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U.S. Army Environmental Center

CONTRACT NUMBER: DAAA15-90-D-0014
DELIVERY ORDER NO 012

FINAL REPORT

AIR POLLUTION EMISSION STATEMENT FOR

SENECA ARMY DEPOT ACTIVITY

NEW YORK

Volume I

SUBMITTED TO:

U.S. ARMY ENVIRONMENTAL CENTER
ABERDEEN PROVING GROUND, MARYLAND 21010-5401

SUBMITTED BY:

GEOMET TECHNOLOGIES, INC.
SUBSIDIARY OF VERSAR, INC.
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GEOMET Report No. EA-2738

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ACRONYMS AND ABBREVIATIONS

AP-42	Compilation of Air Pollution Emission Factors
APES	Air Pollution Emission System
AR	Army Regulation
AST	Aboveground Storage Tank
AWS	American Welding Society
Ba	Barium
bbl	barrel
Bldg	Building
Btu	British Thermal Unit
°C	Degree Celsius
CAAA-90	Clean Air Act Amendments of 1990
CAS	Chemical Abstract Service
CARC	Chemical Agent Resistant Coating
CDROM	Compact Disk Read Only Memory
CHIEF	Clearing House for Inventories and Emission Factors
Co	Cobalt
CO	Carbon Monoxide
COMIS	Care of Machinery in Storage
Cr	Chromium
Cu	Copper
DA	Department of the Army
DD	Defense Department
DEC	Department of Environmental Conservation
Dia	Diameter
DODIC	Department of Defense Identification Code
EPA	Environmental Protection Agency
°F	Degree Fahrenheit
FIRE	Factor Information Retrieval System
ft	feet
gal	gallon
g	gram
HAP	Hazardous Air Pollutant
hp	Horsepower
hr	hour
in	inch
kg	kilogram
kw	kilowatt
l	liter
lb	pound
lpg	liquid petroleum gas
LTOs	Landings and Takeoffs
LTL	Less than a Truck Load
mg	milligram
ml	milliliter
MM	Million
Mn	Manganese
MSDS	Material Safety Data Sheets
N	North

ACRONYMS AND ABBREVIATIONS (Continued)

Ni	Nickel
No	Number
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
NSN	National Stock Number
OB/OD	Open Burning/Open Detonation
PM	Particulate Matter
PM_{10}	Particulate Matter under 10 microns in aerodynamic diameter
ppb	parts per billion
ppm	parts per million
psi	pounds per square inch
psia	pounds per square inch absolute
psig	pounds per square inch gauge
O_3	Ozone
QA/QC	Quality Assurance/Quality Control
oz	ounce
°R	Rankine degree
Ref	Reference
SARA	Superfund Amendments Reauthorization Act
SCC	Source Classification Code
SEAD	Seneca Army Depot
SO_2	Sulfur Dioxide
SO_x	Oxides of Sulfur
TMDE	Test Measurement Diagnostic Equipment
TNMOC	Total Nonmethane Organic Compound
TRI	Toxic Chemical Release Inventory
tpy	tons per year
TSP	Total Suspended Particulate
μm	micrometers
US	United States
USA	United States of America
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound
W	West
wt	weight
yr	year

EXECUTIVE SUMMARY

PURPOSE

The Clean Air Act Amendments of 1990 (CAAA-90) contain several mandates for the conduct of air emissions inventories. In addition, individual states and localities often have requirements for the conduct of air emissions inventories. Army Regulation (AR) 200-1 requires all Army installations to develop and maintain an up-to-date inventory of all air pollution sources, and that they comply with all local, state, and federal environmental regulations. As a result of these various mandates, the Department of the Army (DA) has undertaken an ambitious and proactive program to assess air pollution emissions at all DA facilities. The goal of this program is to develop, a comprehensive reference document and a database describing the air pollution resulting from normal operation. In order to accomplish this goal, DA is conducting air emissions inventories at all its facilities. This document presents the results of the air emissions inventory conducted at Seneca Army Depot, New York.

CONCLUSIONS

The data contained in this document constitutes an Emission Statement as defined in Title I of the CAAA-90. This Emission Statement identifies and quantifies air emissions from stationary air pollution sources at Seneca Army Depot, New York.

Title I of the CAAA-90 requires air pollution source owners located in ozone nonattainment areas to submit an Emission Statement to local regulatory authorities. However, the Seneca Army Depot does not emit more than 50 tpy of VOC or 100 tpy of NO_x, and therefore, is not, at this time required to submit an emission statement. Nevertheless, future CAA-90 or New York regulations may necessitate that the Seneca Army Depot to submit an emission statement. This statement can also be used for permit preparation. This document is designed, therefore, to qualify as an emission statement.

Title III of the CAAA-90 requires facilities that emit more than 10 tons per year (tpy) of a single hazardous air pollution (HAP) or 25 tpy of combined HAPs to meet emission control requirements promulgated by the U.S. Environmental Protection Agency (USEPA). An air emissions inventory is necessary to determine the applicability of Title III requirements. The Seneca Army Depot does not emit more than 10 tpy of a single HAP or 25 tpy of combined HAPs and thus may not be required to meet emission control requisites.

Title V of the CAAA-90 requires each state to institute a permit program which assesses fees based on annual air pollutant emissions. An emissions inventory is necessary to quantify emission rates so as to determine fees. The emission summaries contained in this report may be used to calculate any applicable fees which are based on actual pollutant emission rates. Based on requirements contained in Title V of CAAA-90, New York has established a permit program which assesses fees based on annual air pollutant emission.

Pollutant emission summaries presented in this report are actual pollutant emission rates. An actual emission rate reflects only those emissions generated as a result of source operations. The emission summaries presented in this report reflect emissions of criteria pollutants and HAPs as identified under Title III of the CAAA-90, and toxic chemicals as identified under Section 313 of the Superfund Amendments and Reauthorization Act (SARA). Table ES-1 presents a summary of the annual VOC and criteria pollutants air emissions for each source category at Seneca Army Depot.

Federal and state regulatory authorities may require air emission estimates to be updated and certified on an annual basis.

RECOMMENDATIONS

This emissions statement should be updated annually to reflect the most current data air pollution sources and their associated emissions.

Army activities/units and contractors assigned to the Seneca Army Depot should maintain better records concerning some of the chemical products and equipment used on the installation.

TABLE ES-1. TOTAL ANNUAL VOC AND CRITERIA POLLUTANT EMISSION SUMMARY BY SOURCE CATEGORY

Source Category	TSP		PM_{10}		SO_2		CO		VOC		NO_x	
	lb/yr	ton/yr	lb/yr	ton/yr	lb/yr	ton/yr	lb/yr	ton/yr	lb/yr	ton/yr	lb/yr	ton/yr
Aboveground Storage Tanks	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	134.2	0.06	N/A	N/A
Abrasive Blasting Operations	0.8	<0.01	0.6	<0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aircraft Landing and Takeoffs	449.4	0.22	N/A	N/A	130.6	0.06	2,855.2	1.43	2,161.0	1.08	1,461.5	0.73
Boilers	5,342.9	2.67	4,209.7	2.10	81,810.8	40.90	2,510.3	1.25	260.5	0.13	19,997.5	10.00
Woodworking Operations	2,730.0	1.37	1,444.2	0.72	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Degreasing Operations	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	423.8	0.21	N/A	N/A
Firefighting Training	N/A	N/A	650.3	0.33	8.5	<0.01	4,904.5	2.45	930.8	0.47	59.5	0.03
Gasoline Service Stations	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,836.6	0.91	N/A	N/A
Generators	15.2	<0.01	141.7	0.07	178.5	0.08	4,148.3	2.09	345.8	0.17	2,370.1	1.19
Miscellaneous Chemicals	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,264.2	0.63	N/A	N/A
Painting Operations	135.3	0.07	63.2	0.03	N/A	N/A	N/A	N/A	1,706.9	0.85	N/A	N/A
Pesticide Applications	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	84.9	0.04	N/A	N/A
Surface Coating Operations	78.4	0.04	36.6	0.02	N/A	N/A	N/A	N/A	1,279.5	0.64	N/A	N/A
Underground Storage Tanks	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	66.5	0.03	N/A	N/A
Water Treatment Plant	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welding Operations	4.8	<0.01	4.8	<0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	**8,756.8**	**4.37**	**6,551.1**	**3.27**	**82,128.4**	**41.04**	**14,418.3**	**7.22**	**10,494.7**	**5.22**	**23,888.6**	**11.95**

N/A: Not Applicable

SENECA ARMY DEPOT EMISSIONS INVENTORY

1.0 AUTHORITY

This document is the final report for Contract No. DAAA15-90-D-0014 for the Seneca Army Depot. This contract requested that GEOMET perform an air emissions inventory for Seneca Army Depot, New York.

2.0 PURPOSE

A comprehensive air pollutant emissions inventory was conducted at the Seneca Army Depot to quantify actual emissions of criteria pollutants and hazardous air pollutants emitted at those installations during the base year 1993. This document presents the results of this inventory. This study was performed in accordance with the requirements of Title I, III and V of the CAAA-90.

A description of each source that potentially emits air pollutants and the characterization of its emissions are presented in this document. In addition, emission inventory forms along with the QA/QC-Calculation Verification forms are presented in separated appendices in Volume II of this document.

3.0 REGULATORY REQUIREMENTS

- <u>Clean Air Act Amendments of 1990</u>

  Title I of the CAAA-90 requires air pollution source owners located in ozone (O_3) nonattainment areas to submit an emission statement to local regulatory authorities (Ref. 1). This emission statement must identify and quantify air emissions of nitrogen oxide (NO_x) and volatile organic compounds (VOCs) from stationary air pollution sources.

  Title III of the CAAA-90 requires air pollution sources that emit more than 10 tpy of any single HAP, or more than 25 tpy of any combination of HAPs to meet emission control requirements. An emission inventory is necessary to determine applicability of the Title III requirements.

  Title V of the CAAA-90 requires each state to institute a permit program that will assess fees based on annual air pollutant emissions. The emission summaries contained in this report may be used to calculate any applicable fees which are based on actual pollutant emission rates. An actual emission rate reflects only those emissions generated as a result of emission source operation.

- New York Regulations (Ref. 2)

  Seneca Army Depot is located in Seneca County, New York. The state air pollution control authority for these installations is the New York State, Department of Environmental Conservation, Division of Air Resources in Albany, New York. Seneca County is included in EPA Region II, headquartered in New York, New York and is classified as an attainment area for all air quality criteria pollutants; however, since it is located in New York State, which is the northeast ozone transport region, the conditions that apply to areas designated as moderate nonattainment for ozone apply to this region also. Any stationary source in the transport region that has the potential to emit 50 tpy or more of VOCs is considered a major source.

  New York has adopted the federal standards for sulfur dioxide, carbon monoxide, and nitrogen dioxide. The state has special standards for ambient ozone levels of 80 ppb and for non-methane hydrocarbons (0.24 ppm from 6-9 a.m.). New York also has an air toxics program which places all air toxics into high, moderate and low toxicity emission categories. Some of the air toxics listed are not included on the federal HAP list.

  Each source in New York is rated on its potential to cause harm to the environment or to exceed some standard. Sources applying for construction or operating permits are also assigned a rating.

- Superfund Amendments and Reauthorization Act

  As a result of Executive Order 12856 (3 August 1993), the Toxic Chemical Release Inventory (TRI) requirements of SARA Title III, Section 313 are enforceable at all Federal facilities. These regulations require reporting of all discharges to land, air and water for chemicals which exceed applicable thresholds for manufacturing, processing or otherwise use. Although it is not the purpose of this emissions statement to determine chemical eligibility under Section 313 rules, some of the hazardous air pollutant (HAP) emission rates calculated for this report may be useful for future TRI reporting requirements. HAPs emitted at the Seneca Army Depot which are also regulated chemicals under SARA Title III Section 313 are noted in the HAP Emission Summary Tables. These HAPs may be liable to TRI reporting requirements if applicable manufacturing, processing or otherwise use thresholds are exceeded.

- Army Regulation

  All Army installations are required by Army Regulation (AR) 200-1 to maintain an up-to-date inventory for all their air pollution sources and to comply with all local, state and Federal regulatory requirements regarding air pollution abatement (Ref. 3). This report fulfills the AR mandate for compiling an inventory of air pollution sources. The inventory should be amended as necessary to reflect increases or decreases in air pollution emissions at Seneca Army Depot.

4.0 INSTALLATION

4.1 Location

The Seneca Army Depot Activity is located in Romulus (Seneca County) New York. The location is between the two largest lakes (Seneca and Cayuga Lakes) of the Finger Lakes region. A portion of the installation borders on Seneca Lake and the installation is within five miles of Cayuga Lake. The terrain in the region may be typified as flat, used mainly for agriculture. The Seneca Army Depot installation covers nearly 11,000 acres. Figure 1 illustrates the geographic location of Seneca Army Depot (Ref. 4).

The point of contact and mailing address for correspondence dealing with the inventory is:

Mr. Thomas Grasek
Seneca Army Depot Activity
SDSTO-SEI-PE
Route 96
Romulus, New York 14541

4.2 Mission

The primary mission for the Seneca Army Depot is twofold:

1. Receipt, storage, issue, maintenance, and demilitarization of conventional munitions

2. Receipt, storage, and issue of general supplies including hazardous materials

The secondary mission for the Seneca Army Depot consists of the following:

1. Continental U.S. care of materials in storage for the U.S. Army Reserve Command

2. Strategic and critical materials storage

3. Logistics support and training assistance to the Army Reserve and National Guard units

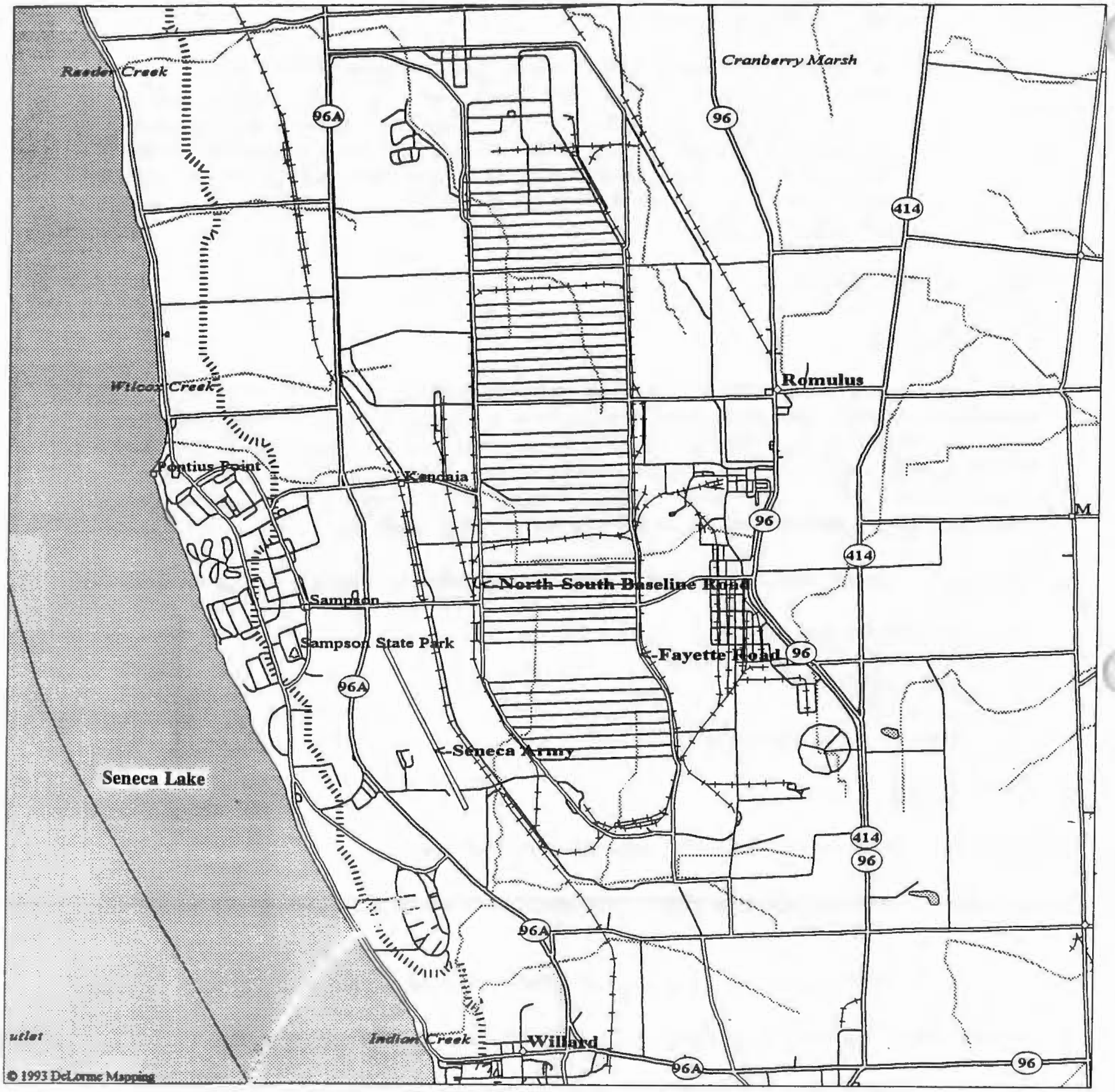

Figure 1. Geographic Location of the Seneca Army Depot

4.3 Tenants

The tenant organizations identified at the Seneca Army Depot are:

- U.S. Coast Guard LORAN-C Transmitting Station
- Defense Finance and Accounting Service
- U.S. Army Test, Measurement, and Diagnostic Equipment Support Operations
- Defense Reutilization and Marketing Office - Romulus Branch
- U.S. Army Health Clinic

5.0 EMISSIONS INVENTORY

5.1 Personnel Contacted During the Emissions Inventory

This emissions inventory was performed with the collaboration of personnel from Seneca Army Depot. Appendix A lists the personnel contacted during the development of this emissions inventory.

5.2 Emissions Inventory Process

- The following GEOMET personnel were responsible for performing the field survey, calculating the emissions, preparing the inventory data, and developing the final report.

- Timothy Sletten Mike Onesty	Site Visit
- Timothy Sletten	Final Report Preparation
- Radhika Narayanan Gregory Mason Diane Pappafotis Laura Niang	Emissions Calculations
- Josefina Doumbia	QA/QC

The above personnel can be reached at (301) 428-9898.

- The air emissions inventory for Seneca Army Depot was developed following the guidelines provided in the *Air Pollution Emission Inventory Protocol for Army Installations and Activities (Protocol)* (Ref. 5). The site visits to Seneca Army Depot was conducted June 6 through June 10, 1994.

- The first step in this inventory included delivering an entrance briefing to the involved Seneca Army Depot personnel, gathering data through a series of interviews with operations and maintenance personnel, record searching, and document reviewing, and delivering an exit briefing summarizing the field work to the Seneca Army Depot personnel. Data were gathered on all sources potentially emitting pollutants of interest in the data collection forms approved in the technical plan.

- The second step in the inventory covered emissions calculations for all pollutants of interest. In general, most emission rates were estimated through the use of emissions factors and mass balances.

- Emission factor calculations were performed according to EPA-recommended procedures. This consisted of using AP-42 (including Supplement F) (Ref. 6) for most emission factors, followed by the Locating and Estimating Series from the Clearing House for Inventories and Emissions Factors (CHIEF) CDROM (Ref. 7); the USEPA Factor Information Retrieval System (FIRE) (Ref. 8); and the VOC/PM Speciation Data System (SPECIATE) Version 1.4 (Ref. 9 and 10).

- This inventory calculated emissions for VOCs, SO_2, NO_x, CO, TSP, and PM_{10} as well as for federal hazardous air pollutants and New York toxics.

- As a Quality Assurance and Quality Control (QA/QC) check, at least 10 % of the emission estimate calculations for each source category were recalculated. When the agreement was less than 98 percent, all of the calculations for the source category were redone. The QA/QC check calculations were recorded on the "*AUDIT OF EMISSION DATA - CALCULATIONS VERIFICATION FORM*" provided in the Protocol and are contained in Volume II of this document.

- The results of the emissions calculations were input into the Army Air Pollution Emission System (APES) software provided by the government to develop the air emissions database for the Seneca Army Depot. A 360K floppy disk(s) containing the air emissions database will be submitted under separate cover.

5.3 Emissions Summary

- **Criteria Pollutants/VOCs**

  Table 1 presents the total annual emission rates for criteria pollutants and VOCs at the Seneca Army Depot. Calendar year 1993 was used as the baseline emissions inventory. When 1993 data was not available the most recent, consecutive twelve month period for which data was available was used. Source descriptions, emissions calculations methods and sample calculations for each source category shown in Table 1 may be found in Appendices B through V. Emissions of VOC, NO_x, CO, SO_2, PM_{10}, and TSP were calculated. All sulfur oxide emissions were assumed to be sulfur dioxide (SO_2.)

  The criteria pollutants with the highest emission rates were SO_2 and NO_x. Their emissions were approximately 41 tpy for SO_2 and 12 tpy for NO_x. The source category which made the most significant emission contribution to the SO_2 and NO_x emission rates were boilers.

- **HAPS**

  Annual emissions of HAPs for the Seneca Army Depot are presented in Table 2. None of the HAPs at the Seneca Army Depot were emitted in quantities which exceeded 1 ton per year. The largest HAP emission rate was 853.8 lb/yr (0.43 tpy), for Toluene.

- **SARA Title III Chemicals**

  SARA Section 313 toxic chemical and their threshold quantities emissions are indicated in Table 2. Section 313 requires users of listed chemicals to report releases to the environment of any listed chemical if that release exceeds 10,000 lb/yr. None of the listed SARA chemicals at the Seneca Army Depot exceed this threshold.

TABLE 1. TOTAL ANNUAL VOC AND CRITERIA POLLUTANT EMISSION SUMMARY BY SOURCE CATEGORY

Source Category	TSP		PM_{10}		SO_2		CO		VOC		NO_x	
	lb/yr	ton/yr	lb/yr	ton/yr	lb/yr	ton/yr	lb/yr	ton/yr	lb/yr	ton/yr	lb/yr	ton/yr
Aboveground Storage Tanks	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	134.2	0.06	N/A	N/A
Abrasive Blasting Operations	0.8	<0.01	0.6	<0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aircraft Landing and Takeoffs	449.4	0.22	N/A	N/A	130.6	0.06	2,855.2	1.43	2,161.0	1.08	1,461.5	0.73
Boilers	5,342.9	2.67	4,209.7	2.10	81,810.8	40.90	2,510.3	1.25	260.5	0.13	19,997.5	10.00
Woodworking Operations	2,730.0	1.37	1,444.2	0.72	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Degreasing Operations	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	423.8	0.21	N/A	N/A
Firefighting Training	N/A	N/A	650.3	0.33	8.5	<0.01	4,904.5	2.45	930.8	0.47	59.5	0.03
Gasoline Service Stations	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,836.6	0.91	N/A	N/A
Generators	15.2	<0.01	141.7	0.07	178.5	0.08	4,148.3	2.09	345.8	0.17	2,370.1	1.19
Miscellaneous Chemicals	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1,264.2	0.63	N/A	N/A
Painting Operations	135.3	0.07	63.2	0.03	N/A	N/A	N/A	N/A	1,706.9	0.85	N/A	N/A
Pesticide Applications	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	84.9	0.04	N/A	N/A
Surface Coating Operations	78.4	0.04	36.6	0.02	N/A	N/A	N/A	N/A	1,279.5	0.64	N/A	N/A
Underground Storage Tanks	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	66.5	0.03	N/A	N/A
Water Treatment Plant	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welding Operations	4.8	<0.01	4.8	<0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	**8,756.8**	**4.37**	**6,551.1**	**3.27**	**82,128.4**	**41.04**	**14,418.3**	**7.22**	**10,494.7**	**5.22**	**23,888.6**	**11.95**

N/A: Not Applicable

TABLE 2. TOTAL ANNUAL HAP EMISSIONS SUMMARY

Hazardous Air Pollutant	CAS No	Emission Rate		Accidental Release List?	Threshold Quantity (lb)	SARA Title III?
		(lb/yr)	(ton/yr)			
Acetaldehyde	75-07-0	104.8	0.05	No	N/A	Yes
Acetone *	67-64-1	438.2	0.22	No	N/A	Yes
Acrolein	107-02-8	51.4	0.03	Yes	1,000	Yes
Antimony Compounds	N/A	2.0	<0.01	No	N/A	No
Arsenic Compounds	N/A	5.0	<0.01	No	N/A	No
Barium Compounds*	N/A	<0.1	<0.01	No	N/A	No
Benzene	71-43-2	151.4	0.08	No	N/A	Yes
Beryllium Compounds	N/A	0.3	<0.01	No	N/A	No
Butadiene, 1,3-	106-99-0	43.7	0.02	No	N/A	Yes
Butyl acetate*	123-86-4	99.2	0.05	No	N/A	No
Butyl alcohol, n-*	71-36-3	58.7	0.03	No	N/A	Yes
Butyl Benzyl Phthalate*	85-68-7	2.9	<0.01	No	N/A	Yes
Cadmium Compounds	N/A	9.4	<0.01	No	N/A	No
Chlorine	7782-50-5	121.8	0.06	Yes	2,500	Yes
Chlorobenzene	108-90-7	0.6	<0.01	No	N/A	Yes
Chromium Compounds	N/A	73.8	0.04	No	N/A	No
Cobalt Compounds	N/A	5.2	<0.01	No	N/A	No
Copper Compounds*	N/A	20.0	0.01	No	N/A	No
Cumene	98-82-8	6.5	<0.01	No	N/A	Yes
Cyclohexane*	110-82-7	13.3	0.01	No	N/A	Yes
Dichlorvos	62-73-7	0.2	<0.01	No	N/A	Yes
Ethyl acetate*	141-78-6	25.4	0.01	No	N/A	No
Ethylbenzene	100-41-4	115.3	0.06	No	N/A	Yes
Ethylene glycol	107-21-1	16.6	0.01	No	N/A	Yes
Formaldehyde	50-00-0	357.1	0.18	Yes	500	Yes
Furfural*	91-20-3	10.3	0.01	No	N/A	No
Glycol Ethers	N/A	5.0	<0.01	No	N/A	No
Heptane *	142-82-5	61.0	0.03	No	N/A	No
Hexamethylene-1,6-diisocyanate	822-06-0	0.3	<0.01	No	N/A	No
Hexane	110-54-3	83.4	0.04	No	N/A	No
Isobutyl acetate*	110-19-0	166.6	0.08	No	N/A	Yes
Isopropyl alcohol*	67-63-0	50.0	0.03	No	N/A	Yes
Isopropylamine*	75-31-0	0.1	<0.01	No	N/A	No
Lead Compounds	N/A	8.6	<0.01	No	N/A	No

TABLE 2. TOTAL ANNUAL HAP EMISSIONS SUMMARY
(Continued)

Hazardous Air Pollutant	CAS No	Emission Rate		Accidental Release List?	Threshold Quantity (lb)	SARA Title III?
		(lb/yr)	(ton/yr)			
Manganese Compounds	N/A	3.8	<0.01	No	N/A	No
Mercury Compounds	N/A	1.5	<0.01	No	N/A	No
Methyl Alcohol	67-56-1	5.5	<0.01	No	N/A	Yes
Methyl chloroform	71-55-6	44.2	0.02	No	N/A	Yes
Methyl ethyl ketone	78-93-3	185.7	0.09	No	N/A	Yes
Methyl isobutyl ketone	108-10-1	57.1	0.03	No	N/A	Yes
Methylene chloride	75-09-2	102.3	0.05	No	N/A	Yes
Naphthalene	91-12-3	35.0	0.02	No	N/A	No
Nickel Compounds	N/A	104.7	0.05	No	N/A	No
Phenol	108-95-2	5.6	<0.01	No	N/A	Yes
Polycyclic Organic Matter	N/A	0.6	<0.01	No	N/A	No
Propionaldehyde	123-38-6	21.1	0.01	No	N/A	Yes
Propoxur (Baygon)	114-26-1	0.5	<0.01	No	N/A	Yes
Pyrethrum*	8003-34-7	<0.1	<0.01	No	N/A	No
Selenium Compounds	N/A	1.6	<0.01	No	N/A	No
Styrene	100-42-5	12.2	0.01	No	N/A	No
Tetrachloroethylene	127-18-4	120.8	0.06	No	N/A	Yes
Toluene	108-88-3	853.8	0.43	No	N/A	Yes
Trimethylpentane, 2,2,4-	540-84-1	3.5	<0.01	No	N/A	No
Xylenes	1330-20-7	190.6	0.10	No	N/A	Yes
Xylenes (m & p)	N/A	305.8	0.15	No	N/A	No
Xylenes, m-	108-38-3	0.6	<0.01	No	N/A	Yes
Xylenes, o-	95-47-6	137.6	0.07	No	N/A	Yes
Xylenes, p-	106-42-3	4.8	<0.01	No	N/A	Yes
Zinc Oxide*	1314-13-2	2.6	<0.01	No	N/A	No
TOTAL		4,309.6	2.14			

N/A: Not Applicable
* New York Regulated HAP

- **Ozone Season Emissions**

  Ozone season VOC and NO_x emissions for each source category were also calculated and listed in Table 3 for the Seneca Army Depot. Ozone season emissions are reported for the 3 month period of June, July and August (92 days) as specified by the EPA and were also calculated as workday emissions.

