

Appendix B1a



Emissions Inventory Documentation for the District of Columbia: 2014 Area Source Methodologies

February 2016/July 2017

Prepared by:

Monitoring and Assessment Branch
Air Quality Division
Department of Energy and Environment
1200 First Street NE, Fifth Floor
Washington, DC 20002

TABLE OF CONTENTS

INTRODUCTION	1
APPENDICES	3
1.0 ANNUAL AREA SOURCE ESTIMATES.....	4
1.1 ICI FUEL COMBUSTION.....	4
1.2 RESIDENTIAL FUEL COMBUSTION.....	7
1.3 RESIDENTIAL WOOD COMBUSTION (RWC).....	8
1.4 ROAD DUST.....	10
1.5 COMMERCIAL COOKING.....	11
1.6 CONSTRUCTION DUST.....	12
1.6.1 Residential Construction.....	12
1.6.2 Non-Residential Construction.....	12
1.6.3 Road Construction.....	13
1.7 SOLVENTS	14
1.7.1 Architectural Surface Coatings.....	17
1.7.2 Auto Refinishing	18
1.7.3 Surface Coatings – Traffic Markings	18
1.7.4 Surface Coatings – Marine Coatings, Miscellaneous Manufacturing, Industrial Maintenance Coatings, and Other Special Purpose Coatings	19
1.7.5 Solvent Cleaning (Degreasing)	19
1.7.6 Dry Cleaning	20
1.7.7 Graphic Arts	20
1.7.8 Commercial & Consumer Products	22
1.7.9 Asphalt Paving and Roofing	22
1.8 PORTABLE FUEL CONTAINERS (PFCS).....	24
1.9 GASOLINE DISTRIBUTION	25
1.9.1 Gasoline Distribution, Stage I.....	25
1.9.2 Gasoline Distribution, Stage II.....	26
1.9.3 Aviation Gas – Stage I & II.....	26
1.10 WASTE DISPOSAL & MISCELLANEOUS	28
1.10.1 Publicly Owned Treatment Works (POTWs).....	28
1.10.2 Residential Charcoal Grilling	29
2.0 MARINE, AIR, AND RAIL (MAR)	30
2.1 Marine.....	30
2.2 Air.....	30
2.3 Railroad	31
2.3.1 Class I Line Hauls	31
2.3.2 Class I Passenger Trains	32

2.3.3 Class II Locomotives..... 32
2.3.4 Class III Locomotives and Rail Yards 32
4.0 OZONE SEASON DAY EMISSIONS..... 34

DRAFT

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) develops a National Emissions Inventory (NEI) every three years for air quality assessment and planning purposes. Emissions due to human-based anthropogenic activities are estimated for numerous source categories that are classified as point (large facilities), area (smaller stationary sources that cumulatively result in substantial emissions), nonroad, and onroad sources. This document addresses area source data, methodologies, and considerations.

Area source emissions are calculated using data about how much activity occurs in a sector. Activity levels are function of inputs, or a number of surrogate parameters based on the area's socioeconomic data such as population and employment projections.

Emissions are also calculated based on technical information about the emissions source, such as a typical emissions rate or factor. According to the U.S. Environmental Protection Agency (EPA), "an **emissions factor** is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. These factors are usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant (e.g., kilograms of particulate emitted per megagram of coal burned). Such factors facilitate estimation of emissions from various sources of air pollution. In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all facilities in the source category (i.e., a population average)."¹

$$\text{Emissions} = \text{Activity Data} * \text{Emission Factor (per pollutant)}$$

For conversions, 1 short ton is equivalent to 2000 pounds.

Emissions are calculated using default emission factors provided by the EPA.

Occasionally, adjustments are made either within or outside of the emissions factor (EF) based on additional information such as the efficiency of emissions controls (CE), rule effectiveness (RE), or rule penetration (RP). If applicable, point source activity or emissions may be subtracted from area source estimates to avoid double-counting of emissions in the larger inventory. The additional step of allocating emissions to counties, often described, is not necessary for District of Columbia (District) estimates since it is a single jurisdiction.

2014 NEI

In 2008, the Eastern Regional Technical Advisory Committee (ERTAC)² was formed by states and multi-jurisdictional organizations (MJOs) to oversee the coordination and improvement of

¹ <http://www3.epa.gov/ttnchie1/ap42/>

² ERTAC notes can be found at:

emissions inventories. For most area source categories, ERTAC reviews and updates the emission factors (EFs), since many come from an EPA document of EFs called AP-42 that has not been updated regularly since the 1990s. ERTAC EFs are used in EPA's default calculations for the 2014 National Emissions Inventory (NEI).

