Appendix F –Development of Emission Inventory for Modeling

The non-residential emission inventory section is comprised of three source categories; major, area and mobile. The distinction between major and area sources is based upon regulatory emission cutoffs defined by the USEPA for a single pollutant or class of pollutants. Major sources describe the facilities with the most significant amount of mass emissions. Area sources describe facilities which are either small stand-alone facilities (i.e. gas stations) or locations with fugitive emission releases, such as landfills or sewage treatment plants. Major and area size facilities with individual emission points are also referred to as point sources or stationary sources. Mobile sources represent passenger car traffic and off-road vehicle traffic. Off-road vehicles generally are described as construction equipment. The emissions of off-road vehicles were not included in this appendix due to the absence of specific emissions information for the Study area.

The listing and emission quantity of all Hazardous Air Pollutants (HAPs) and non-HAPs emitted from major and area point sources can be found in Tables F1 and F2. Pie Charts for the air contaminants with the greatest mass by emissions can also be found in Figures F1 and F2, Emissions from Mobile sources, Figure F3.

1.0 Major Sources

The definition for major sources can be found within the New York State Department of Environmental Conservation's air pollution regulations, 6NYCRR Part 201-2.1(b)(21). The definition for regulated air contaminants, which includes criteria pollutants and hazardous air pollutants, can be found in 6NYCRR Part 200.1[1]

A facility emitting criteria pollutants and/or hazardous air pollutants greater than a federally defined mass emission rate is classified as a major source. Depending on the geographical location within New York State, all criteria pollutants have defined mass emission cutoff amounts signifying the major source level. For example, the Niagara Frontier area, consisting of Niagara and Erie Counties, has a major source cutoff level set at 50 tons per year (TPY) or greater for any single facility's emissions of volatile organic compounds. The federally defined mass emission rate for hazardous air pollutants (HAPs) is the same state-wide and is set at ten (10) tons per year and twenty five (25) tons per year for multiple HAPs emitted. For the Study location, the classification of major was used as a starting point to identify facilities of concern and was not limited to only HAPs when identifying toxic air contaminants. Facilities whose emissions are greater than the federally defined mass emission rate for major facilities are required to obtain a Title V permit.

Sources classified as major sources are required to obtain a Title V air permit (Title V) under federal and state regulations. Major sources are the most rigorously regulated sources in the NYSDEC's air permitting system and are required to submit yearly emission statements of actual emissions to the Department. The emission statements are generated by the facility and

[1] http://www.dec.ny.gov/regs/13427.html

reviewed by staff in NYSDEC's Stationary Source Planning Section. For the purpose of this study, the combined emission statements of 2002, 2005 and 2006 were chosen and the highest reported emission of an individual air contaminant was selected. These years were selected because 2002 and 2005 are classified as periodic inventory years. Periodic inventory years are when a more robust collection of data is required from the regulated facilities. The additional year of 2006 was added as a check and was the latest complete inventory year at the time the data gathering effort began. All of the Title V facilities are also required to submit Toxic Release Inventory[2] data to the USEPA under the Emergency Planning and Community Right-to-Know Act (EPCRA). Emission statement data was compared and verified with all Toxic Release Inventory data. The USEPA releases the National Emission Inventory (NEI) each year after it is complied. The emissions statements filed with NYSDEC are verified and used to populate the NEI.

Table F1 includes the nine Title V sources located within the nine census block Study area. In addition to the nine Title V sources located within the nine census block study area, two facilities, FMC Corporation and Gibraltar Steel Corporation in Table F1 have legally enforceable permit conditions that restrict the facility's emissions below major size limits.

Title V facilities must report all Regulated Air Pollutants:

- Hazardous Air Pollutants;
- Contaminants with a National Ambient Air Quality Standard;
- Chlorofluorocarbons;
- The class of contaminants identified as volatile organic compounds (VOCs);
- Nitrogen oxides;
- Contaminants of the Clean Air Act Amendments section 112(r) accidental release program; and
- Contaminants with a federal emission limit under New Source Performance Standards.

VOCs as a class of compounds can contain numerous individual compounds. Each of these individual compounds within the class can have varying degrees of toxicity. All Title V facilities are required to report the individual HAPs within the VOC category and the remaining VOC compounds as Total VOC. The remaining Total VOC compounds needed to be speciated to understand the potential health hazard associated with the overall reported Total VOCs. The breakdown of Total VOC was obtained from facility records and/or old permit data. Hydrocarbon emissions from combustion sources and gasoline evaporative emissions were assigned to the general classification of aliphatic hydrocarbons and compared to the health-based guidance concentration value of hexane (a straight chain six carbon molecule).

Of the State Facility Permit holders remaining below major source classification, FMC Corp. has a cap of 98 tons per year of sulfur dioxide and Gibraltar Steel Corporation limits its potential emissions below all major source emission levels.

[2] To learn more about the Toxic Release Inventory visit: http://www.epa.gov/tri/triprogram/whatis.htm

Sources included in the major source category account for the largest amount of point source emissions. Within the inventory development process, the emission estimates would be qualitatively determined to be of high quality. Sources within the major source category generally have the most robust data for emission factor estimation and more likely to have been stack tested to verify emissions.