6.0 CONCLUSIONS

- This document is designed to qualify as an emission statement.
- Seneca Army Depot is located in an attainment area for all air criteria pollutants, but is within the eastern ozone transport region and thus regulations applicable to an moderate nonattainment ozone region apply. The Seneca Army Depot emits less than 10 tpy of VOC and less than 50 tpy of NO_x and thus may not be required to submit an annual emission statement. Nevertheless future CAAA-90 or New York regulations may necessitate that the Seneca Army Depot submit an emissions statement.
- Seneca Army Depot emits less than 3 tpy of combined HAPs. Toluene had the largest HAP emission rate, 853.8 lb/yr (0.43 tpy).

7.0 RECOMMENDATIONS

- The emissions statement should be updated annually to reflect the most current data pertaining to air pollution sources on the Seneca Army Depot.
- Army activities/units and contractors assigned to the Seneca Army Depot should maintain better records concerning some of the chemical products and equipment used on the installation.

TABLE 3. ESTIMATED DAILY VOC AND NO_x OZONE SEASON EMISSIONS

Source Category	VOC Emission Rate		NO_x Emission Rate	
	lb/day	lb/work day	lb/day	lb/work day
Aboveground Storage Tanks	1.0	1.4	N/A	N/A
Abrasive Blasting Operations	N/A	N/A	N/A	N/A
Aircraft Landing and Takeoff	5.9	8.2	4.0	5.6
Boilers	0.7	0.9	53.3	74.6
Woodworking Operations	N/A	N/A	N/A	N/A
Degreasing Operations	1.2	1.6	N/A	N/A
Gasoline Service Stations	5.7	8.0	N/A	N/A
Generators	0.9	1.3	6.4	9.0
Miscellaneous Chemicals	3.4	4.8	N/A	N/A
Painting Operations	4.6	6.5	N/A	N/A
Pesticide Applications	0.6	0.8	N/A	N/A
Surface Coating Operations	3.5	4.9	N/A	N/A
Underground Storage Tanks	0.1	0.2	N/A	N/A
Water Treatment Plant	N/A	N/A	N/A	N/A
Welding Operations	N/A	N/A	N/A	N/A
TOTAL	27.6	38.6	63.7	89.2

N/A: Not Applicable

8.0 REFERENCES

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24. Perry, Robert H., *Chemical Engineers Handbook*, Sixth Edition, McGraw-Hill, Inc., New York, NY, 1984.

APPENDIX A

SENECA ARMY DEPOT PERSONNEL CONTACTED DURING THE SITE INSPECTION

Point of Contact	Area of Concern	Phone Number
Randall Battaglia	Environmental Coordinator	607-869-1450
Thomas Grassek	Environmental Engineer	607-869-1450
George Shadman	Public Works Shops	607-869-1470
Joe Scharett	Box & Crate Shop	607-869-1490
Jack LaBour	Vehicle Maintenance	607-869-1396
Fred Kaufman	Public Works Maintenance Repair	607-869-1456
Karen Mikkelborg	Ammo Surveillance Workshop	607-869-4135
David Nichols	Mission Operations	607-869-1525
Clint Kunkle	TMDE	607-869-1385
Jim LaVoie	Machine Shop	607-869-1434
Roy Wilde	Shipping	607-869-1677
Tom Scoon	Mobile Heavy Equipment Repair	607-869-1493
Dale Larson	Pesticides	607-869-4201
Dennis Wells	General Supply	607-869-1310
CWO3 William Allen	Coast Guard	607-869-5393
Chief Symonds	Fire Fighter Training	607-869-4136
John Hennesy	Ammo Branch	607-869-1674
William Plate	Security Branch	607-869-1228
Jim Jones	Open Burning/Open Detonation	607-869-1674
Jan Vanderhoff	Aircraft Landings and Takeoffs	n/a
Jim Brewer	Asphalt	607-869-1532
Jim Calbrese	COMIS Painter	607-869-1525

n/a: not available

APPENDIX B

BOILERS

1. BACKGROUND

- Seneca Army Depot had 200 boilers and furnaces for heat and hot water. All 200 units were in service through May 1993. During the summer of 1993, sixty-three of the units were taken out of service. As a result, only 137 boilers/heaters were in service during the 1993 fall heating season (October - December).

- Most of the 200 boilers identified had rated capacities less than 1,000,000 Btu/hr, operated on No, 2 fuel oil and serviced individual buildings. There were, however, three small heating plants, Buildings 319, 121 and 718, which serviced groups of buildings. Heating plant boilers (seven total) had rated capacities between 6,600,000 and 16,100,000 Btu/hr and operated on No. 6 fuel oil. Two of the heating plants, Buildings 319 and 121, were in service for the entire 1993 heating season. The heating plant at Building 718 was taken out of service during the summer of 1993. Also identified was a group of 22 residential furnaces operated on propane.

- Propane and No. 2 and No. 6 fuel oil consumption was not available by individual boiler but was available by month for all boilers combined. The 1993 post-wide fuel consumption for the three fuels used was the following:

No. 6 Fuel Oil:	303,056 gal
No. 2 Fuel Oil:	203,764 gal
Propane:	32,770 gal

- Two steam cleaners were also identified at the Seneca Army Depot. Both steam cleaners were external combustion units with rated capacities of approximately 245,000 Btu/hr. The steam cleaners operated on diesel fuel and were used approximately 3 hours per week. Each steam cleaner used approximately 60 gal of diesel fuel in 1993.

- Table B-1 lists all boilers and furnaces identified at Seneca Army Depot and includes boiler location, SCC, fuel type and rated capacity. Note that boilers which have identical capacities and are located in the same building are grouped together in the table.

- The following SCCs were assigned to the boilers:

Commercial Boiler - No. 2 Oil, 0.5 - <10 MMBtu/hr	- 1-03-005-01
Residential Furnace - No. 2 Oil, <0.5 MMBtu/hr	- none available
Commercial Boiler - No. 6 Oil, 0.5 - <10 MMBtu/hr	- 1-03-004-01
Industrial Boiler - No. 6 Oil, 10 - 100 MMBtu/hr	- 1-02-004-02
Residential Furnace - Propane, <0.3 MMBtu/hr	- none available
Steam Cleaner - Diesel, <0.5 MMBtu/hr	- none available

TABLE B-1. BOILERS AT SENECA ARMY DEPOT

Building No./Location	Quantity	SCC	Fuel Type	Capacity (Btu/hr)
6	1	n/a	No. 2 Fuel Oil	350,000
101	2	n/a	No. 2 Fuel Oil	150,000
103	1	n/a	No. 2 Fuel Oil	350,000
104	1	n/a	No. 2 Fuel Oil	80,000
106	1	n/a	No. 2 Fuel Oil	250,000
106a	1	n/a	No. 2 Fuel Oil	70,000
113	1	n/a	No. 2 Fuel Oil	250,000
114	1	n/a	No. 2 Fuel Oil	80,000
121	2	1-03-004-01	No. 6 Fuel Oil	6,600,000
126	1	n/a	No. 2 Fuel Oil	80,000
138	1	n/a	Propane	138,000
142	1	n/a	No. 2 Fuel Oil	350,000
308	1	n/a	No. 2 Fuel Oil	200,000
309	1	1-03-005-01	No. 2 Fuel Oil	500,000
319	1	1-02-004-02	No. 6 Fuel Oil	12,000,000
319	1	1-02-004-02	No. 6 Fuel Oil	16,100,000
334	1	n/a	No. 2 Fuel Oil	90,000
353	1	n/a	No. 2 Fuel Oil	150,000
360	1	n/a	No. 2 Fuel Oil	90,000
606	1	n/a	No. 2 Fuel Oil	150,000
609	1	1-03-005-01	No. 2 Fuel Oil	1,000,000
701[a]	1	n/a	No. 2 Fuel Oil	n/a
710[a]	1	n/a	No. 2 Fuel Oil	200,000
714[a]	1	n/a	No. 2 Fuel Oil	350,000
718[a]	2	1-02-004-02	No. 6 Oil	14,500,000
718[a]	1	1-02-004-02	No. 6 Oil	14,500,000
729[a]	1	1-03-005-01	No. 2 Fuel Oil	750,000
733[a]	1	n/a	No. 2 Fuel Oil	n/a
740[a]	1	n/a	No. 2 Fuel Oil	150,000
742[a]	1	n/a	No. 2 Fuel Oil	150,000
746[a]	1	1-03-005-01	No. 2 Fuel Oil	1,000,000
747[a]	1	1-03-005-01	No. 2 Fuel Oil	750,000
748[a]	1	n/a	No. 2 Fuel Oil	90,000
749[a]	1	n/a	No. 2 Fuel Oil	150,000
750[a]	1	n/a	No. 2 Fuel Oil	90,000
751[a]	1	n/a	No. 2 Fuel Oil	90,000
752[a]	1	n/a	No. 2 Fuel Oil	90,000

TABLE B-1. BOILERS AT SENECA ARMY DEPOT
(Continued)

Building No./Location	Quantity	SCC	Fuel Type	Capacity (Btu/hr)
800[a]	1	n/a	No. 2 Fuel Oil	90,000
802[a]	1	n/a	No. 2 Fuel Oil	300,000
805[a]	1	n/a	No. 2 Fuel Oil	225,000
806[a]	1	n/a	No. 2 Fuel Oil	450,000
807[a]	1	n/a	No. 2 Fuel Oil	450,000
812[a]	1	1-03-005-01	No. 2 Fuel Oil	650,000
813[a]	1	1-03-005-01	No. 2 Fuel Oil	2,000,000
816[a]	1	1-03-005-01	No. 2 Fuel Oil	2,000,000
817[a]	1	1-03-005-01	No. 2 Fuel Oil	1,000,000
819[a]	1	1-03-005-01	No. 2 Fuel Oil	1,000,000
824[a]	1	n/a	No. 2 Fuel Oil	150,000
2073	1	1-03-005-01	No. 2 Fuel Oil	1,000,000
2086	1	n/a	No. 2 Fuel Oil	80,000
2104	1	n/a	No. 2 Fuel Oil	150,000
2113	1	n/a	No. 2 Fuel Oil	80,000
2301	1	n/a	No. 2 Fuel Oil	250,000
2305	1	1-03-005-01	No. 2 Fuel Oil	500,000
2306	1	n/a	No. 2 Fuel Oil	350,000
2410	1	n/a	No. 2 Fuel Oil	350,000
2411	1	n/a	No. 2 Fuel Oil	150,000
2485	1	n/a	No. 2 Fuel Oil	175,000
117 (Steam Cleaner)	1	n/a	Diesel	245,000[d]
118 (Steam Cleaner)	1	n/a	Diesel	245,000[d]
Trailer Camp	21	n/a	Propane	75,000
Lake Housing[b]	17	n/a	No. 2 Fuel Oil	80,000
New Lake Housing	31	n/a	No. 2 Fuel Oil	90,000
Eliot Acres[c]	69	n/a	No. 2 Fuel Oil	90,000
Loran C - Coast Guard	1	n/a	No. 2 Fuel Oil	100,000

[a] Boilers in service Jan-May 1993, out of service Oct-Dec 1993.
[b] 17 boilers in service Jan-May 1993, 4 boilers in service Oct-Dec 1993.
[c] 69 boilers in service Jan-May 1993, 47 boilers in service Oct-Dec 1993.
[d] Estimated
n/a: not available

2. EMISSIONS CALCULATIONS METHOD

- The VOC and criteria pollutant calculations for boilers and steam cleaners at Seneca Army Depot were based on emission factors, annual fuel usage, and the rated capacity of the boilers. Emission factors for fuel oil boilers and diesel steam cleaners were obtained from Tables 1.3-2, 1.3-4, 1.3-6 and 1.3-8 in AP-42 (Ref. 6). Propane emission factors were taken from AP-42 Table 1.5-1 (Ref. 6). Tables B-2 and B-3 list the emission factors for fuel oil and propane boilers, respectively. Note, there are no emission factors available for residential size propane furnaces. As a result emission calculations for residential size propane furnaces at the Seneca Army Depot were based upon propane emission factors for commercial size propane boilers.

- For fuel oil emissions, the distribution of Particulate Matter (PM) with a diameter less than 10 microns, referred to as PM_{10} was taken from AP-42 Table 1.3-8 (Ref. 6) for commercial boilers and from AP-42 Table 1.3-6 (Ref. 6) for industrial boilers. According to AP-42, for commercial size boilers, PM_{10} emissions are 55 percent of the total particulate emissions, for boilers burning No. 2 fuel oil, and 62 percent for boilers operating on No. 6 fuel oil. For residential boilers operating on fuel oil No. 2, a PM distribution was not available. As a result the 55 percent value given for PM_{10} from commercial size units was assumed for residential boilers. For industrial size boilers operating on No. 6 fuel oil PM_{10} emissions were indicated to be 86 percent of the total particulate emissions.

- HAP emissions for fuel oil/diesel combustion were calculated using emission factors from AP-42, Tables 1.3-9 and 1.3-11 (Ref 6) and from *Estimating Air Toxics from Coal and Oil Combustion Sources* (Ref. 11). These emission factors have a data rating "E." and are listed in Table B-4. There were no HAP emission factors available for boilers operating on propane.

- For calculation purposes fuel oil and propane used was proportioned among several boiler groups/categories based on the total rated capacity of the group. Boilers were grouped into categories based on boiler type (industrial, commercial, etc.), fuel type and the 1993 operating schedule. Table B-5 lists the boiler groups/categories defined and presents the estimated 1993 fuel use allocated to each category.

- Information on fuel oil content was provided by Seneca Army Depot personnel. The sulfur content for fuel oil No. 2 and fuel oil No. 6 was 0.5 and 1.5 percent respectively. For propane the sulfur content assumed was the default value given in AP-42, 15 grains sulfur per 100 cu ft of LPG (Ref. 6).

- The VOC and NO_x ozone season emissions were calculated for propane boilers only. None of the fuel oil boilers operated during the ozone season.

TABLE B-2. VOC AND CRITERIA POLLUTANT EMISSION FACTORS FOR NO. 2 AND NO. 6 FUEL OIL BOILERS (lb/1,000 gal)

Source	SCC	PM_{10}	TSP[c]	SO_2[c, e]	CO[c]	VOC[d]	NO_x[c]	Data Rating
Commercial Boiler (No. 2 Oil)	1-03-005-01	1.1[a]	2.0	142(S)	5.0	0.34	20.0	A
Residential Furnace (No. 2 Oil)	n/a	1.38[a]	2.5	142(S)	5.0	0.71	18.0	A
Industrial Boiler (No. 6 Oil)	1-02-004-02	*[b]	9.19(S)[e] + 3.22	157(S)	5.0	0.28	55.0	A
Commercial Boiler (No. 6 Oil)	1-03-004-01	**[a]	9.19(S)[e] + 3.22	157(S)	5.0	1.13	55.0	A

Source [a] Table 1.3-8 (Ref. 6)
[b] Table 1.3-6 (Ref. 6)
[c] Table 1.3-2 (Ref. 6)
[d] Table 1.3-4 (Ref. 6)
[e] S Indicates that the weight % of sulfur in the oil should be multiplied by the value given
* PM_{10} is 86% of TSP emission (Ref. 6)
** PM_{10} is 62% of TSP emission (Ref. 6)
n/a: not available

TABLE B-3. VOC AND CRITERIA POLLUTANT EMISSION FACTORS FOR PROPANE FUELED BOILERS (lb/1,000 gal) (Data Rating E)

Source	SCC	PM_{10}	Filterable PM	SO_2	CO	Total Organic Compounds	NO_x
Commercial Boiler > 0.3 MMBtu/hr, < 10 MMBtu/hr	1-03-010-02	N/A	0.4	0.1(S)[a]	1.9	0.5	14.0
Residential Furnace[b] < 0.3 MMBtu/hr	n/a	N/A	N/A	N/A	N/A	N/A	N/A

[a] S indicates that sulfur content of propane should be multiplied by the value given
[b] Emissions for propane residential furnaces were based upon the emission factors for propane commercial boilers.
n/a: not available
N/A: Not Applicable
Source: Table 1.5-1 (Ref. 6)

TABLE B-4. BOILER HAP EMISSION FACTORS FOR FUEL OIL
Data Rating: E

Pollutant	Reference	Fuel Oil No. 2 ($lb/10^{12}$ Btu)	Fuel Oil No. 6 ($lb/10^{12}$ Btu)
Antimony Compounds	1.3-11	N/A	46.0
Arsenic Compounds	1.3-11	4.2	114.0
Beryllium Compounds	1.3-11	2.5	4.2
Cadmium Compounds	1.3-11	10.5	211.0
Chromium Compounds	1.3-11	48.0	128.0
Cobalt Compounds	1.3-11	N/A	121.0
Copper Compounds*	[a]	280.0	280.0
Lead Compounds	1.3-11	8.9	194.0
Mercury Compounds	1.3-11	3.0	32.0
Manganese Compounds	1.3-11	14.0	74.0
Nickel Compounds	1.3-11	170.0	2,330.0
Selenium Compounds	1.3-11	N/A	38.0
Polycyclic Organic Matter	1.3-9	22.5[b]	8.4
Formaldehyde	1.3-9	405.0[b]	405.0

* New York State HAP
N/A: Not Applicable
Source: Tables 1.3.9 and 1.3.11, AP-42 (Ref. 6)
[a] *Estimating Air Toxics from Coal and Oil Combustion Sources* (Ref. 11)
[b] Emission Factor not applicable to residential furnaces (capacity <0.5 MMBtu/hr)

TABLE B-5. ESTIMATED FUEL USE BREAKDOWN BY BOILER GROUP/CATEGORY

Category	Location	No. of Units	Fuel Type	1993 Operating Schedule	Estimated 1993 Fuel Use (gal)
Residential Furnace	Various	158	No. 2	Jan-May	107,333
Residential Furnace	Various	107	No. 2	Nov-Dec	19,287
Commercial Boiler	Various	12	No. 2	Jan-May	72,267
Commercial Boiler	Various	4	No. 2	Nov-Dec	4,877
Commercial Boiler	Bldg. 121	2	No. 6	Jan-May Oct-Dec	38,955 16,875
Industrial Boiler	Bldg. 718	3	No. 6	Jan-May	128,375
Industrial Boiler	Bldg. 319	2	No. 6	Jan-May Oct-Dec	82,928 35,923
Residential Furnace	Trailer Park and Bldg. 138	22	Propane	Jan-Dec	32,770

3. SAMPLE CALCULATIONS

- ***Source***
  Building 121 (2 units)
  6,600,000 Btu/hr (each)
  SCC 1-03-004-01
  Fuel type: Fuel oil No. 6
  Annual fuel usage: 55,830 gal
  Sulfur Content: 1.5%

- ***Assumptions***
  Fuel oil No. 6 heating value: 150,000 btu/hr

Criteria Pollutants

- ***Emission Factors***
  VOC emission factor: 1.13 lb/1,000 gal fuel oil No. 6 (Table 1.3-4, Ref. 6)

- ***Results***
  VOC Emissions (lb/yr) = emission factor * fuel usage * units conversions
  VOC Emissions (lb/yr) = 1.13 (lb/1,000 gal) * 55,830 gal/yr * 1/1,000 (converts fuel use to 1,000s of gallons)
  VOC Emissions = 63.09 lb/yr

HAPs

- ***Emissions Factor***
  Lead Compounds: 194.0 lb/10^{12} Btu (Table 1.3-11, Ref. 6)

- ***Results***
  Lead Compound Emissions (lb/yr) = emission factor (lb/10^{12} Btu) * fuel usage (gal/yr) * fuel usage (gal/yr) * heating value (Btu/gal) * units conversion
  Lead Compound Emissions (lb/yr) = (194 lb/10^{12} Btu) * (55,830 gal/yr) * (150,000 Btu/gal) * 1/10^{12}
  Lead Compound Emissions = 1.62 lb/yr

Ozone

- ***Source***
  Note: Fuel oil boilers did not operate during the ozone season, however there was some minimal use of propane boilers during the ozone season. Therefore, in order to illustrate the ozone season calculation approach we have created a hypothetical ozone season throughput for the fuel oil boiler presented in the above sample calculation.

- ***Assumptions***
  Ozone Season Months: 3 (June, July and August)
  Ozone Season Days: 92
  Ozone Season Fuel use: 8,000 gal (See Note Above)
  5 work days per week

- ***Results***

Ozone Season Emissions (lb/yr) = VOC emissions (lb/yr) * (fuel use ozone season (gal)/annual fuel use (gal)) * (1 yr/days per ozone season)

Ozone Season Emissions (lb/yr) = 63.09 lb/yr * (8,000 gal/55,830 gal) * (1 yr/92 days)

Ozone Season Emissions = 0.098 lb/day

Ozone Season Work Day Emissions (lb/work day) = daily ozone season emission (lb/day) * work day conversion factor (days per week/work days per week

Ozone Season Work Day Emissions (lb/work day) = 0.098 lb/day * (7 days/5 days)

Ozone Season Work Day Emissions = 0.137 lb/work day

4. EMISSIONS SUMMARY

- Table B-6 presents the estimated annual VOC and criteria pollutant emissions from the boilers and steam cleaners at the Seneca Army Depot. Estimated annual HAP emissions are daily ozone season emissions are presented in Tables B-7 and B-8, respectively.

- At least 10 percent of the calculations were verified. The verification yielded a 100 percent agreement.

- Completed emission inventory forms for the boilers and steam cleaners at Seneca Army Depot are presented in Volume II of this document.