For the 2014 NEI, the District accepted most of EPA's default area source calculations. However, for developing the ozone season emissions inventories for use in the 2008 ozone NAAQS maintenance plan, further adjustments were made to the District's NEI data for developing 2014 emissions inventories with no controls by excluding applicable credits for control programs for certain source categories.

For the following categories, better activity data was used and emissions were submitted:

- ICI Tool – included point source subtraction
 - Revised distillate fuel use boiler/engine split
- Solvents Tool:
 - Graphic arts – included point source subtraction
 - Traffic markings – included local data
- POTWs

<http://www.epa.gov/ttn/chief/net/2011inventory.html> ("Nonpoint Emissions Tools and Methods") or at <http://www.ertac.us/>.

APPENDICES

- A – EPA Documentation on the ICI Combustion Tool
- B – EPA Documentation on Residential Distillate Oil Combustion
- C – EPA Documentation on Residential Natural Gas Combustion
- D – EPA Documentation on Residential LPG Combustion
- E – EPA Documentation on the RWC Tool
- F – EPA Documentation on Paved Road Emissions
- G – EPA Documentation on Commercial Cooking Emissions
- H – EPA Documentation on Residential Construction Emissions
- I – EPA Documentation on Nonresidential Construction Emissions
- J – EPA Documentation on Road Construction Emissions
- K – EPA Documentation on the Solvents Tool
- L – EPA Documentation on Solvent Emission Factors
- M – EPA Documentation on Asphalt Paving Emissions
- N – EPA Documentation on Aviation Gas Stage I
- O – EPA Documentation on Aviation Gas Stage II
- P – EPA Documentation on Residential Charcoal Grilling

DRAFT

1.0 ANNUAL AREA SOURCE ESTIMATES

The content of this document draws heavily from existing reference documents developed by EPA, the Maryland Department of the Environment (MDE), Mid-Atlantic Air Management Association (MARAMA), and the U.S. Energy Information Administration (EIA).

1.1 ICI FUEL COMBUSTION

The industrial, commercial, and institutional (ICI) fuel combustion categories typically are inventoried using fuel consumption estimates from the U.S. Energy Information Administration (EIA) State Energy Data System (SEDS), which is the official Federal source of comprehensive state energy statistics.

Source Category		SCC
Industrial; Anthracite Coal*		2102001000
Industrial; Bituminous Coal*		2102002000
Industrial; Distillate oil	Boilers - 2102004001	2102004000
	Engines - 2102004002	
Industrial; Residual Oil		2102005000
Industrial; Natural Gas		2102006000
Industrial; LPG		2102007000
Industrial; Kerosene		2102011000
Industrial; Biomass		2102008000
Commercial/Institutional; Anthracite Coal*		2103001000
Commercial/Institutional; Bituminous Coal*		2103002000
Commercial/Institutional; Distillate Oil	Boilers - 2103004001	2103004000
	Engines - 2103004002	
Commercial/Institutional; Residual Oil		2103005000
Commercial/Institutional; Natural Gas		2103006000
Commercial/Institutional; Liquified Petroleum Gas		2103007000
Commercial/Institutional; Biomass		2103008000
Commercial/Institutional; Kerosene		2103011000

*Coal delivered to the District is presumed to be 100% bituminous/subbituminous (SCC ends in 2000, as opposed to anthracite coal, where the SCC ends in 1000).

For the 2014 NEI, EPA in conjunction with Abt Associates developed a Microsoft® Access-based ICI Combustion Tool³ to assist State, Local, and Tribal agencies with emissions calculations and to generate EPA defaults.

³ U.S. EPA and Abt Associates, "Industrial, Commercial, and Institutional Fuel Combustion: Documentation for EPA's Nonpoint Emissions Estimation Tool, ICI Tool Version 1.4" (December 2015).

The ICI Tool processes SEDS data and adjusts the data to account for the fraction of distillate oil and liquefied petroleum gas (LPG) consumed by nonroad mobile sources, whose emissions are included in the nonroad sector inventory, to avoid double-counting. Nonroad activities such as farming, logging, mining, and construction are considered part of the industrial sector and not the nonroad sector.

The ICI Tool also adjusts the data to account for the fraction of fuel consumed by non-fuel combustion uses of energy, such as product feedstocks (*e.g.*, the use of a natural gas to extract other gasses). It includes a nonpoint source to point source crosswalk and allows the user to perform point source activity or emissions subtractions to avoid double counting between point and nonpoint inventories.