Limitations

6NYCRR Part 202 requires yearly emission statements from major facilities with a larger periodic inventory every three years. The periodic inventory requires the facility owner to report emissions from exempt permitted sources. Emission reporting under Part 202 is based upon self reporting with NYSDEC oversight and the emissions are the actual emissions for the calendar year. Actual emissions are required because facility owners pay an annual fee based upon actual emissions rather than upon potential emissions. The potential for higher ambient impacts can occur if facility operations operated at facility maximum allowed by permit.

In the major source category, the sources range from well characterized emission estimates such as the Huntley electric utility steam generating power plant versus the Tonawanda Coke plant where the emissions have a lesser degree of certainty. The confidence in emission factors for the Coke industry in general are of low quality and the USEPA on July 6, 2009 sent an enforcement action to the owner of Tonawanda Coke to verify the assumptions used to generate facility-wide emissions and in some instances the July 6th action required stack testing.

2.0 Area Sources

Traditionally, area sources have been described as emission sources that are either numerous, relatively small, stand-alone facilities or locations with fugitive emission releases. In 1990, the USEPA revised this general definition for area sources and created a specific regulatory definition for area sources as part of the Clean Air Act amendments. Under the National Emission Standards for Hazardous Air Pollutant (NESHAP) program[3], processes at facilities whose emission potential of one HAP are less than ten tons per year or multiple HAPs are less than twenty-five tons per year can be classified as an area sources. Also, those facilities which have emission limitations restricting emissions of one or more HAPs below ten and twenty-five tons can be classified as an area sources. Facilities exceeding those size limitations are considered major under the NESHAP program.

For the purpose of this study, the definition of area sources will include petroleum bulk storage facilities, trucking depots, sewage treatment plants, landfills and NYSDEC regulated Registration sources.

2.1 Registration Facilities

Under the NYSDEC permitting program, area size sources can be regulated with a Registration Certificate. Registrations are issued to facility owners, whose potential process source emissions

[3] USEPA, Office of Air and Radiation, http://www.epa.gov/ttn/atw/eparules.html

do not exceed the major size classification for HAPs or if possible take legally enforceable limits to keep their actual emissions below 50% of major size classification.

There are twenty-two facilities in the Study area eligible for a Registration certificate. An additional Registration Certificate is held by the Tonawanda sewage treatment plant and its emissions will be addressed separately due to its unique source characteristics. There are an additional three facility owners, who retained permits from our previous permitting system, and are not required to update the permits at this time. The emissions from these facilities are considered negligible and not a significant impact to the Tonawanda area. The Niagara Landfill is a Registered facility but will also be addressed in its own subsection.

Limitations

Facility owners of Registration Certificates are required to list the name of the hazardous air pollutant emitted at the facility but not the quantity. In cases where actual emissions could not be quantified for this report, emission estimates were based upon the maximum allowable under a Registration Certificate.

A listing of Regulated Air Pollutants for Registration facilities can be found in Table F2

2.2 Petroleum Bulk Storage Facilities

Petroleum Bulk Storage (PBS) facilities can include large storage facilities such as the ones identified under the Major sources category list. The major facilities are in the business of unloading petroleum products to tanker trucks for further distribution. PBS facilities can also be smaller storage facilities designed to load fleet vehicles and finally PBS facilities can be gasoline retail stations. Gasoline consists of many chemical compounds, of which benzene, toluene, ethylbenzene and xylene (BTEX) are the compounds monitored for the Study and are considered to be a good representative of gasoline emissions and potential toxic exposure. Other chemical compounds monitored representative of gasoline emissions are the dimethyl and trimethyl benzenes.

Staff from the Division of Environmental Remediation maintains NYSDEC's Petroleum Bulk Storage database. This database lists all active and inactive PBS sites, including last inspections, liquid stored, tank size, number of tanks and age. This database was used to locate the gasoline fleet and retail sites in the study area. Sixteen retail gasoline stations were located in the nine census block study area.

The PBS database was used to locate the number of petroleum storage tanks and their size (in gallons) for facilities located in the study area. Total VOC emissions were estimated according to the potential of yearly throughput of petroleum and emission factors obtained from the Factor Information Retrieval system (FIRE)[4]. Benzene was estimated at 1% of total VOC. Emissions of the storage, fueling and evaporative emissions can be found in Table F2

[4]USEPA - FIRE ,Technology Transfer Network, Clearinghouse for Emissions and Inventories, http://www.epa.gov/ttn/chief/

2.3 Trucking Depots

The mobile emission sector within the nine census tract Study area is extensive. Although, the emissions of air toxics from mobile sources will be addressed under section 3.0 of this Appendix, another potential contribution of air toxic emissions in the study area is from the daily operation of trucking depots. The potential for air toxic emissions are from truck idling, shuttle trucks whose job is to move trailers and to a lesser degree diesel storage.

