herbert Plum, DOE technical contact at (505) 665-5042; and M. J. Byrne, DOE public contact at (505) 665-5025.

Johnson Controls Northern New Mexico (JCNNM) is the first-tier subcontractor for UC and performs many industrial and maintenance operations, including power generation, water purification, structural maintenance, facility grounds maintenance, and motor vehicle maintenance at LANL.

3.0 EXEMPTIONS

Activities that are exempt from EPCRA Section 313 toxic chemical reporting include the following:

Laboratory Activities Exemption

- Listed toxic chemicals that are manufactured, processed, or otherwise used in laboratory activities at a covered facility under the direct supervision of a technically qualified individual do not have to be considered for threshold determinations and release calculations. However, pilot plant scale and specialty chemical production do not qualify for this laboratory activities exemption.

Otherwise Use Exemptions

These include

- use as a structural component of the facility;
- use in routine janitorial or facility grounds maintenance;
- personal uses by employees or other persons;
- use of products containing toxic chemicals for the purpose of maintaining motor vehicles operated by the facility; or
- use of toxic chemicals contained in intake water (used for processing or noncontact cooling) or in intake air (used either as compressed air or for combustion).

4.0 ACTIVITY DETERMINATIONS

Activities at LANL are subject to reporting based on three different activity determinations as defined by EPCRA 313.

> "Manufacture" means to produce, prepare, compound, or import a listed toxic chemical.
>
> "Process" means the preparation of a listed EPCRA Section 313 chemical, after its manufacture, for distribution in commerce. Processing is usually the intentional incorporation of a section 313 chemical into a product.
>
> "Otherwise Use" means any use of an EPCRA Section 313 chemical at a facility that does not fall under the definitions of "manufacture" or "process." A chemical that is otherwise used by a facility is not intentionally incorporated into a product distributed in commerce.

Each of these activity determinations has a corresponding threshold. The thresholds for "manufacture" and "process" are each 25,000 lb, and the threshold for "otherwise use" is 10,000 lb.

5.0 ANALYSIS OF CHEMICAL PROCUREMENT RECORDS

Chemicals used at LANL are purchased through various procurement systems. These systems include STORES, Just-in-Time (JIT), Local Vendor Agreements (LVA), and purchase orders (PO). The Automated Chemical Inventory System (ACIS) tracks the majority of chemicals purchased through these systems. The pure chemicals and mixtures captured in ACIS are discussed in Sections 5.1 and 5.2, respectively. The JIT and STORES procurement systems are discussed in Section 5.3. LVAs and POs are discussed in Section 5.4. Procurement information from all of these sources is combined to compare the amount of toxic chemicals brought on-site to the EPCRA Section 313 thresholds. A summary of the procurement totals is provided in Section 5.5.

5.1 Pure Chemicals in ACIS

The ACIS database tracks the majority of chemical procurements at LANL. Pertinent container information such as chemical name, quantity, Chemical Abstract Service (CAS) numbers, location, and user information is included in the database.

Chemicals with identifiable CAS numbers tracked in ACIS were considered pure chemicals. In 1998, ACIS included 4,172 unique records representing approximately 2,348 pure chemicals. Of these, 156 were listed EPCRA Section 313 chemicals. The total quantity of each pure EPCRA Section 313 chemical procured at LANL and tracked in ACIS was summed by CAS number. For 1998, the sum of each pure EPCRA Section 313 chemical in ACIS was below the 10,000-lb threshold.

5.2 Mixtures in ACIS

Materials in ACIS that do not have CAS numbers are considered mixtures. In 1998 there were approximately 1,824 different chemical mixtures purchased at LANL. Specific usage of the materials was evaluated. Exempt uses (e.g., janitorial, grounds maintenance, employee personal use, etc.) were taken out of the analyses.

After evaluation and exclusion of the exempt uses, Material Safety Data Sheets (MSDS) for the remaining chemical mixtures that were purchased in quantities over 200 lb were reviewed to determine the presence and percent amount of EPCRA Section 313 chemicals. All mixtures over 200 lb that were determined to have EPCRA Section 313 constituents were further evaluated by calculating the weight of each pure chemical component. The EPCRA Section 313 chemicals in the mixtures that did not fall under the various usage exemptions were then added to the quantities of pure EPCRA Section 313 chemicals procured in 1998. The sum of pure chemicals and mixtures did not exceed the 10,000-lb threshold for any EPCRA Section 313 chemical.

Approximately 1,371 records in the ACIS database were for mixtures that were purchased in quantities of less than 200 lb. These were not evaluated for EPCRA Section 313 components. The sum of these unevaluated materials was 8,297 lb, which is less than the 10,000-lb threshold for any single chemical. Table 5.1 shows the quantities of the EPCRA Section 313 chemical constituents that were present in the evaluated mixtures.

Table 5.1. EPCRA Section 313 Constituents from ACIS Mixtures

Total Weight (lb)	Chemical	CAS Number
1,301	n-Hexane	110-54-3
905	Chlorodifluoromethane	75-45-6
485	Ethylene Blycol	107-21-1
96	Dichlorodifluoromethane	75-71-8
41	Hydroquinone	123-31-9
33	Methanol	67-56-1
31	Chloropentafluoroethane	76-15-3
25	Xylene (mixed isomers)	1330-20-7
17	1,2,4-Trimethylbenzene	95-63-6
5	Toluene	108-88-3
4	Benzene	71-43-2
0.4	Propylene	115-07-1

5.3 Just-in-Time Purchasing and STORES

A separate analysis was done that focused on materials purchased through the Just-in-Time (JIT) procurement system and the STORES system that were not captured in the ACIS database.

The main chemical vendor in the JIT procurement system is Fisher Scientific. The primary means to purchase gases is through the gas plant, which uses the STORES system. Therefore, the focus of the analysis was on those purchases from Fisher Scientific and gases that were not captured in the ACIS database for 1998. A total of 832 records were reviewed qualitatively for EPCRA Section 313 chemicals. A summary of the quantities of EPCRA Section 313 chemicals from JIT and STORES not captured in ACIS is listed below in Table 5.2.

Table 5.2. EPCRA Section 313 Constituents from JIT and STORES Not Captured in ACIS

Total Weight (lb)	Chemical	CAS Number
441	n-Hexane	110-54-3
186	Hydrochloric Acid	7647-01-0
87	Nitric Acid	7697-37-2
30	Ammonium Hydroxide	7664-41-7
15	Chloropentafluoroethane	76-15-3
15	Chlorodifluoromethane	75-45-6

5.4 Local Vendor Agreements and Purchase Orders

In addition to the JIT and STORES procurement systems, employees can purchase chemicals through LVAs and POs. These items were analyzed separately for EPCRA Section 313 constituents.