ICI Tool Documentation can be found in **Appendix A**. EPA defaults for this category do not include point source subtraction, so the District ran the ICI Combustion Tool and subtracted point source activity data prior to submittal of emissions estimates to EPA for the NEI.

The District adopted regulations to lower the sulfur content of fuel oil by July 1, 2016, and then to 0.0015 parts per million (ppm) by July 1, 2018 (20 DCMR 801). The limits are not relevant for the 2014 inventory but may impact emissions in future inventories.

Data & Assumptions

The District is unaware of substantial coal usage by smaller sources so assumes that no coal is burned by area sources. It is also assumed that no fuel is used as feedstock, since there is very little manufacturing in the city. According to EIA, "in 2011, 78 percent of retail electricity sales in the District of Columbia went to the commercial sector, and only 1.9 percent went to industrial users, reflecting the District's large concentration of government buildings and museums, as well as other commercial activity."

ICI Combustion Tool documentation references the following sources of activity data:

- Energy Information Administration (EIA) State Energy Data System (SEDS):
<http://www.eia.gov/state/seds/>
 - Distillate oil includes grades 1, 2, and 4
 - Residual oil includes grades 5 and 6, and is banned beginning on July 1, 2016 (see 20 DCMR § 801.2(c))
 - LPG includes propane, propylene, butane, and butylenes, though the product used for domestic heating is composed primarily of propane. LPG is also a source of industrial construction emissions.
 - No point sources in the District use LPG, so there is no need to consider point source subtraction or double-counting of LPG emissions.

- Fuel Oil and Kerosene Sales:
<http://www.eia.gov/petroleum/fueloilkerosene/>

- Provides data in thousand gallons, instead of in thousand barrels (as in SEDS)
- Distillate fuel oil consumption estimates are combined with assumptions used in the regulatory impact assessment for EPA's nonroad diesel emissions rulemaking.

With regards to distillate oil use in the ICI Tool, EPA recommends using a 95% boiler and 5% engine split for commercial sources and a 60% boiler and 40% engine split for industrial sources. The ICI Tool default includes a 50/50 split.

In the District, actual fuel use details were collected for commercial and institutional units that are included in Title V permits but are not included in NEI point source emissions estimates, so are considered area sources. For distillate oil, 71% was used for boilers and 29% was used for diesel generators. Fuel use data for units included in Chapter 2 permits is not available, so the District chose to stay with the default split.

DRAFT

1.2 RESIDENTIAL FUEL COMBUSTION

Residential fuel combustion is not included in the ICI Tool, though calculation methodologies are similar to ICI fuel combustion methodologies. Residential fuels are used for space heating, water heating, dryers, and cooking appliances and grills.

Source Category	SCC
Residential Heating: Anthracite Coal*	2104001000
Residential Heating: Bituminous Coal*	2104002000
Residential Heating: Distillate Oil	2104004000
Residential Heating: Residual Oil	2104005000
Residential Heating: Natural Gas	2104006000
Residential Heating: LPG	2104007000
Residential Heating: Kerosene	2104011000

*Coal delivered to the District is presumed to be 100% bituminous/subbituminous (SCC ends in 2000, as opposed to anthracite coal, where SCC ends in 1000).

The District accepts EPA defaults. Documentation can be found in **Appendices B (distillate oil), C (natural gas), and D (LPG)**.

Data and Assumptions

There are no residential uses of coal or kerosene in the District. According to EIA documentation⁴, "coal consumed by the residential and commercial sectors is reported combined and little information exists for disaggregating the combined sectors' data. The EIA estimates that a decreasing percentage of the combined total is consumed in the residential sector..."

Calculations for this category are based on EIA SEDS data:

<http://www.eia.gov/state/seds/>

4

1.3 RESIDENTIAL WOOD COMBUSTION⁵

Residential wood combustion (RWC) emissions typically occur during the winter to heat homes and for recreation.