As identified in numerous studies and referenced below for a study in the Boston area, fine particulate, ultra-fine particulate and black carbon, a surrogate for diesel particulate, are the air contaminants of most concern when investigating potential health effects from diesel vehicles. (Levy, et.al) The air toxics of concern from trucking depots are fine particulate, ultra-fine particulate and black carbon, a surrogate for diesel particulate. The current Study monitored for $PM_{2.5}$ and did not specifically target black carbon. The TEOM monitors measured all particle material less than 2.5 microns.

The Study area has thirty-three active trucking depots and one bus terminal recorded in the Petroleum Bulk Storage database. When trying to evaluate the amount of trucking activity occurring at these emission sites, it was first thought that the quantity of diesel fuel stored on site could be a potential indicator of facility size and activity. The trucking depots in the Study area have a wide range of storage capacity; the largest trucking site has storage capacity of 120,000 gallons of petroleum diesel and the smallest at 10,000 gallons. Also, the number of loading bays a terminal operates could be another indicator of size and activity. During site-visits with trucking managers, it became clear that diesel storage was not a good measure of activity because storage was used more to buy and store diesel when fuel prices were low. Although, generalizing about the number of bays is a potential method to classify truck depots into large and small, the current economic climate has business down and many idled bays. During site-visits with trucking managers, it was determined that trailer drop-offs and hook-ups account for 15 minutes of time. According to a study conducted by Environ International (Lindhjem), the drop off and hook-up time was closer to 0.57 hours per day. Also, during the day, each facility operates a shuttle truck to move trailers from bay to storage waiting for pick-up.

The estimation of VOC and diesel PM emissions from the trucking depot source category is unknown. Studies have been undertaken to quantify nitrogen oxides, diesel PM and VOCs from idling heavy duty diesel engines as part of the rest-stop electrification programs conducted in New York, California and Oregon but not at on-going operations at a trucking depot. When undertaking a study to determine the localized ambient air impact from trucking depots, the data needed to properly derive an emission estimate are:

1.) The averaged daily number of trucks serviced at each trucking depot;
2.) The average idling time during loading and unloading;
3.) The average emission rate of VOC and diesel PM,

The emission evaluation study conducted by ENVIRON determined truck yard idling at 0.57 hours per day. Baseline estimates of VOCs and diesel PM for idling trucks were generated as an average from three data sources, USEPA (Mobile5 model), Colorado Institute for Fuels and

Environmental Research, and University of California Davis for a study conducted by The New York State Energy Research Development Authority (NYSERDA 2005).

Item#2 can be estimated from the Lindhjem study and Item #3 above can be derived from the NYSERDA study, leaving the estimate of the number of trucks serviced unknown. Also, for the purpose of this study, an estimate of trucking activity was based upon the site-visits where it was determined the number of trucks loading and unloading was in the range of 40 to 80 trucks a day.

The NYSERDA idling study data released emissions factors for VOC and diesel PM of 36.4 grams/hr and 2.19 grams/hr, respectively. Based upon the estimate of 0.57 hours per day of idling, the daily VOC and PM results in 20.7 grams/day and 0.1.2 grams/day, respectively. Using the estimation of each trucking depot servicing 60 trucks a day, the following estimates were derived. Low confidence is assigned to this emission estimate until better verification of truck activity can be established. The benzene is conservatively estimated at 1.0 % of the VOC. Using the emission ratio found in Mobile6, formaldehyde is 7.5 times the emission rate for benzene.

A listing of Regulated Air Pollutants for Registration facilities can be found in Table F2

2.4 Sewage Treatment Plant

Industrial and residential waste water sent to publicly owned treatment works (POTW) may be treated or untreated prior to release. POTWs may treat waste water from residential, institutional, and commercial facilities and/or storm water runoff. A POTW will consist of a primary settling tank or tanks, biotreatment, secondary settling, and disinfection.

As stated by the Great Lakes Commission, whose charge is to reduce air deposition and discharge to the Great Lakes, "specific industrial and commercial activities are the largest source of organic compounds entering the municipal collection systems. However, other residential sources of organic compounds such as home maintenance and cleaning products contribute to the total organic compounds that enter the POTWs. These organic compounds produce emissions through volatilization at the surface of the wastewater during treatment processes. Nationwide estimates indicate that POTWs are significant sources of volatile organic compounds (VOC) in the United States."[5]

One sewage treatment plant is located within the nine census block Study area. The Tonawanda SD #2 facility holds a Registration Certificate from NYSDEC indicating that the potential of volatile organic compound and nitrogen dioxides emissions from this facility are below fifty and 100 tons per year, respectively and actual emissions are below 25 and 50 tons per year respectively. Tonawanda SD #2 has a three stage aqueous packed tower odor scrubbing system. Foul air from a thermal conditioning sludge treatment process containing low molecular weight volatile compounds passes through first a water scrubber; second, an oxidative scrubber; third, an alkaline scrubber. It is then discharged to the atmosphere through a roof exhaust stack.

[5] http://wiki.glin.net/dashboard.action

Emissions for this source category are derived based upon the National Emission Inventory methodology established in 1999. POTW emission factors are in units of pounds of HAP emitted per million gallons of wastewater (lb/10^6 gal) treated. The amount of waste water treated at the Tonawanda SD #2 was obtained from NYSDEC's Division of Water and the following estimates were calculated.