The LVA and PO system contained a total of 414,791 records, of which approximately 7,800 were chemical purchases. These chemical purchases were reviewed qualitatively to identify EPCRA Section 313 chemicals and evaluate the uses of the chemicals. The items that contributed the largest amount were determined to be used for custodial purposes. Therefore, they fall under the janitorial maintenance exemption. Descriptions and quantities of these orders are summarized in Table 5.3.

Table 5.3. Analysis of Local Vendor Agreements and Purchase Orders

Total Amount	Chemical	Exemption
380 gal (3,170 lb)	Degreaser, non-butyl	Janitorial maintenance
1,880 gal (15,683 lb)	Liquid Bleach, 5.25% chlorine	Janitorial maintenance

5.5 Procurement Totals

Pure chemicals and mixtures tracked in ACIS were summed and evaluated for threshold levels of EPCRA Section 313 chemicals. A more comprehensive analysis of chemical purchases at LANL was provided by the analysis of procurements from JIT, STORES, LVA, and POs not captured in ACIS. The additional quantities identified through these procurement methods were added to the totals of ACIS pure and mixed chemicals. The ten highest EPCRA Section 313 chemicals procured in 1998 are listed in Table 5.4. Appendix A includes a listing of all EPCRA Section 313 chemicals purchased at LANL in 1998.

Table 5.4. Top Ten EPCRA Section 313 Chemicals Procured in 1998

Total Weight (lb)	Chemical	CAS Number
8,507	Chlorodifluoromethane	75-45-6
7,791	Nitric acid	7697-37-2
4,890	Hydrochloric acid	7647-01-0
3,750	Chlorine	7782-50-5
2,776	Dichloromethane	75-09-2
2,487	Ethylene glycol	107-21-1
2,229	Methanol	67-56-1
1,907	n-Hexane	110-54-3
1,500	Trichlorofluoromethane	75-69-4
1,073	Isopropyl alcohol	67-63-0

6.0 PRODUCTION OPERATIONS

Most of the chemicals at LANL are used in research or for production-type operations such as power production or water purification. Three activities at LANL that are considered to be production operations are power production, plutonium metal processing, and drinking water treatment.

UC staff at LANL have the ability to generate electrical power for the entire LANL complex (Fig. 6-1). Power production activities involve the use of large quantities of sulfuric acid, an EPCRA Section 313 chemical. The sulfuric acid is used to maintain ionization columns that generate deionized water for steam production. In addition, chemicals are used in the steam plant cooling towers and are discussed further in Section 7.3.

Plutonium metal processing has been considered a production-type operation in previous years for the purpose of EPCRA Section 313 Form R reporting, although most of the operations conducted at the plutonium processing facility involve projects related to actinide research. Nitric acid used to process plutonium metal has historically exceeded the 10,000-lb reporting threshold. However, in 1998 only 5,452 lb of nitric acid was used in plutonium processing.

Historically DOE and UC have owned and operated a potable water supply system that provides water to LANL as well as to county residents. In September 1998 this system was sold to Los Alamos County. The analysis of LANL's 1998 chemical use associated with the potable water supply system includes the time period limited to January–August 1998.

Potable water treatment operations involve treating or purifying water to drinking water standards. In the January to August 1998 period, about 64% of the water that was treated by first-tier subcontractor JCNNM was sold to the community. The remaining 36% remained on LANL property and was used for process activities and employees' personal use.

Fig. 6-1. One of several turbines at the Laboratory's power plant.

The operations described above represent some of the production-type operations conducted at LANL. These operations were evaluated to determine EPCRA Section 313 reporting applicability because they can potentially use large amounts of chemicals and do not typically qualify for the exemptions. For operations that are known to use large amounts of listed toxic chemicals, the site managers or chemical users were contacted to obtain end-user information on the quantities used, as well as the processes in which they are used. The Automated Chemical Inventory System (ACIS), procurement records, and the records from individual contractors are also examined.

7.0 ADDITIONAL EVALUATION OF CERTAIN TOXIC CHEMICALS

The toxic chemicals described below either are used in relatively high volumes at LANL or are brought on-site via avenues other than the labwide procurement systems. Additional analyses were required to determine total usage of these chemicals. The following sections provide a more detailed description of the work performed to obtain accurate information on the amount of each of these chemicals at LANL in 1998.

7.1 Sulfuric Acid

Since 1995, DOE and UC have not reported on sulfuric acid because the EPCRA Section 313 reporting guidelines state that sulfuric acid must be reported *"only if it is an aerosol."* In 1997, the U.S. Environmental Protection Agency (EPA) provided additional guidance on the reporting of sulfuric acid aerosols.[1] The guidance document for the reporting of aerosols now states:

The amounts of acid aerosols generated in storage tanks are to be applied towards the 'manufacture' threshold for sulfuric acid aerosols. The amount of acid aerosol to be applied towards the 'manufacture' threshold is the average amount that existed in the atmosphere above the acid solution during the year.

EPA also provided guidance on estimating sulfuric acid aerosol emissions from the combustion of fuel oil.[1] It states:

All sulfuric acid produced within the stack, including the gas not just the mist, falls under the EPCRA section 313 definition of a sulfuric acid aerosol . . . . Sulfuric acid aerosols are produced during fuel oil combustion from the oxidation of sulfur contained in the fuel.

In 1998, 9,000 gal. of 93.1% sulfuric acid was used for demineralizer regeneration. This represents approximately 84,000 lb of sulfuric acid. An additional 197 lb of sulfuric acid was purchased in 1998 and used in various locations around LANL. However, because both of these activities use sulfuric acid in a liquid form, they are not reportable under EPCRA Section 313. In accordance with EPA guidance, there are two potential sources of creating the aerosol form of sulfuric acid at LANL. Each is discussed below.

Aerosol Tank Emissions—Sulfuric acid stored in storage tanks generates a small amount of sulfuric acid mist in the vapor space of the tank. Calculations on the amount of sulfuric acid mist generated are based on the amount of sulfuric acid stored, the size of the storage tank, and the number of tank turnovers. Using the EPA-approved TANKS 3.1 computer model, an estimated 0.02 lb of sulfuric acid mist was generated in LANL's sulfuric acid tank in 1998. This sulfuric acid mist is considered "manufactured" and is subject to the 25,000-lb threshold for EPCRA Section 313 reporting.

Fuel Combustion Byproducts—Industrial-type combustion sources (boilers, generators, etc.) which generate combustion byproducts at LANL operate primarily on natural gas, although in one instance, fuel oil is available as backup. In 1998, LANL's large industrial sources were fueled exclusively with natural gas. EPA guidance does not discuss or provide emission factors for sulfuric acid aerosol emissions from the combustion of natural gas. However, according to LANL's 1998 emissions inventory,[2] 437 lb of sulfur oxides were released into the air from the combustion of natural gas by industrial sources at LANL. For this air emissions estimate, it was assumed that natural gas contains a maximum of 0.1% sulfur. If it is assumed that the sulfur oxide emissions are all sulfuric acid aerosols "manufactured" as a byproduct of fuel consumption, then 437 lb was generated. This sulfuric acid mist is considered "manufactured" and is subject to the 25,000-lb threshold for EPCRA Section 313 reporting. Table 7.1 summarizes the uses and quantities of sulfuric acid at LANL for 1998.