Source Category	SCC
Residential Heating: Fireplaces (cordwood)	2104008100
Residential Heating: Inserts non certified	2104008210
Residential Heating: Inserts EPA certified non-cat	2104008220
Residential Heating: Inserts EPA certified cat	2104008230
Residential Heating: free standing WS non certified	2104008310
Residential Heating: free standing WS EPA certified non-cat	2104008320
Residential Heating: free standing WS EPA certified cat	2104008330
Residential Heating: pellet stoves	2104008400
Residential Heating: furnace indoor	2104008510
Residential Heating: Hydronic heater: outdoor	2104008610
Residential Heating: Outdoor wood burning device, NEC	2104008700
Residential Heating: Firelog	2104009000
Residential Heating: Kerosene	2104011000

EPA and Abt Associates developed and improved a Microsoft® Access®-based RWC Tool⁶ that computes the amount of wood burned and emissions of criteria pollutants and hazardous air pollutants (HAPs) from 12 different wood burning appliance types. Conventional RWC units were constructed prior to 1988. EPA-certified units are those constructed after 1988 that must meet EPA emission standards. RWCs may or may not contain a catalyst to improve the burn efficiency. Fireplaces with inserts have fan-forced air circulation systems to force heat into a room, and fireplaces without inserts have glass door fire screens or fire backs to passively reflect heat.

The District accepts EPA defaults based on the RWC Tool. RWC Tool documentation can be found in **Appendix E**.

Data & Assumptions

Methodologies for determining RWC activity vary by the type of RWC appliance. The Tool considers the number of residential units and the percent of occupied units for a specific appliance category or the number of appliances. Burn rates, the amount of wood burned

⁵ EIIIP Chapter 2

⁶ U.S. EPA and Abt Associates, "Residential Wood Combustion: Documentation for EPA's Nonpoint Emissions Estimation Tool, Residential Wood Combustion Tool Version 2.7 Corrected" (August 2015).

annually per appliance, and average density of the dry cordwood fuel burned are factors. Tool documentation references the following sources of activity data:

- Number of occupied units – U.S. Census, Occupied Units:
<http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk>
- Appliance Profiles – American Housing Survey:
<http://www.census.gov/programs-surveys/ahs/data.html>
 - EPA assumes that no main heating with woodstoves occurs in counties with more than 4,000 households per square mile.
 - EPA assumes that there is no main heating with firelogs.
 - Pellet-fired profiles are based on 2007 sales data from a pellet fuels institute that had regional sales data for pellet stoves.
- Burn Profiles – Assumptions are based on engineering judgment; for example:
 - For fireplaces used as a secondary heating source, the tool assumes one fire per week for 7 months
 - For outdoor pleasure fires, the tool assumes approximately 4 fires per year.
- Wood Density – From 2005 Timber Products Output (TPO) fuel wood consumption data:
http://ncrs2.fs.fed.us/4801/fiadb/rpa_tpo/wc_rpa_tpo.ASP
 - The density by county is computed by taking the volume of wood reported by species in the TPO and then multiplying by a species density

Survey data is incorporated into RWC calculations.

1.4 ROAD DUST

This category estimates fugitive dust that is disturbed and reenters the air when vehicles travel on paved and unpaved roads, causing health problems.

Source Category	SCC	Pollutant(s)
Paved road	2294000000	PM ₂₅ -PRI, PM ₂₅ -FIL PM ₁₀ -PRI, PM ₁₀ -FIL
Unpaved roads	2296000000	n/a

EPA's estimates are based on annual vehicle miles traveled (VMT) by roadway type. There are six roadway types: interstate, other freeways and expressways, other principal arterial, minor arterial, collector, and local roads.

The District accepts EPA defaults for this source category. Documentation can be found in **Appendix F**.

Data & Assumptions

The methodology used for the 2014 inventory was revised in part to account for the use of MOVES.

VMT data by vehicle type was derived from a 2011 EPA MOVES modeling run and grown to 2014. EF calculations involved silt loadings per roadway class based on average daily traffic volumes (ADTV) and road length, though allocations of road length were not a factor for the District since it is one jurisdiction. Average vehicle weights by road type were also calculated.

The District is not a PM₁₀ nonattainment or maintenance area, so no controls were applied. Precipitation was not accounted for in the 2014 inventory.

1.5 COMMERCIAL COOKING

Commercial cooking emissions are estimated for all types of meat cooked on five different cooking devices: chain-driven (conveyorized) charbroilers, underfired charbroilers, deep-fat fryers, flat griddles, and clamshell griddles. Deep fat frying of French fries is included in the calculations.

Source Category	SCC
Conveyorized Charbroiling	2302002100
Underfired Charbroiling	2302002200
Deep Fat Frying	2302003000
Flat Griddle Frying	2302003100
Clamshell Griddle Frying	2302003200

The District accepts EPA defaults. Documentation can be found in **Appendix G**.

The District's opacity regulations at 20 DCMR 606 are not considered in the emissions calculations for this category.

Data & