October 15, 2019

SPECIFICATION SHEET: NONPT 2016v1 Platform

Description: Nonpoint (nonpt) emissions, for simulating 2016 and future year U.S. air quality

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1. EXECUTIVE SUMMARY

This document details the approach and data sources to be used for developing 2016 emissions for the nonpoint (nonpt) sector, which consists of all sources from 2014NEIv2 nonpoint that are not included in the afdust, ag, cmv_c1c2, cmv_c3, np_oilgas, rail, and rwc sectors. Emissions for 2016 version 1 (v1) platform include projections based on census population for certain sources, projections from member states of the Mid-Atlantic Regional Air Management Association (MARAMA) and updates for several states based on comments. Because this sector

covers a wide variety of sources, spatial surrogates, temporal profiles, and speciation profiles are also varied. Projection methods for nonpt are in process and this document will be updated when emission projections are finalized. Base year inventories were processed into a format that can be input to air quality models with the Sparse Matrix Operating Kernel Emissions (SMOKE) modeling system v4.6. National and state-level emission summaries for key pollutants are provided.

2. INTRODUCTION

The starting point for the 2016v1 platform nonpt inventory is the 2014NEIv2, including all nonpoint sources that are not included in the afdust, ag, cmv_c1c2, cmv_c3, np_oilgas, rail, and rwc sectors. The types of sources in the nonpt sector include, but are not limited to:

- stationary source fuel combustion, including industrial, commercial, and residential and orchard heaters;
- commercial sources such as commercial cooking;
- industrial processes such as chemical manufacturing, metal production, mineral processes, petroleum refining, wood products, fabricated metals, and refrigeration;
- solvent utilization for surface coatings such as architectural coatings, auto refinishing, traffic marking, textile production, furniture finishing, and coating of paper, plastic, metal, appliances, and motor vehicles;
- solvent utilization for degreasing of furniture, metals, auto repair, electronics, and manufacturing;
- solvent utilization for dry cleaning, graphic arts, plastics, industrial processes, personal care products, household products, adhesives and sealants;
- solvent utilization for asphalt application and roofing, and pesticide application;
- storage and transport of petroleum for uses such as portable gas cans, bulk terminals, gasoline service stations, aviation, and marine vessels;
- storage and transport of chemicals;
- waste disposal, treatment, and recovery via incineration, open burning, landfills, and composting;
- cellulosic biorefining;
- miscellaneous area sources such as cremation, hospitals, lamp breakage, and automotive repair shops.

A list of all SCCs in the nonpt sector is provided in Appendix A.

3. INVENTORY DEVELOPMENT METHODS

The emissions in the nonpt sector are from the nonpoint data category of 2014NEIv2 but are not included in other sectors from that category such as ag, afdust, cmv_c1c2, cmv_c3, rail and rwc. The nonpt emissions in 2016v1 platform are equivalent to those in the 2014NEIv2 except for the following changes.

Projection to 2016 inside MARAMA region

2014-to-2016 projection packets for all nonpoint sources were provided by MARAMA for the following states: CT, DE, DC, ME, MD, MA, NH, NJ, NY, NC, PA, RI, VT, VA, and WV.

New Jersey provided their own projection factors for projection from 2014 to 2016 which were mostly the same as those provided by MARAMA, except for three SCCs with differences (SCCs: 2302070005, 2401030000, 2401070000). For those three SCCs, the projection factors provided by New Jersey were used instead of the MARAMA factors.

Projection to 2016 outside MARAMA region

In areas outside of the MARAMA states, historical census population, sometimes by county and sometimes by state, was used to project select nonpt sources from 2014NEIv2 to 2016v1 platform. The population data was downloaded from the US Census Bureau. Specifically, the "Population, Population Change, and Estimated Components of Population Change: April 1, 2010 to July 1, 2017" file (https://www2.census.gov/programs-surveys/popest/datasets/2010-2017/counties/totals/co-est2017-alldata.csv). A ratio of 2016 population to 2014 population was used to create a growth factor that was applied to the 2014NEIv2 emissions with SCCs matching the population-based SCCs listed in Table 1. Positive growth factors (from increasing population) were not capped, but negative growth factors (from decreasing population) were flatlined for no growth.

Table 1. 2016v1 platform SCCs for Census-based growth

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
2302002100	Industrial Processes	Food and Kindred Products: SIC 20	Commercial Charbroiling	Conveyorized Charbroiling
2302002200	Industrial Processes	Food and Kindred Products: SIC 20	Commercial Charbroiling	Under-fired Charbroiling
2302003000	Industrial Processes	Food and Kindred Products: SIC 20	Commercial Deep Fat Frying	Total
2302003100	Industrial Processes	Food and Kindred Products: SIC 20	Commercial Deep Fat Frying	Flat Griddle Frying

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
2302003200	Industrial Processes	Food and Kindred Products: SIC 20	Commercial Deep Fat Frying	Clamshell Griddle Frying
2401001000	Solvent Utilization	Surface Coating	Architectural Coatings	Total: All Solvent Types
2401002000	Solvent Utilization	Surface Coating	Architectural Coatings - Solvent-based	Total: All Solvent Types
2401003000	Solvent Utilization	Surface Coating	Architectural Coatings - Water-based	Total: All Solvent Types
2401100000	Solvent Utilization	Surface Coating	Industrial Maintenance Coatings	Total: All Solvent Types
2401200000	Solvent Utilization	Surface Coating	Other Special Purpose Coatings	Total: All Solvent Types
2425000000	Solvent Utilization	Graphic Arts	All Processes	Total: All Solvent Types
2425010000	Solvent Utilization	Graphic Arts	Lithography	Total: All Solvent Types
2425020000	Solvent Utilization	Graphic Arts	Letterpress	Total: All Solvent Types
2425030000	Solvent Utilization	Graphic Arts	Rotogravure	Total: All Solvent Types
2425040000	Solvent Utilization	Graphic Arts	Flexography	Total: All Solvent Types
2440020000	Solvent Utilization	Miscellaneous Industrial	Adhesive (Industrial) Application	Total: All Solvent Types
2460000000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Processes	Total: All Solvent Types
2460100000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Personal Care Products	Total: All Solvent Types
2460200000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Household Products	Total: All Solvent Types
2460400000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Automotive Aftermarket Products	Total: All Solvent Types
2460500000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Coatings and Related Products	Total: All Solvent Types

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
2460600000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Adhesives and Sealants	Total: All Solvent Types
2460800000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All FIFRA Related Products	Total: All Solvent Types
2460900000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	Miscellaneous Products (Not Otherwise Covered)	Total: All Solvent Types
2461800000	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Pesticide Application: All Processes	Total: All Solvent Types
2461800001	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Pesticide Application: All Processes	Surface Application
2461800002	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Pesticide Application: All Processes	Soil Incorporation
2461870999	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Pesticide Application: Non-Agricultural	Not Elsewhere Classified
2465800000	Solvent Utilization	Miscellaneous Non-industrial: Consumer	Pesticide Application	Total: All Solvent Types
2501011011	Storage and Transport	Petroleum and Petroleum Product Storage	Residential Portable Gas Cans	Permeation
2501011012	Storage and Transport	Petroleum and Petroleum Product Storage	Residential Portable Gas Cans	Evaporation (includes Diurnal losses)
2501011013	Storage and Transport	Petroleum and Petroleum Product Storage	Residential Portable Gas Cans	Spillage During Transport
2501011014	Storage and Transport	Petroleum and Petroleum Product Storage	Residential Portable Gas Cans	Refilling at the Pump - Vapor Displacement
2501011015	Storage and Transport	Petroleum and Petroleum Product Storage	Residential Portable Gas Cans	Refilling at the Pump - Spillage
2501012011	Storage and Transport	Petroleum and Petroleum Product Storage	Commercial Portable Gas Cans	Permeation

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
2501012012	Storage and Transport	Petroleum and Petroleum Product Storage	Commercial Portable Gas Cans	Evaporation (includes Diurnal losses)
2501012013	Storage and Transport	Petroleum and Petroleum Product Storage	Commercial Portable Gas Cans	Spillage During Transport
2501012014	Storage and Transport	Petroleum and Petroleum Product Storage	Commercial Portable Gas Cans	Refilling at the Pump - Vapor Displacement
2501012015	Storage and Transport	Petroleum and Petroleum Product Storage	Commercial Portable Gas Cans	Refilling at the Pump - Spillage
2630020000	Waste Disposal	Treatment and Recovery	Wastewater Treatment, Public Owned	Total Processed
2640000000	Waste Disposal	Treatment and Recovery	TSDFs, All TSDF Types	Total: All Processes
2810025000	Miscellane-ous Area Sources	Other Combustion	Residential Grilling	Total
2810060100	Miscellane-ous Area Sources	Other Combustion	Cremation	Humans

Other updates

In New Jersey, emissions for SCCs for Industrial (2102004000) and Commercial/Institutional (2103004000) Distillate Oil, Total: Boilers and IC Engines were removed at that state's request. These emissions were derived from EPA estimates, and double counted emissions that were provided by New Jersey and assigned to other SCCs.

The state of New Jersey also requested that animal waste NH3 emissions from the following SCCs be removed: 2806010000 – Cats, 2806015000 – Dogs, 2807020001 – Black Bears, 2807020002 – Grizzly Bears, 2807025000 – Elk, 2807030000 – Deer, and 2810010000 – Human Perspiration and Respiration. These emissions existed in CA, DE, ME, NJ, and UT, and were removed from all states.

The state of Alaska reported several nonpoint sources that were missing in 2014NEIv2. Some of the sources reported by Alaska were identified in our EGU inventory and removed from the new nonpoint inventory. The rest of the stationary sources were converted to an FF10-formatted nonpoint inventory and included in 2016v1 platform in the nonpt sector.

The state of Alabama requested that their ICI Wood emissions (2102008000), which totaled more than 32,000 tons/year of PM2.5 emissions in the beta version of this emissions modeling platform and were significantly higher than other states' ICI Wood emissions, be removed from 2016v1 platform.

The state of New York provided a new set of non-residential wood combustion emissions for inclusion in 2016v1 platform. These new combustion emissions replace the emissions derived from the MARAMA projection.

4. ANCILLARY DATA

Spatial Allocation

Spatial allocation of nonpt emissions to the contiguous US (CONUS) 36km and 12km domains used for air quality modeling is accomplished using spatial surrogates. Spatial surrogates map county polygons to the uniformly spaced grid cells of a modeling domain. Reports summarizing total emissions by spatial surrogate at the state and county level were developed. A national summary by spatial surrogate is provided in Table 2.

Table 2. 2016v1 platform nonpt emissions by spatial surrogate (12US1 domain)

Surrogate	Description	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
100	Population	0	0	0	0	0	0	1,240,692
150	Residential Heating - Natural Gas	94,659	42,973	219,189	3,632	3,632	1,442	13,296
170	Residential Heating - Distillate Oil	8,209	1,563	31,048	3,356	3,356	41,193	1,051
180	Residential Heating - Coal	3,045	20	101	53	53	1,086	111
190	Residential Heating - LP Gas	9,233	111	33,230	175	175	705	1,292
239	Total Road Avg. Annual Daily Traffic (AADT)	786	0	25	551	551	0	274,266
240	Total Road Miles	0	0	0	0	0	0	34,027
242	All Restricted AADT	0	0	0	0	0	0	5,451

Surrogate	Description	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
244	All Unrestricted AADT	0	0	0	0	0	0	96,232
271	National Transportation Atlas Database (NTAD) Class 1 2 3 Railroad Density	0	0	0	0	0	0	2,252
300	National Land Cover Database (NLCD) Low Intensity Development	554,038	5,198	27,727	104,108	104,108	3,722	71,770
306	NLCD Med + High	252,481	27,518	180,692	207,536	207,536	62,698	950,022
307	NLCD All Development	1,561,803	25	46,331	126,722	126,722	14,185	601,828
308	NLCD Low + Med + High	131,347	1,027	171,603	16,096	16,096	13,527	65,123
310	NLCD Total Agriculture	0	0	0	37	37	0	204,819
319	NLCD Crop Land	6,361	0	0	95	95	71	293
320	NLCD Forest Land	7,399	69	378	1,289	1,289	9	474
505	Industrial Land	0	0	0	0	0	0	174
535	Residential + Commercial + Industrial + Institutional + Government	110	5	2	130	130	0	39
560	Hospital (COM6)	0	0	0	0	0	0	0
580[1]	Food Drug Chemical Industrial (IND3)	0	0	0	0	0	0	0
650	Refineries and Tank Farms	51	0	22	0	0	0	99,564

[1] Surrogate 580 is not mapped to any nonpt sources in 2016, but is mapped to cellulosic biorefineries that are present in the future year nonpt inventories.

Surrogate	Description	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
711	Airport Areas	0	0	0	0	0	0	271
801	Port Areas	0	0	0	0	0	0	8,194

Temporal Allocation

All nonpt inventories are annual and are temporalized to hourly within SMOKE using month-of-year, day-of-week, and hour-of-day temporal profiles. Reports summarizing total emissions according to the monthly, day-of-week, and hour-of-day temporal profile assignments were developed at the state and county level. A national summary by temporal profile is provided in Table 3.

Table 3. 2016v1 platform nonpt emissions by temporal profile

Monthly profile	Weekly profile	Diurnal profile	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
4	**7**	**36**	0	0	0	0	0	0	34,153
14	**7**	**24**	7,383	0	378	1,286	1,286	9	471
22	**18**	**26**	144	0	333	10	10	25	33
33	**9**	**14**	0	0	0	0	0	0	14,946
33	**17**	**13**	0	0	0	0	0	0	25,157
140	**7**	**26**	0	0	0	0	0	0	38,944
169	**7**	**26**	0	0	0	0	0	0	4,622
173	**7**	**26**	0	0	0	0	0	0	6,192
197[2]	**7**	**24**	0	0	0	0	0	0	0
199	**7**	**26**	0	25	0	0	0	0	336,461
200	**7**	**26**	0	0	0	0	0	0	2,619
253	**7**	**26**	0	0	0	261	261	0	222,912
257	**7**	**26**	0	5	0	0	0	0	377,463
258	**7**	**26**	0	0	0	12	12	0	371,671
260	**7**	**26**	0	0	2	3	3	0	143,523
262	**7**	**24**	8,347	5	2,047	1,660	1,660	191	1,754
262	**7**	**25**	82	0	59	3	3	0	101,179
262	**7**	**26**	1,339,150	27,857	59,920	265,779	265,779	18,236	1,921,618
262	**7**	**250**	65	0	2	561	561	38	186
262	**8**	**26**	211,264	5,461	174,107	109,960	109,960	59,207	10,923
266	**7**	**26**	0	0	0	2	2	0	8,324
287	**7**	**26**	0	0	0	0	0	0	49,651
469	**8**	**26**	132,248	1,031	174,310	16,067	16,067	13,656	9,945
485	**7**	**26**	115,229	44,833	283,529	7,175	7,175	44,226	15,757
1215	**7**	**26**	0	0	0	0	0	0	12
1560	**7**	**26**	0	69	0	0	0	0	0
1600	**7**	**26**	197,489	0	5,923	15,585	15,585	1,939	14,190
1601	**7**	**26**	64,181	0	1,915	5,033	5,033	630	4,536
1612	**7**	**26**	114,265	0	3,392	8,900	8,900	1,122	7,934

[2] Cellulosic refineries in the future year inventories use this profile, but no 2016 sources use this profile.

1613	**7**	**26**	209,279	0	6,212	21,089	21,089	687	14,527
1645	**7**	**26**	51,251	0	1,529	4,019	4,019	503	3,622
BBQ	**61500**	**BBQ[1]**	237,880	0	5,102	13,316	13,316	0	4,482

[1] There are separate diurnal outdoor barbecue profiles for weekdays (BBQ5) and weekends (BBQ2).

Chemical Speciation

The nonpt sector includes emissions for particulate matter < 2.5 μm ($PM_{2.5}$), oxides of nitrogen (NOx), and VOC, among other criteria pollutants. These three inventory pollutants must be converted to air quality modeling species through an emissions processing step referred to as "chemical speciation". The U.S. EPA SPECIATE[3] database was used to develop factors to map the inventory species to the chemical species required for air quality modeling. The nonpt sector uses partial HAP integration for VOCs. A GSPRO_COMBO is used to speciate VOC emissions from portable fuel containers (PFCs), Stage 1 refueling, and other gasoline storage SCCs. Reports summarizing total PM2.5 and VOC emissions according to speciation profile were developed at the state and county level.

5. Emissions Projection Methods

The Control Strategy Tool (CoST) was used to apply projection/growth factors and controls to emissions modeling inventories to create future year inventories for nonpt sector emissions. Information about CoST and related data sets is available from https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-analysis-modelstools-air-pollution. CoST allows the user to apply projection (growth) factors, controls and closures at various geographic and inventory key field resolutions. Each of these CoST datasets, also called "packets" or "programs," provides the user with the ability to perform numerous quality assurance assessments as well as create SMOKE-ready future year inventories. Future year inventories are created for each emissions modeling sector via a CoST "strategy" and each strategy includes all base year 2016 inventories and applicable CoST packets. For the nonpt sector, CoST uses two packet types as described below:

1. PROJECTION: This packet allows the user to increase or decrease emissions for virtually any geographic and/or inventory source level. Projection factors are applied as multiplicative factors to the 2016 emissions inventories prior to the application of any possible subsequent CONTROLs. A PROJECTION packet is desirable when information is based more on activity assumptions rather than known control measures.

[3] https://www.epa.gov/air-emissions-modeling/speciate-version-45-through-40

2. CONTROL: These packets are applied after any/all PROJECTION packet entries. The user has similar level of control as PROJECTION packets regarding specificity of geographic and/or inventory source level application. Control factors are expressed as a percent reduction (0 to 100) and can be applied in addition to any pre-existing inventory control, or as a replacement control where inventory controls are first backed out prior to the application of a more-stringent replacement control.

Future year projections for the nonpoint sources of the 2016v1 platform were generated for years 2023 and 2028. These projections consisted of two components: (1) using historical and/or forecast activity data to generate future-year emissions before applicable control technologies are applied (PROJECTION or growth factors component) and (2) estimating impacts of applicable control technologies on future-year emissions (CONTROL factors component).

Some inventories were generated using recently developed modules ("upstream modules") that are housed within the EMF. These modules assisted in developing projection packets, or in some cases stand-alone inventories, related to producing or transporting mobile source fuels.

Stand-Alone Inventories

The 2023 and 2028 nonpoint projections involved stand-alone inventories described here.