Listed in Table F3 are the total VOCs estimated for this source category and the five Category C contaminants determined to be above our Annual Guideline Concentration.

2.5 Landfills

The Study area encompasses three landfills in close proximity to two of NYSDEC's air monitoring stations. One landfill, Huntley flyash landfill, located between Grand Island Blvd and the Tonawanda Coke Corporation is an actively used landfill; the other two landfills are no longer used municipal solid waste landfills. The Niagara Landfill located north of the Highway 290, adjacent to the toll booths and River Road has been closed since the middle 1990's. The Niagara landfill size is below the thresholds for the New Source Performance Standards, Subpart Cc, requiring a flare or 98% control on captured gas emissions. Even though the landfill was below the New Source Performance Standards (NSPS) threshold, this site was equipped with a flare at the time of final capping. The flare is no longer in use due to issues with gas production and ceased operation. The other municipal landfill adjacent to Highway 290, between two mile creek and the Conrail railroad tracks was the town of Tonawanda's landfill. The site was recently reopened for waste relocation work. This landfill was the site of a municipal waste incinerator and the bottom ash was disposed of on-site. Also, some solid waste was disposed on-site and radioactive waste from the Manhattan project was located at this site. The incinerator and landfill shut down in the early 1980's. Most of the activity was along Hackett Road. A final cover is not on the site as of this report.

Emissions from the two municipal waste landfills are based upon the EPA software program LandGEM. LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of land filled waste in MSW landfills. The software provides a simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills (USEPA, 2005c). The emissions were based upon the landfills being filled up to but not exceeding the NSPS limit of 2.5 million cubic meters of waste.[6]

Listed in Table F3 are the total VOC estimated for this source category and the five Category C contaminants that were above our AGCs.

[6] USEPA New Source Performance Standard, Subpart WWW, §60.750, 61 FR 9919, March 12, 1996 and New Source Performance Standard, Subpart Cc, §60.30c, 61 FR 9919, March 12, 1996

3.0 Mobile Sources

For this study, the mobile source inventory was restricted to on-road diesel and gasoline engines of all size weight classes. The size weight classes included in the inventory are included in Table F4.

To determine the ambient air concentrations attributed to vehicle traffic, the generated emissions were modeled with the Human Exposure Model (HEM3)[7], derived by the USEPA. The list of size weight classes in Table F4 was restricted to seven major weight class categories for the purpose of modeling mobile sources. The seven weight class categories are a function of the SMOKE emission processor which prepares emissions for large scale modeling exercises. Sparse Matrix Operator Kernel Emissions (SMOKE) is an "emissions data modeling system that prepares emissions data for use in air quality models. It converts the resolution of pollution source inventories into the hourly, gridded, model-species resolution needed by air quality models."[8] Smoke was not used in the Study but its methodology was chosen to represent the seven large automotive classes which capture the majority of emissions from this source sector.

For the study area, a majority of the emissions, 90.5 percent, were attributed to SMOKE categories Light Duty Gas Vehicle (LDGV), Light Duty Gas Truck (LDGT1) and LDGT2. The remaining emissions were attributed to the Heavy Duty Gas and Diesel Vehicle classes.

To generate emission factors for various types of light-duty and a heavy-duty vehicle, the Division of Air Resources uses MOBILE6[9]. MOBILE6 is a computer-based model used to analyze air pollutant impacts from gasoline-fueled and diesel highway mobile sources. The software program provides the user with a flexible analytical tool that can be applied in a wide variety of air quality planning functions. Among the many conditions that can be altered are roadway type, ambient temperature, weekday/weekend and gasoline formulation.

The grams per mile emission factors generated by MOBILE6 for criteria pollutants and for a limited set of hazardous air pollutants, were integrated with daily vehicle miles traveled (DVMT) to construct an emission profile for a given roadway in the Tonawanda Study area. The Study area of Tonawanda was represented by the following roadway classifications: urban interstate, urban primary arterial, urban major collector and urban local. These four road classifications accounted for 814, 948 annual DVMT. The annual DVMT is calculated based upon the measured annual average daily traffic counts multiplied by the roadway length to determine DVMT.

Using emission factors and the DVMT for the study area, the emissions were calculated for the mobile source contribution in the Study area in tons per year and listed in Table F5 and Figure F3.

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[7] USEPA, Fate, Exposure and Risk Models, http://www.epa.gov/ttn/fera

[8] SMOKE v2.5 User Manual, The institute for the Environment - The University of North Carolina at Chapel Hill, 2008

[9] Mobile6 software and documentation are available at http://www.epa.gov/otaq/mobile

Table F1 Listing of Major Sources in Study Area

Facility	DEC ID	Address	Main Product
3M Tonawanda	9146400164	35 Sawyer Ave.	Production of cellulose sponges
E I Dupont Yerkes	9146400031	Sheridan Drive at River Road	Production of Corian® shape products and Tedlar® polymer
GM Powertrain	9146400048	2995 River Road	Primary processes involve the machining of engine components, as well as engine assembly and testing.
Goodyear Dunlop Tires	9146400030	3333 River Road	Production of truck, motorcycle, (ATV) and automobile tires.
Huntley Steam Station	9146400130	3500 River Road	Coal-fired steam generation power plant
Indeck-Yerkes Energy	9146400153	1 Sheridan Ave	Cogeneration of steam and electrical energy
NOCO Energy Corporation	9146400090	700 Grand Island Blvd.	Bulk marketing terminal for the distribution of gasoline, diesel products and asphalt
Sunoco Tonawanda Terminal	9146400132	3733 River Road	Bulk marketing terminal for the distribution of gasoline, diesel products and ethanol
Tonawanda Coke Corporation	9146400113	3750 River Road	Production of metallurgical foundry coke