TABLE B-6. ESTIMATED TOTAL ANNUAL VOC AND CRITERIA POLLUTANT EMISSIONS FROM BOILERS

	Fuel Oil No. 2				Fuel Oil No. 6				Propane		Diesel Steam Cleaner			
	Residential Furnace SCC: N/A		Commercial 1-03-005-01		Industrial 1-02-004-02		Commercial 1-03-004-01		Residential SCC: n/a		<0.5 MMBtu SCC: n/a		Total	
Pollutant	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)
TSP	316.6	0.16	154.3	0.08	3,909.2	1.95	949.4	0.47	13.1	0.01	0.3	<0.01	5,342.9	2.67
PM_{10}	174.1	0.09	84.9	0.04	3,361.9	1.68	588.6	0.29	N/A	N/A	0.2	<0.01	4,209.7	2.10
SO_2	8,990.0	4.50	5,477.2	2.74	54,137.9	27.07	13,148.0	6.57	49.2	0.02	8.5	<0.01	81,810.8	40.90
CO	633.1	0.32	385.7	0.19	1,149.4	0.57	279.2	0.14	62.3	0.03	0.6	<0.01	2,510.3	1.25
VOC	90.3	0.05	26.2	0.01	64.4	0.03	63.1	0.03	16.4	0.01	0.1	<0.01	260.5	0.13
NO_x	2,279.2	1.14	1,542.9	0.77	12,643.7	6.32	3,070.7	1.54	458.8	0.23	2.2	<0.01	19,997.5	10.00

n/a: not available
N/A: Not Applicable

TABLE B-7. ESTIMATED ANNUAL HAP EMISSIONS FROM BOILERS

Chemical Name	CAS No.	Fuel Oil No. 2				Fuel Oil No. 6				Diesel Steam Cleaner		Total	
		Residential Furnace SCC: n/a		Commercial 1-03-005-01		Industrial 1-02-004-02		Commercial 1-03-004-01		<0.5 MMBtu SCC: n/a			
		(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)
Antimony Compounds	N/A	N/A	N/A	N/A	N/A	1.6	<0.01	0.4	<0.01	N/A	N/A	2.0	<0.01
Arsenic Compounds	N/A	0.1	<0.01	<0.1	<0.01	3.9	<0.01	1.0	<0.01	<0.1	<0.01	5.0	<0.01
Beryllium Compounds	N/A	<0.1	<0.01	<0.1	<0.01	0.1	<0.01	<0.1	<0.01	<0.1	<0.01	0.1	<0.01
Cadmium Compounds	N/A	0.2	<0.01	0.1	<0.01	7.3	<0.01	1.8	<0.01	<0.1	<0.01	9.4	<0.01
Chromium Compounds	N/A	1.2	<0.01	0.7	<0.01	4.4	<0.01	1.1	<0.01	<0.1	<0.01	7.4	<0.01
Lead Compounds	N/A	0.2	<0.01	0.1	<0.01	6.7	<0.01	1.6	<0.01	<0.1	<0.01	8.6	<0.01
Mercury Compounds	N/A	0.1	<0.01	<0.1	<0.01	1.1	<0.01	0.3	<0.01	<0.1	<0.01	1.5	<0.01
Manganese Compounds	N/A	0.2	<0.01	0.2	<0.01	2.6	<0.01	0.6	<0.01	<0.1	<0.01	3.6	<0.01
Nickel Compounds	N/A	3.0	<0.01	1.8	<0.01	80.3	0.04	19.5	0.01	<0.1	<0.01	104.6	0.05
Polycyclic Organic Matter	N/A	N/A	N/A	0.2	<0.01	0.3	<0.01	0.1	<0.01	<0.1	<0.01	0.6	<0.01
Formaldehyde	50-00-0	N/A	N/A	4.4	<0.01	14.0	0.01	3.4	<0.01	<0.1	<0.01	21.8	0.01
Selenium Compounds	N/A	N/A	N/A	N/A	N/A	1.3	<0.01	0.3	<0.01	N/A	N/A	1.6	<0.01
Copper Compounds*	N/A	5.0	<0.01	3.0	<0.01	9.7	<0.01	2.3	<0.01	<0.1	<0.01	20.0	0.01
Cobalt Compounds	N/A	N/A	N/A	N/A	N/A	4.2	<0.01	1.0	<0.01	N/A	N/A	5.2	<0.01
TOTAL		**10.0**	**0.01**	**10.5**	**0.01**	**137.5**	**0.07**	**33.4**	**0.02**	**<0.1**	**<0.01**	**191.4**	**0.70**

* New York State HAP
N/A: Not Applicable
n/a: not available

TABLE B-8. DAILY OZONE SEASON EMISSIONS FROM BOILERS AND HEATERS

Pollutant	Emission Rate	
	lb/day	lb/work day
VOC	0.7	0.9
NO_x	53.3	74.6

APPENDIX C

GENERATORS

1. BACKGROUND

- Twenty-one generator/pump units were identified at the Seneca Army Depot. Sixteen units were emergency backup generators. Fifteen of the backup generators used diesel fuel, one backup unit used gasoline. The remaining five units were one diesel fired and four gasoline fired water pumps.

- The largest generator on post was a 850 kw emergency unit. The remaining emergency units had rated capacities between 20 and 330 kw. The water pumps all had 130 hp capacities.

- The majority of the emergency generators were tested 1 hour, once or twice per month. Water pumps were also used approximately one hour per month each.

- Table C-1 lists the location/activity, rated capacity, SCC, fuel type and operating hours for all Seneca Army Depot generators and pumps.

- The following SCCs were assigned to the generators:

  2-02-001-02 - Diesel, < 600 hp (<447 kw)
  2-02-004-01 - Diesel, > 600 hp (>447 kw)
  2-02-003-01 - Gasoline, < 600 hp (<447 kw)
  2-02-001-04 - Water Pump, Distillate Oil
  None Available - Water Pump, Gasoline

TABLE C-1. SENECA ARMY DEPOT GENERATORS

Location	No. of Units	Rated Capacity (kw)	SCC	Fuel Type	Operating Schedule (ea) (hr/yr)
Bldg 4	1	260	2-02-001-02	Diesel	26
Bldg 101	1	125	2-02-001-02	Diesel	26
Bldg 122	1	25	2-02-001-02	Diesel	26
Bldg 701	1	40	2-02-001-02	Diesel	26
Bldg 715	1	45	2-02-001-02	Diesel	26
Bldg 722	1	60	2-02-001-02	Diesel	12
Bldg 729	1	20	2-02-001-02	Diesel	52
Bldg 819	1	850	2-02-001-02	Diesel	12
Bldg 2304	1	150	2-02-001-02	Diesel	26
Bldg 2411	2	250	2-02-001-02	Diesel	12
Loran C	2	330	2-02-001-02	Diesel	26
Portable	1	50	2-02-001-02	Diesel	12
Portable	1	300	2-02-001-02	Diesel	12
102	1	30	2-02-003-01	Gasoline	52
334 - pump	1	130 hp	2-02-003-01	Gasoline	12
353 - pump	3	130 hp	2-02-002-04	Gasoline	12
2411 - pump	1	130 hp	2-02-003-01	Diesel	12

2. EMISSIONS CALCULATIONS METHOD

- The VOC and criteria pollutant emissions from diesel and gasoline generators and pumps were estimated based on power ratings, hours of operation and emission factors.

- The "hydrocarbon" emission factors were assumed to represent VOC emissions.

- The source of VOC and criteria pollutant emission factors for diesel and gasoline generators less than 600 hp (447 kw) was Table 3.3-1 of AP-42 (Ref. 6). For the diesel generator whose capacity exceeded 600 hp, the VOC and criteria pollutant emission factors were obtained from AP-42 Table 3.4-1 and Table 3.4-5. All diesel and gasoline emission factors used along with associated data ratings are presented in Table C-2.

- HAP emissions for diesel generators less than 600 hp (447 kw) were based upon emission factors obtained from Table 3.3-3 of AP-42 (Ref 6). For the diesel generator which had a 850 kw capacity HAP emission factors were obtained from AP-42 Table 3.4-3 (Ref. 6). The HAP emissions for the gasoline generators were obtained using profile No. 1101 from *EPA's Air Emissions Species Manual Volume 1 - Volatile Organic Compounds Species Profiles* (Ref. 9). Table C-3 presents these emission factors.

- The sulfur content of diesel fuel was assumed to be 0.4 percent by weight. (Page A-3, AP-42 (Ref. 6)) indicated that this is a typical default value.

- The VOC and NO_x ozone season emission for all generators were also calculated.

TABLE C-2. VOC AND CRITERIA POLLUTANTS EMISSION FACTORS FOR GENERATORS

Pollutant	Diesel Fuel[a] (g/hp-hr) Large Gen.> 600 hp SCC: 2-02-004-01 Data Rating: C	Diesel Fuel[b] (g/hp-hr) Small Gen < 600 hp SCC: 2-02-001-02 Data Rating: D	Gasoline Fuel[a] (g/hp-hr) SCC: 2-02-003-01 Data Rating: D
NO_x	11.0	14.0	5.16
CO	2.4	3.03	199.0
SO_2	3.67(S)[d,e]	0.931	0.268
VOC	0.33[f]	1.14[c]	9.67[c]
TSP	0.2426[f,g]	1.0	0.327
PM_{10}	0.1578[f,g]	g	g

Source: [a] AP-42 Table 3.4-1 (Ref. 6)
[b] AP-42 Table 3.3-1 (Ref.6)
[g] AP-42 Table 3.4-5 (Ref. 6)

[c] VOC emission is the sum of exhaust, crank case,evaporative and refueling VOC emissions factors

[d] S indicates that sulfur content of diesel fuel should be multiplied by the value given

[e] Data Rating B

[f] Data Rating E

g PM_{10} emission factor not available. Emission factor for PM_{10} was assumed to be the same as for TSP

TABLE C-3. HAP EMISSION FACTORS FOR GENERATORS

Hazardous Air Pollutant	Diesel Fuel[a] (lb/MMBtu) Large Gen. > 600 hp SCC: 2-02-004-01 Data Rating: E	Diesel Fuel[b] (lb/MMBtu) Small Gen. < 600 hp SCC: 2-02-001-02 Data Rating: E	Gasoline[c] (wt %) Data Rating: B
Benzene	7.76E-04	9.33E-04	1.39
Toluene	2.81E-04	4.09E-04	5.14
Xylenes (isomers)	1.93E-04	2.85E-04	N/A
1,3-Butadiene	N/A	<3.91E-05	1.68
Formaldehyde	7.89E-05	1.18E-03	0.74
Acetaldehyde	2.52E-05	7.67E-04	0.28
Acrolein	7.88E-05	9.25E-05	0.06
Naphthalene	N/A	8.48E-05	N/A
Hexane (isomers)	N/A	N/A	0.87
2,2,4-Trimethylpentane	N/A	N/A	1.97
Propionaldehyde	N/A	N/A	0.02
Ethyl benzene	N/A	N/A	0.77
o-Xylene	N/A	N/A	1.56
p-Xylene	N/A	N/A	2.56
Cyclohexane*	N/A	N/A	1.40
n-Heptane*	N/A	N/A	0.65

N/A: Not Applicable
* New York State HAP
Source: [a] Table 3.4-3 (Ref.6)
[b] Table 3.3-3 (Ref. 6)
[c] EPA Speciation Profile No. 1101 (Ref. 9)

3. SAMPLE CALCULATIONS

- ***Source***

  Emergency generator at Building 4
  SCC: 2-02-001-02
  Fuel Type: Diesel
  Rated Capacity: 260 kw = 348.58 hp (kw x 1.3407 conversion to hp, Appendix A (Ref. 6))
  Operating Schedule: 26 hr/yr

Criteria Pollutants

- ***Emission Factor***

  VOC emission factor = 1.14 g/hp-hr (Table 3.3-1, Ref. 6)

- ***Results***

  VOC emissions (lb/yr) = Emission factor (g/hp-hr) * rated capacity (hp) * operating schedule (hr/yr) * conversion factor
  VOC emissions (lb/yr) = 1.14 g/hp-hr * 348.58 hp * 26 hr/yr * 1 lb/453.6 g
  VOC emissions = 22.78 lb/yr

HAPs

- ***Emissions Factor***

  Benzene emission factor = 9.33 x 10^{-4} lb/MMBtu (Table 3.3-3, Ref. 6)

- ***Results***

  Benzene Emissions (lb/yr) = Emissions factor (lb/MMBtu) * operating schedule (hr/yr) * rated capacity (hp) * [conversion factor]
  Benzene Emissions (lb/yr) = 9.33 x 10^{-4} (lb/MMBtu) * 26 hr/yr * 348.58 hp * 2.542 10^{-3} MMBtu/hp-hr
  Benzene Emissions = 0.0215 lb/yr

Ozone

- ***Assumptions***

  Ozone season months: 3
  Ozone season days: 92
  5 work days per week
  Equal Annual usage

- ***Results***

  Ozone season emissions (lb/day) = VOC emissions (lb/yr) * (ozone season months / months per year) * (1 yr / ozone season days)
  Ozone season emissions (lb/day) = 22.78 lb/yr * (3 months / 12 months) * (1 yr / 92 days)
  Ozone season emissions = 0.0619 lb/day

  Ozone season work day emissions (lb/work day) = ozone season daily emissions (lb/day) * work day conversion (days per week / work days per week)
  Ozone season work day emissions (lb/work day) = 0.0619 lb/day * (7 days / 5 work days)
  Ozone season work day emissions = 0.0866 lb/work day

4. EMISSIONS SUMMARY

- Table C-4 presents the estimated annual VOC and criteria pollutant emissions from generators at the Seneca Army Depot. Estimated annual HAP emissions are presented in Table C-5. Daily VOC and NO_x ozone season emissions are presented in Table C-6.

- At least 11 percent of the calculations were verified. The verification yielded a 100 percent agreement.

- Completed emission inventory forms for the generators at the Seneca Army Depot are presented in Volume II of this document.

TABLE C-4. ESTIMATED TOTAL ANNUAL VOC AND CRITERIA POLLUTANT EMISSIONS FROM GENERATORS

Pollutant	Generator (gasoline) SCC: 2-02-003-01		Generator (diesel) (>600 hp) SCC: 2-02-004-01		Generator (diesel) (<600 hp) SCC: 2-02-001-02		Pump(gasoline) SCC: n/a		Pump (diesel) 2-02-001-04		Total	
	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)
TSP	N/A	N/A	7.3	<0.01	N/A	N/A	4.5	<0.01	3.4	<0.01	15.2	<0.01
PM_{10}	1.5	<0.01	4.8	<0.01	135.4	0.07	N/A	N/A	N/A	N/A	141.7	0.07
SO_2	1.2	<0.01	44.3	0.02	126.1	0.06	3.7	<0.01	3.2	<0.01	178.5	0.08
CO	917.6	0.46	72.4	0.04	410.3	0.21	2,737.6	1.37	10.4	0.01	4,148.3	2.09
VOC	44.6	0.02	9.9	<0.01	154.4	0.08	133.0	0.07	3.9	<0.01	345.8	0.17
NO_x	23.8	0.01	331.6	0.17	1,895.6	0.95	71.0	0.04	48.1	0.02	2,370.1	1.19

n/a: Not Available
N/A: not applicable - all particulate emissions are assumed to be PM_{10}

TABLE C-5. ESTIMATED ANNUAL HAP EMISSIONS FROM GENERATORS

Chemical Name	CAS No.	Generator (gasoline) SCC: 2-02-003-01		Generator (diesel) (>600 hp) SCC: 2-02-004-01		Generator (diesel) (<600 hp) SCC: 2-02-001-02		Pump (gasoline) SCC: n/a		Pump (gasoline) SCC: 2-02-001-04		Total	
		(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)
Benzene	71-43-2	0.6	<0.01	<0.1	<0.01	0.1	<0.01	1.8	<0.01	<0.1	<0.01	2.5	<0.01
Toluene	108-88-3	2.3	<0.01	<0.1	<0.01	0.1	<0.01	6.8	<0.01	<0.1	<0.01	9.2	<0.01
Xylenes (Isomers)	1330-20-7	N/A	N/A	<0.1	<0.01	<0.1	<0.01	N/A	N/A	<0.1	<0.01	<0.1	<0.01
o-Xylene	95-47-6	0.7	<0.01	N/A	N/A	N/A	N/A	2.1	<0.01	N/A	N/A	2.8	<0.01
p-Xylene	106-42-3	1.1	<0.01	N/A	N/A	N/A	N/A	3.4	<0.01	N/A	N/A	4.5	<0.01
Formaldehyde	50-00-0	0.3	<0.01	<0.1	<0.01	0.2	<0.01	1.0	<0.01	<0.1	<0.01	1.5	<0.01
1,3-Butadiene	106-99-0	0.7	<0.01	N/A	N/A	<0.1	<0.01	2.2	<0.01	<0.1	<0.01	2.9	<0.01
Acetaldehyde	75-07-0	0.1	<0.01	<0.1	<0.01	0.1	<0.01	0.4	<0.01	<0.1	<0.01	0.6	<0.01
Acrolein	107-02-8	<0.1	<0.01	<0.1	<0.01	<0.1	<0.01	0.1	<0.01	<0.1	<0.01	0.1	<0.01
Naphthalene	91-20-3	N/A	N/A	<0.1	<0.01	<0.1	<0.01	N/A	N/A	<0.1	<0.01	<0.1	<0.01
Hexane	110-54-3	0.4	<0.01	N/A	N/A	N/A	N/A	1.2	<0.01	N/A	N/A	1.6	<0.01
2,2,4-Trimethylpentane	540-84-1	0.9	<0.01	N/A	N/A	N/A	N/A	2.6	<0.01	N/A	N/A	3.5	<0.01
Propionaldehyde	123-38-6	<0.1	<0.01	N/A	N/A	N/A	N/A	<0.1	<0.01	N/A	N/A	<0.1	<0.01
Ethyl benzene	100-41-4	0.3	<0.01	N/A	N/A	N/A	N/A	1.0	<0.01	N/A	N/A	1.3	<0.01
Cyclohexane*	110-82-7	0.6	<0.01	N/A	N/A	N/A	N/A	1.9	<0.01	N/A	N/A	2.5	<0.01
n-Heptane*	142-82-5	0.3	<0.01	N/A	N/A	N/A	N/A	0.9	<0.01	N/A	N/A	1.2	<0.01
TOTAL		**8.3**	**<0.01**	**<0.1**	**<0.01**	**0.5**	**<0.01**	**25.4**	**0.01**	**<0.1**	**<0.01**	**34.2**	**0.02**

N/A: Not Applicable
n/a: not available
* New York State HAP

TABLE C-6. DAILY OZONE SEASON EMISSIONS FROM GENERATORS

Pollutant	Daily Ozone Season Emissions	
	(lb/day)	(lb/work day)
VOC	0.9	1.3
NO_x	6.4	9.0

APPENDIX D

UNDERGROUND STORAGE TANKS

1. BACKGROUND

- Fifty-eight active underground storage tanks (USTs) were identified at the Seneca Army Depot. Nine storage tanks had capacities equal to or greater than 10,000 gallons. Nineteen tanks had capacities equal to or greater than 1,000 gallons and less 10,000 gallons. The remaining thirty storage tanks had capacities less than 1,000 gallons, the smallest was 500 gallons.

- The five largest tanks ranged between 20,000 and 40,000 gallons and stored No. 6 fuel oil and JP-4. Two tanks stored waste oil, all remaining tanks were used for No. 2 fuel oil/diesel fuel

- Annual throughput was available by month for the JP-4 tank at the airfield and the diesel tank at Building 120. For all remaining tanks individual tank throughput was not available, however total post wide fuel used was available by month. For these tanks annual throughput was estimated using the following method. It was assumed that for each fuel type delivered the fuel was processed either through USTs or ASTs. Total fuel processed through USTs was determined by proportioning all fuel delivered between ASTs and USTs based on the total combined capacity for each tank category. For the USTs used to store No. 2 fuel oil/diesel fuel, the total combined throughput was 106,984 gallons. The total storage capacity of the ASTs and USTs was calculated. The total No. 2 fuel oil throughput was multiplied by the fraction of the storage capacity of the USTs and similarly for the ASTs. Throughput for individual tanks was estimated by multiplying the ratio of the individual UST tank capacity to the total UST capacity times the portion of UST throughput. For fuel oil No. 6 there were no need to proportion the fuel between the ASTs and USTs since there were no No. 6 fuel oil ASTs.

  The estimated total annual throughput for each fuel type was further proportioned, by month into individual tanks or grouped tanks, based on the total storage capacity of each tank or group. Only USTs with identical capacities were grouped together.

- Total post wide annual throughput for all USTs combined, by fuel type was as follows:

Fuel Oil No. 2/Diesel:	106,984 gallons
Fuel Oil No. 6:	303,056 gallons
Waste Oil:	Not Available
JP-4:	25,813 gallons

- Table D-1 presents the building number, product stored, SCC, capacity, and estimated annual throughput for the USTs at the Seneca Army Depot. Note this table lists only those USTs which were in service at the end of 1993. There were at least another 88 USTs at Seneca Army Depot that were temporarily out of service and thus were not included in this report.

- The SCCs assigned to these USTs represent working losses and are the following:

Distillate Oil No. 2:	4-04-004-14 (Diesel fuel and No. 2 fuel oil)
Waste Oil:	4-04-004-98
No. 6 Fuel Oil:	4-04-004-98
JP-4:	4-04-004-10

TABLE D-1. UNDERGROUND STORAGE TANKS

Building No.	No. of Tanks	Product Stored	SCC	Capacity (gal)	Estimated Annual Throughput (Combined) (gal/yr)
106	1	No. 2 Fuel Oil	4-04-004-14	5,000	5,069
127	1	No. 2 Fuel Oil	4-04-004-14	12,000	12,166
113, 606	2	No. 2 Fuel Oil	4-04-004-14	2,000	4,056
103, 813	2	No. 2 Fuel Oil	4-04-004-14	2,500	5,069
101, 609, 816, 819	4	No. 2 Fuel Oil	4-04-004-14	3,000	12,166
6, 106A, 353, 3605	5	No. 2 Fuel Oil	4-04-004-14	500	2,535
Various	7	No. 2 Fuel Oil	4-04-004-14	1,000	7,097
Various	23	No. 2 Fuel Oil	4-04-004-14	550	12,825
120	1	Diesel	4-04-004-14	10,000	31,707
729	2	Diesel	4-04-004-14	550	1,115
815	1	Diesel	4-04-004-14	3,000	3,041
819	1	Diesel	4-04-004-14	10,000	10,138
117, 355A	2	Waste Oil	4-04-004-98	2,005	n/a
718	1	No. 6 Fuel Oil	4-04-004-98	40,000	86,587
121, 319	2	No. 6 Fuel Oil	4-04-004-98	30,000	129,882
319, 718	2	No. 6 Fuel Oil	4-04-004-98	20,000	86,587
Air Field	1	JP-4	4-04-004-10	30,000	25,813

n/a: not available

2. EMISSIONS CALCULATIONS METHOD

- The pollutant associated with fuel storage is VOCs. The emissions associated with storage tanks are related to working and standing losses. Working loss emissions occur from the filling and emptying of tanks. Standing loss emissions occur from vapor expansion and contraction due to fluctuations in temperature and pressure. Standing (breathing) losses from USTs were assumed to be minimal because being underground limits the USTs' exposure to diurnal temperature changes. Therefore, emissions estimates for USTs at the installation do not include standing losses.

- VOC emissions from USTs were estimated using the working loss equations for fixed roof tanks contained in Section 12.3.1 of AP-42 (Ref. 6). Data on the physical and chemical properties of No. 2, No. 6 fuel oil and JP-4 needed to solve the AP-42 equations were obtained from Table 12.3.2 of AP-42 (Ref. 6).

- The following assumptions were made during these calculations:

  - The vapor molecular weight and vapor pressure were taken from Table 12.3.2 of AP-42 (Ref. 6), at a fuel temperature of 60 °F.

  - Tank diameters (D) and length (L), were obtained from UST manufacturers (Ref. 12).

- Because species profiles for Diesel/No. 2 fuel oil and No. 6 fuel oil were not available, HAP emissions were not estimated for these fuel types.

- HAP emissions for the tank storing JP-4 were calculated using the VOC speciation provided in the *Installation Restoration Toxicology Guide* (Ref. 13). Table D-2 presents these emission factors.

- VOC ozone season emission were also calculated. Fuel throughput for the ozone season was available for several tanks, most tanks however did not have an ozone season throughput.

TABLE D-2. HAP EMISSION FACTORS FOR THE JP-4 UST

Hazardous Air Pollutant	Emission Factor (% weight)
Hexane	2.21
Benzene	0.50
Toluene	1.33
Ethylbenzene	0.37
o-Xylene	1.01
p-Xylene	0.35
m-Xylene	0.96
Napthalene	0.50
Cyclohexane*	1.24
Heptane*	2.21

* New York State HAP
Source: *Installation Restoration Toxicology Guide* (Ref. 13)

3. SAMPLE CALCULATIONS

VOC

- ***Source***

  Seneca Army Depot, UST at Building 120
  Fuel stored: Diesel Fuel
  Annual throughput: 31,707 gal/yr = 754.93 bbl/yr
  Ozone Season fuel throughput: 4,927 gal/yr = 117.31 bbl/yr
  Tank capacity: 10,000 gal
  SCC: 4-04-004-14

- ***Assumptions***

  Diameter: 8 ft (Ref. 12)
  Length: 26.75 ft (Ref. 12)
  Vapor pressure (P_{VA}) at 60°F: 0.0074 psia (Ref. 6)
  Molecular weight (M_V) of liquid: 130 lb/lb-mole (Ref. 6)

- ***Emission Equations***

  $$L_W = 0.0010\ M_V\ P_{VA}\ Q\ K_N\ K_P$$

where:

- L_W = Working Losses, lb/yr
- M_V = Vapor Molecular weight, lb/lb-mole
- P_{VA} = Vapor Pressure at daily average liquid surface temperature
- Q = Annual Net throughput, bbl/yr
- K_N = Turnover factor dimensionless
  for turnovers > 36, $K_N = (180 + N)/6N$
  for turnovers ≤ 36, $K_N = 1$

  N = number of turnovers per year, dimensionless

- K_P = Working loss product factor, dimensionless, 0.75 for crude oil. For all other organic liquids, $K_P = 1$

$$N = \frac{5.614\ Q}{V_{LX}}$$

where:

- N = Number of turnovers per year, dimensionless
- Q = Annual net throughput, bbl/yr
- V_{LX} = Tank maximum liquid volume, ft^3

$$V_{LX} = \frac{\pi}{4} D^2 H_{LX}$$

where:

- D = Diameter, ft
- H_{LX} = Maximum liquid height, ft

- ***Results***

Working loss $L_W = 0.0010\ M_V\ P_{VA}\ Q\ K_N\ K_P$

M_V = 130 lb/lb-mole
P_{VA} = 0.0074 psia at 60 °F
Q = 754.93 bbl/yr
K_P = 1

To determine K_N, N needs to be determined:

$$N = \frac{5.614\ Q}{V_{LX}}$$

$$V_{LX} = \frac{(3.14)(8^2)(26.75)}{4} = 1,343.92$$

$$N = \frac{(5.614)(754.93)}{1,343.92} = 3.15$$

Therefore: $N \leq 36$ So $K_N = 1$

L_W = 0.0010 (130) (0.0074) (754.93) (1) (1)
L_W = 0.73 lb/yr

HAPs

There were no HAP emission factors for emissions from the storage of diesel fuel

Ozone

- ***Assumptions***

USTs operate 7 days/week
Days per ozone season: 92
Ozone season fuel throughput: 4,927 gal/yr = 117.31 bbl/yr

- ***Results***

$$\text{Ozone Season emissions (lb/day)} = \frac{\text{Working Loss (ozone season)}}{\text{ozone season days}}$$

Working Loss $L_W = 0.0010\ M_V\ P_{VA}\ Q\ Kn\ Kp$
M_V = 130 lb/lb-mole
P_{VA} = 0.0074 psia at 60 °F
Q = 117.31 bbl/O_3 season
K_P = 1

To determine Kn, N needs to be determined:

$$N = \frac{5.614\ Q}{V_{LX}}$$

V_{LX} = 1,343.92 (from VOC sample calculation above)

$$N = \frac{(5.614)(117.31)}{1,343.92}$$

N = 0.49

Therefore: $N \leq 36$ So Kn = 1

L_W (ozone season) = 0.0010 (130) (0.0074) (117.31) (1) (1)
L_W (ozone season) = 0.113 lb

L_W (ozone season day) = 0.113 lb * $\frac{1}{92\ \text{days}}$

L_w (ozone season day) = .0012 lb/day

4. EMISSIONS SUMMARY

- Table D-3 presents the estimated annual VOC emission from USTs on the Seneca Army Depot. Table D-4 presents the estimated annual HAP emissions for the JP-4 UST. The estimated daily ozone season VOC emissions from the USTs were 0.1 lb/day and 0.2 lb/work day.
- At least 14 percent of the calculations were verified. The verification yielded a 100 percent agreement.
- Completed emission inventory forms for the USTs at the Seneca Army Depot are presented in Volume II of this document.

TABLE D-3. ESTIMATED ANNUAL VOC EMISSIONS FROM USTS

Product	SCC	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Diesel/No.2 Fuel Oil	4-04-004-14	2.5	<0.01
No. 6 Fuel Oil	4-04-004-98	0.1	<0.01
JP-4	4-04-004-10	63.9	0.03
TOTAL		**66.5**	**0.03**

TABLE D-4. ESTIMATED ANNUAL HAP EMISSIONS FROM THE JP-4 UST

Chemical Name	CAS No.	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Hexane	110-54-3	1.4	<0.01
Benzene	71-43-2	0.3	<0.01
Toluene	108-88-3	0.9	<0.01
Ethylbenzene	100-41-4	0.2	<0.01
O-Xylene	95-47-6	0.6	<0.01
p-Xylene	106-42-3	0.2	<0.01
m-Xylene	108-38-3	0.6	<0.01
Napthalene	91-20-3	0.3	<0.01
Heptane*	142-82-5	2.3	<0.01
Cyclohexane*	110-82-7	0.8	<0.01
TOTAL		**7.6**	**<0.01**

* New York State HAP

APPENDIX E

ABOVEGROUND STORAGE TANKS

1. BACKGROUND

- Sixty one active aboveground storage tanks (ASTs) were identified at the Seneca Army Depot. Two tanks stored gasoline, one tank was used to store waste oil, seven tanks stored diesel fuel and the remaining fifty one tanks were used to store No. 2 fuel oil. Capacities for the tanks ranged between 185 and 60,000 gallons.

- Annual throughput for No.2 fuel oil and diesel was not available by individual tank, however total post wide fuel use was available by month. As a result annual throughput was estimated using the following method. It was assumed that all fuel (No. 2 oil/diesel) was processed either through ASTs or USTs. Total fuel processed through ASTs was determined by proportioning all fuel delivered between ASTs and USTs based on the total combined capacity for each tank category. For the ASTs storing No. 2 fuel oil and diesel the total combined estimated throughput was 128,487 gallons.

  The estimated total annual throughput for fuel oil No. 2 and diesel was further proportioned, by month into individual tanks or grouped tanks, based on the total storage capacity of each tank or group. Only ASTs with identical capacities were grouped together.

- For the waste oil tank there was no throughput information available. The two gasoline ASTs supplied fuel to emergency generators. Installation personnel estimated that these tanks had a small annual throughput, which probably did not exceed 250 gallons per year.

- The SCCs assigned to the ASTs are presented in Table E-1.

- Table E-2 presents the building number/location, product stored, SCC, capacity, and estimated annual throughput for the ASTs at the Seneca Army Depot. Note, this table lists only those ASTs which were in service at the end of 1993. There are at least another 14 ASTs at Seneca Army Depot which are temporarily out of service and thus were not included in this report. All active ASTs identified were painted white.

TABLE E-1. FIXED ROOF TANK SCCs

Fuel Type	Working Losses	Breathing Losses
Distillate Fuel (No. 2 Oil and Diesel)	4-03-010-21	4-03-001-07
Waste Oil	4-03-001-99	4-03-001-98
Gasoline	4-03-001-03	4-03-001-01

n/a: not available

TABLE E-2. ABOVEGROUND STORAGE TANKS (Fixed Roof Tanks)

Building No.	No. of Tanks	Product Stored	Capacity (gal)	Estimated Annual Throughput (gal)
104	1	No. 2 Fuel Oil	185	188
129	1	No. 2 Fuel Oil	60,000	60,830
367	1	No. 2 Fuel Oil	2,000	2,027
609	1	No. 2 Fuel Oil	1,000	1,014
717	1	No. 2 Fuel Oil	40,600	41,161
Field	1	No. 2 Fuel Oil	550	558
138, 2113	2	No. 2 Fuel Oil	500	1,014
Various	43	No. 2 Fuel Oil	275	11,988
106G	1	Diesel	550	557
2411	1	Diesel	2,000	2,028
T137	1	Diesel	200	203
Loran C	1	Diesel	6,000	6,083
4, 715, 2304	3	Diesel	275	836
102	1	Gasoline	275	250
334	1	Gasoline	500	250
118	1	Waste Oil	500	n/a

n/a: not available

2. EMISSIONS CALCULATIONS METHOD

- The pollutant associated with fuel storage is VOCs. The emissions associated with storage tanks are related to working and standing losses. Working loss emissions occur from the filling and emptying of tanks. Standing loss emissions occur from vapor expansion and contraction due to fluctuations in temperature and pressure.

- VOC emissions from fixed roof ASTs were calculated using the equations for standing and working losses for fixed roof tanks contained in Section 12.3.1 of AP-42 (Ref. 6). Information on the vapor molecular weight (mv) and vapor pressure at various temperatures for the No.2 fuel oil, gasoline and diesel stored were obtained from Table 12.3-2 of AP-42 (Ref. 6). These values were obtained for a temperature of 60 °F. Data on the daily maximum and daily minimum ambient temperatures (T_{ax} and T_{an}) and on the solar insolation factor (I) were taken from the closest city to the installation listed in Table 12.3-6 of AP-42 (Ref.6). For the ASTs at the Seneca Army Depot the data for Buffalo, NY, were used. The tank paint solar absorbance factor (α) was taken from Table 12.3-7 of AP-42 (Ref. 6). If the condition of the tank was unknown, the tank was assumed to be in good condition. The vapor pressure (psi) at the daily average liquid temperature (P_{VA}) was taken from Table 12.3-2 of AP-42 (Ref. 6) by interpolating between the vapor pressures for the daily minimum and maximum liquid surface temperatures (°F.).

- There was no throughput estimate available for the waste oil tank at Building 118, therefore no emission calculations were performed for this storage tank.

- Because species profiles for No. 2 fuel oil and diesel fuel were not available, HAP emissions were not estimated for these tanks. HAP emissions from the gasoline ASTs were speciated from total VOCs based on percent composition by weight values obtained from the EPA *Air Emissions Species Manual* (Ref. 9), Profile No. 1190. The gasoline emission factors are listed in Table E-3. These emission factors have a data rating "B.

- The VOC ozone season emissions for the ASTs were also calculated. Fuel throughput during the ozone season were made for the gasoline ASTs by multiplying the annual gasoline throughput by the fraction of the year that is in the ozone season, i.e., 92 days in ozone season/365 days per year. Fuel records indicated there was no fuel oil/diesel throughput during the ozone season.

TABLE E-3. VOC EMISSION SPECIATION FACTORS FOR GASOLINE (Data Rating B)

Pollutant	Emission Factor (Wt %)
Hexane	3.91
Benzene	3.25
Toluene	15.22
Ethylbenzene	4.67
Cumene	0.33
Chlorobenzene	0.03
Naphthalene	0.80
O-xylene	6.41
Xylenes (m & p)	15.28
Styrene	0.17
Heptane*	1.84

Source: Profile 1190 (Ref. 9)
* New York State HAP

3. SAMPLE CALCULATIONS AST

VOC

- ***Source***
  Location: Seneca Army Depot, Bldg. 102
  White fixed roof, horizontal AST in good condition
  Gasoline
  Estimated annual throughput: 250 gal/yr = 5.95 bbl/yr
  Length: 5 ft (Ref. 12)
  Diameter: 3 ft (Ref. 12)

- ***Emission Equations***
  $L_T = L_S + L_W$

  L_T = Total losses
  L_S = Standing losses
  L_W = Working losses

  Standing Losses

  $L_S = 365\ V_V\ W_V\ K_E\ K_S$

  $$V_V = \frac{\pi}{4} D_E{}^2 H_{VO}$$

  where: V_V = Vapor Space Volume, ft^3
  D_E = Effective Tank Diameter, ft
  H_{VO} = Vapor Space Outage, ft

  $$D_E = \sqrt{\frac{L * D}{0.785}}$$

  where: L = Tank Length, ft
  D = Tank Diameter, ft

  $H_{VO} = D * 0.5$

  where: D = Tank Diameter, ft

  $$W_V = \frac{M_V P_{VA}}{RT_{LA}}$$

  where: W_V = Vapor Density, lb/ft^3
  M_V = Vapor Molecular Weight, lb/lb-mole
  (values taken from AP-42 Table 12.3-2 for petroleum products)
  P_{VA} = Vapor Pressure at Daily Average Liquid, Temp., psia (interpolated from Table 12.3-2 of AP-42 using value for T_{LA})
  R = Ideal Gas Constant, 10.731 psia * ft^3/lb-mole * °R
  T_{LA} = Daily Average Liquid Surface Temperature, °R

$$T_{LA} = 0.44\, T_{AA} + 0.56\, T_B + 0.0079\, \alpha\, I$$

T_{LA} = Daily Average Liquid Surface Temperature, °R
T_{AA} = Daily Average Ambient Temperature, °R
T_B = Liquid Bulk Temperature, °R
α = Tank Paint Solar Absorptance, dimensionless (taken from AP-42 Table 12.3.7)
I = Daily Solar Insolation Factor, Btu/ft^2 day (taken from AP-42, Table 12.3-6)

$$K_E = \frac{\Delta T_V}{T_{LA}} + \frac{\Delta P_V - \Delta P_B}{P_A - P_{VA}}$$

where:
K_E = Vapor space expansion factor, dimensionless
ΔT_V = Daily Vapor Temp. Range, °R
ΔP_V = Daily Vapor Pressure Range, psi
ΔP_B = Breather Vent Pressure Setting, psig
P_A = Atmospheric Pressure, 14.7 psia
P_{VA} = Vapor Pressure at Daily Average Liquid Surface Temp., psia
T_{LA} = Daily Average Liquid Surface Temp., °R

$$\Delta T_V = 0.72\, \Delta T_A + 0.028\, \alpha\, I$$

where: ΔT_A = Daily Ambient Temperature Range, °R

$$\Delta P_V = P_{VX} - P_{VN}$$

where: P_{VX} = Vapor pressure at the daily maximum liquid surface temperature, psia (interpolated from Table 12.3-2 of AP-42 using value for T_{LX})

$$T_{LX} = (T_{LA} + 0.25\, \Delta T_V) - 460$$

where: T_{LX} = Daily maximum liquid surface temperature, °F

P_{VN} = Vapor pressure at the daily minimum liquid surface temperature, psia (interpolated from Table 12.3-2 of AP-42 using value for T_{LN})

$$T_{LN} = (T_{LA} - 0.25\, \Delta T_V) - 460$$

where: T_{LN} = Daily minimum liquid surface temperature, °F

$$\Delta P_B = P_{BP} - P_{BV}$$

where:
P_{BP} = Breather Vent Pressure Setting, psig
P_{BV} = Breather Vent Vacuum Setting, psig (without specific information on breather vent pressure settings assume P_{BP} = 0.03 psig and P_{BV} = -(0.03 psig)

$$K_S = \frac{1}{1 + 0.053\ P_{VA}\ H_{VO}}$$

K_S = Vented Vapor Saturation factor, dimensionless

P_{VA} and H_{VO} defined previously

<u>Working Losses</u>

$$L_W = 0.0010\ M_V\ P_{VA}\ Q\ K_N\ K_P$$

where:
- L_W = Working Losses, lb/yr
- M_V = Vapor Molecular weight, lb/lb-mole (AP-42, Table 12.3.2.)
- P_{VA} = Vapor Pressure at daily average liquid surface temp., psia
- Q = Annual Net throughput, bbl/yr
- K_N = Turnover Factor
  - for turnovers >36, $K_N = (180 + N) / 6N$
  - for turnovers $\leq$36, $K_N = 1$

where: $N = \frac{5.614Q}{VL_x}$

where:
- N = number of turnovers
- Q = fuel amount (bbl/yr)
- VL_x = tank maximum liquid volume (ft^3)

K_P = Working Loss Product factor, dimensionless, $K_P = 0.75$ for crude oil, $K_P = 1.0$ for other liquids

- ***<u>Assumptions</u>***

Conversion factor: 42 gal/bbl
AP-42 Table 12.3-6, temperature and insolation values for Buffalo, NY

Annual average T_{AX} = 55.8 °F (515.8 °R)
T_{AN} = 39.3 °F (499.3 °R)
I = 1,034

α = 0.17 (AP-42 Table 12.3-7)
I = 1,034 (AP-42 Table 12.3-6)
Molecular Weight: 62 lb/lb-mole
Vapor Pressure at 60 °F: 6.90 psia

K_P = 1, since liquid stored is gasoline

- ***<u>Results</u>***

<u>Standing Losses</u>

$$L_S = 365\ V_V\ W_V\ K_E\ K_S$$

$$D_E = \sqrt{\frac{5 * 3}{0.785}} = 4.3713$$

$$V_V = \frac{\pi}{4} D_E^2 H_{VO} = \left[\frac{3.1416}{4}\right] \left[4.3713^2\right] \left[3 * 0.5\right]$$

$$= (0.785)\ (19.108)\ (1.5) = 22.500$$

$$V_V = 22.500$$

$$W_V = \frac{M_V P_{VA}}{R T_{LA}}$$

$$T_{LA} = 0.44\ T_{AA} + 0.56\ T_B + 0.0079\ \alpha\ I$$

$$T_{AA} = \frac{T_{AX} + T_{AN}}{2}$$

where: T_{AX} = daily maximum temperature, °R
T_{AN} = daily minimum temperature, °R

values for T_{AX} and T_{AN} are provided in Table 12.3-6 of AP-42

$T_B = T_{AA} + 6\alpha - 1$ ($\alpha = 0.17$) from Table 12.3-7 of AP-42

$$T_{AA} = \left[\frac{515.8 + 499.3}{2}\right] = 507.57$$

$$T_B = [T_{AA} + 6\alpha - 1] = 507.55 + 6\ (0.17) - 1 = 507.57$$

$$T_{LA} = 0.44\ (507.55) + 0.56\ (507.57) + 0.0079\ (0.17)\ (1{,}034) = 508.95$$

P_{VA} is interpolated from Table 12.3-2 of AP-42 using T_{LA} as follows:

$T_{LA} = 508.95 - 460 = 48.95$ °F

From Table 12.3-2: psi at 40 °F = 4.7
psi at 50 °F = 5.7

$$\frac{\Delta psi}{°F} = \frac{5.7 - 4.7}{10} = 0.1$$

$$P_{VA} = \left[0.1 \frac{psi}{°F}\right] [48.95\ °F - 40\ °F] + 4.7\ psi = 5.60\ psi$$

$$W_V = \frac{(62)(5.60)}{(10.731)(508.95)} = 0.064$$

$$K_E = \frac{\Delta T_V}{T_{LA}} + \frac{\Delta P_V - \Delta P_B}{P_A - P_{VA}}$$

where: $\Delta T_V = 0.72\ \Delta T_A + 0.028\ \alpha\ I$
$= 0.72\ (515.8 - 499.3) + (0.028)\ (0.17)\ (1{,}034) = 16.80$

$\Delta P_V = P_{VX} - P_{VN}$

where: P_{VX} = vapor pressure at the daily maximum liquid surface temperature, psi

P_{VX} is interpolated from Table 12.3-2 of AP-42 using the value of T_{LX} as follows:

$$T_{LX} = (T_{LA} + 0.25\ \Delta T_V) - 460$$

$$= ((508.95 + (0.25)\ (16.80)) - 460 = 53.15\ ^{\circ}F$$

from Table 12.3-2: psi at 50 °F = 5.7
psi at 60 °F = 6.9

$$\frac{\Delta psi}{^{\circ}F} = \frac{6.9 - 5.7}{10\ ^{\circ}F} = 0.12\ psi$$

$$P_{VX} = \left[\frac{0.12\ psi}{^{\circ}F}\right] \left[53.15\ ^{\circ}F - 50\ ^{\circ}F\right] + 5.7\ psi = 6.08$$

P_{VN} = vapor pressure at the daily minimum liquid surface temperature, psi

P_{VN} is interpolated from Table 12.3-2 of AP-42 using the value of T_{LN} as follows:

$$T_{LN} = (T_{LA} - 0.25\ \Delta T_V) - 460$$

$$= ((508.95 - (0.25)\ (16.80)) - 460 = 44.75\ ^{\circ}F$$

from Table 12.3-2: psi at 40 °F = 4.7
psi at 50 °F = 5.7

$$\frac{\Delta psi}{^{\circ}F} = \frac{5.7 - 4.7}{10\ ^{\circ}F} = 0.10$$

$$P_{VN} = \left[\frac{0.10\ psi}{^{\circ}F}\right] \left[44.75\ ^{\circ}F - 40\ ^{\circ}F\right] + 4.7\ psi = 5.18\ psi$$

$$\Delta P_V = 6.08 - 5.18 = 0.90$$

$\Delta P_B = P_{BP} - P_{BV}$

default values $P_{BP} = 0.03$ psig

$P_{BV} = -0.03$ psig

$\Delta P_B = 0.03 - (-0.03) = 0.06$ psig

P_A = atmospheric pressure = 14.7 psia

P_{VA} = vapor pressure at daily average liquid temp., psia

$$K_E = \frac{16.80}{508.95} + \frac{0.90 - 0.06}{14.7 - 5.60}$$

$$K_E = 0.033 + 0.092 = 0.125$$

$$K_S = \frac{1}{1 + 0.053\, P_{VA}\, H_{VO}}$$

$$H_{VO} = D * 0.5$$

$$H_{VO} = (3)(0.5) = 1.5$$

$$K_S = \frac{1}{1 + (0.053)(5.60)(1.5)} = 0.692$$

$$L_S = 365 * V_V * W_V * K_E * K_S$$

$$L_S = (365)(22.500)(0.064)(0.125)(0.692) = 45.46 \text{ lb/yr}$$

<u>Working Losses</u>

$L_W = (0.0010)(M_V)(P_{VA})(Q)(K_N)(K_P)$

Where: $M_V = 62$ lb/lb-mole
$P_{VA} = 5.60$ psia
$Q = 5.95$ bbl
$K_p = 1$

$$K_N = \frac{180 + N}{6N}$$

To determine K_N, N needs to be determined.

$$N = \frac{5.614Q}{V_{LX}}$$

$$V_{LX} = \frac{\pi}{4} D^2 H_{LX}$$

V_{LX} = Tank maximum liquid volume (ft^3)
H_{LX} = Maximum liquid height (ft) (equal to diameter for horizontal tank)

$$V_{LX} = \frac{3.1416}{4} (3^2 * 5) = 35.34$$

$$N = \frac{(5.614 * 5.95)}{35.34} = 0.945$$

Therefore, N <36 so K_N = 1

$$L_W = (0.0010)(62)(5.60)(5.95)(1)(1) = 2.06 \text{ lb/yr}$$

Total Losses

$L_T = L_S + L_W$

L_T = 45.46 lb/yr + 2.06 lb/yr = 47.52 lb/yr

HAPs

- ***Emission Factor***
  Percent composition by weight of hexane: 3.91 % (Profile 1190, Ref. 9)

- ***Results***
  Hexane Emissions (lb/yr) = VOC Emissions (lb/yr) * percent by weight hexane
  Hexane Emissions (lb/yr) = 47.52 lb/yr * 0.0391
  Hexane Emissions = 1.86 lb/yr

Ozone

- ***Source***
  Q = ((250 gal/yr) / (42 bbl/gal)) * (3 months per year / 12 months per year)
  Q = 1.49 bbl/ozone season

- ***Assumptions***
  Ozone season months: 3 (June, July and August)
  Ozone season days: 92
  5 work days per week
  Gasoline throughput evenly distributed throughout the year

- ***Ozone Season Data***

	June	July	August
T_{AX} (°F)	75.6	80.2	98.2
T_{AX} (°F)	56.4	61.2	59.6
I	1,804	1,784	1,513

Ozone Season T_{AX} (°F) = (75.6 + 80.2 + 78.2)/3 = 78.0 (538.0 °R)
Ozone Season T_{AN} (°F) = (56.4 + 61.2 + 59.6)/3 = 59.1 (519.1 °R)
Ozone Season I = (1,804 + 1,776 + 1,513)/3 = 1,697.7

- ***Results***

$L_S = 92 \cdot V_V \quad W_V \quad K_E \quad K_S$

$V_V = 22.50$ (as defined above)

$$W_V = \frac{M_V\ P_{VA}}{R\ T_{LA}}$$

$T_{LA} = 0.44\ T_{AA} + 0.56\ T_B + 0.0079\ \alpha I$

$$T_{AA} = \frac{T_{AX} + T_{AN}}{2} = \frac{538.0 + 519.1}{2} = 528.6$$

$T_B = T_{AA} + 6\alpha\text{-}1 = 528.6 + 6(0.17) - 1 = 528.6$

$T_{LA} = 0.44\ (528.6) + 0.56\ (528.6) + 2.28 = 232.6 + 296.0 + 2.28 = 530.9$

P_{VA} is interpolated from T_{LA} as explained above.

$P_{VA} = 8.43$

$$W_V = \frac{(62)\ (8.43)}{(10.731)\ 530.9} = 0.092$$

K_E is calculated as defined above substituting ozone season values for T_{AX}, T_{AN} and I.

$$K_E = \frac{21.71}{530.9} + \frac{1.645 - 0.06}{14.7 - 8.43} = 0.29$$

Where:

$T_{LX} = 76.253$, therefore $P_{VX} = 9.300$
$T_{LN} = 65.396$, therefore $P_{VN} = 7.655$
$P_V = 9.300 - 7.655 = 1.645$

$$K_S = \frac{1}{1 + 0.053\ (8.43)\ (1.5)} = 0.599$$

$L_S = 92\ (22.5)\ (0.092)\ (0.29)\ (0.599) = 33.1$ lb/ozone season

$L_W = (0.0010)\ (62)\ (8.43)\ (1.49)\ (1)\ (1) = 0.78$ lb

$L_T = L_S + L_W = 33.1 + 0.78 = 33.9$ lb/ozone season

Daily ozone emissions = (33.9 lb/ozone season) / (92 days/ozone season) = 0.37 lb/day

Ozone season work day emissions (lb/work day) = 0.37 lb/day * (7 days / 5 work days)

Ozone season work day emissions = 0.52 lb/work day

4. EMISSIONS SUMMARY

- Tables E-4 and E-5 present the estimated annual VOC and HAP emissions from ASTs at the Seneca Army Depot, respectively. The estimated daily ozone season VOC emissions are presented in Table E-6.

- At least 12 percent of the calculations were verified. The verification yielded a 99.95 percent agreement.

- Completed emission inventory forms for the ASTs at the Seneca Army Depot are presented under separate cover in Volume II.

TABLE E-4. ESTIMATED ANNUAL VOC EMISSIONS FROM ASTS

Fuel Type	Loss	SCC	Emission Rate	
			lb/yr	ton/yr
Diesel Fuel/No. 2 Fuel Oil	Working	4-03-010-21	1.7	<0.01
	Standing	4-03-001-07	9.9	<0.01
Gasoline	Working	4-03-001-03	4.1	<0.01
	Standing	4-03-001-01	118.5	0.06
Waste Oil	Working	4-03-001-99	N/A	N/A
	Standing	4-03-001-98	N/A	N/A
TOTAL			**134.2**	**0.06**

n/a: not available
N/A: Not Applicable

TABLE E-5. ESTIMATED ANNUAL HAP EMISSIONS FROM GASOLINE ASTS

Chemical Name	CAS No.	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Hexane	110-54-3	4.8	<0.01
Cumene	98-82-8	0.4	<0.01
Benzene	71-43-2	4.0	<0.01
Toluene	108-88-3	18.7	0.01
Ethylbenzene	100-41-4	5.0	<0.01
O-Xylene	95-47-6	7.9	<0.01
Styrene	100-42-5	0.2	<0.01
Chlorobenzene	108-90-7	<0.1	<0.01
Naphthalene	91-20-3	1.0	<0.01
Xylenes (M & P)	N/A	18.7	0.01
Heptane*	142-82-5	2.3	<0.01
TOTAL		**63.0**	**0.02**

N/A: Not Applicable
* New York State HAP

TABLE E-6. ESTIMATED DAILY OZONE SEASON EMISSIONS FROM ASTS

Emission Rate (lb/day)	Emission Rate (lb/work day)
1.0	1.4

APPENDIX F

DEGREASING OPERATIONS

1. BACKGROUND

- Twenty-two degreasers were located at the Seneca Army Depot. All of the degreasers, except one, were Safety Kleen units which used Safety Kleen 105 solvent and were equipped with a lid and dispensing nozzle. The remaining degreaser was also a Safety Kleen degreaser but used a heavy duty lacquer thinner as the degreasing solvent. This degreaser was a Safety Kleen model 107 degreaser which consisted of a circular bowl, equipped with a dispensing nozzle but did not have a lid.

- The hours each degreaser was used varied greatly, ranging between 2 hours per year for the degreasers at Building 323 (Supply) to 180 hours per year for the degreasers at Building 317 (COMIS). Information on the difference between the quantity of fresh solvent delivered to degreasers versus old solvent removed was not available.

- Table F-1 lists the location, building, solvent type, SCC, surface area, and hours operated for the degreasers at the Seneca Army Depot. Not listed in this table is a inactive vapor degreaser located in Building 360 (Permit No. 03603).

- The SCC assigned to the degreasers was 4-01-003-35.

TABLE F-1. SENECA ARMY DEPOT DEGREASERS

Building No.	No. of Units	Type of Solvent	Surface Area (ft^2)	Operating Schedule (hr/yr)
117	2	Safety Kleen 105	6	12
118	3	Safety Kleen 105	6	52
121	1	Safety Kleen 105	6	120
122	1	Safety Kleen 105	6	156
317	3	Safety Kleen 105	7.6	180
317	4	Safety Kleen 105	6	180
317	1	Heavy Duty Lacquer Thinner	3.1	36
319	1	Safety Kleen 105	6	120
320	1	Safety Kleen 105	6.7	52
321	2	Safety Kleen 105	6	52
323	2	Safety Kleen 105	6.7	2
718	1	Safety Kleen 105	6	40

2. EMISSIONS CALCULATIONS METHOD

- VOC emissions from all the degreasers at Seneca Army Depot were calculated based on degreaser surface area, hours of operation, VOC fraction by weight, emission factor - 0.08 lb VOC/hour/ft^2 obtained from Table 4.6-2 of AP-42 (Ref. 6), and emission reduction factor obtained from Table 4.6-3 of AP-42 (Ref. 6). The emission reduction factor is presented as a range of values between 28 percent and 83 percent. In order to maintain the most conservative approach, the "worst-case" reduction factor (i.e., 28%) was chosen.

- HAP emissions were calculated based on composition factors obtained from the MSDSs for Safety Kleen 105 and the heavy duty lacquer thinner. The composition factors for each individual HAP were multiplied by the total VOC emissions. Note that when weight percents were presented as a range on the MSDS, the most conservative percent was used (i.e., the percent which yielded the highest emission rate). The HAP composition factors used are presented in Table F-2.

- Ozone season emissions were also calculated for the degreasers.

TABLE F-2. HAP EMISSION FACTORS FOR DEGREASERS

Pollutant	Heavy Duty Lacquer Thinner (% weight of VOCs)[a]	Safety Kleen Type 105 (% weight of VOCs)
Toluene	62.7	0.5
Xylenes (isomers)	10.4	1.0
Ethyl benzene	10.4	0.5
Tetrachloroethylene	1.0	0.5
Methyl ethyl ketone	39.3	N/A
Methyl isobutyl ketone	29.5	N/A
Isopropyl alcohol *	9.6	N/A
Acetone*	19.2	N/A
n-Butyl acetate*	18.4	N/A
Ethyl acetate*	18.4	N/A
Isobutyl acetate*	18.4	N/A
n-Butyl alcohol*	9.6	N/A
Methyl alcohol	2.9	N/A
Methylene chloride	1.0	N/A
Methyl chloroform	1.0	0.5

[a] All values were presented as a range. The values that yielded the highest emission rates are listed but also exceed 100 percent.

N/A: Not Applicable

* New York State HAP

Source: MSDS for each solvent

3. SAMPLE CALCULATIONS

VOC

- ***Source***
  Bldg 121
  Safety Kleen 105 Solvent
  Surface area: 6.0 ft^2
  Annual operation: 120 hr/yr
  Solvent density: 6.6552 lb/gal (MSDS)
  Percent VOC by weight: 99.5 (MSDS)
  SCC: 4-01-003-35

- ***Emission Factor***
  VOC emission factor: 0.08 lb/hr/ft^2 (Table 4.6-2, Ref. 6)
  Reduction factor: 0.28 (Table 4.6-3, Ref. 6)

- ***Results***
  VOC Emissions (lb/yr) = emission factor (lb/hr/ft^2) * surface area (ft^2) * annual operation (hr/yr) * (1 - emission reduction factor) * % VOC by weight
  VOC Emissions (lb/yr) = 0.08 lb/hr/ft^2 *6.0 ft^2 * 120 hr/yr * (1 - 0.28) * 0.995
  VOC Emissions = 41.26 lb/yr

HAPs

- ***Emission Factor***
  Toluene composition: 0.5% by weight (MSDS)

- ***Results***
  Toluene emissions (lb/yr) = VOC emissions (lb/yr) * Toluene composition (%)
  Toluene emissions (lb/yr) = 41.26 lb/yr * 0.005
  Toluene emissions = 0.21 lb/yr

Ozone

- ***Assumptions***
  Ozone season months: 3
  Ozone season days: 92
  5 days per work week

- ***Results***
  Ozone season emissions (lb/day) = VOC emissions (lb/yr) * (ozone season months / months per year) * (1 yr / ozone season days)
  Ozone season emissions (lb/day) = 41.26 lb/yr * (3 months / 12 months) * (1 yr / 92 days)
  Ozone season emissions = 0.11 lb/day

  Ozone season work day emissions (lb/work day) = ozone season daily emissions (lb/day) * work day conversion (days per week / work days per week)
  Ozone season work day emissions (lb/work day) = 0.11 lb/day * (7 days / 5 work days)
  Ozone season work day emissions = 0.15 lb/work day

4. EMISSIONS SUMMARY

- Table F-3 presents the estimated annual VOC and daily ozone season emissions from degreasing operations at the Seneca Army Depot. HAP emissions from the degreasers are presented in Table F-4.
- At least 12 percent of the calculations were verified, the verification yielded a 99.99 percent agreement.
- Complete emissions inventory forms for all degreasers are presented in Volume II of this document.

TABLE F-3. ESTIMATED ANNUAL VOC AND DAILY OZONE EMISSIONS FROM DEGREASING OPERATIONS

VOC Emission Rate		Daily Ozone Season Emission Rate	
(lb/yr)	(ton/yr)	(lb/day)	(lb/work day)
423.8	0.21	1.2	1.6

TABLE F-4. ESTIMATED ANNUAL HAP EMISSIONS FROM DEGREASING OPERATIONS

Hazardous Air Pollutant	CAS No.	Emission Rate	
		(lb/yr)	(ton/yr)
Toluene	108-88-3	88.0	0.04
Xylene (isomers)	1330-20-7	17.3	0.01
Ethyl benzene	100-41-4	15.8	0.01
Tetrachloroethylene	127-18-4	2.8	<0.01
Methylene chloride	75-09-2	1.4	<0.01
Methyl alcohol	67-56-1	4.0	<0.01
Methyl ethyl ketone	78-93-3	54.2	0.03
Methyl isobutyl ketone	108-10-1	40.7	0.02
Acetone*	67-64-1	26.5	0.01
Ethyl acetate*	141-78-6	25.4	0.01
Isobutyl acetate*	110-19-0	25.4	0.01
n-Butyl acetate*	123-86-4	25.4	0.01
Isopropyl alcohol*	67-63-0	13.2	0.01
n-Butyl alcohol*	71-36-3	13.2	0.01
Methyl chloroform	71-55-6	2.8	<0.01
TOTAL		**356.1**	**0.17**

* New York State HAP

APPENDIX G

GASOLINE STATIONS

1. BACKGROUND

- Two gas stations were identified at the Seneca Army Depot. The two gas stations identified were the Public Works gas station at Building 120 and the Lake Boat House gas dispensing facility at Building 2456.

- The Public Works gas station at the Seneca Army Depot dispensed 136,314 gallons of gasoline from a single 20,00 gallon capacity underground storage tank. The Lake Boat House dispensed approximately 500 gallons of gasoline from a single 550 gallon capacity, white aboveground storage tank.

- The Public Works gas station was equipped with Stage I vapor recovery. There was no Stage I or Stage II vapor recovery for the lake Boat House gas dispensing facility.

- The SCCs assigned to all gas stations were:

- Submerged balanced filling (Stage I control)	4-06-003-06
- UST breathing and emptying	4-06-003-07
- Vehicle refueling with no controls	4-06-004-01
- Spillage losses without controls	4-06-004-02
- AST splash filling (Working Loss)	4-03-001-03
- AST breathing and emptying (Standing Loss)	4-03-001-01

2. EMISSIONS CALCULATIONS METHOD

- The emissions associated with gasoline service stations are VOCs and HAPs which occur as a result of filling, breathing/emptying, vehicle refueling and spillage losses. VOC emission factors for submerged filling and breathing, emptying and spillage were taken from Table 4.4-7 of AP-42 (Ref. 6). The emission factor for vehicle refueling (1,290 mg/l) was taken from Sections 3.3 and 3.4 of the *Technical Guidance - Stage II Vapor Recovery Systems for Control of Vehicle Refueling Emissions at Gasoline Dispensing Facilities, Volume 1* (Ref. 14) and corresponded to the annual average specific to the state of New York. Table G-1 lists these emission factors.

- VOC emissions for fuel dispensing operations from the AST at the Lake Boat House were performed in two steps. In the first step, VOC emissions were calculated based on the equations for standing and working losses for fixed roof tanks contained in Section 12.3.1 of AP-42 (Ref. 6) following the method described in Appendix E. When performing this calculation, the following assumptions and variables were used:

  - Vapor molecular weight (mv) and vapor pressure for gasoline were obtained from Table 12.3-2 of AP-42 (Ref. 6). These values were obtained for a fuel temperature of 60 °F. In this table, all gasoline was assumed to be "gasoline RVP 13."

  - Data on the daily maximum and daily minimum ambient temperatures (T_{ax} and T_{an}) and on the solar insolation factor (I) were taken from the closest city listed in Table 12.3-6 of AP-42 (Ref. 6). For the ASTs dispensing fuel at Seneca Army Depot, the data for Buffalo, New York was used.

  - The tank paint solar absorbance factor (a) was taken from Table 12.3-7 of AP-42 (Ref. 6). If the color and condition of the tank were unknown, it was assumed to be white and in good condition.

  - The vapor pressure (psi) and the daily average liquid temperature (P_{va}) were taken from Table 12.3-2 of AP-42 (Ref. 6) by interpolating between the vapor pressures for the annual average of daily minimum and maximum liquid surface temperatures (degrees F).

- The second step involved applying the emission factors shown in Table G-1 for vehicle refueling and spillage. Total VOC emissions were calculated by adding the VOC emissions for standing/breathing and tank filling losses from ASTs to the VOC emissions calculated for vehicle refueling and spillage.

- HAP emissions from gasoline dispensing operations at Seneca Army Depot were speciated from total VOCs based on percent composition by weight values obtained from the EPA *Air Emissions Species Manual* (Ref. 9), Profile No. 1190. Table G-2 lists the HAPs emission factors for gasoline. These emission factors have a data rating "B."

- The VOC ozone season emissions for gas stations were also calculated. Data on gasoline dispensed by month was available.

TABLE G-1. GASOLINE DISPENSING EMISSION FACTORS

Operation	Emission Factor (lb/1000 gal)
Submerged Filling (Stage I vapor recovery)	0.3
Breathing/Emptying	1.0
Vehicle Refueling[a]	1,290 mg/l
Spillage Losses	0.7

Source: Table 4.4-7 (Ref 6)
[a] Table 3-6 (Ref 14)

TABLE G-2. VOC EMISSION SPECIATION FACTORS FOR GASOLINE DATA RATING: B

Pollutant	Emission Factor (Wt %)
Hexane	3.91
Benzene	3.25
Toluene	15.22
Ethylbenzene	4.67
Cumene	0.33
Chlorobenzene	0.03
Naphthalene	0.80
O-xylene	6.41
Xylenes (m & p)	15.28
Styrene	0.17
Heptane*	1.84

* Indicates New York State HAP
Source: Profile No. 1190 (Ref.9)

3. SAMPLE CALCULATIONS

- ***Source***

  Public Works Gas Station, Building 120
  Submerged tank filling, Stage I vapor recovery
  Annual Throughput: 136,314 gal/yr unleaded gasoline
  Ozone Season Throughput: 35,551 gallons
  SCC: 4-06-003-06 Balanced Submerged Filling
  4-06-003-07 UST Breathing and Emptying
  4-06-004-01 Vehicle Refueling Without Controls
  4-06-004-02 Spillage Losses

<u>VOCs</u>

- ***Emission Factors***

  Submerged filling UST losses = 0.3 lb/1,000 gallons (Table 4.4-7, Ref. 6)
  Breathing/emptying losses = 1.0 lb/1,000 gallons (Table 4.4-7, Ref. 6)
  Vehicle refueling losses = 1,290 mg/l (Table 3-6, Ref. 14)
  Spillage losses = 0.7 lb/1,000 gallons (Table 4.4-7, Ref. 6)
  Conversion factor = [(1 kg/1x10^6 mg) * (2.2046 lb/kg) * (3.7854 l/gal)]
  Conversion factor = 8.34x10^{-6} lb-liter/mg-gallon

- ***Results***

  Filling UST losses (lb/yr) = Submerged filling emission factor (lb/1000 gal) throughput (gal/yr) * units conversion
  Filling UST losses (lb/yr) = 0.3 lb/1000 gal * 136,314 gal/yr * 1/1000 (converts fuel use to 1,000s of gallons)
  Filling UST losses = 40.89 lb/yr

  Breathing/emptying losses (lb/yr) = Breathing/emptying losses (lb/1,000 gal) * throughput (gal/yr) * units conversion
  Breathing/emptying losses (lb/yr) = 1.0 lb/1,000 gal * 136,314 gal/yr * 1/1000 (converts fuel use to 1,000s of gallons)
  Breathing/emptying losses = 136.31 lb/yr

  Vehicle refueling losses (lb/yr) = Refueling emission factor (mg/l) * conversion factor * throughput (gal/yr)
  Vehicle refueling losses (lb/yr) = 1,290 mg/l * 8.34x10^{-6} lb-liter/mg-gallon * 136,314 gal/yr
  Vehicle refueling losses = 1,466.55 lb/yr

  Spillage losses (lb/yr) = Spillage emission factor (lb/1,000 gal) * throughput (gal/yr) * units conversion
  Spillage losses (lb/yr) = 0.7 lb/1,000 gal * 136,314 gal/yr * 1/1000 (converts fuel use to 1,000s of gallons)
  Spillage losses = 95.42 lb/yr

  Total VOC emissions (lb/yr) = Filling loss (lb/yr) + Breathing/emptying loss (lb/yr) + Vehicle refueling loss (lb/yr) + Spillage loss (lb/yr)
  Total VOC emissions (lb/yr) = 40.89 lb/yr + 136.31 lb/yr + 1,466.55 lb/yr + 95.42 lb/yr
  Total VOC emissions = 1,739.2 lb/y

  <u>Note:</u> VOC emissions for the Lake Boat House fuel dispensing facility were calculated in the same manner as above except for breathing/emptying losses and working losses (filling losses). The breathing/emptying losses and working losses for the AST fuel dispensing facility were calculated by using the breathing loss and working loss equations for ASTs, as shown in Appendix E, Sample Calculations.

HAPs

- ***Emissions Factor***
  Percent composition by weight of hexane: 3.91 % (Profile 1190, Ref. 9)

- ***Results***
  Hexane Emissions (lb/yr) = VOC Emissions (lb/yr) * Percent by weight hexane
  Hexane Emissions (lb/yr) = 1,739.2 lb/yr * 0.0391
  Hexane Emissions = 68.0 lb/yr

Ozone

- ***Assumptions***
  Ozone season months: June, July and August
  Ozone season days: 92
  5 days per work week

- ***Results***
  Ozone season emissions (lb/day) = VOC emissions (lb/yr) * (throughput ozone season (gal) / annual throughput (gal)) * (1 yr / days per ozone season)
  Ozone season emissions (lb/day) = 1739.2 lb/yr * (35,551 gal / 136,314 gal) * (1 yr / 92 days)
  Ozone season emissions = 4.93 lb/day

  Ozone season work day emissions (lb/work day) = daily ozone season emission (lb/day) * work day conversion factor (days per week / work days per week)
  Ozone season work day emissions (lb/work day) = 4.93 lb/day * (7 days / 5 days)
  Ozone season work day emissions = 6.9 lb/work day

4. EMISSIONS SUMMARY

- Tables G-3 and G-4 present the estimated annual VOC and HAP emissions, respectively for the gas stations at the Seneca Army Depot. Daily ozone season VOC emissions from gasoline service stations are presented in Table G-5.

- At least 11 percent of the calculations were verified. This verifications yielded a 100 percent agreement.

- Completed emission inventory forms for the gasoline service stations are presented in Volume II of this document.

TABLE G-3. ESTIMATED ANNUAL VOC EMISSIONS

Type of VOC Loss	SCC	Underground Storage Tank (lb/yr)	Underground Storage Tank (ton/yr)	Aboveground Storage Tank (lb/yr)	Aboveground Storage Tank (ton/yr)	Total (lb/yr)	Total (ton/yr)
Filling UST Losses	4-06-003-06	40.9	0.02	N/A	N/A	40.9	0.02
UST Breathing/Emptying Losses	4-06-003-07	136.3	0.07	N/A	N/A	136.3	0.07
AST Standing Storage Loss	4-03-001-01	N/A	N/A	87.6	0.04	87.6	0.04
AST Working Loss Emissions	4-06-010-07	N/A	N/A	4.1	<0.01	4.1	<0.01
Vehicle Refueling Losses	4-06-004-01	1,466.5	0.73	5.4	<0.01	1,471.9	0.73
Spillage Losses	4-06-004-02	95.4	0.05	0.4	<0.01	95.8	0.05
TOTAL		**1,739.1**	**0.87**	**97.5**	**0.04**	**1,836.6**	**0.91**

N/A: Not Applicable

TABLE G-4. ESTIMATED ANNUAL HAP EMISSIONS FROM GASOLINE SERVICE STATIONS

Hazardous Air Pollutant	CAS No.	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Hexane	110-54-3	71.8	0.04
Cumene	98-82-8	6.1	<0.01
Benzene	71-43-2	59.7	0.03
Toluene	108-88-3	279.5	0.14
Ethylbenzene	100-41-4	74.8	0.04
o-Xylene	95-47-6	117.7	0.06
Styrene	100-42-5	3.1	<0.01
Chlorobenzene	108-90-7	0.6	<0.01
Naphthalene	91-20-3	14.7	0.01
Xylenes (m & p)	N/A	280.6	0.14
Heptane*	142-82-5	33.8	0.02
TOTAL		**942.4**	**0.48**

N/A: Not Applicable
* New York State HAP

TABLE G-5. ESTIMATED DAILY OZONE SEASON VOC EMISSIONS FROM GASOLINE SERVICE STATIONS

Daily Ozone Season Emission Rate (lb/day)	Daily Ozone Season Emission Rate (lb/work day)
5.7	8.0

APPENDIX H

AIRCRAFT LANDINGS AND TAKEOFFS

1. BACKGROUND

- The Seneca Army Depot had a single airfield which handled a variety of helicopters and fixed wing aircraft in 1993.
- Table H-1 presents the type of aircraft that used the Seneca Army Depot airfield along with number of LTO cycles per aircraft, aircraft description and power plant type or assumed power plant type.
- The SCCs assigned for LTOs were the following:
  Rotary Wing Aircraft: 2-76-010-14
  Fixed Wing Aircraft: 2-75-020-11

TABLE H-1. AIRCRAFT LANDINGS AND TAKEOFFS AT SENECA ARMY DEPOT

DOD Designation	Description	SCC	Number of Power Plants	Type of Power Plant	LTO Cycles per Year
C-12	(turbo prop.)	2-75-020-11	2	PT600 (actual) PT6A-27 *	34
C-5A	Galaxy	2-75-020-11	4	TF39-GE-1	12
C-141	Starlifter	2-75-020-11	4	TF33-P-3/5/7	12
U-21	(turbo prop.)	2-75-020-11	2	PT60 (actual) PT6A-27 *	28
UH-60	Black Hawk (turbo prop.)	2-76-010-14	2	T700 (actual) T58-GE-5 *	2
C-23		2-75-020-11	1	R.Da.7 *	2
C-26		2-75-020-11	1	R.Da.7 *	2
EH-60		2-76-010-14	2	T-58-GE-5 *	8
G-1		2-75-020-11	1	R.Da.7 *	2
OH-58	Kiowa	2-76-010-14	1	T53-L-11D *	4
P-3		2-75-020-11	1	n/a	12
UH-1	Iroquois	2-76-010-14	1	T53-L-11D *	190

* Power plant was assumed for that aircraft
n/a: not available (no emissions calculated)

2. EMISSIONS CALCULATIONS METHOD

- Calculations were based on the total LTO cycles for the identified aircraft type and emission factors.

- Criteria pollutant emission from aircraft LTOs were estimated using emission factors obtained from Tables II-1-9 and II-1-10 of AP-42, Vol.II (Ref. 15). The emission factors used are presented in Table H-2.

- HAP emissions were speciated from total VOCs based on emission factors presented in the *Air Emissions Species Manual, Volume I*, Profile No. 1097 (Ref. 9). These factors are shown in Table H-3.

- The VOC and NO_x ozone season emissions for LTOs were also calculated.