Cellulosic Biorefineries

As in previous air quality modeling exercises, cellulosic plants are treated as area sources and spread across the entire area of the county where they are projected to be located. Cellulosic biofuel refinery siting is based on the types of feedstocks that were determined to be most economical, along with projected volumes. The methodology used to determine most likely plant locations is described in Section 1.8.1.3 of the RFS2 RIA . Although the cellulosic inventory is intended to represent future facilities, due to the fact that the facilities do not currently exist, they are represented as nonpoint sources until such facilities are actually built.

The inventory for cellulosic biorefineries for 2028 was generated using upstream modules. The upstream modules assumed input volumes of 100 million RIN gallons of cellulosic diesel, and 400 million RIN gallons of cellulosic ethanol for 2028. The inventory for cellulosic biorefineries for 2023 was generated by interpolating between the 2016 volumes (no cellulosic fuel being produced) and the 2028 volumes to get 38 million RIN gallons of cellulosic diesel and 150 million RIN gallons of cellulosic ethanol.

Growth

The 2023 and 2028 nonpoint projections involved several growth and projection methods described here.

Inside MARAMA region

2016-to-2023 and 2016-to-2028 projection packets for all nonpoint sources were provided by MARAMA for the following states: CT, DE, DC, ME, MD, MA, NH, NJ, NY, NC, PA, RI, VT, VA, and WV. MARAMA provided one projection packet per year for portable fuel containers (PFCs), and a second projection packet per year for all other nonpt sources.

The MARAMA projection packets were used throughout the MARAMA region, except in North Carolina and New Jersey. Both NC and NJ provided separate projection packets for the nonpt sector, and those projection packets were used instead of the MARAMA packets in those two states. New Jersey did not provide projection factors for PFCs, and so NJ PFCs were projected using the MARAMA PFC growth packet.

Industrial Sources outside MARAMA region

The Energy Information Administration's (EIA) Annual Energy Outlook (AEO) for year 2019 was used as a starting point for projecting industrial sources in this sector. SCC's were mapped to AEO categories and projection factors were created using a ratio between the base year and projection year estimates from each specific AEO category. For the nonpoint sector, only 2018 AEO Table 2 was used to map SCCs to AEO categories for the projections of industrial sources. Depending on the category, a projection factor may be national or regional. The maximum projection factor was capped at a factor of 1.25 and the minimum projection factor was capped at 0.5. Aircraft and rail sources were not projected using this method. Sources within the MARAMA region were not projected with these factors, but with the MARAMA-provided growth factors.

Evaporative Emissions from Transport of Finished Fuels outside MARAMA region

Estimates on growth of evaporative emissions from transporting finished fuels are partially covered in the nonpoint and point oil and gas projection packets. However, there are some processes with evaporative emissions from storing and transporting finished fuels which are not included in the nonpoint and point oil and gas projection packets, e.g. withdrawing fuel from tanks at bulk plants, filling tanks at service stations, etc., and those processes are included in nonpoint other. The Energy Information Administration's (EIA) Annual Energy Outlook (AEO) for year 2018 was used as a starting point for projecting volumes of finished fuel that would be

transported in future years, e.g. 2023 and 2028. Then these volumes were used to calculate inventories associated with evaporative emissions in 2016, 2023, and 2028. Those emission inventories were mapped to the appropriate SCCs and projection packets were generated from 2016 to 2023 and 2016 to 2028. The work to generate the inventories and projection packets happened within modules in the EMF. Sources within the MARAMA region were not projected with these factors, but with the MARAMA-provided growth factors.

Human Population Growth outside MARAMA region

For SCCs that are projected based on human population growth, population projection data were available from the BenMAP model by county for several years, including 2017, 2023, and 2028. These human population data were used to create modified county-specific projection factors. Note that 2017 is being used as the base year since 2016 human population is not available in this dataset. A newer human population dataset was assessed but it did not have trustworthy near-term (e.g., 2023/2028) projections, and was not used; for example, rural areas of NC were projected to have more growth than urban areas, which is the opposite of what one would expect. Growth factors were limited to a range of 0.9-1.35 for 2023 and 0.85-1.6 for 2028, but none of the factors fell outside that range. (The 1.35 and 1.6 caps are based on 5% annual growth.) Sources within the MARAMA region were not projected with these factors, but with the MARAMA-provided growth factors.

Control

The final step in the projection of emissions to a future year is the application of any control technologies or programs. For future-year New Source Performance Standards (NSPS) controls (e.g. oil and gas, Reciprocating Internal Combustion Engines (RICE), Natural Gas Turbines, and Process Heaters), we attempted to control only new sources/equipment using the following equation to account for growth and retirement of existing sources and the differences between the new and existing source emission rates.

$$Qn = Qo \{ [(1 + Pf) t – 1] Fn + (1 - Ri) t \ Fe + [1 - (1 - Ri) t] Fn] \}$$ ***Equation 1***

where:

Qn = emissions in projection year
Qo = emissions in base year
Pf = growth rate expressed as ratio (e.g., 1.5=50 percent cumulative growth)
t = number of years between base and future years
Fn = emission factor ratio for new sources
Ri = retirement rate, expressed as whole number (e.g., 3.3 percent=0.033)

Fe = emission factor ratio for existing sources

The first term in Equation 1 represents new source growth and controls, the second term accounts for retirement and controls for existing sources, and the third term accounts for replacement source controls. For computing the CoST % reductions (Control Efficiency), the simplified Equation 2 was used for 2028 projections:

$$Control\_Efficiency_{2028}(\%) = 100 * (1- [(Pf_{2028}-1)*Fn + (1-Ri)^{12} + (1-(1-Ri)^{12})*Fn]/ Pf_{2028}) \quad \textbf{Equation 2}$$

Here, the existing source emissions factor (Fe) is set to 1.0, 2028 (future year) minus 2016 (base year) is 12, and new source emission factor (Fn) is the ratio of the NSPS emission factor to the existing emission factor. Table 4 shows the values for Retirement rate and new source emission factors (Fn) for new sources with respect to each NSPS regulation and other conditions within. For the nonpt sector, the RICE NSPS control program was applied when estimating year 2023 and 2028 emissions for the 2016v1 modeling modelling platform. Further information about the application of NSPS controls can be found in Section 4 of the *Additional Updates to Emissions Inventories for the Version 6.3, 2011 Emissions Modeling Platform for the Year 2023* technical support document (https://www.epa.gov/sites/production/files/2017-11/documents/2011v6.3_2023en_update_emismod_tsd_oct2017.pdf).

Table 4. Assumed retirement rates and new source emission factor ratios for NSPS rules

NSPS Rule	Sector(s)	Retirement Rate years (%/year)	Pollutant Impacted	Applied where?	New Source Emission Factor (Fn)
Oil and Gas	np_oilgas, pt_oilgas	No assumption	VOC	Storage Tanks: 70.3% reduction in growth-only (>1.0)	0.297
				Gas Well Completions: 95% control (regardless)	0.05
				Pneumatic controllers, not high-bleed >6scfm or low-bleed: 77% reduction in growth-only (>1.0)	0.23
				Pneumatic controllers, high-bleed >6scfm or low-bleed: 100% reduction in growth-only (>1.0)	0.00
				Compressor Seals: 79.9% reduction in growth-only (>1.0)	0.201
				Fugitive Emissions: 60% Valves, flanges, connections, pumps, open-ended lines, and other	0.40
				Pneumatic Pumps: 71.3%; Oil and Gas	0.287
RICE	np_oilgas, pt_oilgas, nonpt, ptnonipm	40, (2.5%)	NO_X	Lean burn: PA, all other states	0.25, 0.606
				Rich Burn: PA, all other states	0.1, 0.069
				Combined (average) LB/RB: PA, other states	0.175, 0.338
				Lean burn: PA, all other states	1.0 (n/a), 0.889

NSPS Rule	Sector(s)	Retirement Rate years (%/year)	Pollutant Impacted	Applied where?	New Source Emission Factor (Fn)
			CO	Rich Burn: PA, all other states	0.15, 0.25
				Combined (average) LB/RB: PA, other states	0.575, 0.569
			VOC	Lean burn: PA, all other states	0.125, n/a
				Rich Burn: PA, all other states	0.1, n/a
				Combined (average) LB/RB: PA, other states	0.1125, n/a
Gas Turbines	pt_oilgas, ptnonipm	45 (2.2%)	NO_X	California and NO_X SIP Call states	0.595
				All other states	0.238
Process Heaters	pt_oilgas, ptnonipm	30 (3.3%)	NO_X	Nationally to Process Heater SCCs	0.41

RICE NSPS

For RICE NSPS controls, the EPA emission requirements for stationary engines differ according to whether the engine is new or existing, whether the engine is located at an area source or major source, and whether the engine is a compression ignition or a spark ignition engine. Spark ignition engines are further subdivided by power cycle, two-stroke versus four-stroke, and whether the engine is rich burn or lean burn. We applied NSPS reduction for lean burn, rich burn and "combined" engines using Equation 2 and information listed in Table 4. Table 5 lists the nonpoint and point source SCCs where RICE NSPS controls were applied for the 2016v1 platform. Table 6 shows the reduction in emissions in the nonpt sector after the application of the RICE NSPS CONTROL packet for both future years 2023 and 2028.

Table 5. Point source SCCs and Engine Type in 2016v1 modeling platform where RICE NSPS controls applied.