State Facility Permit Holders:

Facility	DEC ID	Address	Main Product
FMC Corporation	9146400040	37 Sawyer Ave.	Production of persulfates and peracetic acid using batch and continuous process
Gibraltar Steel Corporation	9146400256	1050 Military Road	Engaged in the cold reducing tempering and, in certain cases, the annealing of cold-rolled steel coils to pre-specified dimensions

Table F2 Area Sources in Study Area

Registration Facilities

The tons per year of all regulated air pollutants with VOC and HAP broken out for Registration facilities located in the Tonawanda Community Air Monitoring Study area.

All Regulated Air Contaminants	VOC Total	HAP Total
310.6	106.6	94.8

Petroleum Bulk Storage

The tons per year of VOC and Benzene broken out for Petroleum Bulk Storage facilities located in the Tonawanda Community Air Monitoring Study area.

Petroleum Bulk Storage	VOC TPY	Benzene TPY
Gasoline Retail	122.2	1.22
Gasoline Fleet	13.5	0.14
Total	135.7	1.36

Trucking Depots

The estimated tons per year of VOCs and Diesel PM for Trucking Depots located in the Tonawanda Community Air Monitoring Study area.

VOC Total TPY	Formaldehyde TPY	Benzene Total TPY	Diesel PM Total TPY
8.8	0.66	0.09	0.51

Table F3 Emission Inventory for Air Toxics Exceeding NYSDEC's AGCs (units are tons per year)[a]

Facility Size	Total VOC	Benzene	Formaldehyde	Carbon Tetrachloride	Acetaldehyde	Acrolein
Major	365.9	23.8	0.49	0	11.96	0.42
Registration	106.6	1.1	6.9	0	0	0.007
Sewage Treatment Plants	32.7	0.31	<0.01	0.05	0.014	0.018
Landfills	51.13	0.17	< 0.001	< 0.001	< 0.001	< 0.001
Petroleum Bulk Storage	135.7	1.36	< 0.001	< 0.001	< 0.001	< 0.001

[a] Estimated emissions for HAPs identified exceeding NYSDEC's health-based Annual Guideline Concentrations (AGC)from the point sources are listed in this table

Table F4 Size Weight Classes Used in Automotive Inventory

MOBILE6 Vehicle Types	SMOKE Vehicle Type
LDGV: Light Duty Gasoline Vehicles (Passenger Cars)	LDGV
LDGT1: Light Duty Gasoline Trucks 1 (0-6,000 lbs. GVWR, 0-3,750 lbs)	LDGT1
LDGT2: Light Duty Gasoline Trucks 2 (0-6,000 lbs. GVWR, 3,751-5,750 lbs)	LDGT1
LDGT3: Light Duty Gasoline Trucks 3 (6,001-8,500 lbs. GVWR, 0-5,750 lbs.)	LDGT2
LDGT4: Light Duty Gasoline Trucks 4 (6,001-8,500 lbs. GVWR, >5,751 lbs)	LDGT2
HDGV2b: Class 2b Heavy Duty Gasoline Vehicles (8,501-10,000 lbs)	HDGV
HDGV3: Class 3 Heavy Duty Gasoline Vehicles (10,001-14,000 lbs)	HDGV
HDGV4: Class 4 Heavy Duty Gasoline Vehicles (14,001-16,000 lbs)	HDGV
HDGV5: Class 5 Heavy Duty Gasoline Vehicles (16,001-19,500 lbs)	HDGV
HDGV6: Class 6 Heavy Duty Gasoline Vehicles (19,501-26,000 lbs)	HDGV
HDGV7: Class 7 Heavy Duty Gasoline Vehicles (26,001-33,000 lbs)	HDGV
HDGV8a: Class 8a Heavy Duty Gasoline Vehicles (33,001-60,000 lbs)	HDGV
HDGV8b: Class 8b Heavy Duty Gasoline Vehicles (>60,000 lbs)	HDGV
HDGB: Gasoline Buses (School, Transit, and Urban)	HDGV
LDDV: Light Duty Diesel Vehicles (Passenger Cars)	LDDV
LDDT12: Light Duty Diesel Trucks 1 and 2 (0-6,000 lbs)	LDDT
LDDT34: Light Duty Diesel Trucks 3 and 4 (6,001-8,500 lbs)	LDDT
HDDV2b: Class 2b Heavy Duty Diesel Vehicles (8,501-10,000 lbs)	HDDV
HDDV3: Class 3 Heavy Duty Diesel Vehicles (10,001-14,000 lbs)	HDDV
HDDV4: Class 4 Heavy Duty Diesel Vehicles (14,001-16,000 lbs)	HDDV
HDDV5: Class 5 Heavy Duty Diesel Vehicles (16,001-19,500 lbs)	HDDV
HDDV6: Class 6 Heavy Duty Diesel Vehicles (19,501-26,000 lbs)	HDDV
HDDV7: Class 7 Heavy Duty Diesel Vehicles (26,001-33,000 lbs)	HDDV
HDDV8a: Class 8a Heavy Duty Diesel Vehicles (33,001-60,000 lbs)	HDDV
HDDV8b: Class 8b Heavy Duty Diesel Vehicles (>60,000 lbs)	HDDV
HDDBT: Diesel Transit and Urban Buses	HDDV
HDDBS: Diesel School Buses	HDDV

Table F5 Mobile Source Emission (units are tons per year)

Naphthalene	Benzene	Formaldehyde	1, 3-Butadiene	Acetaldehyde	Acrolein
0.35	6.52	1.98	0.78	0.86	0.12

Figure F1 Modeled Point Source HAP Emissions - Tons per Year

CAS#	Chemical Name	Tons per year	CAS#	Chemical Name	Tons per year
50000	Formaldehyde	7.402	101144	Methyl chloroaniline	0.054
56235	Carbon tetrachloride	0.053	101688	Diphenylmethane diisocyanate	0.010
57125	Cyanide Compounds	1.046	106467	Dichlorobenzene,1,4-	0.040
59892	Nitrosomorpholine	0.009	106934	Ethylene Dibromide	0.005
62533	Aniline	0.561	106990	Butadiene	0.098
67561	Methanol	2.107	107028	Acrolein	0.445
67663	Chloroform	0.478	107062	Dichloroethane, 1,2	0.049
67721	Hexachloroethane (Perchloroethane)	0.085	107131	Acrylonitrile	0.313
68122	Dimethylformamide	1.500	107211	Ethylene glycol	1.031
71432	Benzene	25.291	108054	Vinyl acetate	6.003
71556	Trichloroethane, 1,1,1-	5.565	108101	Methyl isobutyl ketone	4.190
74839	Methyl bromide (Bromomethane)	0.002	108883	Toluene	12.563
74873	Methyl chloride (Chloromethane)	0.073	108907	Chlorobenzene	0.085
74908	Hydrogen cyanide	1.338	108952	Phenol	0.146
75003	Chloroethane	0.098	110805	2-Ethoxy ethanol	0.537
75014	Vinyl chloride	0.427	117817	Ethylhexyl phthalate, bis-2-	0.128
75058	Acetonitrile	1.525	118741	Hexachlorobenzene	0.005
75070	Acetaldehyde	11.975	121448	Triethylamine	0.131
75092	Methylene chloride	8.460	121697	Dimethylaniline, N,N-	0.015
75150	Carbon disulfide	203.642	123319	Hydroquinone	0.043
75218	Ethylene oxide	0.011	123911	Dioxane, 1,4-	0.002
75252	Bromoform (Tribromomethane)	0.054	127184	Tetrachloroethylene	1.064
75343	Dichloroethane 1,1-	0.216	131113	Dimethyl phthalate	0.008
75354	Dichloroethylene 1,1-	0.045	132649	Dibenzofuran	0.001
75569	Propylene oxide	0.103	140885	Ethylacrylate	0.004
78591	Isophorone	0.958	463581	Carbonyl sulfide	3.344
78875	Dichloropropane, 1,2-	0.019	584849	Toluene-2, 4-diisocyanate	0.130
78933	Methyl ethyl ketone (2-Butanone)	3.120	1330207	Xylene - Mixed isomers	16.794
	Chemical Name	**Tons per year**	**CAS#**	**Chemical Name**	**Tons per year**

CAS#					
79016	Trichloroethylene	1.950	1634044	Methyl tert butyl ether	0.030
79345	Tetrachloroethane, 1,1,2,2-	0.023	7439921	Lead compounds	0.065
80626	Methyl methacrylate	100.354	7439965	Manganese compounds	0.011
82688	Pentachloronitrobenzene	0.012	7439976	Mercury (elemental)	0.143
84742	Di-n-butyl phthalate	0.680	7440020	Nickel	0.062
87683	Hexachloro-1,3-butadiene	0.003	7440360	Antimony compounds	0.001
87865	Pentachlorophenol	0.559	7440382	Arsenic Compounds	0.035
91203	Naphthalene	1.867	7440417	Beryllium compounds	0.001
92524	Biphenyl	0.016	7440439	Cadmium compounds	0.091
92671	Aminobiphenyl	0.002	7440473	Chromium compounds	0.027
95487	Cresol, o-	0.060	7440484	Cobalt compounds	0.030
95534	Toluidine, o-	0.017	7647010	Hydrogen chloride	180.334
98828	Cumene (Isopropylbenzene)	1.471	7664393	Hydrogen fluoride	63.200
98862	Acetophenone	0.414	8007452	Coke oven emissions	4.900
98953	Nitrobenzene	0.014	130498292	PAH-TOTAL	1.556
100414	Ethylbenzene	7.198			
100425	Styrene	0.371		**Total**	688.901
100447	Benzyl chloride	0.001			