7.2 Nitric Acid

A total of 7,791 lb of nitric acid was received at LANL through the procurement systems described in Section 5. The large purchasers and end-users were contacted to determine how the nitric acid was used. A total of 4,140 lb was verified as being used for sample preparation in laboratory settings. Additionally, the bioassay program at LANL, a program that monitors employee exposure to radio-active elements, used approximately 2,100 lb of nitric acid. This is also considered a laboratory activity. The nitric acid not accounted for through these end-user contacts was composed of numer-

Table 7.1. Summary of Sulfuric Acid Quantities for 1998

Description of Use or Method of Operation	1998 Sulfuric Acid Quantity	Data Source	EPCRA Section 313 Usage Category	Threshold
Ionization Column Maintenance	84,000 lb	JCNNM	Not subject to SARA 313 because not in aerosol form	N/A
Laboratory Use	197 lb	ACIS	Laboratory Activities Exempt	N/A
• Storage Tank Aerosols	• 000.02 lb	• Calculated with EPA TANKS 3.1 program	Manufactured	
• Fuel Combustion Byproducts	• 437.00 lb	• Calculated from fuel records	Manufactured	
	437.02 lb			25,000 lb

ous small purchases (a total of 96 separate purchases totaling 1,551 lb), and it was assumed to be used in laboratory settings as well. Therefore all nitric acid purchased through the procurement systems at LANL was considered to be exempt from EPCRA Section 313 reporting as a laboratory activities exemption.

Nitric acid used for plutonium processing is purchased by the individual facility and does not go through the procurement systems described in Section 5. Therefore the end-user of nitric acid in the plutonium processing facility was contacted to obtain accurate usage information for 1998. An additional 5,452 lb of nitric acid was used in plutonium processing activities in 1998. The nitric acid is considered “otherwise used” in this application and is subject to the 10,000-lb reporting threshold.

The amount of nitric acid used in plutonium processing in 1998 was approximately 80% less than that used in 1997 because several processes were not operational in 1998. This downward trend in nitric acid use for plutonium processing has been ongoing for the past few years and is expected to continue. Table 7.2 summarizes the 1998 threshold determinations for nitric acid.

Table 7.2. Summary of Nitric Acid Use for 1998

Description of Usage	1998 Nitric Acid Usage	Data Source	EPCRA Section 313 Usage Category	Threshold
TA-55 Plutonium Processing	5,452 lb	End User	Otherwise Used	10,000 lb
Laboratory Use	197 lb	ACIS/JIT and phone calls to purchasers	Laboratory Activities Exempt	N/A

7.3 Chlorine

The bulk of the chlorine at LANL is used in water treatment (i.e., wastewater treatment, cooling tower water, and drinking water). The chemicals used in water treatment include chlorine gas, sodium chloride, and chlorine-bromine tablets. Each water treatment application is described below, along with its corresponding threshold determinations.

<u>Sewage Treatment</u>

The Sanitary Waste Systems Consolidation (SWSC) plant treated 117 million gal. of wastewater in 1998 with the mixed oxide (MIOX) treatment system (Fig. 7-1).

Fig. 7-1. MIOX system for treating sanitary waste.

A brine solution made from salt (sodium chloride) is passed through an electrolytic cell where it is converted into a strong oxidizing solution that is composed of hypochlorous acid, chlorine, chlorine dioxide, and ozone. Of these four chemicals, chlorine, chlorine dioxide, and ozone are listed EPCRA Section 313 chemicals. Although these mixed oxidants are generally 20% to 40% more effective than chlorine gas, the MIOX system is estimated to be about 5% as efficient as treatment with chlorine [i.e., procurement records indicate that approximately 95% more salt (by weight) was required to provide the same treatment effect as was provided the previous year with chlorine gas].

Salt, a compound of sodium and chloride, is not a listed EPCRA Section 313 chemical. However, the quantities of chlorine, chlorine dioxide, and ozone that are produced as byproducts of the process are EPCRA Section 313 chemicals and are considered "manufactured" in this process. The estimated quantities of these oxidants were calculated from manufacturer's data and represent the maximum quantities that could be produced by the full capacity operation of the three cells in the SWSC plant's treatment system. If the system is run at full capacity, a maximum of 10,950 lb of chlorine, 228 lb of chlorine dioxide, and 228 lb of ozone could be produced. Based on a ratio of throughput of wastewater through the system in 1998, a total of 1,423 lb of chlorine, 30 lb of ozone, and 30 lb of chlorine dioxide was generated. Each of these chemicals is well below the manufacturing threshold of 25,000 lb.

Cooling Tower Water Treatment

UC staff at LANL operate a series of four large cooling towers at the main power plant (Fig. 7-2) and a number of small cooling towers at other locations throughout the complex. In 1998, 7,300 lb of chlorine/bromine tablets (Formula 314-T) were used to treat cooling tower water at the main power plant and at seven cooling towers at TA-53 (Fig. 7-3). The Formula 314-T tablets are not subject to EPCRA Section 313 reporting requirements because they do not fall into any of the regulated compound categories, they are not a mixture, and their CAS number, 126-06-7, is not included on the EPCRA Section 313 list of chemicals. However, the quantities of chlorine and bromine produced as byproducts of the process apply to the threshold for "manufacture." According to the manufacturer, small amounts of chlorine can be produced from the treated water by exposure to ultraviolet light or ozone.

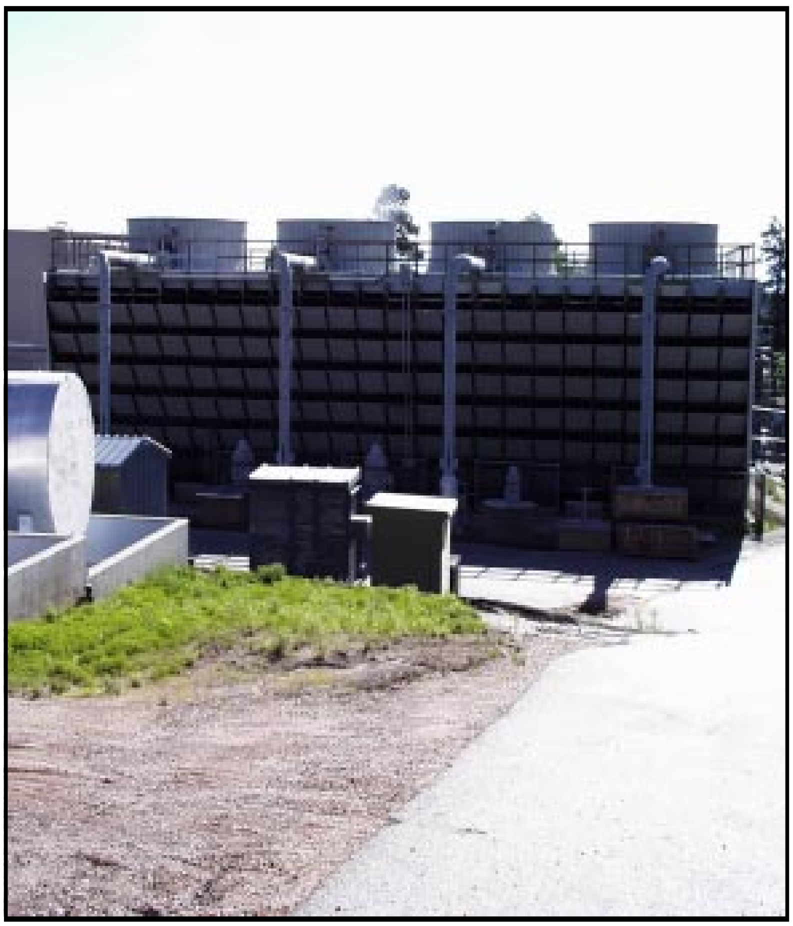

Fig. 7-2. Power plant cooling tower.

Fig. 7-3. Cooling tower at TA-53.

The chlorine produced, however, would be less than 0.1% of the total tablets used in water treatment. Therefore, approximately 7.3 lb of chlorine (as Cl_2) was produced in 1998 from the use of the tablets. The amount of bromine (as Br_2) produced is significantly less than 0.1%. Other byproducts—hypochlorous acid (7790-92-3), hypobromous acid (13517-11-8), and hypochlorite (14380-61-1)—are not regulated under EPCRA Section 313.

According to JCNNM, the maintenance contractor for various other small cooling towers throughout LANL, 400 lb of chlorine gas was used for cooling tower water treatment in 1998. The quantity of chlorine used in this application is considered "otherwise used" and is well below the 10,000-lb threshold.

Drinking Water Treatment

Approximately 1.02 billion gal. of drinking water was treated with chlorine gas from January through August 1998. In September 1998 the potable water treatment system was sold to Los Alamos County.

During the period that DOE and UC owned and operated this water treatment system, Los Alamos County purchased 0.654 billion gal. of water (64% of the quantity treated) for community use. The remaining 36% of the water was used at LANL as process water, or for employee personal use. The total amount of chlorine gas (Fig. 7-4) used to treat the water was 3,837 lb. This amount was confirmed through chemical procurement records, and end-user logbooks.

Fig. 7-4. Chlorine gas cylinders.

The use of 3,837 lb of chlorine is applied to two different thresholds. The chlorine in the drinking water that is sold to the community falls under "the intentional incorporation of a listed toxic chemical into a product for distribution to commerce,"[3] so by definition, 64% of the chlorine used in drinking water treatment was "processed." The remaining 36% of the chlorine in the water that remained for use at LANL is used for employee personal use and as process water. Because records are not available to quantify the amount used for employee personal use (and therefore exempt), the entire amount was applied to the 10,000-lb threshold for "otherwise used."

Table 7-3 provides a summary of the threshold determinations for chlorine. Chemicals such as chloroform and bromine were not subjected to threshold determination because their quantities did not come close to the most conservative threshold of 10,000 lb. No reporting thresholds were exceeded; therefore, no reporting for chlorine was required.

7.4 Lead

On the basis of procurement records, only 5 lb of lead and lead compounds were purchased in 1998. However, three different activities at LANL that involve the use of lead or lead compounds were also evaluated to determine if any EPCRA Section 313 thresholds were exceeded.

Lead Melting

Approximately 7,200 lb of lead was melted and formed into specific shapes for glove-box and exposure shielding. Lead melting as an activity is applied to the "process" threshold, on the basis of

Table 7.3. Chlorine Threshold Determinations for 1998

Description of Use of Generation	1998 Chlorine Amount	Data Source	EPCRA Section 313 Usage Category	Threshold
• SWSC	• 1,423 ob	• Calculations based on throughput	Manufactured	25,000 lb
• Cooling Towers	• 7 lb	• Calculations based on amount of 314-T used	Manufactured	25,000 lb
	1,430 lb			
Potable Water	3,837 lb	ACIS and end-user calculation[a]	Processed	25,000 lb
Miscellaneous Cooling Towers	400 lb	JCNNM	Otherwise Used	10,000 lb

[a] ACIS shows 3,750 lb of chlorine purchased in 1998. End-user records show 3,837 lb of chlorine was actually used.

guidance provided by the EPA to DOE facilities in the *Department of Energy Toxic Chemical Release Inventory Reporting* "*Qs & As*."[4] Questions 34 and 37 apply to the lead-melting activities and the appropriate threshold determination. The questions and answers read as follows:

> *34. Lead shielding was used in the transportation of nuclear warheads. The lead shields are being recycled into containers for radioactive waste storage. Would the lead from the shields be exempt from TRI reporting under the article exemption?*
>
> *No. Melting and reforming the lead shields to form storage containers would constitute manufacturing of an article, which negates the article exemption for the lead shield. Because the lead is intentionally incorporated into the radioactive waste storage containers, the lead is processed and subject to the 25,000-lb threshold.*
>
> *37. What is the difference between "process" and "otherwise use"?*
>
> *"Process" implies incorporation; the chemical added is intended to become part of a product further distributed. "Otherwise use" implies non-incorporation; the chemical is not intended to become part of a product (e.g., use of toxic chemicals in the remediation of wastes is an "otherwise use" activity).*

Lead Shielding Decontamination

In 1998, approximately 10,000 lb of radioactively contaminated lead shielding was decontaminated at LANL (Fig. 7-5). This treatment of lead qualifies for an "article exemption" on the following basis:[5]

. . . it is formed to a specific shape or design during manufacture, that has end use functions dependent in whole or in part upon its shape or design during end use, and that do not release a toxic chemical under normal circumstances of processing or otherwise use of the item at the facility.

Fig. 7-5. Lead decontamination site.

The decontamination of the lead removes only the radioactive contamination and does not change the form of the lead.

A second criterion that must be evaluated under the article exemption is that the processing or otherwise use of the articles may not result in total releases to the environment of more than 0.5 lb. There are no emissions of lead into the air since decontamination is a wet operation.

The total estimated release of lead to wastewater is 4 g (0.009 lb), well below the 0.5-lb "article exemption" release allowance. Form R instructions[5] state:

EPA will allow this release to be rounded to zero, and the manufactured items remain exempt as articles.

Lead Shot at the Firing Range

Approximately 8,800 lb of lead contained in ammunition was shot at the firing range. This amount was applied to the "otherwise used" threshold of 10,000 lb.

The thresholds for the different activity determinations involving lead are listed in Table 7.4.