SCC	Lean, Rich, or Combined	SCCDESC
20200202	Combined	Internal Combustion Engines; Industrial; Natural Gas; Reciprocating
20200253	Rich	Internal Combustion Engines; Industrial; Natural Gas; 4-cycle Rich Burn
20200254	Lean	Internal Combustion Engines; Industrial; Natural Gas; 4-cycle Lean Burn
20200256	Lean	Internal Combustion Engines; Industrial; Natural Gas; 4-cycle Clean Burn
20300201	Combined	Internal Combustion Engines; Commercial/Institutional; Natural Gas; Reciprocating
2102006000	Combined	Stationary Source Fuel Combustion; Industrial; Natural Gas; Total: Boilers and IC Engines
2102006002	Combined	Stationary Source Fuel Combustion; Industrial; Natural Gas; All IC Engine Types
2103006000	Combined	Stationary Source Fuel Combustion; Commercial/Institutional; Natural Gas; Total: Boilers and IC Engines

Table 6. Emissions reductions (tons) after the application of the RICE NSPS CONTROL packet for the nonpoint sector in 2023 and 2028.

year	poll	2016v1 (tons)	emissions reductions (tons)	% change
2023	CO	2,688,250	-16,982	-0.6%
2023	NOX	718,766	-23,704	-3.3%
2028	CO	2,688,250	-23,145	-0.9%
2028	NOX	718,766	-33,621	-4.7%

Fuel Sulfur Rules

Fuel sulfur rules, based on web searching and the 2011 emissions modeling NODA comments, are currently limited to the following states: Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island and Vermont. The fuel limits for these states are incremental starting after year 2012, but are fully implemented by July 1, 2018, in all of these states.

A summary of the sulfur rules by state, with emissions reductions is provided in Table 7. This table reflects the impacts of the MARAMA packet only, as these reductions are not estimated in non-MARAMA states. Most of these reductions occur in the nonpt sector; a small amount of reductions occur in the ptnonipm sector, and a negligible amount of reductions occur in the pt_oilgas sector.

Table 7. Summary of fuel sulfur rule impacts on nonpoint SO2 emissions for 2023 and 2028.

year	poll	2016v1 (tons)	emissions reductions (tons)	% change
2023	SO2	140,469	-28,137	-20.0%
2028	SO2	140,469	-24,200	-17.2%

Controls specific to MARAMA States

The Industrial/Commercial/Institutional Boilers and Process Heaters MACT Rule, hereafter simply referred to as the "Boiler MACT," was promulgated on January 31, 2013, based on reconsideration. Background information on the Boiler MACT can be found at: https://www.epa.gov/stationary-sources-air-pollution/industrial-commercial-and-institutional-boilers-and-process-heaters. The Boiler MACT promulgates national emission standards for the control of HAPs (NESHAP) for new and existing industrial, commercial, and institutional (ICI)

boilers and process heaters at major sources of HAPs. The expected cobenefit for CAPs at these facilities is significant and greatest for SO2 with lesser impacts for direct PM, CO and VOC. Due to compliance dates, it is assumed that states have complied with this rule, however, North Carolina has an extension and therefore this rule is still considered for impacted sources. North Carolina supplied their own control packet that covers the MACT Rule impacts for their state.

MARAMA provided control packets to apply to portable fuel containers and sources impacted by the ozone transport commission regulations.

6. EMISSIONS PROCESSING REQUIREMENTS

Nonpt sector emissions were processed for air quality modeling using the Sparse Matrix Operator Kernel Emissions (SMOKE[4]) modeling system. All nonpt sector inventories are annual, but the sector is typically run through SMOKE as a monthly sector; i.e. Smkinven is run 12 times, each with a different SMKINVEN_MONTH setting. This is because in prior emissions platforms, the nonpt sector has occasionally included at least one monthly inventory. SMOKE applies the same monthly temporalization to annual sources as it would when running Smkinven on an annual basis, so this does not impact the emissions. The downside to this approach is a small amount of additional processing time.

Nonpt sector emissions are processed for seven representative days per month (one for each day of the week), plus holidays. This is a 2-D sector in which all emissions are output to a single layer gridded emissions file.

7. EMISSIONS SUMMARIES

National and state totals by pollutant for the 2016v1 platform cases are provided here in Table 8 – Table 10, and some example plots (Figure 1 – Figure 3). Additional nonpt plots and maps are available online through the LADCO website[5] and the Intermountain West Data Warehouse[6].

Descriptions of the emissions platform cases shown in the tables and plots below are as follows: 2014fd = 2014NEIv2 and 2014 NATA

2016fe = 2016 alpha platform (grown from 2014NEIv2)

[4] http://www.smoke-model.org/index.cfm
[5] https://www.ladco.org/technical/modeling-results/2016-inventory-collaborative/
[6] http://views.cira.colostate.edu/iwdw/eibrowser2016

2016ff, 2023ff, and 2028ff = 2016, 2023, and 2028 cases from the 2016 beta platform

2016fh, 2023fh, and 2028fh = 2016, 2023, and 2028 cases from the 2016 v1 platform

Table 8. Comparison of national total annual CAPS nonpt emissions (tons/yr)

Pollutant	2014fd	2016fe	2016ff	2016fh	2023ff	2023fh	2028ff	2028fh
CO	2,738,901	2,738,901	2,742,927	2,688,250	2,781,216	2,703,594	2,804,449	2,724,317
NH3	122,006	122,006	121,986	79,286	123,029	80,208	123,317	80,483
NOX	765,230	765,230	764,158	718,766	770,213	717,548	767,711	717,196
PM10	617,154	617,154	618,938	578,756	651,513	587,630	671,952	602,343
PM2.5	503,253	503,253	504,895	470,720	531,289	479,866	548,565	492,026
SO2	163,983	163,983	162,816	140,469	119,792	108,187	120,389	108,787
VOC	3,725,042	3,725,042	3,759,706	3,747,807	3,879,362	3,809,259	3,978,460	3,852,662

Table 9. Comparison of state total annual NOx nonpt emissions (tons/yr)

State	2014fd	2016fe	2016ff	2016fh	2023ff	2023fh	2028ff	2028fh
Alabama	20,003	20,003	20,004	9,192	21,609	8,901	22,894	8,897
Alaska	5,641	5,641	5,642	6,411	5,891	6,812	5,887	6,835
Arizona	8,398	8,398	8,401	8,401	8,861	8,822	9,000	8,884
Arkansas	9,830	9,830	9,831	9,831	10,461	9,844	10,668	10,075
California	47,933	47,933	47,943	47,943	45,853	46,413	44,461	46,107
Colorado	7,210	7,210	7,213	7,213	7,221	7,221	7,228	7,228
Connecticut	12,273	12,273	12,273	10,619	11,902	10,546	11,934	10,097
Delaware	2,891	2,891	2,892	2,648	3,204	2,968	3,223	2,989
D.C.	1,682	1,682	1,682	1,650	1,719	1,788	1,727	1,841
Florida	17,247	17,247	17,261	17,261	18,493	19,348	19,207	20,036
Georgia	19,404	19,404	19,409	19,409	19,401	19,445	19,336	19,346
Hawaii	395	395	395	395	395	395	395	395
Idaho	4,657	4,657	4,658	4,658	4,743	4,721	4,822	4,774
Illinois	48,552	48,552	48,552	48,552	47,280	46,860	46,012	45,550
Indiana	12,832	12,832	12,833	12,833	12,621	12,639	12,487	12,450
Iowa	9,481	9,481	9,482	9,482	9,417	9,502	9,254	9,304
Kansas	7,232	7,232	7,232	7,232	7,236	7,240	7,152	7,151
Kentucky	6,212	6,212	6,213	6,213	6,283	6,255	6,322	6,271
Louisiana	7,325	7,325	7,326	7,326	7,929	7,530	8,116	9,606
Maine	6,484	6,484	6,485	6,244	6,375	6,033	6,350	5,572
Maryland	11,448	11,448	11,449	11,075	11,620	11,516	11,708	11,776
Massachusetts	27,958	27,958	27,960	23,072	27,201	22,821	26,865	22,014
Michigan	38,590	38,590	38,591	38,591	37,910	37,430	37,405	36,710
Minnesota	22,313	22,313	22,314	22,314	22,420	22,137	21,975	21,739
Mississippi	3,625	3,625	3,626	3,626	3,628	4,555	3,631	5,483
Missouri	14,530	14,530	14,531	14,531	14,183	14,257	13,940	13,955
Montana	5,050	5,050	5,051	5,051	5,123	5,012	5,086	4,971

State	2014fd	2016fe	2016ff	2016fh	2023ff	2023fh	2028ff	2028fh
Nebraska	2,755	2,755	2,756	2,756	2,757	2,757	2,758	2,758
Nevada	3,251	3,251	3,253	3,253	3,324	3,294	3,326	3,286
New Hampshire	10,782	10,782	10,782	8,427	10,626	8,253	10,592	7,847
New Jersey	25,978	25,978	24,808	20,116	24,706	20,047	24,767	19,899
New Mexico	7,678	7,678	7,678	7,678	7,538	7,209	7,408	7,133
New York	58,447	58,447	58,448	53,415	59,017	53,417	58,985	53,417
North Carolina	15,795	15,795	15,799	15,059	17,031	16,440	17,555	17,260
North Dakota	1,275	1,275	1,275	1,275	1,279	1,276	1,279	1,277
Ohio	35,082	35,082	35,083	35,083	34,678	34,070	34,031	33,346
Oklahoma	8,363	8,363	8,364	8,364	8,361	8,091	8,304	8,068
Oregon	8,623	8,623	8,626	8,626	8,473	8,547	8,244	8,500
Pennsylvania	61,553	61,553	61,554	51,747	64,286	52,918	64,390	52,968
Rhode Island	3,468	3,468	3,468	2,792	3,382	2,787	3,386	2,705
South Carolina	9,338	9,338	9,340	9,340	9,795	9,428	10,027	9,646
South Dakota	1,213	1,213	1,213	1,213	1,214	1,214	1,214	1,214
Tennessee	18,084	18,084	18,086	18,086	18,558	17,848	18,697	17,871
Texas	46,146	46,146	46,162	46,162	46,476	44,936	45,619	44,469
Utah	4,854	4,854	4,856	4,856	4,696	4,804	4,600	4,712
Vermont	3,176	3,176	3,176	3,004	3,061	2,990	2,997	2,747
Virginia	18,382	18,382	18,384	16,988	19,474	17,824	19,849	17,905
Washington	11,868	11,868	11,873	11,873	11,913	11,665	11,806	11,703
West Virginia	7,798	7,798	7,798	4,752	8,341	5,004	8,573	5,036
Wisconsin	20,062	20,062	20,063	20,063	20,157	19,623	20,118	19,420
Wyoming	1,022	1,022	1,022	1,022	1,023	1,023	1,023	1,023
Puerto Rico	864	864	864	864	889	893	894	893
Virgin Islands	59	59	59	59	63	61	64	62
Tribal Data	120	120	120	120	120	120	120	120

Table 10. Comparison of state total annual VOC nonpt emissions (tons/yr)

State	2014fd	2016fe	2016ff	2016fh	2023ff	2023fh	2028ff	2028fh
Alabama	69,875	69,875	70,147	69,420	72,012	70,317	73,587	70,730
Alaska	7,944	7,944	7,986	8,231	8,018	8,172	8,018	8,054
Arizona	68,370	68,370	69,694	69,694	74,541	73,999	78,574	77,401
Arkansas	53,026	53,026	53,344	53,344	55,170	54,049	56,672	54,250
California	224,154	224,154	225,686	225,686	231,651	230,093	236,612	233,665
Colorado	35,883	35,883	36,987	36,987	39,594	39,587	41,779	41,764
Connecticut	41,841	41,841	41,861	42,129	42,761	38,638	43,518	38,317
Delaware	6,054	6,054	6,125	6,148	6,356	6,229	6,535	6,280
D.C.	4,685	4,685	4,837	4,829	4,870	5,321	4,897	5,674
Florida	219,307	219,307	224,596	224,596	237,390	235,372	248,059	243,504
Georgia	136,011	136,011	137,573	137,573	142,680	140,280	146,929	141,754
Hawaii	14,570	14,570	14,641	14,641	14,641	14,351	14,641	14,019
Idaho	42,629	42,629	42,991	42,991	43,868	42,959	44,600	42,628
Illinois	134,425	134,425	134,538	134,538	136,879	136,033	138,756	136,921

State	2014fd	2016fe	2016ff	2016fh	2023ff	2023fh	2028ff	2028fh
Indiana	94,795	94,795	95,310	95,310	97,189	96,214	98,769	96,666
Iowa	48,853	48,853	49,145	49,145	49,697	48,989	50,151	48,588
Kansas	48,078	48,078	48,323	48,323	49,674	49,001	50,796	49,321
Kentucky	59,746	59,746	60,238	60,238	62,339	61,645	64,094	62,601
Louisiana	73,941	73,941	74,278	74,278	75,609	72,767	76,714	70,566
Maine	14,862	14,862	14,904	14,946	15,378	14,812	15,767	14,673
Maryland	49,454	49,454	49,778	49,528	51,834	45,842	53,552	46,872
Massachusetts	75,762	75,762	76,266	73,537	77,855	73,868	79,162	74,013
Michigan	127,745	127,745	128,177	128,177	129,631	128,121	130,817	127,575
Minnesota	66,590	66,590	67,120	67,120	69,336	68,325	71,144	68,951
Mississippi	44,951	44,951	45,097	45,097	45,992	45,081	46,741	44,757
Missouri	85,136	85,136	85,566	85,566	87,533	86,678	89,185	87,314
Montana	26,621	26,621	26,770	26,770	27,237	26,105	27,627	25,068
Nebraska	33,936	33,936	34,191	34,191	34,777	34,530	35,269	34,743
Nevada	30,441	30,441	31,202	31,202	33,318	32,956	35,085	34,284
New Hampshire	14,128	14,128	14,177	13,077	14,620	13,072	14,981	13,133
New Jersey	78,490	78,490	78,734	78,879	79,992	79,787	81,036	79,861
New Mexico	30,565	30,565	30,622	30,622	31,875	31,310	32,910	31,701
New York	208,400	208,400	209,334	206,459	213,573	203,924	217,104	202,840
North Carolina	125,863	125,863	127,757	127,572	134,420	136,621	139,954	142,452
North Dakota	22,843	22,843	22,983	22,983	23,140	22,786	23,270	22,484
Ohio	151,524	151,524	152,146	152,146	154,738	154,070	156,853	155,435
Oklahoma	55,214	55,214	55,662	55,662	57,018	55,780	58,142	55,455
Oregon	51,675	51,675	52,643	52,643	54,785	54,462	56,551	55,864
Pennsylvania	170,578	170,578	171,039	170,467	173,599	172,353	175,619	173,431
Rhode Island	11,009	11,009	11,041	10,933	11,278	10,968	11,478	11,022
South Carolina	67,073	67,073	68,173	68,173	71,040	69,790	73,420	70,719
South Dakota	28,579	28,579	28,693	28,693	28,984	28,785	29,228	28,793
Tennessee	101,507	101,507	102,608	102,608	106,885	105,472	110,465	107,433
Texas	309,651	309,651	315,069	315,069	331,220	326,523	344,515	334,320
Utah	30,668	30,668	31,353	31,353	33,068	32,772	34,502	33,843
Vermont	7,384	7,384	7,396	7,479	7,633	7,416	7,829	7,340
Virginia	93,072	93,072	93,764	89,948	98,073	90,601	101,642	90,789
Washington	101,843	101,843	103,558	103,558	108,029	106,922	111,733	109,275
West Virginia	22,928	22,928	22,990	22,656	23,241	22,230	23,437	21,823
Wisconsin	64,543	64,543	64,743	64,743	66,289	65,432	67,557	65,728
Wyoming	7,978	7,978	8,007	8,007	8,184	8,003	8,334	7,939
Puerto Rico	28,189	28,189	28,189	28,189	28,194	28,195	28,196	28,196
Virgin Islands	900	900	900	900	900	900	900	900
Tribal Data	753	753	753	753	753	753	753	753

Figure 1. Annual County-total 2016 nonpt NOx emissions

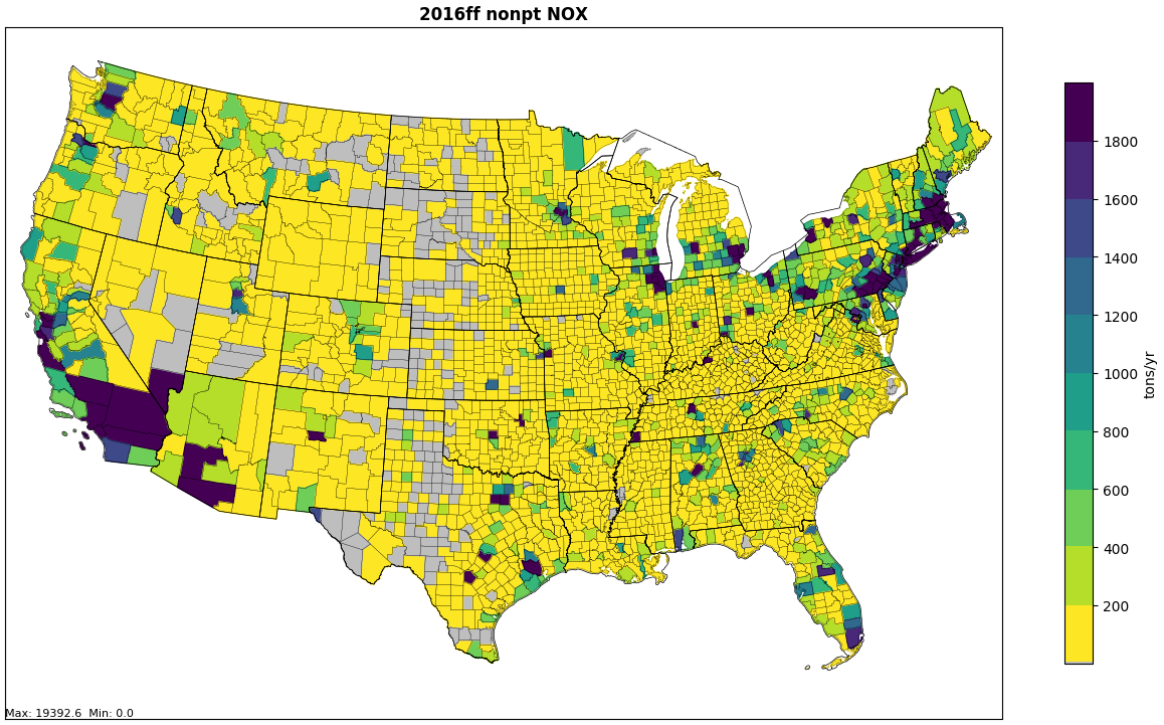


Figure 2. Annual County-total 2016 nonpt PM2.5 emissions

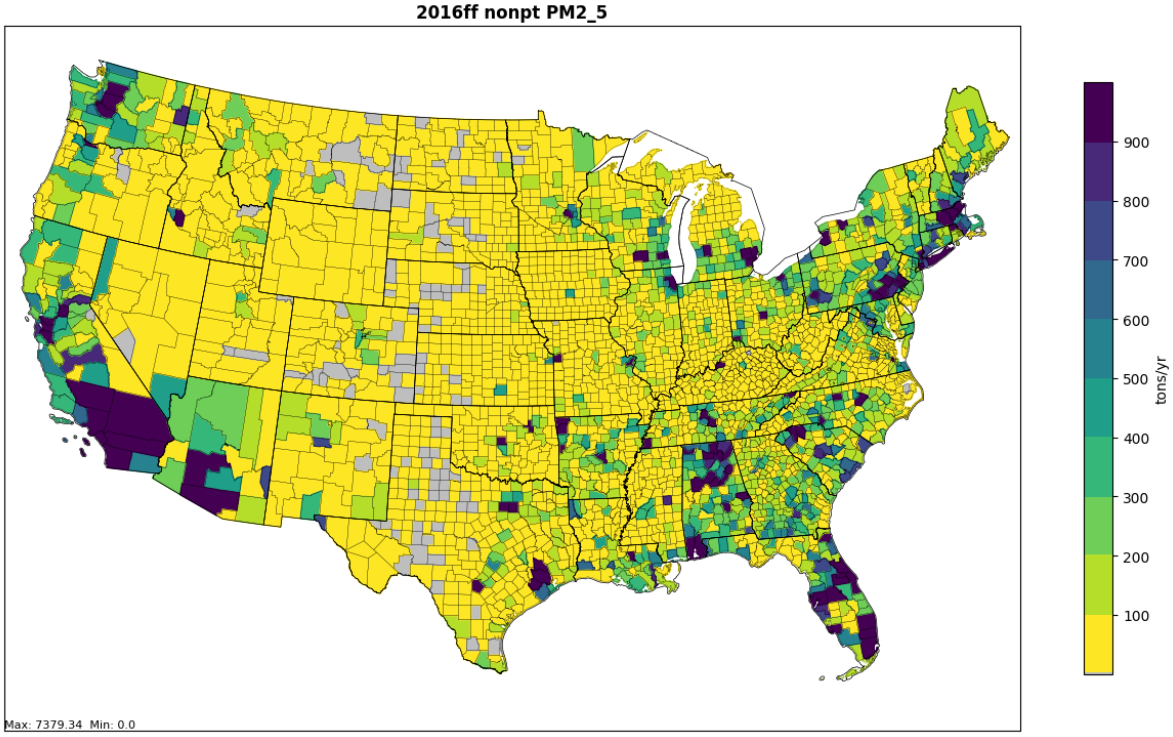
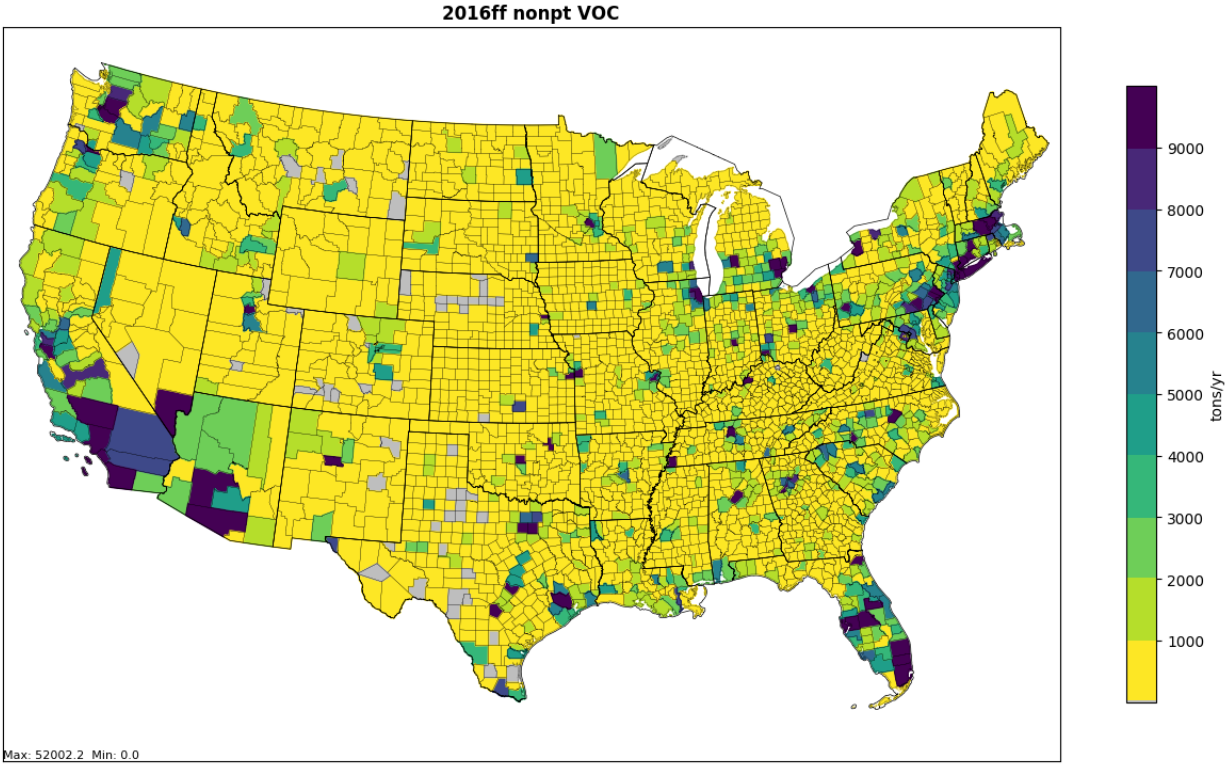


Figure 3. Annual County-total 2016 nonpt VOC emissions



Appendix A: List of SCCs in nonpt sector

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
2102001000	Stationary Source Fuel Combustion	Industrial	Anthracite Coal	Total: All Boiler Types
2102002000	Stationary Source Fuel Combustion	Industrial	Bituminous/Subbituminous Coal	Total: All Boiler Types
2102004000	Stationary Source Fuel Combustion	Industrial	Distillate Oil	Total: Boilers and IC Engines
2102004001	Stationary Source Fuel Combustion	Industrial	Distillate Oil	All Boiler Types
2102004002	Stationary Source Fuel Combustion	Industrial	Distillate Oil	All IC Engine Types
2102005000	Stationary Source Fuel Combustion	Industrial	Residual Oil	Total: All Boiler Types
2102006000	Stationary Source Fuel Combustion	Industrial	Natural Gas	Total: Boilers and IC Engines
2102007000	Stationary Source Fuel Combustion	Industrial	Liquified Petroleum Gas (LPG)	Total: All Boiler Types
2102008000	Stationary Source Fuel Combustion	Industrial	Wood	Total: All Boiler Types
2102011000	Stationary Source Fuel Combustion	Industrial	Kerosene	Total: All Boiler Types
2102012000	Stationary Source Fuel Combustion	Industrial	Waste oil	Total
2103001000	Stationary Source Fuel Combustion	Commercial/Institutional	Anthracite Coal	Total: All Boiler Types
2103002000	Stationary Source Fuel Combustion	Commercial/Institutional	Bituminous/Subbituminous Coal	Total: All Boiler Types
2103004000	Stationary Source Fuel Combustion	Commercial/Institutional	Distillate Oil	Total: Boilers and IC Engines
2103004001	Stationary Source Fuel Combustion	Commercial/Institutional	Distillate Oil	Boilers
2103004002	Stationary Source Fuel Combustion	Commercial/Institutional	Distillate Oil	IC Engines
2103005000	Stationary Source Fuel Combustion	Commercial/Institutional	Residual Oil	Total: All Boiler Types
2103006000	Stationary Source Fuel Combustion	Commercial/Institutional	Natural Gas	Total: Boilers and IC Engines
2103007000	Stationary Source Fuel Combustion	Commercial/Institutional	Liquified Petroleum Gas (LPG)	Total: All Combustor Types
2103008000	Stationary Source Fuel Combustion	Commercial/Institutional	Wood	Total: All Boiler Types
2103011000	Stationary Source Fuel Combustion	Commercial/Institutional	Kerosene	Total: All Combustor Types

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
2104001000	Stationary Source Fuel Combustion	Residential	Anthracite Coal	Total: All Combustor Types
2104002000	Stationary Source Fuel Combustion	Residential	Bituminous/Subbituminous Coal	Total: All Combustor Types
2104004000	Stationary Source Fuel Combustion	Residential	Distillate Oil	Total: All Combustor Types
2104006000	Stationary Source Fuel Combustion	Residential	Natural Gas	Total: All Combustor Types
2104007000	Stationary Source Fuel Combustion	Residential	Liquified Petroleum Gas (LPG)	Total: All Combustor Types
2104011000	Stationary Source Fuel Combustion	Residential	Kerosene	Total: All Heater Types
2275085000	Mobile Sources	Aircraft	Unpaved Airstrips	Total
2294000000	Mobile Sources	Paved Roads	All Paved Roads	Total: Fugitives
2301000000	Industrial Processes	Chemical Manufacturing: SIC 28	All Processes	Total
2301020000	Industrial Processes	Chemical Manufacturing: SIC 28	Process Emissions from Synthetic Fibers Manuf (NAPAP cat. 107)	Total
2301030000	Industrial Processes	Chemical Manufacturing: SIC 28	Process Emissions from Pharmaceutical Manuf (NAPAP cat. 106)	Total
2301040000	Industrial Processes	Chemical Manufacturing: SIC 28	Fugitive Emissions from Synthetic Organic Chem Manuf (NAPAP cat. 102)	Total
2302000000	Industrial Processes	Food and Kindred Products: SIC 20	All Processes	Total
2302002100	Industrial Processes	Food and Kindred Products: SIC 20	Commercial Cooking - Charbroiling	Conveyorized Charbroiling
2302002200	Industrial Processes	Food and Kindred Products: SIC 20	Commercial Cooking - Charbroiling	Under-fired Charbroiling
2302003000	Industrial Processes	Food and Kindred	Commercial Cooking - Frying	Deep Fat Frying