TABLE H-2. VOC AND CRITERIA POLLUTANT EMISSION FACTORS FOR LTOs (lb/LTO)

Power Plant Type	CO	NO_x[a]	VOC[b]	SO_x[c]	TSP
PT6A-27[d]	1.73	0.15	1.27	0.03	0.00
TF39-GE-1[d]	82.12	79.60	28.08	3.84	4.12
TF-33-P-3/5/7[d]	92.40	19.20	87.68	3.00	33.00
T58-GE-5[d]	13.54	3.02	6.78	0.44	0.40
R.Da.7[e]	36.26	0.92	22.42	0.58	0.00
T53-L-11D[d]	1.55	1.19	2.53	0.20	0.00

[a] Nitrogen oxides reported as NO_2
[b] VOCs reported as total hydrocarbons. Volatile organics include unburned hydrocarbons and organic pyrolysis products
[c] Sulfur oxides and sulfuric acid reported as SO_2
[d] Aircraft power plant type and emission factors pertain to military aircraft (Table II-1-10, Ref. 15)
[e] Aircraft power plant type and emission factors pertain to civil aircraft (Table II-1-9, Ref. 15)

TABLE H-3. HAP EMISSION FACTORS FOR AIRCRAFT

Pollutant	Civilian Aircraft Emission Factors (% of VOCs)[a]	Military Aircraft Emission Factors (% of VOCs)[b]
1,3-Butadiene	1.80	1.89
Formaldehyde	15.01	15.48
Acetaldehyde	4.65	4.83
Propionaldehyde	0.95	0.98
Acrolein	2.27	2.38
Benzene	1.94	2.02
Toluene	0.52	0.55
Ethyl benzene	0.17	0.18
o-Xylene	0.19	0.20
Styrene	0.39	0.41
Phenol	0.24	0.26
Naphthalene	0.57	0.60
m- & p-Xylenes	0.29	0.30
Heptane*	0.06	0.07
Acetone*	2.45	2.41

* Indicates New York state HAP

Source: [a] Profile No. 1098 (Ref. 9)
[b] Profile No. 1097 (Ref. 9)

3. SAMPLE CALCULATIONS

- ***Source***
  Seneca Army Depot Airfield
  Type of aircraft: Galaxy (C5-A)
  Number of LTOs: 12 cycles per year
  Military Aircraft

- ***Assumptions***
  Aircraft power plant type: TF39-GE-1
  All hydrocarbon emissions are assumed to be VOCs
  Fuel Type: JP-4

VOC

- ***Emission Factors***
  VOC emission factor: 28.08 lb/LTO cycle (Table II-1-10, Ref. 15)

- ***Results***
  VOC emissions (lb/yr) = emission factor (lb/LTO cycle) * number of LTO cycles/yr
  VOC emissions (lb/yr) = 28.08 lb/LTO cycle * 12 LTO cycles
  VOC emissions = 336.96 lb/yr

HAPs

- ***Emission Factors***
  Toluene emission factor: 0.55 % of VOCs (Profile No. 1097, Ref. 9)

- ***Results***
  Toluene emissions (lb/yr) = VOC emissions (lb/yr) * toluene emission factor (%)
  Toluene emissions (lb/yr) = 336.96 lb/yr * 0.0055
  Toluene emissions = 1.85 lb/yr

Ozone

- ***Assumptions***
  Ozone season months: 3
  Days per ozone season: 92
  Five days per work week

- ***Results***
  Ozone season emissions (lb/day) = VOC emissions (lb/yr) * (ozone season months / months per year) * (1 yr / ozone season days)
  Ozone season emissions (lb/day) = 336.9 lb/yr * (3 months / 12 months) * (1 yr / 92 days)
  Ozone season emissions = 0.92 lb/day

  Ozone season work day emissions (lb/work day) = ozone season daily emissions (lb/day) * work day conversion factor (days per week / work days per week)
  Ozone season work day emissions (lb/work day) = 0.92 lb/day * (7 days/5 work days)
  Ozone season work day emissions = 1.29 lb/work day

4. EMISSIONS SUMMARY

- Tables H-4 and H-5 present the total annual VOC and criteria pollutant emissions, and HAP emissions from the Seneca Army Depot aircraft LTOs, respectively. Daily ozone season emissions are presented in Table H-6.
- At least 15 percent of the calculations were verified. The verification yielded 100 percent agreement.
- Completed emissions inventory forms for the Seneca Army Depot landing and takeoff operations are presented in Volume II of this document.

TABLE H-4. ESTIMATED ANNUAL VOC AND CRITERIA POLLUTANT EMISSIONS FROM AIRCRAFT LANDINGS/TAKEOFFS

Pollutant	Rotary Wing Aircraft SCC: 2-76-010-14		Fixed Wing Aircraft SCC: 2-75-020-11		Total	
	lb/yr	ton/yr	lb/yr	ton/yr	lb/yr	ton/yr
VOC	558.6	0.28	1,602.4	0.08	2,161.0	1.08
NO_x	261.1	0.13	1,200.4	0.60	1,461.5	0.73
TSP	4.0	<0.01	445.4	0.22	449.4	0.22
CO	436.1	0.22	2,419.1	1.21	2,855.2	1.43
SO_2	43.2	0.02	87.4	0.04	130.6	0.06

TABLE H-5. ESTIMATED ANNUAL HAP EMISSIONS FROM AIRCRAFT LANDINGS/TAKEOFFS

Hazardous Air Pollutant	CAS No.	Rotary Wing Aircraft SCC: 2-76-010-14		Fixed Wing Aircraft SCC: 2-75-020-11		Total	
		lb/yr	ton/yr	lb/yr	ton/yr	lb/yr	ton/yr
1,3 Butadiene	106-99-0	10.6	0.01	30.2	0.02	40.8	0.03
Formaldehyde	50-00-0	86.5	0.04	247.4	0.12	333.9	0.16
Acetaldehyde	75-07-0	27.0	0.01	77.2	0.04	104.2	0.05
Propionaldehyde	123-28-6	5.5	<0.01	15.7	0.01	21.2	0.01
Acrolein	107-02-8	13.3	0.01	38.0	0.02	51.3	0.03
Benzene	71-43-2	11.3	0.01	32.3	0.02	43.6	0.03
Toluene	108-88-3	3.1	<0.01	8.8	<0.01	11.9	0.01
Ethylbenzene	100-41-4	1.0	<0.01	2.9	<0.01	3.9	<0.01
o-Xylene	95-47-6	1.1	<0.01	3.2	<0.01	4.3	<0.01
Styrene	100-42-5	2.3	<0.01	6.5	<0.01	8.8	<0.01
Phenol	108-95-2	1.5	<0.01	4.1	<0.01	5.6	<0.01
Naphthalene	91-12-3	3.4	<0.01	9.6	<0.01	13.0	0.01
m-Xylene and p-Xylene	N/A	1.7	<0.01	4.8	<0.01	6.5	<0.01
Heptane	142-82-5	0.4	<0.01	1.1	<0.01	1.5	<0.01
Acetone	67-64-1	13.5	0.01	38.7	0.02	52.2	0.03
TOTAL		82.2	0.09	520.5	0.25	702.7	0.36

* New York regulated HAP
N/A: Not Applicable

TABLE H-6. DAILY VOC AND NO_x OZONE SEASON EMISSIONS

Pollutant	Daily Ozone Season Emission Rate	
	(lb/day)	(lb/work day)
VOC	5.9	8.2
NO_x	4.0	5.6

APPENDIX I

WELDING OPERATIONS

1. BACKGROUND

- Welding operations were identified in Buildings 117, 118 and 320 of the Seneca Army Depot. The welding activities at Buildings 117 and 118 were small operations related to basic vehicle and equipment maintenance. The welding operation at Building 117 used approximately 20 lb/yr of certanium welding rod. The welding operation at Building 118 used approximately 10 lb/yr of alloy welding rod and had a direct exhaust vent to the outside.

- The largest welding activity on post occurred at the machine shop located in Building 320. This welding operation used approximately 170 lb/yr of welding rods (6013, 7024 and 7018), 5 lb/yr of aluminum stick, 20 lb/yr of wire, 3 lb/yr of brazing rod and 1/4 lb/yr of silver solder.

- The SCC associated with this operation is 3-09-999-99.

2. EMISSIONS CALCULATIONS METHOD

- Calculations of emissions from welding operations were based on fume generation rates, the weight percent of metals in the fume by rod type, and on the weight of welding material used. These emission factors were obtained from *Section 313, Clarification and Guidance for the Metal Fabrication Industry* (Ref. 16), *Fumes and Gases in the Welding Environment* (Ref. 17), and *Emission Factors for Arc Welding* (Ref. 18).

- When an emission factor for a specific type of welding material was not provided, the emission factor used corresponded to the material with the most similar American Welding Society (AWS) Code and/or to the material with the most similar ingredients. Table I-1 presents the assumptions regarding welding rod similarity, and the fume generation rates and metals percentages used for calculation of welding rod emissions.

- Total suspended particle emissions were obtained by multiplying the weight of the welding material by the fume generation rate.

- PM_{10} emissions were assumed to be the same as TSP emissions since the fumes released in welding operations ranged between 0.1 and 8 μm.

- VOC and NO_x emissions are not generated from welding operations. As a result ozone season emission calculations are not performed.

- HAP emissions were considered to be equivalent to the emissions of the Federal and State metals identified.

TABLE I-1. EMISSION FACTORS FOR WELDING OPERATIONS

Rod Type Used	Rod Type Assumed for Calculations (AWS Code)	Fume Generation Rate (g/kg)	% Metals
Certanium (702) & Certanium (247)	E70T-1	12.1	Mn: 9.2 Co: < 0.1 Ba: < 0.1 Cu: < 0.1 Cr: < 0.1 Ni: < 0.1
Super Blue X American Alloys Welding Rod & Brazing Rod	Haynes C-276	14.2	Mn: 0.7 Ni: 16.8 Cr: 5.4
6013	E6013	20.0	Cu: 0.2 Mn: 4.9 Co: <0.1 Ba: < 0.1 Cr: < 0.1 Ni: < 0.1
7024 & 7018	E7018	21.1	Cu: < 0.1 Mn: 4.1 Cr: < 0.1 Ni: < 0.1 Co: < 0.1 Ba: < 0.1
Aluminum Stick	ER5356	72.3	N/A
Wire	E70T-5	21.0	Mn: 11.1
Silver Solder	E6010	35.9	Cu: 0.1 Mn: 4.2 Co: < 0.1 Ba: < 0.1 Cr: < 0.1 Ni: < 0.1

N/A: Not Applicable
Source: Ref. 16, 17 and 18
Note: Cu and Ba are New York State HAPs

3. SAMPLE CALCULATIONS

Criteria Pollutants

- ***Source***
  Location: Building 320
  Rod type: 6013
  Annual usage: 50 lb/yr
  SCC: 3-09-999-99

- ***Assumptions***
  Welding rod assumed for calculation was E6013

- ***Emission Factor***
  Fume generation rate: 20.0 g/kg [grams of fumes per kilogram of total metal deposited] (Ref.16)

- ***Results***
  Total TSP (lb/yr) = Amount of rod used (lb/yr) * fumes generated (g/kg) * (conversion factor)
  Total TSP (lb/yr) = 50 lb/yr * 20.0 g/kg * (1 kg/2.2 lb * 1 lb/453.6 g)
  Total TSP = 1.0 lb/yr

HAPs

- ***Source***
  Manganese is a HAP
  Metal composition: 4.9% by weight of fumes is manganese (Ref. 16)

- ***Results***
  Manganese emissions = TSP emissions (lb/yr) * percent manganese in fumes
  Manganese emissions = 1.0 lb/yr * 0.049
  Manganese emissions = 0.049 lb/yr

Ozone

There were no VOC or NO_x emissions from the welding operations. As a result no ozone season emission calculations were performed.

4. EMISSIONS SUMMARY

- Tables I-2 and I-3 present the estimated total annual criteria pollutant emissions and the estimated total annual HAP emissions, respectively.
- At least 12 percent of the calculations were verified. The verification yielded 100 percent agreement.
- Complete emissions inventory forms for welding operations are presented in Volume II of this document.

TABLE I-2. ESTIMATED ANNUAL CRITERIA POLLUTANT EMISSIONS FROM WELDING OPERATIONS

Pollutant	Emission Rate (lb/yr)	Emission Rate (ton/yr)
TSP	4.8	<0.01
PM_{10}	4.8	<0.01

TABLE I-3. ESTIMATED ANNUAL HAP EMISSIONS FROM WELDING OPERATIONS

Pollutant	CAS No.	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Copper*	7440-50-8	<0.1	<0.01
Manganese compounds	N/A	0.2	<0.01
Chromium compounds	N/A	<0.1	<0.01
Nickel compounds	N/A	<0.1	<0.01
Cobalt compounds	N/A	<0.1	<0.01
Barium compounds*	N/A	<0.1	<0.01
TOTAL		**0.2**	**<0.01**

* Indicates New York State HAP
N/A: Not Applicable

APPENDIX J

ABRASIVE BLASTING OPERATIONS

1. BACKGROUND

- The Seneca Army Depot had two abrasive blasting operations, one located in Building 317 (COMIS) and the other in Building 360. Both abrasive blasting booths were manufactured by Wheelabrator and measured 15 ft long x 8 ft high x 8 ft wide. The abrasive blasting operation in Building 317 (Permit No. 03171) used plastic media to clean off miscellaneous metal parts. Approximately 80 lb of abrasive was added to the booth in 1993. The booth exhausts to a cyclone dust collection system.

- The blasting operation in Building 360 was used for only 2 days since early 1993. The type of abrasive used was steel shot, however there was no information available on the amount used or added. This booth is now listed as inactive under permit No. 03602.

- The SCC assigned to abrasive blasting operations is A2309100200.

2. EMISSIONS CALCULATION METHOD

- Abrasive blasting emissions consist of particulate matter only.

- Emission calculations were based on the quantity of abrasive material used and emission factors obtained from Table 2-2 of *Air Quality Permits, A Handbook for Regulators and Industry* (Ref. 19). These emissions factors are presented in Table J-1.

- Emission calculations were performed for the abrasive blasting operation at Building 317 only. There was no information available concerning the amount of abrasive used for the operation at building 360.

TABLE J-1. PARTICULATE MATTER EMISSION FACTORS FOR ABRASIVE BLASTING

Blasting Media	TSP Emission Factor (lb/lb of abrasive)	PM_{10} Emission Factor (lb/lb of TSP)
Plastic	0.01	0.70

Source: Table 2-2 (Ref. 19)

3. SAMPLE CALCULATIONS

- ***Source***
  Bldg 317
  Quantity Abrasive Used: 80 lb/yr; plastic media
  SCC: A2309100200

- ***Emission Factors***
  TSP: 0.01 lb/lb of abrasive (Ref. 19)
  PM_{10}: 0.70 lb/lb of TSP (Ref. 19)

- ***Results***
  TSP (lb/yr) = Usage (lb/yr) * TSP Emission Factor (lb/lb)
  TSP (lb/yr) = 80 lb/yr * 0.01 lb/lb
  TSP = 0.80 lb/yr

  PM_{10} (lb/yr) = TSP (lb/yr) * PM_{10} Emission Factor (lb/lb)
  PM_{10} (lb/yr) = 0.80 lb/yr * 0.70 lb/lb
  PM_{10} = 0.56 lb/yr

HAPs

HAP emissions are not associated with abrasive blasting operations.

Ozone

There are no VOC ozone season emissions associated with abrasive blasting operations.

4. EMISSIONS SUMMARY

- The estimated annual particulate matter emissions from the abrasive blasting operations at the Seneca Army Depot were 0.8 lb/yr (< 0.01 tpy) for TSP and 0.6 lb/yr (< 0.01 tpy) for PM_{10}.
- One hundred percent of the calculations were verified. The verification yielded one hundred percent agreement.
- Completed emission inventory forms for the abrasive blasting operations at the Seneca Army Depot are presented in Volume II of this document.

APPENDIX K

PAINTING OPERATIONS

1. BACKGROUND

- Eight paint booths were identified at the Seneca Army Depot. Only two booths had active permits and were used in 1993. The remaining paint booths had either inactive permits or were in the process of being permitted. All booths were fitted with fabric air filters.

- The active booths were located at Buildings 317 and 360. Only the booth at Building 317 was used on a regular basis in 1993. The paint booth at Building 360 was used only twice since February 1993, once to paint fuel cells in 1993 and once to paint fenders in May 1994. Both painting activities at building 360 involved the use of CARC paint. Information on the quantity of paint used however was available for fender painting only. Approximately 30 gallons were used over a one week period this project. The paint booth itself was enclosed, measuring 30 ft long x 12 ft wide x 15 ft high.

- The paint booth at Building 317 was used on a weekly basis or at least 5 times a month for several hours each time. The annual quantity of paint and thinner used was approximately 140 and 120 gallons, respectively. The booth was open at one end and measured 10 ft long x 10 ft wide x 8 ft high.

- Table K-1 lists the location and dimensions of all paint booths identified, including those that were inactive.

- The SCC assigned for painting operations is 4-02-001-10.

TABLE K-1. PAINT SPRAY BOOTHS AT SENECA ARMY DEPOT

Building No.	Dimensions (ft)	Status
117	30L x 15W x 15H	Inactive
317	10L x 10W x 8H	Active
18	15L x 12W x 10H	Inactive
323	12L x 8W x 8H	Inactive
360	30L x 12W x 15H	Active
612	5L x 6W x 7H	Inactive
813	24L x 9W x 14H	Inactive
2073	5L x 10W x 8H	Inactive

2. EMISSIONS CALCULATIONS METHOD

- Engineering calculations were used to estimate emissions from the painting operation in the active booths. These calculations were based on product VOC and HAP compositions, and specific gravity obtained from individual MSDSs, as well as usage rate information obtained during the site visit to the Seneca Army Depot.

- The VOC emissions were calculated by multiplying the amount of product used by the VOC weight percent. The product usage, in lb/yr, was calculated by multiplying the volume of the product used (gal), by the specific gravity of the product, and by the density of water.

- Because paints are basically composed of solids contained in various solvents (i.e., volatiles) that evaporate as the paint dries, TSP emissions were calculated by subtracting the percent volatile from 100 to determine the percent solids. The percent solids were then multiplied by the total amount of product used (lb/yr), by the transfer efficiency factor based on the application method, and by an emission reduction factor based on the efficiency of pollution control devices.

- The spray method used at Seneca Army Depot was by air atomization which has a transfer efficiency of 50 percent (Ref. 20). This value was used when calculating particulate emissions.

- The following assumptions were used during calculation of painting operations emissions:

  - When weight percents were presented as a range, the most conservative percent was used (i.e., the percent which yielded the highest emission rate).

  - 47% of the TSP emitted from painting operations was assumed to be PM_{10} (Ref. 10, Profile No. 25403).

  - A particulate removal efficiency of 60 percent was assumed for dry filters (Ref. 24).

- HAP emissions were calculated by first identifying those constituents listed on the MSDS which are federal or New York HAPs. HAP emissions were then calculated by multiplying the weight percent of each identified HAP, as given on the MSDS, by the total annual usage of the product (lb/yr).

- Emissions from the paint booth at Building 360 were based upon paint usage from May 1994.

3. SAMPLE CALCULATIONS

- ***Source***
  Paint Booth, Building 317
  Product: So-Sure Zinc Chromate Primer
  Usage: 20 gal/yr
  Specific gravity: 1.082 (MSDS)
  Volatiles: 94.79 % (MSDS)
  Pigment: 5.21% (MSDS)
  Density of water at 24°C = 0.997 g/ml (Ref. 21)
  SCC: 4-02-001-10

- ***Assumptions***
  Surface Coating transfer efficiency: 50% (Ref. 20)
  PM_{10} = 46.7% of TSPs (Ref. 10, Profile No. 25403)
  Dry filter efficiency: 60% (Ref. 24)

Criteria Pollutants

- ***Results***
  Paint Usage (lb/yr) = Primer (gal/yr) * specific gravity * water density (g/ml) * (conversion units)
  Paint Usage (lb/yr) = 20 (gal/yr) * 1.082 * 0.997 g/ml * 3,785 ml/gal * 1 lb/453.6 g
  Paint Usage (lb/yr) = 20 (gal/yr) * 1.082 * 8.319 (lb/gal)
  Paint Usage = 180.023 lb/yr

  VOC Emissions (lb/yr) = paint usage (lb/yr) * % volatiles
  VOC Emissions (lb/yr) = 180.023 lb/yr * 0.9479
  VOC Emissions = 170.644 lb/yr

  TSP (lb/yr) = paint usage (lb/yr) * % pigment * (1 - paint transfer efficiency) * (1 - filter efficiency)
  TSP (lb/yr) = 180.023 lb/yr * 0.0521 * (1-0.50) * (1-0.60)
  TSP = 1.876 lb/yr

  PM_{10} (lb/yr) = TSP (lb/yr) * 46.7%
  PM_{10} (lb/yr) = 1.876 lb/yr * 0.467
  PM_{10} = 0.876 lb/yr

HAPs

- ***Source***
  Toluene composition: 15.83% by weight (MSDS)

- ***Results***
  Toluene emissions (lb/yr) = Paint usage (lb/yr) * % toluene
  Toluene Emissions (lb/yr) = 180.023 lb/yr * 0.1583
  Toluene Emissions = 28.5 lb/yr

Ozone

- ***Assumptions***
  Months per ozone season: 3
  Days per ozone season: 92
  5 work days in a week

- ***Results***
  Ozone season emissions (lb/day) = VOC emissions (lb/yr) * (months per ozone season / months per year) * (1 yr / ozone season days)
  Ozone season emissions (lb/day) = 170.644 lb/yr * (3 months / 12 months) * (1 yr / 92 days)
  Ozone season emissions = 0.464 lb/day

  Ozone season work day emissions (lb/work day) = ozone season daily emissions (lb/day) * work day conversion factor (days per week / work days per week)
  Ozone season work day emissions (lb/work day) = (0.464 lb/day) * (7 days / 5 work days)
  Ozone season work day emissions = 0.650 lb/work day

4. EMISSIONS SUMMARY

- Tables K-2 and K-3 present the estimated annual VOC and criteria pollutant emissions and estimated annual HAP emissions from paint booth operations at the Seneca Army Depot, respectively. Daily VOC ozone season emissions were 4.6 lb/day and 6.5 lb/work day.

- At least 12 percent of the calculations were verified. The verification yielded a 100 percent agreement.

- Volume II presents information on each building given as a set. Each set provides NSNs, usage, % HAPs, % VOCs and the total emissions for HAPs and VOCs.

- Completed emission inventory forms for the active paint booths at the Seneca Army Depot are presented in Volume II of this document.

TABLE K-2. ESTIMATED ANNUAL VOC AND CRITERIA POLLUTANT EMISSIONS FROM THE PAINT BOOTH AT SENECA ARMY DEPOT

Pollutant	Emission Rate	
	(lb/yr)	(ton/yr)
TSP	135.3	0.07
PM_{10}	63.2	0.03
VOC	1,706.9	0.85

TABLE K-3. ESTIMATED ANNUAL HAP EMISSIONS FROM THE PAINT BOOTH AT THE SENECA ARMY DEPOT

Pollutant	CAS No.	Annual HAP Emissions (lb/yr)	Annual HAP Emissions (ton/yr)
Isobutyl acetate*	110-19-0	124.2	0.06
Isopropyl alcohol*	67-63-0	33.7	0.02
Methyl ethyl ketone	78-93-3	91.6	0.05
Acetone*	67-64-1	80.0	0.04
Butyl acetate*	123-86-4	39.7	0.02
n-Butyl alcohol*	71-36-3	44.9	0.02
Butyl Benzyl Phthalate*	85-68-7	2.9	<0.01
Chromium compounds	n/a	66.4	0.03
Cyclohexane*	110-82-7	10.0	<0.01
Ethylbenzene	100-41-4	13.7	0.01
Glycol Ethers	n/a	4.7	<0.01
n-Heptane*	142-82-5	20.0	0.01
Hexane	110-54-3	2.0	<0.01
Hexamethylene-1,6 diisocyanate	822-06-0	0.3	<0.01
Methyl isobutyl ketone	108-10-1	16.3	0.01
Methylene chloride	75-09-2	50.7	0.03
Toluene	108-88-3	236.2	0.12
Xylene	1330-20-7	112.6	0.06
TOTAL		**949.9**	**0.48**

* Indicates New York State HAP
n/a: not available

APPENDIX L

SURFACE COATING

1. BACKGROUND

- This section examines emissions from activities which used paints and coatings in an open uncontrolled environment. At the Seneca Army Depot, ten activities were identified which were involved in surface coating operations.

- For most of the shops identified surface coating operations were primarily limited to the use of aerosol spray cans. Several activities used small quantities of paint in brush on operations. In general all surface coating operations identified were minor. None of the operations identified used more than 100 aerosol spray cans or 50 gallons of brush application paint per year.

- Table L-1 lists the location and the quantity of material used for all shops/activities involved in surface coating at the Seneca Army Depot.

- The SCC assigned for surface coating/solvent usage is 4-02-999-95.

TABLE L-1. SURFACE COATING ACTIVITIES AT THE SENECA ARMY DEPOT

Building No.	Activity/Shop	Material Used	Annual Quantity Used
121, 319	Boiler Plants	Gray Floor Enamel Enamel for boilers Aluminum Paint	30 gal 15 gal 2 gal
117	Vehicle and Equip. Maintenance	So Sure Black	1 gal
357	Mobile Heavy Equip. Repair	So Sure Lacquer	6 - 12 oz cans
320	Machine Shop	So Sure Paint	6 - 12 oz cans
5	LTL	So Sure Flat Black Lacquer So Sure Orange So Sure Obliterating	4 - 12 oz cans 5 - 12 oz cans 4 - 12 oz cans
2073	Ammo Maintenance	Enamel Olive Drab So Sure Olive Drab So Sure Sand Obliterating So Sure Orange Lacquer So Sure Black Marsh Spray Stencil Ink So Sure Yellow Lacquer Diograph Stencil Ink	15 gal 21 - 12 oz cans 6 - 12 oz cans 1 - 12 oz can 1 - 12 oz can 1 - 12 oz can 1 - 12 oz can 36 gal
113	Box and Crate Shop	Devo Latex Brown Devo All Weather White	36 gal 1 gal
317	COMIS	So Sure Lacquer Gray So Sure Enamel Gray	25 gal 25 gal
612	Ammo Maintenance	So Sure Lacquer Olive Drab So Sure Lacquer Orange So Sure Lacquer Black Marsh Spray Stencil Ink Diagraph Stencil Ink So Sure Sand Obliterating So Sure Yellow Lacquer Olive Drab Enamel Brush	14 - 12 oz cans 1 - 12 oz can 1 - 12 oz can 1 - 12 oz can 24 gal 2 - 12 oz cans 1 - 12 oz can 10 gal
323	Shipping	Concord Sealer Gray Uline Maskout Paint Tan Bostic Super Tan	30 gal 3 - 13 oz cans 80 - 17 oz cans

2. EMISSIONS CALCULATIONS METHOD

- Engineering calculations were used to estimate emissions from paint use in uncontrolled open areas. These calculations were based on information taken from individual MSDSs and vendor contacts on the specific gravity of the product, on the percentage of the various pollutants of concern, and on the usage rate information obtained during the site visit to the Seneca Army Depot.

- The VOC emissions were calculated by multiplying the amount of aerosol product used by the VOC weight percent. The amount of aerosol product used was determined by multiplying the number of aerosol cans used by the weight per can to obtain pounds per year used. For brush application paint the product usage, in lb/yr, was calculated by multiplying the volume of the product used (gal), by the specific gravity of the product, and by the density of water.

- Since paints are basically composed of solids contained in various solvents (i.e., volatiles) which evaporate as the paint dries, TSP emissions for paints were calculated by subtracting the percent volatile from 100 to determine the percent solids. The percent solids was then multiplied by the total amount of product used (lb/yr) and a transfer efficiency factor based on the application method.

- The following assumptions were used during calculation of emissions:

  - When weight percents were presented as a range, the most conservative percent was used (i.e., the percent which yielded the highest emission rate).

  - When calculating particulate emissions, for brush applications, a transfer efficiency of 100 percent was assumed. For aerosol spray can application a transfer efficiency of 50% was assumed (Ref. 20).

  - 47% of the TSP emitted from painting operations was assumed to be PM_{10} (Ref. 10, Profile No. 25403).

- HAP emissions were calculated by first identifying those constituents listed on the MSDS which are federal or New York HAPs. HAP emissions were then calculated by multiplying the weight percent of each identified HAP, as given on the MSDS, by the total annual usage of the product (lb/yr).

- The daily ozone season emissions were also calculated for surface coating operations.

3. SAMPLE CALCULATIONS

- ***Source***
  Building 317
  Product: So-Sure Lacquer - Gray
  SCC: 4-02-999-95
  Usage: 25 gal/yr
  % Volatiles: 80.24% by weight (MSDS)
  Pigment content: 19.76% by weight (MSDS)
  Specific gravity: 0.968 (MSDS)
  Density of water at 24 °C = 0.997 g/ml (Ref. 21)

- ***Assumptions***
  Surface Coating transfer efficiency: 50% (Ref. 20)
  PM_{10} = 46.7% of TSPs (Ref. 10, Profile No. 25403)

Criteria Pollutants

- ***Results***
  Paint Usage (lb/yr) = lacquer use (gal/yr) * specific gravity * water density (g/ml) * (conversion units)
  Paint Usage (lb/yr) = 25 (gal/yr) * 0.968 * (0.997 g/ml * 3,785 ml/gal * 1 lb/453.6 g)
  Paint Usage (lb/yr) = 25 gal/yr * 0.968 * 8.319 lb/gal
  Paint Usage = 201.32 lb/yr

  VOC Emissions (lb/yr) = paint usage (lb/yr) * % volatiles
  VOC Emissions (lb/yr) = 201.32 lb/yr * 0.8024
  VOC Emissions = 161.539 lb/yr

  TSP (lb/yr) = paint usage (lb/yr) * % pigment * (1 - paint transfer efficiency)
  TSP (lb/yr) = 201.32 lb/yr * 0.1976 * (1-0.50)
  TSP = 19.89 lb/yr

  PM_{10} (lb/yr) = TSP (lb/yr) * 46.7%
  PM_{10} (lb/yr) = 19.89 lb/yr * 0.467
  PM_{10} = 9.289 lb/yr

HAPs

- ***Source***
  Toluene composition: 28.55% by weight (MSDS)

- ***Results***
  Toluene Emissions (lb/yr) = paint usage (lb/yr) * % toluene
  Toluene Emissions (lb/yr) = 201.32 lb/yr * 0.2855
  Toluene Emissions = 57.5 lb/yr

Ozone

- ***Assumptions***
  Months per ozone season: 3
  Days per ozone season: 92
  5 work days in a week

- ***Results***

Ozone season emissions (lb/day) = VOC emissions (lb/yr) * (months per ozone season / months per year) * (1 yr / ozone season days)

Ozone season emissions (lb/day) = 161.539 lb/yr * (3 months / 12 months) * (1 yr / 92 days)

Ozone season emissions = 0.439 lb/day

Ozone season work day emissions (lb/work day) = ozone season daily emissions (lb/day) * work day conversion factor (days per week / work days per week)

Ozone season work day emissions (lb/work day) = (0.439 lb/day) * (7 days / 5 work days)

Ozone season work day emissions = 0.615 lb/work day

4. EMISSIONS SUMMARY

- Table L-2 presents the estimated annual VOC and criteria emissions for surface coating activities at the Seneca Army Depot. Estimated annual HAP emissions are presented in Table L-3. Daily ozone season emissions of VOCs were 3.5 lb/day and 4.9 lb/work day.

- At least 10 percent of the calculations were verified. The verification yielded a 100 percent agreement.

- See Volume II for information on each building given as a set. Each set provides NSNs, usage, % HAPs, % VOCs and the total emissions for HAPs and VOCs.

- Completed emission inventory forms for surface coating at the Seneca Army Depot are presented in Volume II of this document.

TABLE L-2. ESTIMATED ANNUAL VOC AND CRITERIA POLLUTANT EMISSIONS FROM SURFACE COATING

Pollutant	Emission Rate	
	(lb/yr)	(ton/yr)
TSP	78.4	0.04
PM_{10}	36.6	0.02
VOC	1,279.5	0.64

TABLE L-3. ESTIMATED ANNUAL HAP EMISSIONS FROM SURFACE COATING

Chemical Name	CAS No.	Emission Rate	
		(lb/yr)	(ton/yr)
Acetone*	67-64-1	270.9	0.14
Butyl acetate*	123-86-4	34.1	0.02
Butyl alcohol, n-	71-36-3	0.6	<0.01
Ethylbenzene	100-41-4	0.6	<0.01
Ethylene glycol	107-21-1	16.6	0.01
Isopropyl alcohol*	67-63-0	2.7	<0.01
Methyl ethyl ketone	78-93-3	33.1	0.02
Toluene	108-88-3	191.7	0.10
Xylene	1330-20-7	56.7	0.03
Zinc Oxide*	1314-13-2	2.6	<0.01
TOTAL		**609.6**	**0.32**

* New York State HAP

APPENDIX M

MISCELLANEOUS CHEMICAL USE

1. BACKGROUND

- This appendix discusses any operations at the Seneca Army Depot that used chemicals/solvents in maintenance or service activities.

- Miscellaneous chemical use occurred at twelve locations at the Seneca Army Depot. Table M-1 presents the building number, type of activity, type of products/chemicals used and quantities used for all miscellaneous chemical sources identified.

- The most common types of chemical products used were aerosol spray on type degreasers used at vehicle and equipment/machine maintenance shops. The activities with the largest miscellaneous chemical use were the COMIS shop located at Building 317 and the public works equipment shop located at Building 117.

- The SCC assigned for miscellaneous chemical use is 4-01-888-01.

TABLE M-1. MISCELLANEOUS CHEMICAL SOURCES

Building No.	Activity	Products/Chemicals Used	Annual Quantity Used
118	Equipment Shop	CRC 5-56 Silicon Spray	26 - 12 oz cans 8 - 12 oz cans
117	Equipment & Battery Shop	Battery Cleaner Sulfuric Acid CRC Brake Cleaner	60 - 13.75 oz cans 104 gal 120 - 19 oz cans
N/K	Security	Rifle Bore Cleaner (1) CLP PL-S Rifle Bore Cleaner (2) LSA (1) Rifle Bore Cleaner (3) LSA (2)	5 gal 8 pints 14 - 4 oz cans 21 - 8 oz cans 3 - 4 oz bottles 3 - 2 oz bottles 15 - 2 oz bottles
113	Box & Crate Shop	CRC 5-56	3 - 12 oz cans
122	Public Works Maintenance	WD-40 CRC 5-56 Electromotive 5CRC	36 - 15 oz cans 36 - 12 oz cans 12 - 12 oz cans
122	Locksmith / Sheetmetal	Visi Dust II	12 - 12 oz cans
306	Ammo Surveillance Shop	Stencil Ink	6 - 12 oz cans
317	COMIS	CRC 5-56 WD-40 LPS-3 Rust Inhibitor P-19 CPC DX 330 Grease Remover	12 - 12 oz cans 12 - 12 oz cans 72 - 11 oz cans 110 gal 70 gal
321	TMDE	Denatured Alcohol CRC 5-56 Graffiti Remover	4 gal 6 - 12.5 oz cans 3 - 12 oz cans
612	Ammunition Maintenance	WD-40 CRC 5-56	10 - 12 oz cans 10 - 12 oz cans
323	Shipping	CRC 5-56 One Shot Ink	2 - 12 oz cans 6 - 125 ml cans
35	Mobile Heavy Equipment	PD-680 Type II	3.5 gal

N/K: Not Known

2. EMISSIONS CALCULATIONS METHOD

- Engineering calculations were used to estimate emissions from miscellaneous chemical use. These calculations were based on product VOC and HAP compositions, and specific gravity obtained from individual MSDSs, as well as usage rate information obtained during the site visit to the Seneca Army Depot.

- The amount of product used, for non-aerosol products, was calculated by multiplying the volume of the product used (gal) by the specific gravity of the product and unit conversion factors (based on the density of water) to generate the amount of product used in lb/yr. For aerosol products the amount of product used was calculated by multiplying the number of aerosol cans by the weight per can to obtain pounds per year. The VOC emissions were then calculated by multiplying the amount of product used by the percent VOC. When available, the VOC weight percent was used to calculate VOC emissions. However, the VOC percent by weight is typically not available on MSDSs; vendor contacts are usually required to obtain the VOC percent by weight. When the VOC percent by weight was simply not available, the VOC percent by volume was used to calculate VOC emissions. Using the VOC percent by volume results in a conservative estimate of VOC emissions.

- The following assumptions were used during calculation of emissions:

  - Water was assumed to be included in the reported "percent volatiles by volume." As a result, before calculating VOC emissions, the reported percent water was subtracted from the reported percent volatiles by volume to yield a nonaqueous percent volatiles by volume.

  - When volume or weight percents were presented as a range, the most conservative percent was used (i.e., the percent which yielded the highest emission rate).

- HAP emissions were calculated by first identifying those constituents listed on the MSDS which are federal or New York HAPs. HAP emissions were then calculated by multiplying the weight percent of each identified HAP, as given on the MSDS, by the total annual usage of the product (lb/yr).

- The daily ozone season emissions were also calculated for miscellaneous chemical use.

3. SAMPLE CALCULATIONS

- ***Source***
  Building: 321 (TMDE)
  Product: Denatured Alcohol
  Usage: 4.0 gal/yr
  Specific Gravity = 0.932 (MSDS)
  Volatiles = 100% (MSDS)

VOC

- ***Results***
  Chemical usage (lb/yr) = Denatured Alcohol (gal/yr) * specific gravity * water density (g/ml) * (conversion units)
  Chemical usage (lb/yr) = 4.0 gal/yr * 0.932 * (0.997 g/ml * 3,785 ml/gal * 1 lb/453.6 g)
  Chemical usage (lb/yr) = 4.0 gal/yr * 0.932 * 8.319 lb/gal
  Chemical usage (lb/yr) = 31.013 lb/yr

  VOC Emissions (lb/yr) = Denatured Alcohol usage (lb/yr) * % volatiles
  VOC Emissions (lb/yr) = 31.013 lb/yr * 1.00
  VOC Emissions = 31.013 lb/yr

HAPs

- ***Source***
  From MSDS: Methyl Alcohol Composition = 4.8% by weight (MSDS)

- ***Results***
  Methyl Alcohol Emissions (lb/yr) = Denatured Alcohol usage (lb/yr) * % Methyl Alcohol
  Methyl Alcohol Emissions (lb/yr) = 31.013 lb/yr * 0.048
  Methyl Alcohol Emissions = 1.489 lb/yr

Ozone

- ***Assumptions***
  Months per ozone season: 3
  Days per ozone season: 92

- ***Results***

Ozone season emissions (lb/day) = VOC emissions (lb/yr) * (months per ozone season / months per year) * (1 yr / ozone season days)

Ozone season emissions (lb/day) = 31.013 lb/yr * (3 months / 12 months) * (1 yr / 92 days)

Ozone season emissions = 0.084 lb/day

Ozone season work day emissions (lb/work day) = ozone season daily emissions (lb/day) * work day conversion factor (days per week / work days per week)

Ozone season work day emissions (lb/work day) = 0.084 lb/day * (7 days / 5 work days)

Ozone season work day emissions = 0.118 lb/work day

4. EMISSIONS SUMMARY

- Table M-2 presents the estimated annual VOC and daily ozone season VOC emissions for miscellaneous chemical use at the Seneca Army Depot. HAP emissions from miscellaneous chemical use are presented in Table M-3.

- At least 11 percent of the calculations were verified. The verification yielded a 100 percent agreement.

- Volume II presents information on each building given as a set. Each set provides NSNs, usage, % HAPs, % VOCs and the total emissions for HAPs and VOCs.

- Completed emission inventory forms for miscellaneous chemical use at the Seneca Army Depot are presented in Volume II of this document.

TABLE M-2. ESTIMATED ANNUAL VOC AND DAILY OZONE SEASON EMISSIONS FROM MISCELLANEOUS CHEMICAL USE

VOC Emission Rate		Daily Ozone Season VOC Emission Rate	
(lb/yr)	(ton/yr)	(lb/day)	(lb/work day)
1,264.2	0.63	3.4	4.8

TABLE M-3. ESTIMATED ANNUAL HAP EMISSIONS FROM MISCELLANEOUS CHEMICAL USE

Hazardous Air Pollutant	CAS No.	Emission Rate	
		(lb/yr)	(ton/yr)
Acetone*	67-64-1	8.6	<0.01
Antimony Compounds	n/a	0.1	<0.01
Glycol Ethers	n/a	0.3	<0.01
Hexane	110-54-3	1.9	<0.01
Isobutyl Acetate*	110-19-0	17.0	0.01
Isopropyl alcohol*	67-63-0	0.5	<0.01
Methyl Alcohol	67-56-1	1.5	<0.01
Methyl Chloroform	71-55-6	31.4	0.02
Methylene Chloride	75-09-2	35.5	0.02
Methyl ethyl ketone	78-93-3	0.5	<0.01
Tetrachloroethylene	124-38-9	118.0	0.06
Toluene	108-88-3	2.3	<0.01
Xylene	1330-20-7	4.1	<0.01
TOTAL		**221.7**	**0.11**

* New York State HAP
n/a: not available

APPENDIX N

PESTICIDE/HERBICIDE APPLICATION

1. BACKGROUND

- Several types of pesticides and herbicides were applied at Seneca Army Depot in 1993. The pesticides and herbicides used at the Seneca Army Depot were stored and mixed in Building 606.

- Various pesticides/herbicides were applied throughout Seneca Army Depot, but there was no information as to the specific site of application by pesticide type. However, in general the majority of herbicides were applied along fence lines and around the airport runway. The most commonly used pesticides/herbicides were Arsenal, Bromacil and Glyphosate. The diluted quantities used for these three items were 1,020, 900 and 450 gallons, respectively.

- Table N-1 presents the type of pesticide/herbicide, NSN, concentration (dilution) percentage, diluted quantity, units, material form (i.e., solution, emulsion, etc.), specific gravity, percent VOCs by weight and the percent solubility in water for each pesticide/herbicide used at the Seneca Army Depot. The final column in this table also shows whether or not emissions calculations were performed for each pesticide or herbicide.

- The SCC assigned for pesticide application was A2461800000.

TABLE N-1. PESTICIDE/HERBICIDE AND ANNUAL USAGE INFORMATION

Product	NSN	Conc. %	Annual Quantity Used	Units	Form	Specific Gravity	% VOCs by Weight	% Solubility	Calcs.	VOC lb/yr
Anticoagulant	6840-00-F00-1351	100	81.3	pound	Baits	40	N/A	Soluble		--
Arsenal (Inazapyr)	6840-01-356-8902	0.01	,020.0	gallons	Emulsion	1.09	1	Soluble	*	0.01
Baygon (Propoxur)	6840-00-F00-4019	100	,967.0	fluid oz	Aerosol	0.77	99 (a)	0	*	82.7
Boric acid (PT 240)	6840-01-287-3938	100	46.0	fluid oz	Aerosol	0.983	79.5	4.72	*	0.0
Boric acid (PT 240)	6840-01-287-3938	100	8.9	pound	Aerosol	0.983	79.5	4.72	*	0.0
Bromacil (Borocil)	6840-00-027-6467	0.01	900.0	gallons	Solution	n/a	N/A	Soluble		--
Diazinon	6840-00-844-7355	0.5	112.0	gallons	Emulsion	0.78	99	Slight	*	<0.1
Diazinon	6840-00-844-7355	0.5	322.5	gallons	Solution	0.78	99	Slight	*	0.1
FICAM W	6840-01-087-6672	0.25	160.0	fluid oz	Dust	n/a	N/A	0.004		--
FICAM W	6840-01-087-6672	0.5	80.0	fluid oz	Dust	n/a	N/A	0.004		--
Glyphosate Technical	6840-00-F00-5602	0.02	450.0	gallons	Solution	n/a	0	157.0		--
Imazapyr (Arsenal)	6840-01-356-8902	0.01	300.0	gallons	Emulsion	1.09	1 (a)	Soluble	*	0.0
Maxforce	6840-01-298-1122	100	24.0	pound	Baits	1.44	N/A	0		--
Pyrethrum	6840-00-823-7849	100	117.5	fluid oz	Aerosol	0.91	89.5	0	*	2.1
Resmethrin (Synthrin)	6840-01-104-0780	0.03	5.0	fluid oz	ULV	0.878	96.51	0	*	0.0

* Emissions were calculated
N/A: Not Applicable
n/a: not available
(a) Percent VOCs by Volume

2. EMISSIONS CALCULATIONS METHOD

- Engineering calculations were used to estimate emissions from pesticide/herbicide application at the Seneca Army Depot. These calculations were based on information provided from individual material safety data sheets (MSDS) including material specific gravity, volume/weight percents of the specific pollutants of concern, and total product volatile organic compound composition. This information along with usage rates and dilution ratios provided in the DD Form 1532 allowed for calculation of VOC emissions.

- MSDSs usually provide the VOC content of the material, expressed as a percentage of total volume and in some cases as a percentage of total weight. It is more accurate to estimate VOC emissions using the weight percent of the VOC content. However, since this information is not always available, the percent of total VOCs by volume must instead be used to estimate VOC emissions. It is important to note that utilizing volatile percent by volume will usually overestimate VOC emissions.

- During the calculation of VOC emissions the following assumptions were used:

    1) When volume percentages were presented as a range of values, the most conservative percentage was used (i.e., the percentage which yielded the highest emission rate).

    2) When no dilution ratio information was available from the manufacturer, the dilution ratio was assumed to be 1 percent.

    3) Water and other non-reactive components (i.e., methylene chloride, methyl chloroform, etc.) were assumed to be included in the reported percent volatiles by volume. As a result, when calculating VOC emissions, the non-reactive VOCs were subtracted from the reported total volatile composition.

- Products in aerosol cans are typically sprayed directly from cans without prior dilution. As a result dilution factors were not applied to any aerosol spray products.

- HAP emissions were calculated based on the weight/volume percent of specific HAPs as provided in the MSDS, and on the undiluted portion of the pesticide/herbicide being applied.

- Not all pesticides or herbicides used at the installation generate emissions of VOCs or HAPs. For example, a pesticide or herbicide which is applied in solid form (i.e., bait, dust, or granular media) will not generate an emission. In other cases, such as suspensions, where the material is a powder that is mixed with water, emission estimates are either not applicable or a valid method of calculation was not available. This document does not present emission estimates for pesticides or herbicides having the physical form of a bait, dust, granular media or suspension, or if the material is not reported as having a volatile component. The pesticides that fall in these categories and for which emissions were not calculated are indicated on the Calcs. column in Table N-1.

- The daily VOC ozone season emissions were also calculated for pesticide/herbicide application at the Seneca Army Depot.

3. SAMPLE CALCULATIONS

- ***Source***

  Pyrethrum product applied at Seneca Army Depot
  Annual usage: 117.5 ounces = 0.92 gallons
  Ozone season usage: 0.43 gallons
  Dilution ratio: 100% (MSDS)
  Specific gravity: 0.91 (MSDS)
  VOC content: 89.5% by weight (MSDS)
  Non-reactive VOC content: 60% methyl chloroform by weight (MSDS)
  Water density (24°C) = 8.319 lb/gal (Ref. 21)

Criteria Pollutants

- ***Results***

  Pyrethrum Product usage (lb/yr) = annual pyrethrum product usage (gal/yr) * dilution ratio (%) * specific gravity * water density (lb/gal)
  Pyrethrum Product usage (lb/yr) = 0.92 gal/yr * 1.0 * 0.91 * 8.319
  Pyrethrum Product usage = 6.96 lb/yr

  VOC Emissions (lb/yr) = Pyrethrum product use (lb/yr) * (% VOC content - % non-reactive VOC)
  VOC Emissions (lb/yr) = 6.96 lb/yr * (0.895 - 0.60)
  VOC Emissions = 2.05 lb/yr

HAPs

- ***Source***

  Pyrethrum: 0.5% of mixture by weight (MSDS)

- ***Results***

  Pyrethrum emissions (lb/yr) = pyrethrum usage (lb/yr) * % pyrethrum
  Pyrethrum emissions (lb/yr) = 6.95 lb/yr * 0.005
  Pyrethrum emissions = 0.035 lb/yr

Ozone

- ***Assumptions***

  Ozone season months: 3 (June, July and August)
  Ozone season days: 92
  5 work days per week

- ***Results***

  Ozone season emissions (lb/day) = VOC emissions (lb/yr) * (product use ozoneseason (gal) / annual product use (gal)) * (1 yr / days per ozone season)
  Ozone season emissions (lb/day) = 2.05 lb/yr * (0.43 gal / 0.92 gal) * (1 yr /92 days)
  Ozone season emissions = 0 .01 lb/day

  Ozone season work day emissions (lb/work day) = daily ozone season emission (lb/day) * work day conversion factor (days per week / work days per week)
  Ozone season work day emissions (lb/work day) = 0.01 lb/day * (7 days / 5days)
  Ozone season work day emissions = 0.014 lb/work day

4. EMISSIONS SUMMARY

- The estimated annual VOC emissions from pesticide/herbicide application at the Seneca Army Depot was 84.9 lb/yr (0.04 tpy). Table N-2 presents the estimated annual HAP emissions from pesticide/herbicide applications. Daily ozone season emissions were 0.6 lb/day and 0.8 lb/work day.
- At least 14 percent of the calculations were verified. The verification yielded 100 percent agreement.
- Completed emission inventory forms for Pesticide/Herbicide application at the Seneca Army Depot are presented in Volume II of this document.

TABLE N-2. ESTIMATED ANNUAL HAP EMISSIONS FROM PESTICIDES/HERBICIDES

Hazardous Air Pollutant	CAS No.	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Propoxur	114-26-1	0.5	<0.01
Methyl chloroform	71-55-6	10.0	<0.01
Methylene chloride	75-09-2	14.8	0.01
Dichlorvos	62-73-7	0.2	<0.01
Pyrethrum*	8003-34-7	<0.1	<0.01
Isopropylamine*	75-31-0	0.1	<0.01
TOTAL		25.6	0.01

* Indicates New York State HAP

APPENDIX O

OUTDOOR FIRING RANGE

1. BACKGROUND

- The Seneca Army Depot had a single outdoor firing range which was used for small caliber weapons training for security personnel.
- The munitions expended at the outdoor firing range are provided in Table O-1, along with quantity expended and appropriate DODIC numbers.
- No SCC was assigned for the outdoor firing range.

TABLE O-1. MUNITIONS EXPENDED AT THE OUTDOOR FIRING RANGE

Munitions Type	DODIC No.	Quantity Expended (rounds/yr)
.38 Caliber	A400	2,500
5.56 mm	A071	2,000
.45 Caliber	A475	400
Shot gun	A011	400

2. EMISSION CALCULATIONS METHOD

- The U.S. Army Environmental Hygiene Agency (USAEHA) has indicated that no emission calculations be performed for the munitions expended as the EPA has not established proper emission calculation methods. Therefore, no emissions calculations were performed for the outdoor firing range of the Seneca Army Depot.

APPENDIX P

WATER TREATMENT FACILITIES

1. BACKGROUND

- The Seneca Army Depot had two facilities where wastewater was treated, and one potable water treatment facility. The two wastewater treatment facilities were SEAD-20 (Seneca Army Depot No. 20) located in Building 4, and SEAD-21 (Seneca Army Depot No. 21) located in Building 715. The potable water treatment facility was located in Building 2411.

- The SEAD-20 facility has been operated since 1942 and is still currently in use. The system was designed to handle 250,000 gallons per day. The load of this system was 100 percent domestic sewage and no chemical additions were used during treatment.

- The SEAD-21 facility was operated between 1956 to December 1993, and is no longer in service. The system was designed to handle 750,000 gallons per day, but was generally operated at 300,000 gallons per day. During 1993 no chemicals were used during treatment.

- The potable water treatment facility located in Building 2411 was designed to handle 800,000 gallons per day, but has been operated at 200,000 gallons per day. The water is drawn from the lake and then sent to a chlorine well. The water is then gravity fed to a second fluoridated well and then diverted to the residential area. The chemical usage of this treatment facility during 1993 consisted of 1,200 lb/yr of chlorine and an unknown amount of fluoride liquid.

- The SCC assigned with wastewater treatment is 5-01-007-01.
  There is no SCC associated with potable water treatment.

2. EMISSIONS CALCULATIONS METHOD

- Chlorine is the air pollutant of concern from the potable water treatment plant at Building 2411. The estimate of chlorine emitted was based upon the annual volume of water treated with chlorine, the end of the line chlorine residual in treated water and the emission factor 8.34 lb/10^6 gal/ppm obtained from *Unit Operations and Process in Environmental Engineering* (Ref. 22). Information pertaining to the end of the chlorine residual was not available as a result a typical chlorine residual value (0.2 ppm) was assumed.

- No emission calculation were performed for the two wastewater treatment facilities (Buildings 4 and 715). Neither facility used any additives and there was little to no industrial loading.

3. SAMPLE CALCULATIONS

HAPs

- ***Source***
  Potable Water Treatment Plant, Building 2411
  SCC: 5-01-007-01
  Water Treated Annually: 200,000 gal/day * 365 day/yr = 73,000,000 gal/yr

- ***Assumptions***
  End of the line chlorine value was 0.2 ppm

- ***Emission Factors***
  Chlorine Emission Rate: 8.34 lb/10^6 gal/ppm (Ref. 22)

- ***Results***
  Chlorine Emissions (lb/yr) = Annual Flow (10^6 gal/yr) * chlorine residual (ppm) * chlorine emission factor (lb/10^6 gal/ppm)
  Chlorine Emissions (lb/yr) = 73.0 (10^6 gal/yr) * 0.2 (ppm) * 8.34 lb/10^6 gal/ppm
  Chlorine Emissions = 121.76 lb/yr

4. EMISSIONS SUMMARY

- There were no VOC emissions from wastewater treatment plants at the Seneca Army Depot. The estimated annual chlorine emissions were 121.8 lb/yr (0.06 ton/yr).
- One hundred percent of the calculations were verified. The verification yielded a 100 percent agreement.
- Completed emission inventory forms for the Seneca Army Depot wastewater and potable water treatment facilities are presented in Volume II of this document.

APPENDIX Q

LANDFILLS

1. BACKGROUND

- The Seneca Army Depot had various landfills throughout the facility but only one (SEAD-7) was active in 1993. Overall, information was available for eleven of the landfills. This information is provided in Table Q-1 and includes unit number, area name, area size, dates used and description as to the type of debris handled.

- There was no information available on the quantity of debris disposed for any of the landfills at the Seneca Army Depot. Many of the landfills identified have been inactive for at least fifteen to twenty-five years. For several landfills the date of use were unknown, however, these landfills have mature vegetation growth indicating they also have been inactive for many years. The types of debris disposed in the landfills covered a wide range including radioactive waste, ash, oxidizers, classified parts, construction material and garbage. The active landfill is used for construction debris.

- The SCC assigned to the landfills is 5-02-006-02.

TABLE Q-1. SENECA ARMY DEPOT LANDFILLS

Unit No.	Disposal Area Name	Disposal Area Size	Dates Used	Debris Description
SEAD - 6	Ash Fill Area	600 ft x 300 ft	1941 - early 1960s 1974 - 1979	Ash from burn pits and solid waste incinerator
SEAD - 7	Shale Pit	2 acres	1987 - present	Construction debris
SEAD - 8	Non-Combustible Fill Area	350 ft x 350 ft	1974 - 1979	Bulky non-combustible waste and some construction debris
SEAD - 11	Old Construction Debris Landfill	590 ft x 590 ft	1946 - 1949	Construction debris
SEAD - 12	Radioactive Waste Burial Sites	5 pits (Unknown size)	Pre 1962	Radioactive and nonradioactive wastes from clinic and classified metal parts
SEAD - 13	IRFNA Disposal Site	6 pits (30 ft x 8 ft x 4 ft deep)	Early 1960s	IRFNA - an oxidizer used in missile liquid propellant systems
SEAD - 59	Fill Area West of Bldg. 135	150 ft dia x 10 ft deep	Unknown *	Construction debris
SEAD - 63	Misc. Components Burial Site	80 ft x 60 ft	1950s to 1960s	Inert material (classified parts)
SEAD - 64	Garbage Disposal Areas	4 areas (Unknown size)	Unknown *	Exact makeup of debris unknown
SEAD - 67	Dump Site (East of Sewage Treatment Plant No. 4)	Waste Piles (Unknown size)	Unknown *	Unknown
SEAD - 69	Disposal Area (Bldg. 606)	Waste Piles (Unknown size)	Unknown *	Fence wire, concrete post and pesticide containers

* Landfill is not currently in use.

2. EMISSIONS CALCULATIONS METHOD

- Landfill emissions were not estimated for the following reasons.

  - The quantity of debris disposed was unknown for all landfills and the depth of many landfills was not known.

  - Many landfills were used primarily for disposal of inert materials (construction debris, metal parts). The only active landfill is used for this purpose.

  - Most landfills have been inactive for at least fifteen years, some have been inactive for over twenty five years, for several others the dates of use are unknown.

  - Even though a description of landfill debris has been provided, there were several cases of uncertainty as to the actual/exact debris makeup.

APPENDIX R

OPEN BURNING/OPEN DETONATION

1. BACKGROUND

- The Seneca Army Depot had one open burn pit and one demolition pit where open burning/open detonation (OB/OD) operations are conducted. Both pits were located in the northwest corner of the installation.
- The materials and quantity of materials open burned and detonated, during 1993 at the Seneca Army Depot are provided in Table R-1.
- An SCC for open burning and open detonation of munitions was not available.

TABLE R-1. OPEN BURNING/DETONATION ACTIVITIES AT SENECA ARMY DEPOT

Lot No.	NSN	DODIC No.	Annual Quantity (No. of items disposed)
COP-4-817	1340000286090	N/K	17,653 units
LOP89H016-004	1375007247040	M023	4,966 units
ENB-1-4	1375001436995	N/K	28,808 ft
HEP-64-1	1375007561865	M130	54 units
IRI87A001-025	1375011929174	N/K	241 units
COP-4-793	1340000286090	N/K	9,612 units
ENB87K015-010	1375001809356	M456	3,400 ft

N/K: Not Known

2. EMISSION CALCULATIONS METHOD

- Emissions from the OD facility can not be calculated at this time. The U.S. Environmental Protection Agency has not to date provided guidance or emission factors for the calculation of emissions from OB/OD activities.

- Completed emission inventory forms for open burning and open detonation are presented in Volume II of the document.

APPENDIX S

FIREFIGHTING TRAINING

1. BACKGROUND

- In 1993 the Seneca Army Depot conducted five firefighting training operations. The use of a fire training pit to burn fuel oil was discontinued in 1992.
- During firefighting training wood pallets were stacked into a 50 ft diameter and 15 ft high pile (approximately 150 pallets) and were burned completely.
- The SCC assigned to firefighting training is 5-01-006-04.

2. EMISSION CALCULATION METHOD

- To evaluate the VOC, criteria and hazardous air pollutant emissions from firefighting training it was assumed that the emissions from this activity were equivalent to the emissions from a wood stove since emission factors for firefighting training using wood were not available. Therefore, emission factors for VOC and criteria pollutants have been taken from AP-42, Section 1.10, Table 1.10-1 (Ref. 6). Table S-1 presents the VOC and criteria pollutant emission factors and their data rating. The total non-methane organic compound (TNMOC) emission factor was assumed to be VOC emissions. The following assumptions were made prior to performing the emission calculations:
    - Each wood pallet's volume equaled 5.3 cubic feet (4 ft wide by 4 ft long by 4 in deep)
    - Density of wood equaled 40 lb/cubic feet (AP-42 Appendix A)
    - Each wood pallet consisted of 34 (3 in x 1/2 in x 4 ft) boards
- The HAP emissions were based on emission factors for woodstoves taken from AP-42 Section 1.10, Tables 1.10-3 and 1.10-4. These emission factors which have a E data rating, are presented in Table S-2 .
- VOC and NO_x ozone season emissions were also calculated for firefighting training. Only two training sessions occurred during the ozone season in 1993. These two sessions are not representative of ozone season emissions which are based on a 92-day period. Even though VOC and NO_x ozone season emissions were calculated, they have not been reported in the overall summary table, Table 3.

TABLE S-1. CRITERIA POLLUTANT EMISSION FACTORS FOR WOOD STOVES (lb/ton)

Reference	VOC Data Rating E	NO_x Data Rating C	CO Data Rating B	SO_2 Data Rating B	PM_{10} Data Rating B
Table 1.10-1	43.8	2.8	230.8	0.4	30.6

TABLE S-2. HAP EMISSION FACTORS FOR WOOD STOVES (lb/ton)

HAP	Emission Factor	Reference
Benzene	1.938	Table 1.10-3
Toluene	0.730	Table 1.10-3
Methyl Ethyl Ketone	0.290	Table 1.10-3
o-Xylene	0.202	Table 1.10-3
Furfural *	0.486	Table 1.10-3
Naphthalene	0.288	Table 1.10-4

* New York State HAP
Source: Tables 1.10-3 and 1.10-4 (Ref. 6)

3. SAMPLE CALCULATION

Criteria Pollutant

- ***Source***
  5 burns in 1993, (2 during the ozone season)
  150 wood pallets used per burn
  Density of wood (Pine southern) = 40 lb/ft^3 (Ref. 6)

- ***Assumptions***
  Pine southern wood was assumed to be the primary wood from which the pallets were constructed.
  Each wood pallet was assumed to consist of 34 (3 in x 1/2 in x 4 ft) boards
  - sixteen 3 inch wide boards on top of pallet (4 feet wide)
  - sixteen 3 inch wide boards on bottom of pallet (4 feet wide)
  - two 3 inch wide boards separating top and bottom of pallet

- ***Emission Factors***
  VOC = 43.8 lb/ton (AP-42 Table 1.10-1)

- ***Results***
  Volume of each board: 3 inches x 1/2 inch x 4 feet = 0.0416664 ft^3

  Weight of wood pallets (lb/yr) = number of boards per pallet (board/pallet) * volume of board * (ft^3/board) * number of pallets (pallets/burn) * number of burns (burns/yr) * density of wood burned (lb/ft^3)
  Weight of wood pallets(lb/yr) = 34 board/pallet * 0.0416664 ft^3/board * 150 pallets/burn * 5 burn/yr * 40 lb/ft^3
  Weight of wood pallet = 42,500 lb/yr

  VOC Emissions (lb/yr) = emission factor (lb/ton) * Weight of wood pallets burned (lb/yr) * [conversion factor]
  VOC Emissions (lb/yr) = 43.8 lb/ton * 42,500 lb/yr * [1 ton/ 2000 lb]
  VOC Emissions = 930.75 lb/yr

HAPs

- ***Emission Factor***
  Benzene: 1.938 lb/ton (Ref. 6)

- ***Results***
  Benzene Emissions (lb/yr) = Emission factor (lb/ton) * Weight of wood burned (lb/yr) * [conversion factor]
  Benzene Emissions (lb/yr) = 1.938 lb/ton *42,500 lb/yr * [1 ton / 2000 lb]
  Benzene Emissions = 41.2 lb/yr

Ozone

- ***Source***
  Two days with burns during 1993 ozone season

- ***Results***

  Ozone season emissions (lb/O_3 season) = VOC emissions (lb/yr) * (burns per ozone season / burns per year)

  Ozone season emissions (lb/O_3 season) = 930.75 lb/yr * (2 burns / 5 burns)

  Ozone season emissions = 372.3 lb (total emissions for two days)

4. EMISSIONS SUMMARY

- The estimated annual VOC and criteria pollutant and estimated annual HAP emissions from firefighting training are presented in Tables S-3 and S-4, respectively. The ozone season emissions of VOCs and NO_x were 372.3 lb and 23.5 lb, respectively. The ozone season emissions were the result of emissions on two separate days only.
- At least 10 percent of the calculations were verified. The verification yielded a 100 percent agreement.
- Completed emission inventory forms for the firefighting training at the Seneca Army Depot are presented in Volume II of this document.

TABLE S-3. ESTIMATED ANNUAL CRITERIA AND VOC POLLUTANT EMISSIONS FROM FIREFIGHTER TRAINING (SCC 5-01-006-04)

Pollutant	Emission Rate	
	(lb/yr)	(ton/yr)
PM_{10}	650.3	0.33
SO_2	8.5	<0.01
CO	4,904.5	2.45
NO_x	59.5	0.03
VOC	930.8	0.47

TABLE S-4. ESTIMATED ANNUAL HAP EMISSIONS FROM FIREFIGHTER TRAINING

Chemical Name	CAS No.	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Benzene	71-43-2	41.2	0.02
Toluene	108-88-3	15.5	0.01
Methyl ethyl ketone	78-93-3	6.2	<0.01
o-Xylene	95-47-6	4.3	<0.01
Naphthalene	98-01-1	6.1	<0.01
Furfural *	91-20-3	10.3	0.01
TOTAL		83.6	0.04

* New York State HAP

APPENDIX T

INCINERATORS

1. BACKGROUND

- The Seneca Army Depot had two classified waste incinerators, one located in Building 709 and the other in Building 801. Both incinerators had operating permits and were listed as air contamination point sources Nos. 0801B and 0709B for Buildings 801 and 709 respectively.

- The incinerator at Building 709 was listed as inactive on the operating permit and has not been used since May 1993. There are no plans to operate this incinerator in the future, and according to the operating permit cannot be operated without prior approval from DEC (New York State Department of Environmental Conservation).

- The incinerator at Building 801 is also currently inactive and has not been used since December of 1993. The propane fuel supply tank for the incinerator has been physically removed and the system cannot be operated until a fuel supply is provided. The incinerator itself is a dual chamber unit with a 130 lb/hr capacity.

- Seneca Army Depot also has a incinerator designed for the disposal of obsolete or unserviceable ammunition. The incinerator (Popping Plant) is located at Building 367 and was installed several years ago but to date has never been used.

- The SCC assigned to incinerators is 5-01-001-01.

2. EMISSIONS CALCULATION METHOD

- There was no information on the types or quantities of waste destroyed by each of the classified waste incinerators, and therefore, no emission calculations were performed. Information forms for each of the incinerators is provide in Volume II of this document. Information regarding the amount of materials incinerated was not available because no records had been kept when the incinerators were used and the personnel who might be able to provide estimates were no longer employed at the depot.

APPENDIX U

CUTBACK ASPHALT APPLICATION

1. BACKGROUND

- The Seneca Army Depot applied cutback asphalt for road resurfacing in the ammunition storage areas and for minor road repairs elsewhere. The types of asphalt used were (1) AC-20 Type 3 Binder Dense, (2) AC-20 Type 7 Top Course, and (3) Hot patch.

- The amounts of application for each asphalt were as follows:

  - 1,526,934 cubic yards of AC-20 Type 3
  - 715,556 cubic yards of AC-20 Type 7
  - 20 ton/year (max) of Hot patch

- No SCC was assigned for asphalt application.

2. EMISSIONS CALCULATIONS METHOD

- The primary pollutants of concern from asphalt application are VOCs. VOC emissions from cutback asphalt result from the evaporation of the petroleum distillate solvent or diluent used to liquify the asphalt cement. However, the asphalt used at Seneca Army Depot in 1993 did not contain distillate solvent or diluent. According to the manufacturer (Ref. 23), the asphalt is maintained at 300 - 350 °F prior to and during the application process, and no solvent/diluent is introduced. As a result, emissions of VOCs from asphalt application were assumed to be negligible.

- A completed emission inventory form for asphalt application at the Seneca Army Depot is presented in Volume II of this document.

APPENDIX V

WOODWORKING OPERATIONS

1. BACKGROUND

- The only location where woodworking activity occurred at the Seneca Army Depot was at the box and crate shop located in Building 113.
- The box and crate shop at Building 113 processed wood approximately 780 hours in 1993. All cutting and sanding equipment used in this operation were exhausted through a cyclone dust collector. The dust collector operated approximately 3 hours per day. No pressure treated lumber was used at this shop.
- The wood processing equipment at the box and crate shop consisted of 4 - radial arm saws, 2 - table saws, 1 - joiner, 2 - bandsaws, 1 - wood shaper and 1 - planer.
- The SCC assigned to woodworking operations is 3-07-030-97.

2. EMISSIONS CALCULATION METHOD

- Woodworking emissions consist of particulate matter and any HAPs associated with the use of pressure treated lumber.
- Particulate matter emissions were based on emission factors and the actual number of hours wood was processed/handled. The emission factors, obtained from Table 10.4-1 of AP-42 (Ref. 6), are based on the use of cyclone as the dust collecting media and are as follows:
    - sander dust: 5 lb/hr of operation
    - other operations: 2 lb/hr of operation
- The portion of PM_{10} in the total dust emissions was obtained from AP-42, Appendix C.1-10 (Ref. 6). The emission factor provided indicated that 52.9 percent of TSPs was PM_{10}.
- HAP emissions were not calculated because pressure treated lumber was not used.

Date 10/3/94

RESPONSE TO DEPARTMENT OF THE ARMY COMMENTS FOR SENECA ARMY DEPOT

COMMENT #1 All Sections, 2LT Pate

Comment:

In all tables values in lbs/day should be reported to 1 decimal place. Values in TPY should be reported to 2 decimal places.

Recommendation:

Correct all tables that have values that are reported incorrectly.

Response:

Table entries have been changed to the appropriate number of decimal places.

Appendix B - Boilers

COMMENT #2 Page B-5, Table B-3, Mr. Grow

Comment:

The TSP emission factor for residential combustion is listed as 2.5 lb/1000 gal. It should be 0.3 lb/1000 gal.

Recommendation:

Change the TSP emission factor to 0.3 lb/1000 gal. Make the corresponding change to the PM_{10} emission factor.

Response:

Use of 2.5 lb/1000 gal is correct. The 0.3 lb/1000 gal that is shown in AP-42 is an error (per telephone conversation with OAQPS-EPA.

Appendix C - Generators

COMMENT #3 Page C-3, Emissions Calculation Method, Mr. Grow

Comment:

The sulfur content was listed as 0.4 percent with AP-42 given as the reference. The specific section of AP-42 was not provided.

Recommendation:

Provide more specific information about the section of AP-42 that provided the sulfur content.

Response:

Page A-3 AP-42 has been added to the text.

COMMENT #4 Page C-4, Table C-2, Mr. Grow

Comment:

A PM_{10} emission factor was not listed for SCCs 2-02-001-02 and 2-02-003-01. However, the PM_{10} emission factor could be assumed to be equal to TSP if no other factor is available.

Recommendation:

Use the TSP emission factor to determine PM_{10} emissions from SCCs 2-02-001-02 and 2-02-003-01.

Response:

The PM-10 emission factor was assumed to be equal to the TSP emission factor, as recommended by Mr. Grow. However, since PM-10 is a sub-set of TSP and it is assumed to be the same as TSP but is not in addition to TSP, then the whole amount is listed under PM-10 and the entire amount is removed from row 1 (TSP) of Table C-4 and all other affected tables.

APPENDIX D: UNDERGROUND STORAGE TANKS

COMMENT #5 Page D-l, Mr. Scheibler

Comment:

It is stated in the background that No. 2 fuel oil and diesel total amounts were proportioned to determine tank throughput. Assumptions as to how these amounts were proportioned should be given.

Recommendation:

Show how these fuel amounts were proportioned to determine each tank throughput.

Response:

The text at the third bullet on page D-1 describes the method used to proportion No. 2 fuel oil between the USTs and ASTs. Additional text has been added to expand the description of the method.

COMMENT #6 Page D-2, Mr. Scheibler

Comment:

This text states that there is no SCC for UST No. 6 fuel oil available. The SCC 4-04-004-98 for working loss could be used for this type of emission.

Recommendation:

a. Include the SCC code 4-04-004-98 for working loss in the text for UST No. 6 fuel oil.

b. Correct all other areas where this may apply (i.e., Tables D-l, D-3 and data sheets).

Response:
4-04-004-98 has been included as suggested.

COMMENT #7 Page D-5, Sample Calculations, Mr. Scheibler

Comment:
The assumption (Psia at 60 °F: 0.0074) should be changed to (Vapor pressure P_{va} at 60 °F: 0.0074 psia). The assumption (Molecular weight of liquid: 130 lb/lb-mole) should be changed to (Molecular weight (M_v): 130 lb/lb-mole).

Recommendation:
Correct these two assumptions in this section.

Response:
Assumptions were re-stated as suggested.

COMMENT #8 USTs Data Sheets, Mr. Scheibler

Comment:
Some data spaces on the USAEHA data sheets were left blank.

Recommendation:
Fill in all data spaces that you have data for especially the monthly throughputs.

Response:
As stated in the text in Appendix D monthly throughput was only available for two tanks. The monthly throughput for those two tanks was included on the data forms.

APPENDIX E: ABOVEGROUND STORAGE TANKS

COMMENT #9 Page E-3, Section 2, Paragraph 2, Mr. Scheibler

Comment:
The last sentence is wrong and needs to be changed to explain what was actually done. The sample calculations show that the vapor pressures (P_{VA}) was found by interpolating between the columns of 40°F and 50°F.

Recommendation:
Change the last sentence to process used in the sample calculations for vapor pressures (P_{va}).

Response:

The sentence is correct as written. Interpolation between 40 and 50 °F is shown in the example calculation but maximum and minimum temperatures were used in the calculations.

COMMENT #10 Page E-3, Section 2, Paragraph 5, Mr. Scheibler

Comment:

What does the sentence "Fuel throughput during the ozone season were made for the gasoline ASTs" mean.

Recommendation:

Give more information on how the ASTs gasoline throughput were obtained for ozone season.

Response:

Paragraph was rewritten to explain that VOC emissions during the ozone season, from gasoline storage tanks were calculated using a pro-rated portion of the annual throughput.

COMMENT #11 ASTs Data Sheets, Mr. Scheibler

Comment:

The AST data sheets show that vapor pressures (P_{va}) were obtained for a temperature of 60 °F. This does not match the correct procedure shown in Appendix E, Sample Calculations for P_{va}.

Recommendation:

Correct all areas in this emission statement which this mistake affects.

Response:

The calculations were done correctly as described in the example calculation. The value shown on the data sheet is a default value but not the actual value used in the calculation.

COMMENT #12 ASTs Data Sheets, Mr. Scheibler

Comment:

Some data spaces on the USAEHA data sheets were left blank.

Recommendation:

Fill in all data spaces that you have data for especially the monthly throughputs.

Response:
All data that was provided has been entered on the data forms.

Appendix F

No Comment.

APPENDIX G: GASOLINE STATIONS

COMMENT #13 Page G-1, Section 1, Mr. Scheibler

Comment:
The AST splash filling SCC code is wrong.

Recommendation:
Use the same SCC code (4-03-001-03) as you used in Appendix E for gasoline ASTs.

Response:
AST splash fill SCC was changed as suggested.

COMMENT #14 Page G-2, Section 2, Mr. Scheibler

Comment:
The first assumption in Paragraph 2 is incorrect for the vapor pressure. The vapor pressure (P_{va}) should be obtained for the liquid surface temperature (T_{la}) as shown in Appendix E, Sample Calculations.

Recommendation:
Delete vapor pressure from this assumption.

Response:
The comment addresses vapor pressure. The assumption describes vapor molecular weight. The intent of the comment is not understood. No action taken.

COMMENT #15 Page G-2, Section 2, Mr. Scheibler

Comment:
The last assumption in Paragraph 2 is incorrect for the vapor pressure. Vapor pressure (P_{va}) is not interpolated using the daily minimum and maximum liquid surface temperatures, it is interpolated using the annual average liquid surface temperature (T_{la}) as shown in Appendix E, Sample Calculations.

Recommendation:
Delete this non-assumption from text since the procedure for P_{va} is shown in the sample calculations.

Response:
The text was modified slightly to better explain the procedure used.

COMMENT #16 Gasoline Service Station Data Sheet for Building 2456, Mr. Scheibler

Comment:
This data sheet shows that vapor pressures (P_{va}) were obtained for a temperature of 60 °F. This does not match the correct procedure shown in Appendix E, Sample Calculations for P_{va}.

Recommendation:
Correct all areas in this emission statement which this mistake affects.

Response:
The correct procedure was used in the calculations. A default value appears in the data sheets.

Appendix H-M

No Comment.

Appendix N - Pesticide/Herbicide Application

COMMENT #17 Page N-I, General Comment, Mr. Moultrie
Pesticide/Herbicide Application

Comment:
How can the emissions total, presented on page N-6, be verified if the emission rates from each type of pesticide/herbicide, presented on Table N-1, are not shown.

Recommendation:
Change Table N-1 to show the emissions from each type of pesticide/herbicide and also include the total emissions from all applications on the table.

Response:
VOC emissions from each type of pesticide/herbicide have been added to Table N-1. Emissions from each type of pesticide/herbicide are shown in the data sheets.

Appendix O - Outdoor Firing Range

COMMENT #18 Page O-1, Emissions Calculations Method, 2LT Ruccolo

Comment:

The U.S. Army Environmental Hygiene Agency is listed as "Health Agency".

Recommendation:

Correct name of USAEHA to read U.S. Army Environmental "Hygiene" Agency.

Response:

Correction was made.

Appendix P-S

No Comments

Appendix T - Incinerators

COMMENT #19 Page T-I, Emissions Calculation Method, Mr. Grow

Comment:

The emissions were not determined for the incinerators because there was no information on the types or quantities of waste destroyed. The text also states that these sources require operating permits. Therefore, more information on these sources should be provided. Either the emissions from these sources should be determined or detailed information as to why information was not available should be provided.

Recommendation:

Estimate incinerator emissions or provide detailed information as to why information was not available to determine the emissions.

Response:

Additional text was added to explain the data are not available, i.e., no records had been made regarding how much material was burned and the personnel who might be able to estimate material burned are no longer employed there.

Appendix U

No Comments

Appendix V - Woodworking Operations

COMMENT #20 Page V-2, Woodworking Operations, 2LT Gilbride

Comment:

The SCC listed in the sample calculation is not the same SCC assigned to woodworking as stated on page V-1.

Recommendation:

Use only one SCC per source.

Response:

Changed SCC on sample calculation page to agree with page V-1.