Table 7.4. Lead Threshold Determinations for 1998

Description of Usage	1998 Lead Usage	EPCRA Section 313 Usage Category	Threshold
Laboratory Use	5 lb	Laboratory Activities Exempt	N/A
Lead Melting	7,200 lb	Processed	25,000 lb
Decontamination	10,000 lb	Article Exemption	N/A
Ammunition Firing	8,800 lb	Otherwise Used	10,000 lb

7.5 Chlorodifluoromethane and Other Refrigerants

UC staff at LANL operate numerous chillers, refrigerators, and HVAC systems that use EPCRA Section 313 chemicals such as trichlorofluoromethane (R-11), dichlorodifluoromethane (R-12), chlorodifluoromethane (R-22), and trichlorotrifluoroethane (R-113). Purchases of these refrigerants may be captured in ACIS, STORES, the Gas Plant Records, and JIT. Additionally, refrigeration maintenance contractors may fill or "top-off" units when they conduct scheduled or on-call maintenance. Initial review of procurements records showed that over 5,000 lb of R-22 was purchased at LANL in 1998. Procurements of other EPCRA Section 313 refrigerants were all below 2,000 lb. A more detailed analysis of the various data sources was conducted to evaluate the actual amount of R-22 and other refrigerants used in 1998. On the basis of this detailed analysis, a total of 8,507 lb of R-22 was calculated as being procured in 1998. All uses of R-22 are considered "otherwise used" and are subject to the 10,000-lb threshold for EPCRA Section 313 reporting. Therefore for 1998 none of the refrigerants were used above threshold quantities and no reporting is necessary.

7.6 Beryllium

Approximately 265 lb of beryllium was processed at LANL in 1998. The reporting threshold for "processing" under EPCRA Section 313 is 25,000 lb; therefore, it was below reporting requirements.

7.7 Cyanide and Nitrate Compounds

Explosives

Explosives were evaluated because many contain nitrates and/or cyanides that are regulated under EPCRA Section 313. Explosives data from project operations journals were used to determine the types and amounts of explosives detonated and burned at LANL because explosives are not captured in any of the procurement systems.

Nitrates

Nitrate compounds are reportable only when in aqueous solutions, according to the EPCRA Section 313, Toxic Chemical Release Inventory instructions:

> *Nitrate compounds (water dissociable; reportable only when in aqueous solution)* **. . .**

The nitrate components that are part of or produced from explosives activities at LANL are not in aqueous solutions.

According to procurement data, additional nitrate compounds used at LANL totaled 203 lb. This total was applied to the "otherwise used" threshold determination for nitrate compounds. The reporting threshold for "otherwise used" is 10,000 lb; therefore, reporting is not required.

Cyanides

Cyanide compounds at LANL were investigated according to EPCRA Section 313 guidance for both "otherwise used" and "manufactured" thresholds. The compounds are classified as "otherwise used" if they are brought on-site and already contain cyanides as a chemical component of the explosives. However, a review of the chemicals contained in the explosives revealed that they do not contain cyanide compounds as defined by the EPCRA Section 313 instructions:[7]

> *Cyanide Compounds, X^+CN^- where $X = H^+$ or any other group where a formal dissociation may occur. For example KCN or $Ca(CN)_2$.*

The chemical constituents reviewed are shown in Table 7-5.

Table 7.5. Chemical Constituents in Explosives

Chemical Constituent
Hexahydro-1,3,5-trinitro-1,3,5-triazine
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
Polyurethane solution system
Bis(2,2-dinitropropyl)acetal/bis(2,2-dinitropropyl) formal (plasticizer)
2-Methyl-1,3,5-trinitrobenzene
Barium nitrate
1,1-(1,2-Ethenediyl) bis-(2,4,6-trinitrobenzene)
2,2-Bis [(nitroxy) methyl]-1,3-propanediol, dinitrate
2,4,6-Trinitro-1,3,5-benzenetriamine
N-methyl-N,2,4,6-tetranitrobenzenamine

Also classified under the threshold determination of “otherwise used” are the cyanide compounds used for other activities at LANL. Approximately 23 lb of cyanides were used for other activities and were evaluated against the “otherwise used” reporting threshold of 10,000 lb.

The 25,000-lb “manufacture” threshold for reporting was applied to all cyanides produced from explosive activities. Approximately 124 lb of cyanides were “manufactured” from 12,011 lb of explosives; therefore, reporting is not required (Table 7.6).

Table 7.6. Cyanide Threshold Determination

Description of Usage	Amount of Cyanide	EPCRA Section 313 Usage Category	Threshold
Explosives	124	Manufactured	25,000
Otherwise Used	23	Otherwise Used	10,000

APPENDIX A

EPCRA SECTION 313 CHEMICAL PURCHASING AND RECEIVING DATA ANALYSIS

Table A-1. Total Pounds of EPCRA Section 313 Chemicals Procured at LANL in 1998 (p. 1 of 5)

CAS NO	Chemical	Total (lb)[a]
75456	CHLORODIFLUOROMETHANE	8,507
7697372	NITRIC ACID	7,791
7647010	HYDROCHLORIC ACID	4,890
7782505	CHLORINE	3,750
75092	DICHLOROMETHANE	2,776
107211	ETHYLENE GLYCOL	2,487
67561	METHANOL	2,229
110543	N-HEXANE	1,907
75694	TRICHLOROFLUOROMETHANE	1,500
67630	ISOPROPYL ALCOHOL	1,073
75058	ACETONITRILE	680
75718	DICHLORODIFLUOROMETHANE	493
79016	TRICHLOROETHYLENE	368
7664393	HYDROFLUORIC ACID	336
67663	CHLOROFORM	291
NA	BERYLLIUM COMPOUNDS	265[b]
76131	TRICHLOROTRIFLUOROETHANE	234
107062	ETHYLENE DICHLORIDE	206
NA	NITRATE COMPOUNDS	203[c]
115071	PROPYLENE	199
7664939	SULFURIC ACID	197
68122	N,N-DIMETHYLFORMAMIDE	189
108883	TOLUENE	188
79005	1,1,2-TRICHLOROETHANE	156
NA	CYANIDE COMPOUNDS	147[d]
NA	ZINC COMPOUNDS	114
NA	MANGANESE COMPOUNDS	113
872504	1-METHYL-2-PYRROLIDINONE	112
7664417	AMMONIA, ANHYDROUS	84
7664382	PHOSPHORIC ACID 85%	76
78933	METHYL ETHYL KETONE	75
71432	BENZENE	52
76153	CHLOROPENTAFLUOROETHANE	46
123319	HYDROQUINONE	41
56235	CARBON TETRACHLORIDE	33
108952	PHENOL	28
7440473	CHROMIUM	20

[a] Data Source: ACIS, JIT, STORES, LVA, and operations information
[b] Used in permitted machining operations
[c] Evaluated on the basis of procurement data
[d] Evaluated on the basis of procurement data and data from high explosives producing cyanide compounds

Table A-1. Total Pounds of EPCRA Section 313 Chemicals Procured at LANL in 1998 (p. 2 of 5)

CAS NO	Chemical	Total (lb)[a]
1634044	METHYL TERT-BUTYL ETHER	20
110827	CYCLOHEXANE	19
1344281	ALUMINUM OXIDE	19
NA	CADMIUM COMPOUNDS	16
121448	TRIETHYLAMINE	17
95636	1,2,4-TRIMETHYLBENZENE	17
64186	FORMIC ACID	14
108383	M-XYLENE	14
50000	FORMALDEHYDE SOLUTION, 37%	13
NA	NICKEL COMPOUNDS	12
75150	CARBON DISULFIDE	12
111422	DIETHANOLAMINE	11
7632000	SODIUM NITRITE	11
123911	1,4-DIOXANE	11
110861	PYRIDINE	10
71363	N-BUTYL ALCOHOL	9
71556	METHYL CHLOROFORM	9
79345	1,1,2,2-TETRACHLOROETHANE	9
100425	STYRENE MONOMER	8
7440508	COPPER	8
75003	CHLOROETHANE	8
95476	O-XYLENE	7
98953	NITROBENZENE	6
106423	P-XYLENE	6
7429905	ALUMINUM	6
77781	DIMETHYL SULFATE	6
78922	SEC-BUTYL ALCOHOL	5
108101	METHYL ISOBUTYL KETONE	5
127184	TETRACHLOROETHYLENE	5
7440393	BARIUM STANDARD SOLUTION	5
7439976	MERCURY	5
NA	COPPER COMfS	5
NA	LEAD COMPOUNDS	5
NA	CHROMIUM COMPOUNDS	4
7440484	COBALT REFERENCE STANDARD 1000PPM	4
NA	MERCURY COMPOUNDS	4
80626	METHYL METHACRYLATE	4
109864	ETHYLENE GLYCOL MONOMETHYL ETHER	4
584849	TOLYLENE 2,4-DIISOCYANATE	3
75354	VINYLIDENE CHLORIDE	3
124403	DIMETHYLAMINE	3
64675	DIETHYL SULFATE	3

[a] Data Source: ACIS, JIT, STORES, LVA, and operations information

Table A-1. Total Pounds of EPCRA Section 313 Chemicals Procured at LANL in 1998 (p. 3 of 5)

CAS NO	Chemical	Total (lb)[a]
101779	4,4'-METHYLENEDIANILINE	3
7550450	TITANIUM TETRACHLORIDE	3
NA	COBALT COMPOUNDS	3
NA	SILVER COMPOUNDS	3
79061	ACRYLAMIDE	2
91203	NAPHTHALENE	2
78842	ISOBUTYLALDEHYDE	2
75650	TERT-BUTYL ALCOHOL	2
NA	ARSENIC COMPOUNDS	2
NA	BARIUM COMPOUNDS	2
NA	SELENIUM COMPOUNDS	2
NA	THALLIUM COMPOUNDS	2
7726956	BROMINE	2
85449	PHTHALIC ANHYDRIDE	2
108907	CHLOROBENZENE	2
62533	ANILINE	2
7440666	ZINC	2
98884	BENZOYL CHLORIDE	2
106887	1,2-EPOXYBUTANE	1
302012	HYDRAZINE	1
76062	CHLOROPICRIN	1
95534	O-TOLUIDINE	1
100447	BENZYL CHLORIDE	1
79221	METHYL CHLOROFORMATE	1
104949	P-ANISIDINE	1
106934	ETHYLENE DIBROMIDE	1
106898	EPICHLOROHYDRIN	1
7782492	SELENIUM	1
95545	O-PHENYLENEDIAMINE	1
98828	CUMENE	1
107197	PROPARGYL ALCOHOL	1
79118	CHLOROACETIC ACID	1
7440020	NICKEL	1
101688	METHYLENE BISPHENYL ISOCYANATE	1
79447	DIMETHYLCARBAMOYL CHLORIDE	1
120809	CATECHOL	1
87627	2,6-DIMETHYLANILINE	1
108601	BIS(2-CHLOROISOPROPYL)ETHER	1
NA	ANTIMONY COMPOUNDS	1
7439921	LEAD	<1
1314201	THORIUM OXIDE	<1
107051	ALLYL CHLORIDE	<1

[a] Data Source: ACIS, JIT, STORES, LVA, and operations information

Table A-1. Total Pounds of EPCRA Section 313 Chemicals Procured at LANL in 1998 (p. 4 of 5)

CAS NO	Chemical	Total (lb)[a]
119904	3,3'-DIMETHOXYBENZIDINE	<1
20816120	OSMIUM TETROXIDE	<1
96333	METHYL ACRYLATE	<1
630206	1,1,1,2-TETRACHLOROETHANE	<1
4098719	ISOPHORONE DIISOCYANATE	<1
96184	1,2,3-TRICHLOROPROPANE	<1
119937	3,3'-DIMETHYLBENZIDINE	<1
10034932	HYDRAZINE SULFATE	<1
100016	P-NITROANILINE	<1
87865	PENTACHLOROPHENOL	<1
86306	N-NITROSODIPHENYLAMINE	<1
7783064	HYDROGEN SULFIDE	<1
121142	2,4-DINITROTOLUENE	<1
106514	QUINONE	<1
75070	ACETALDEHYDE	<1
541413	ETHYL CHLOROFORMATE	<1
74884	IODOMETHANE (METHYL IODIDE)	<1
135206	CUPFERRON	<1
90948	4,4'-BIS(DIMETHYLAMINO)-BENZOPHENONE	<1
75569	PROPYLENE OXIDE	<1
107131	ACRYLONITRILE	<1
7723140	PHOSPHORUS, RED	<1
94360	BENZOYL PEROXIDE	<1
7440622	VANADIUM POWDER	<1
26628228	SODIUM AZIDE	<1
680319	HEXAMETHYLPHOSPHORAMIDE	<1
1313275	MOLYBDENUM (VI)OXIDE	<1
51285	2,4-DINITROPHENOL	<1
107302	CHLOROMETHYL METHYL ETHER	<1
92524	BIPHENYL	<1
822060	HEXAMETHYLENE DIISOCYANATE	<1
122667	1,2-DIPHENYLHYDRAZINE	<1
126987	METHACRYLONITRILE	<1
106478	P-CHLOROANILINE	<1
61825	AMITROLE	<1
556616	METHYLISOTHIOCYANATE	<1
90040	O-ANISIDINE	<1
106445	P-CRESOL	<1
80159	CUMENE HYDROPEROXIDE	<1
96093	STYRENE OXIDE	<1
79107	ACRYLIC ACID	<1
98862	ACETOPHENONE	<1

[a] Data Source: ACIS, JIT, STORES, LVA, and operations information

Table A-1. Total Pounds of EPCRA Section 313 Chemicals Procured at LANL in 1998 (p. 5 of 5)

CAS NO	Chemical	Total (lb)[a]
85018	PHENANTHRENE	<1
554132	LITHIUM CARBONATE	<1
55210	BENZAMIDE	<1
989388	C.I. BASIC RED 1	<1
7440224	SILVER POWDER	<1
132649	DIBENZOFURAN	<1
123728	N-BUTYRALDEHYDE	<1
121697	N,N-DIMETHYLANILINE	<1
76028	TRICHLOROACETYL CHLORIDE	<1
1910425	PARAQUAT DICHLORIDE	<1
20325400	3,3'-DIMETHOXYBENZIDINE DIHYDROCHLORIDE	<1
7440439	CADMIUM	<1
1120714	PROPANE SULTONE	<1

[a] Data Source: ACIS, JIT, STORES, LVA, and operations information

APPENDIX B

SUBCONTRACTOR CHEMICAL USAGE DATA

Table B-1. LANL Subcontractor On-Site Chemical Use for 1998

Subcontractor	Chemical Type and Usage	Was Chemical Use Included in LANL's Chemical Inventory?	Subcontractor Contact
SAIC	None	N/A	Office 672-3666
Weston	None	N/A	Office 662-6445
Radian	None	N/A	Cindy Backlund
ICF Kaiser (IT Corporation)	None	N/A	Patricia Rael
ERM Golder	None	N/A	Al Funk
JCNNM	Sulfuric Acid–9,000 gal Chlorine–400 lb Chloro-Bromine Tablets–7,300 lb	Sulfuric Acid and Chlorine–NO 314T Tablets–YES	Suzanne Moore
LATA	None	N/A	Bob Hull
Butler	None	N/A	N/A
IT Corporation	None	N/A	Glenn VanDerpoel
Merrick	None	N/A	David Munger
Weirich	None	N/A	Office (505) 242-2055
The Plus Group	None	N/A	Terry McCabe
Benchmark	Cyclohexane–100 mL Hydrochloric Acid–200 mL Nitric Acid–800 mL Phenol–2 g Sodium Azide–2 g Sulfuric Acid–500 mL Zinc Dust–1 g	Yes	Marke Talley
Comforce (Ray Rashkin)	None None	N/A N/A	Office (505) 889-3535
Techlaw Inc.	None	N/A	N/A
Fire Department	Class A Fire Suppressant Foam–25 gal Microblaze–1 gal	No	Juan Pacheco
Bechtel Nevada	None	N/A	Ramon Martinez John S. Rohrer
Morrison Knudsen Corp. (ERM Golder, IT, and LATA)	Nitric acid–50 mL Hydrochloric acid–50 mL (preservatives)	No	John F. Dejoia William (Bill) B. Hardesty

APPENDIX C

AIR EMISSION ESTIMATES FOR HIGH-VOLUME TOXIC CHEMICALS

C.1. Nitric Acid Air Emissions

To better determine nitric acid emissions, LANL conducted a source test in 1988.[8] During the test, processes using the most nitric acid were run at maximum operating conditions. Because the processes have not changed significantly since that test, the emission factors determined from the source test were applied to the 1998 usage quantity to calculate 1998 emissions. Mass balances and engineering judgment were used to estimate the emissions for several processes that used only small amounts of nitric acid and, therefore, were not tested. Nitric acid emissions from the storage tank were estimated by scaling storage tank emissions from previous years by the total throughput of nitric acid in 1998. Original nitric acid storage tank emissions were calculated with the EPA-provided software TANKS 3.1. The emissions from the nitric acid storage tank totaled approximately 2 lb. Table C.1-1 shows the controlled emissions and the emission factors used for the estimates. Table C.1-2 provides a description of the processes and the basis for the emission factors.

Table C.1-1. Controlled 1998 Nitric Acid Emissions from Plutonium Processing

Process (Room No.)	HNO_3 (lb)	Emission Factors (lb/lb)			Controlled Emissions (lb/yr)		
		Nitric Acid	Nitrogen Oxide	Nitrogen Dioxide	Nitric Acid	Nitrogen Oxide	Nitrogen Dioxide
Waste Immobilization (401)	27	0.0	0.001	0.0047	0.0	0.03	0.13
Cascade Dissolution (401)	136	0.00136	0.00109	0.003	0.18	0.15	0.41
Cascade Dissolution (420)	0	0.075	0.0099	0.095	0.0	0.0	0.0
Distillation (401)[a]	2726	0.0016	0.0012	0.0034	4.36	3.27	9.27
Alpha Counting (116)	11	0.0	0.015	0.0442	0.0	0.17	0.51
Anion Exchange (409)	4443	0.0012	0.0	0.0	5.33	0.0	0.0
ICP (106)	11	0.0	0.01	0.03	0.0	0.11	0.33
OH Cake Dissolution (409)	245	0.014	0.0069	0.019	3.43	1.69	4.66
Filtrate Concentration (209)[a]	0	0.0016	0.0012	0.0034	0.0	0.0	0.0
ATLAS (409)	572	0.014	0.0069	0.019	8.0	3.9	10.8
Metallography (115)	6	0.0099	0.0	0.0	0.06	0.0	0.0
TOTAL	**5452**						

[a] The usage total for nitric acid (HNO_3) does not include either distillation processes or filtrate concentration processes, both of which use recovered nitric acid from other processes.

Table C.1-2. Nitric Acid Operations in Plutonium Processing

Process (Room)	Description	Emission Basis
Waste Immobilization (401)	Ammonia-containing chemical waste is stored in a glovebox for a few days prior to its neutralization and solidification with cement in open cans. Nitric acid is used to clean the glovebox and is left in the cement-containing cans to oxidize overnight. The cans are loaded in lead-lined drums and shipped to TA-54 for waste disposal.	99.14% of nitric acid remains in product. The difference converts to nitrogen oxide and nitrogen dioxide (Ref. 1).
Cascade Dissolution (401)	Plutonium oxide dissolved in 15.6 M of nitric acid with calcium difluoride at 96°C.	Use 1988 emission factors.
Cascade Dissolution (420)	Plutonium dioxide and magnesium oxide dissolved in 10 M of nitric acid at 100°C.	Use 1988 emission factors.
Distillation (401)	Waste nitric acid, ammonia, and water are condensed before disposal. The distillate is condensed in a one-shell, two-pass condenser and sent to TA-50. Bottoms are sent to TA-54 for disposal.	Use 1988 emission factors.
Alpha Counting (116)	Radioactive samples are dissolved in nitric acid and heated to 122°C during analytical processing.	87.59% of nitric acid remains in product or waste. The difference converts to nitrogen oxide and nitrogen dioxide (Ref. 1).
Anion Exchange (409)	Plutonium solution is passed through a resin bed after the pH and concentration is adjusted to 7 M using a 15.6-M solution of nitric acid.	Assume the volume of nitric acid used displaces an equal volume of air saturated with nitric acid.
Inductively Coupled Plasma (ICP) Atomic Emission Spectroscopy (106)	An 8-M nitric acid solution is used to dilute plutonium solution samples and as a blank standard for ICP analysis.	Lab personnel estimate 4% of the nitric acid remains in the plasma and is emitted as nitrogen oxides (Ref. 1).
OH Cake Dissolution (409)	Plutonium hydroxide precipitates from various plutonium recovery processes are filtered, concentrated, and redissolved.	Use “Scrap Dissolution and Plutonium Oxide Dissolution (209)” emission factors (1988).
Filtrate Concentration (209)	Plutonium hydroxide precipitates from various plutonium recovery processes are filtered, concentrated, and redissolved.	Use “Distillation (401)” emission factors (1988).
Advanced Testing Line for Actinide Separation (ATLAS) (409)	Samples prepared for research and development with an integrated module of dissolution, ion exchange, precipitation, and calcination.	Use “OH Cake Dissolution (409)” emission factors (1988).
Metallography (115)	Cut plutonium samples are placed in a nitric acid etching solution to clean the cut surfaces.	Assume 1% evaporates, on basis of engineering judgment.

C.2. Emissions of Chlorine and Related Compounds

Emissions from Wastewater Treatment

Air emissions are generated from the treatment of wastewater with the MIOX system. Chloroform emissions were calculated using the most conservative emission factor available. The chloroform air emissions are shown in Table C.2-1. Data were not available from the MIOX manufacturer to estimate chlorine, chlorine dioxide, and ozone emissions. There was no chlorine released in water because the water is de-chlorinated before its release from the SWSC plant.

Table C.2-1. Sewage Treatment Air Emissions

Pollutant	Emission Factor	Reference	Emissions (lb/yr)
Chloroform	1.68×10^{-7} lb/1000 gal.	EPA-450/2-90-011 (Ref. 9)	0.02
Chlorine	NA	NA	Undetermined

Emissions from Cooling-Tower Water Treatment

Air emissions from treatment of water at the various cooling towers were calculated and are shown in Table C.2-2. Bromoform, chlorine, and chloroform are all released as air pollutants from cooling-tower water treatment with 314-T. Chlorine and chloroform are released as air pollutants from cooling-tower water treatment with chlorine.

Table C.2-2. Cooling Tower Water Treatment Air Emissions

Pollutant	Emission Factor	Reference	Emissions (lb/yr)
Chloroform	6.25 lb/10^6 gal. of cooling water	EPA-450/2-90-011 (Ref. 9)	253
Bromoform	2.95 lb/10^6 gal. of cooling water	Engineering calculations based on molecular weight	119
Chlorine	NA	Engineering calculations[a]	76
Bromine	NA	Engineering calculations[a]	125

[a] Maximum emissions are calculated assuming all chlorine and bromine in the water are emitted.

Emissions from Drinking Water Treatment

Air emissions from drinking-water treatment are shown in Table C.2-3. Chloroform is the only pollutant released from the process into the air. All residual chlorine is assumed to remain in the water to prevent bacteria from growing during transport of the potable water to its final location.

Table C.2-3. Drinking Water Treatment Air Emissions

Pollutant	Emission Factor	Reference	Emissions (lb/yr)
Chloroform	3.42×10^{-4} lb/1000 gal.	EPA-450/2-90-011 (Ref. 9)	350

C.3. Emissions of Lead

Each of the areas where lead is used has the potential to generate small quantities of air emissions. The decontamination process is a wet process, and therefore any lead dust is assumed to remain in the water. Lead emissions from ammunition firing and lead melting are shown in Table C.3-1.

Table C.3. Lead Emissions

Lead Usage	Emission Factor	Reference	Emissions (lb/yr)
Ammunition Firing	2×10^{-5} lb/cartridge	Engineering calculations	25
Melting	1.5 lb/ton	EPA-AP-42 (Ref. 10)	5.4

C.4. Emissions of Chlorodifluoromethane

In 1998, 8,507 lb of chlorodifluoromethane (R-22) was purchased at LANL through various procurement avenues. Because of requirements of Title VI of the 1990 Clean Air Act Amendments (Stratospheric Ozone Program), UC began implementing a refrigerant tracking system in June 1998. This system is designed to track individual units containing refrigerants, as well as the maintenance and repair records for each unit. When this system is fully implemented and populated with up-to-date service and repair records, it will be used to track the amount of chlorodifluoromethane (and other refrigerant compounds) added to each unit. Before implementation of this system, there were no central files or database for tracking this information.

Purchasing records for refrigerants are not a good indication of air emissions. Refrigerants are typically purchased in 30-lb or 50-lb cylinders, and a small inventory of cylinders is maintained on-site and used for repairs on leaking systems. Often only 5 or 10 lb is used at a time, and the cylinder is then returned to inventory. The refrigerant tracking system will record the amount of refrigerant added to units during each repair and maintenance call.

There are a number of reasons that refrigerant is added to a unit:

- to fill or top-off a unit because refrigerant has leaked;
- to replace one refrigerant compound with another to meet CFC phase-out goals;
- to evacuate a unit to conduct repairs or maintenance and then refill with same refrigerant; and
- to add refrigerant to a new unit before startup.

The amount of refrigerant added to a unit because of leakage can be assumed to be equal to the amount of refrigerant emitted to the atmosphere. When the refrigerant tracking system is fully implemented it will track leak rates for each unit, as well as the amount of refrigerant added to each unit because of leakage. This information will be used to calculate air emissions for future years.

From April to December 1998 the refrigerant tracking system indicates that 698 lb of R-22 was added to units as a direct result of leaking equipment.

APPENDIX D

REFERENCES

REFERENCES

1. U.S. Environmental Protection Agency, "Guidance for Reporting Sulfuric Acid (Acid Aerosols Including Mists, Vapors, Gas, Fog, and Other Airborne Forms of Any Particle Size)," in *EPCRA, Section 313*, EPA-745-R-97-007 (1997).

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4. U.S. Department of Energy, *Toxic Chemical Release Inventory Reporting 'Qs & As,'* DOE/EH-0374 (March 1994).

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7. U.S. Environmental Protection Agency, "Toxic Chemical Release Inventory Reporting Form R and Instructions," Revised 1999, EPA 745-K-99-001, p. II-23.

8. PEI Associates, "Process Emission Rates, Plutonium Processing Facility, Area 400 Ventilation Exhaust, Technical Area 55," PN 3003-26-7 (February 1989).

9. U.S. Environmental Protection Agency, "Toxic Air Pollutant Emission Factors—A Compilation for Selected Air Toxic Compounds and Sources, Second Edition," EPA-450/2-90-011 (1990).

10. U.S. Environmental Protection Agency, "Compilation of Air Pollutant Emission Factors (AP-42), Fifth Edition," [Air CHIEF CD-ROM] (1995).

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