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
		Products: SIC 20		
2302003100	Industrial Processes	Food and Kindred Products: SIC 20	Commercial Cooking - Frying	Flat Griddle Frying
2302003200	Industrial Processes	Food and Kindred Products: SIC 20	Commercial Cooking - Frying	Clamshell Griddle Frying
2302010000	Industrial Processes	Food and Kindred Products: SIC 20	Meat Products	Total
2302050000	Industrial Processes	Food and Kindred Products: SIC 20	Bakery Products	Total
2302070000	Industrial Processes	Food and Kindred Products: SIC 20	Fermentation/Beverages	Total
2302070001	Industrial Processes	Food and Kindred Products: SIC 20	Fermentation/Beverages	Breweries
2302070005	Industrial Processes	Food and Kindred Products: SIC 20	Fermentation/Beverages	Wineries
2302070010	Industrial Processes	Food and Kindred Products: SIC 20	Fermentation/Beverages	Distilleries
2302080000	Industrial Processes	Food and Kindred Products: SIC 20	Miscellaneous Food and Kindred Products	Total
2302080002	Industrial Processes	Food and Kindred Products: SIC 20	Miscellaneous Food and Kindred Products	Refrigeration
2304000000	Industrial Processes	Secondary Metal	All Processes	Total

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
		Production: SIC 33		
2305000000	Industrial Processes	Mineral Processes: SIC 32	All Processes	Total
2305070000	Industrial Processes	Mineral Processes: SIC 32	Concrete, Gypsum, Plaster Products	Total
2305080000	Industrial Processes	Mineral Processes: SIC 32	Cut Stone and Stone Products	Total
2306000000	Industrial Processes	Petroleum Refining: SIC 29	All Processes	Total
2306010000	Industrial Processes	Petroleum Refining: SIC 29	Asphalt Paving/Roofing Materials	Total
2307000000	Industrial Processes	Wood Products: SIC 24	All Processes	Total
2308000000	Industrial Processes	Rubber/Plastics : SIC 30	All Processes	Total
2309000000	Industrial Processes	Fabricated Metals: SIC 34	All Processes	Total
2309100200	Industrial Processes	Fabricated Metals: SIC 34	Coating, Engraving, and Allied Services	Abrasive Blasting
2311000000	Industrial Processes	Construction: SIC 15 - 17	All Processes	Total
2311010000	Industrial Processes	Construction: SIC 15 - 17	Residential	Total
2311020000	Industrial Processes	Construction: SIC 15 - 17	Industrial/Commercial/Institutional	Total
2311030000	Industrial Processes	Construction: SIC 15 - 17	Road Construction	Total
2312000000	Industrial Processes	Machinery: SIC 35	All Processes	Total
2325000000	Industrial Processes	Mining and Quarrying: SIC 14	All Processes	Total
2399000000	Industrial Processes	Industrial Processes: NEC	Industrial Processes: NEC	Total
2399010000	Industrial Processes	Industrial Refrigeration	Refrigerant Losses	All Processes
2401001000	Solvent Utilization	Surface Coating	Architectural Coatings	Total: All Solvent Types

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
2401001050	Solvent Utilization	Surface Coating	Architectural Coatings	All Other Architectural Categories
2401005000	Solvent Utilization	Surface Coating	Auto Refinishing: SIC 7532	Total: All Solvent Types
2401005700	Solvent Utilization	Surface Coating	Auto Refinishing: SIC 7532	Top Coats
2401005800	Solvent Utilization	Surface Coating	Auto Refinishing: SIC 7532	Clean-up Solvents
2401008000	Solvent Utilization	Surface Coating	Traffic Markings	Total: All Solvent Types
2401010000	Solvent Utilization	Surface Coating	Textile Products: SIC 22	Total: All Solvent Types
2401015000	Solvent Utilization	Surface Coating	Factory Finished Wood: SIC 2426 thru 242	Total: All Solvent Types
2401020000	Solvent Utilization	Surface Coating	Wood Furniture: SIC 25	Total: All Solvent Types
2401025000	Solvent Utilization	Surface Coating	Metal Furniture: SIC 25	Total: All Solvent Types
2401030000	Solvent Utilization	Surface Coating	Paper: SIC 26	Total: All Solvent Types
2401035000	Solvent Utilization	Surface Coating	Plastic Products: SIC 308	Total: All Solvent Types
2401040000	Solvent Utilization	Surface Coating	Metal Cans: SIC 341	Total: All Solvent Types
2401045000	Solvent Utilization	Surface Coating	Metal Coils: SIC 3498	Total: All Solvent Types
2401050000	Solvent Utilization	Surface Coating	Miscellaneous Finished Metals: SIC 34 - (341 + 3498)	Total: All Solvent Types
2401055000	Solvent Utilization	Surface Coating	Machinery and Equipment: SIC 35	Total: All Solvent Types
2401060000	Solvent Utilization	Surface Coating	Large Appliances: SIC 363	Total: All Solvent Types
2401065000	Solvent Utilization	Surface Coating	Electronic and Other Electrical: SIC 36 - 363	Total: All Solvent Types
2401070000	Solvent Utilization	Surface Coating	Motor Vehicles: SIC 371	Total: All Solvent Types
2401075000	Solvent Utilization	Surface Coating	Aircraft: SIC 372	Total: All Solvent Types
2401080000	Solvent Utilization	Surface Coating	Marine: SIC 373	Total: All Solvent Types

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
2401085000	Solvent Utilization	Surface Coating	Railroad: SIC 374	Total: All Solvent Types
2401090000	Solvent Utilization	Surface Coating	Miscellaneous Manufacturing	Total: All Solvent Types
2401100000	Solvent Utilization	Surface Coating	Industrial Maintenance Coatings	Total: All Solvent Types
2401200000	Solvent Utilization	Surface Coating	Other Special Purpose Coatings	Total: All Solvent Types
2415000000	Solvent Utilization	Degreasing	All Processes/All Industries	Total: All Solvent Types
2420000000	Solvent Utilization	Dry Cleaning	All Processes	Total: All Solvent Types
2425000000	Solvent Utilization	Graphic Arts	All Processes	Total: All Solvent Types
2440000000	Solvent Utilization	Miscellaneous Industrial	All Processes	Total: All Solvent Types
2440020000	Solvent Utilization	Miscellaneous Industrial	Adhesive (Industrial) Application	Total: All Solvent Types
2460000000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Processes	Total: All Solvent Types
2460100000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Personal Care Products	Total: All Solvent Types
2460200000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Household Products	Total: All Solvent Types
2460400000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Automotive Aftermarket Products	Total: All Solvent Types
2460500000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Coatings and Related Products	Total: All Solvent Types
2460600000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All Adhesives and Sealants	Total: All Solvent Types

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
2460800000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	All FIFRA Related Products	Total: All Solvent Types
2460900000	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial	Miscellaneous Products (Not Otherwise Covered)	Total: All Solvent Types
2461000000	Solvent Utilization	Miscellaneous Non-industrial: Commercial	All Processes	Total: All Solvent Types
2461020000	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Asphalt Application: All Processes	Total: All Solvent Types
2461021000	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Cutback Asphalt	Total: All Solvent Types
2461022000	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Emulsified Asphalt	Total: All Solvent Types
2461023000	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Asphalt Roofing	Total: All Solvent Types
2461024000	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Asphalt Pipe Coating	Total: All Solvent Types
2461160000	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Tank/Drum Cleaning: All Processes	Total: All Solvent Types
2461800001	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Pesticide Application: All Processes	Surface Application
2461800002	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Pesticide Application: All Processes	Soil Incorporation
2461850000	Solvent Utilization	Miscellaneous Non-industrial: Commercial	Pesticide Application: Agricultural	All Processes
2501000150	Storage and Transport	Petroleum and Petroleum Product Storage	All Storage Types: Breathing Loss	Jet Naphtha
2501011011	Storage and Transport	Petroleum and Petroleum	Residential Portable Gas Cans	Permeation

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
		Product Storage		
2501011012	Storage and Transport	Petroleum and Petroleum Product Storage	Residential Portable Gas Cans	Evaporation (includes Diurnal losses)
2501011013	Storage and Transport	Petroleum and Petroleum Product Storage	Residential Portable Gas Cans	Spillage During Transport
2501011014	Storage and Transport	Petroleum and Petroleum Product Storage	Residential Portable Gas Cans	Refilling at the Pump - Vapor Displacement
2501011015	Storage and Transport	Petroleum and Petroleum Product Storage	Residential Portable Gas Cans	Refilling at the Pump - Spillage
2501012011	Storage and Transport	Petroleum and Petroleum Product Storage	Commercial Portable Gas Cans	Permeation
2501012012	Storage and Transport	Petroleum and Petroleum Product Storage	Commercial Portable Gas Cans	Evaporation (includes Diurnal losses)
2501012013	Storage and Transport	Petroleum and Petroleum Product Storage	Commercial Portable Gas Cans	Spillage During Transport
2501012014	Storage and Transport	Petroleum and Petroleum Product Storage	Commercial Portable Gas Cans	Refilling at the Pump - Vapor Displacement
2501012015	Storage and Transport	Petroleum and Petroleum Product Storage	Commercial Portable Gas Cans	Refilling at the Pump - Spillage
2501050120	Storage and Transport	Petroleum and Petroleum Product Storage	Bulk Terminals: All Evaporative Losses	Gasoline
2501055120	Storage and Transport	Petroleum and Petroleum	Bulk Plants: All Evaporative Losses	Gasoline