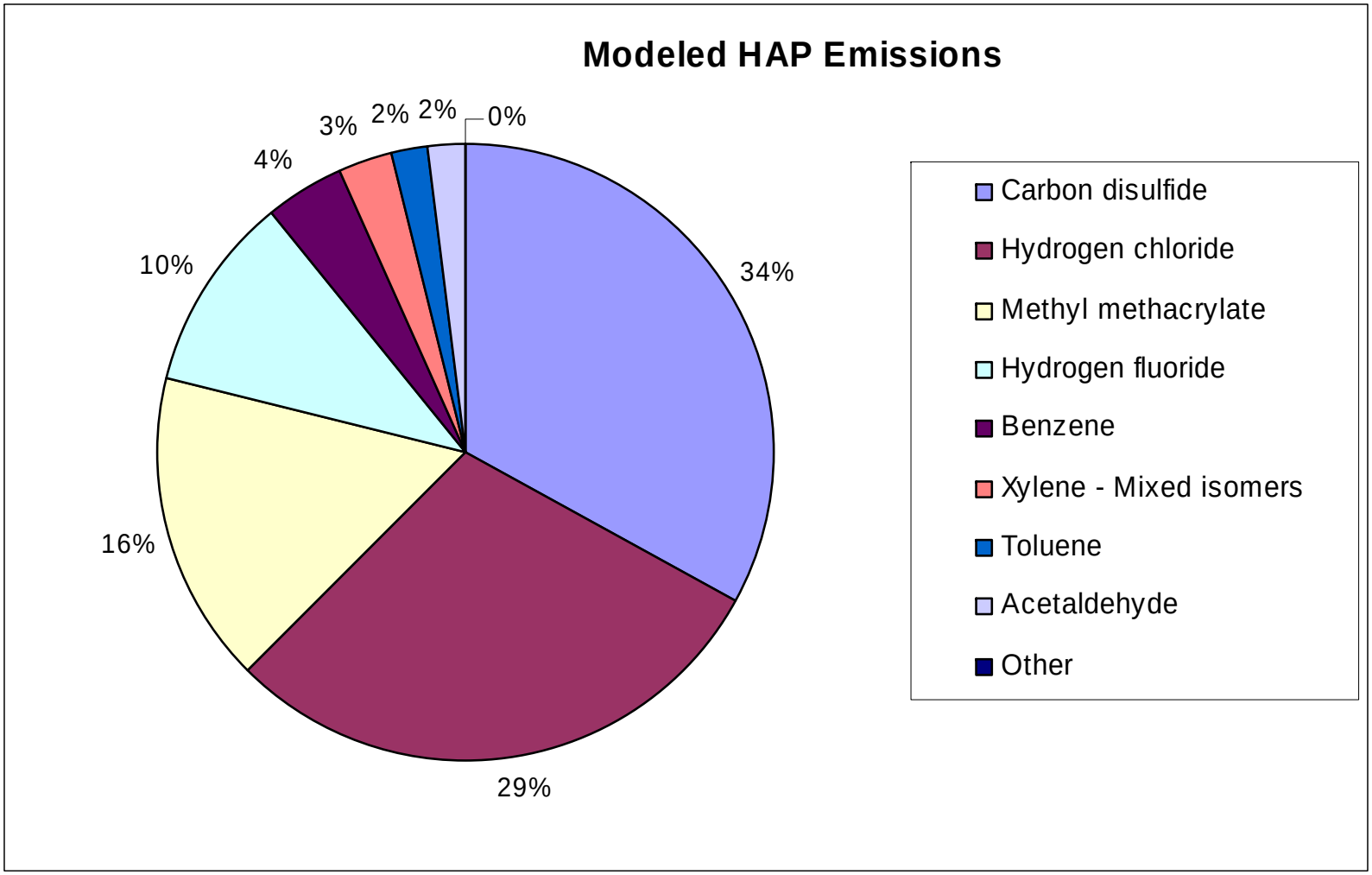
Modeled HAP Emissions
34%
29%
16%
10%
4%
3%
2%
2%
0%
Carbon disulfide
Hydrogen chloride
Methyl methacrylate
Hydrogen fluoride
Benzene
Xylene - Mixed isomers
Toluene
Acetaldehyde
Other

Figure F2 Modeled Point Source Non-HAP Emissions - Tons per Year

CAS#	Chemical Name	Tons per year	CAS#	Chemical Name	Tons per year
64175	Ethanol	23.122	111762	2-Butoxy ethanol	5.925
67630	Isopropanol	58.312	120821	Trichlorobenzene, 1,2,4-	1.825
67641	Acetone	0.337	126987	Methacrylonitrile	0.018
75025	Vinyl fluoride	38.841	127195	Dimethylacetamide	82.899
75183	Dimethyl sulfide	0.450	142825	Heptane	55.521
75274	Bromodichloromethane	0.475	540590	Acetylene dichloride	0.255
75434	Dichloromonofluoromethane	0.070	630206	Tetrachloroethane, 1,1,1,2-	0.173
75456	Chlorodifluoromethane	0.104	872504	Methyl pyyrolidone	7.742
75718	Dichlorodifluoromethane	1.759	7429905	Aluminum compounds	37.012
85687	Butylbenzylphthalate	0.031	7439987	Molybdenum	0.003
86306	Nitrosodiphenylamine, N-	0.054	7440393	Barium	0.264
95636	Trimethyl benzene 1,2,4-	0.961	7446119	Sulfur trioxide	0.110
96128	Dibromo-3-chloropropane, 1,2-	0.013	7664417	Ammonia	491.749
96333	Methylacrylate	0.015	7664939	Sulfuric acid	1.920
100027	Nitrophenol, 4-	0.006	7722841	Hydrogen peroxide	1.000
109660	Pentane	7.875	7783064	Hydrogen sulfide	1.165
110123	Methyl isoamyl ketone	0.625		**Total**	**820.6**

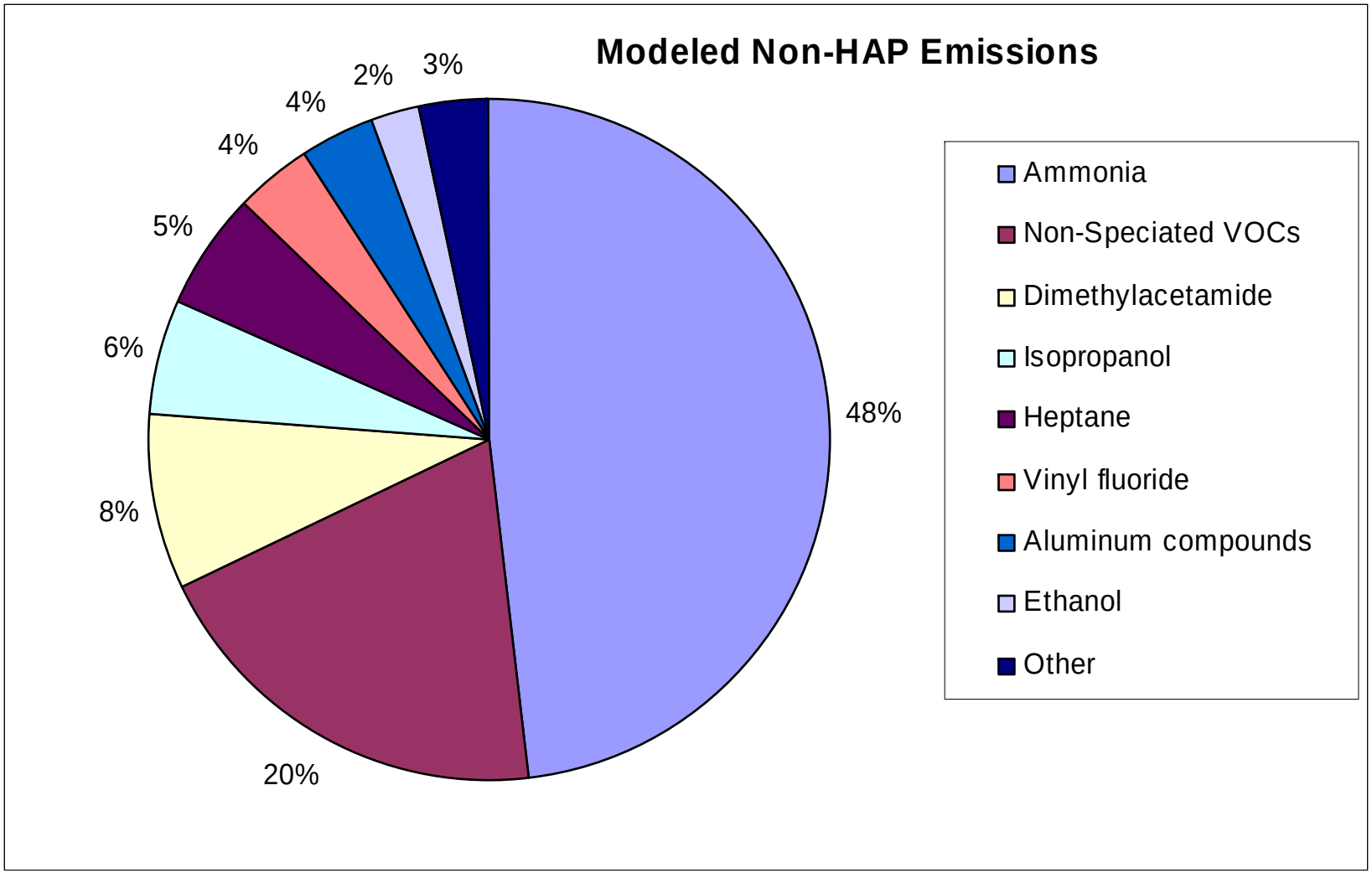
Modeled Non-HAP Emissions
48%
20%
8%
6%
5%
4%
4%
2%
3%
Ammonia
Non-Speciated VOCs
Dimethylacetamide
Isopropanol
Heptane
Vinyl fluoride
Aluminum compounds
Ethanol
Other

Figure F3 Modeled Mobile Source Emissions