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
		Product Storage		
2501060050	Storage and Transport	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Stage 1: Total
2501060051	Storage and Transport	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Stage 1: Submerged Filling
2501060052	Storage and Transport	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Stage 1: Splash Filling
2501060053	Storage and Transport	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Stage 1: Balanced Submerged Filling
2501060201	Storage and Transport	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Underground Tank: Breathing and Emptying
2501070053	Storage and Transport	Petroleum and Petroleum Product Storage	Diesel Service Stations	Stage 1: Balanced Submerged Filling
2501070201	Storage and Transport	Petroleum and Petroleum Product Storage	Diesel Service Stations	Underground Tank: Breathing and Emptying
2501080050	Storage and Transport	Petroleum and Petroleum Product Storage	Airports : Aviation Gasoline	Stage 1: Total
2501080100	Storage and Transport	Petroleum and Petroleum Product Storage	Airports : Aviation Gasoline	Stage 2: Total
2501080201	Storage and Transport	Petroleum and Petroleum Product Storage	Airports : Aviation Gasoline	Underground Tank: Breathing and Emptying
2501995120	Storage and Transport	Petroleum and Petroleum	All Storage Types: Working Loss	Gasoline

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
		Product Storage		
2501995180	Storage and Transport	Petroleum and Petroleum Product Storage	All Storage Types: Working Loss	Kerosene
2505000120	Storage and Transport	Petroleum and Petroleum Product Transport	All Transport Types	Gasoline
2505010000	Storage and Transport	Petroleum and Petroleum Product Transport	Rail Tank Car	Total: All Products
2505020000	Storage and Transport	Petroleum and Petroleum Product Transport	Marine Vessel	Total: All Products
2505020030	Storage and Transport	Petroleum and Petroleum Product Transport	Marine Vessel	Crude Oil
2505020060	Storage and Transport	Petroleum and Petroleum Product Transport	Marine Vessel	Residual Oil
2505020090	Storage and Transport	Petroleum and Petroleum Product Transport	Marine Vessel	Distillate Oil
2505020120	Storage and Transport	Petroleum and Petroleum Product Transport	Marine Vessel	Gasoline
2505020150	Storage and Transport	Petroleum and Petroleum Product Transport	Marine Vessel	Jet Naphtha
2505020180	Storage and Transport	Petroleum and Petroleum Product Transport	Marine Vessel	Kerosene
2505020900	Storage and Transport	Petroleum and Petroleum	Marine Vessel	Tank Cleaning

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
		Product Transport		
2505030120	Storage and Transport	Petroleum and Petroleum Product Transport	Truck	Gasoline
2505040120	Storage and Transport	Petroleum and Petroleum Product Transport	Pipeline	Gasoline
2510000000	Storage and Transport	Organic Chemical Storage	All Storage Types: Breathing Loss	Total: All Products
2520010000	Storage and Transport	Inorganic Chemical Storage	Commercial/Industrial: Breathing Loss	Total: All Products
2601000000	Waste Disposal, Treatment, and Recovery	On-site Incineration	All Categories	Total
2601010000	Waste Disposal, Treatment, and Recovery	On-site Incineration	Industrial	Total
2601020000	Waste Disposal, Treatment, and Recovery	On-site Incineration	Commercial/Institutional	Total
2610000100	Waste Disposal, Treatment, and Recovery	Open Burning	All Categories	Yard Waste - Leaf Species Unspecified
2610000300	Waste Disposal, Treatment, and Recovery	Open Burning	All Categories	Yard Waste - Weed Species Unspecified (incl Grass)
2610000400	Waste Disposal, Treatment, and Recovery	Open Burning	All Categories	Yard Waste - Brush Species Unspecified
2610000500	Waste Disposal, Treatment, and Recovery	Open Burning	All Categories	Land Clearing Debris (use 28-10-005-000 for Logging Debris Burning)
2610030000	Waste Disposal, Treatment, and Recovery	Open Burning	Residential	Household Waste (use 26-10-000-xxx for Yard Wastes)
2620010000	Waste Disposal, Treatment, and Recovery	Landfills	Industrial	Total

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
2620030000	Waste Disposal, Treatment, and Recovery	Landfills	Municipal	Total
2620030001	Waste Disposal, Treatment, and Recovery	Landfills	Municipal	Dumping/Crushing/Spreading of New Materials (working face)
2630010000	Waste Disposal, Treatment, and Recovery	Wastewater Treatment	Industrial	Total Processed
2630020000	Waste Disposal, Treatment, and Recovery	Wastewater Treatment	Public Owned	Total Processed
2635000000	Waste Disposal, Treatment, and Recovery	Soil and Groundwater Remediation	All Categories	Total
2640000000	Waste Disposal, Treatment, and Recovery	TSDFs	All TSDF Types	Total: All Processes
2650000000	Waste Disposal, Treatment, and Recovery	Scrap and Waste Materials	Scrap and Waste Materials	Total: All Processes
2650000002	Waste Disposal, Treatment, and Recovery	Scrap and Waste Materials	Scrap and Waste Materials	Shredding
2660000000	Waste Disposal, Treatment, and Recovery	Leaking Underground Storage Tanks	Leaking Underground Storage Tanks	Total: All Storage Types
2680001000	Waste Disposal, Treatment, and Recovery	Composting	100% Biosolids (e.g., sewage sludge, manure, mixtures of these matls)	All Processes
2680002000	Waste Disposal, Treatment, and Recovery	Composting	Mixed Waste (e.g., a 50:50 mixture of biosolids and green wastes)	All Processes
2680003000	Waste Disposal, Treatment, and Recovery	Composting	100% Green Waste (e.g., residential or municipal yard wastes)	All Processes
2801000000	Miscellaneous Area Sources	Agriculture Production - Crops	Agriculture - Crops	Total

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
2801520000	Miscellaneous Area Sources	Agriculture Production - Crops	Orchard Heaters	Total, all fuels
2801600000	Miscellaneous Area Sources	Agriculture Production - Crops	Country Grain Elevators	Total
2806010000	Miscellaneous Area Sources	Domestic Animals Waste Emissions	Cats	Total
2806015000	Miscellaneous Area Sources	Domestic Animals Waste Emissions	Dogs	Total
2807020001	Miscellaneous Area Sources	Wild Animals Waste Emissions	Bears	Black Bears
2807020002	Miscellaneous Area Sources	Wild Animals Waste Emissions	Bears	Grizzly Bears
2807025000	Miscellaneous Area Sources	Wild Animals Waste Emissions	Elk	Total
2807030000	Miscellaneous Area Sources	Wild Animals Waste Emissions	Deer	Total
2807040000	Miscellaneous Area Sources	Wild Animals Waste Emissions	Birds	Total
2810003000	Miscellaneous Area Sources	Other Combustion	Cigarette Smoke	Total
2810005000	Miscellaneous Area Sources	Other Combustion	Managed Burning, Slash (Logging Debris)	Unspecified Burn Method (use 2610000500 for non-logging debris)
2810005001	Miscellaneous Area Sources	Other Combustion	Managed Burning, Slash (Logging Debris)	Pile Burning
2810010000	Miscellaneous Area Sources	Other Combustion	Human Perspiration and Respiration	Total
2810025000	Miscellaneous Area Sources	Other Combustion	Residential Grilling (see 23-02-002-xxx for Commercial)	Total
2810030000	Miscellaneous Area Sources	Other Combustion	Structure Fires	Unspecified

SCC	Tier 1 Description	Tier 2 Description	Tier 3 Description	Tier 4 Description
2810035000	Miscellaneous Area Sources	Other Combustion	Firefighting Training	Total
2810040000	Miscellaneous Area Sources	Other Combustion	Aircraft/Rocket Engine Firing and Testing	Total
2810050000	Miscellaneous Area Sources	Other Combustion	Motor Vehicle Fires	Unspecified
2810060100	Miscellaneous Area Sources	Other Combustion	Cremation	Humans
2810060200	Miscellaneous Area Sources	Other Combustion	Cremation	Animals
2830000000	Miscellaneous Area Sources	Catastrophic/Accidental Releases	All Catastrophic/Accidental Releases	Total
2840000000	Miscellaneous Area Sources	Automotive Repair Shops	Automotive Repair Shops	Total
2840010000	Miscellaneous Area Sources	Automotive Repair Shops	Auto Top and Body Repair	Total
2850000010	Miscellaneous Area Sources	Health Services	Hospitals	Sterilization Operations
2851001000	Miscellaneous Area Sources	Laboratories	Bench Scale Reagents	Total
2862000000	Miscellaneous Area Sources	Swimming Pools	Total (Commercial, Residential, Public)	Total
30125010	Industrial Processes	Chemical Manufacturing	Methanol/Alcohol Production	Ethanol by Fermentation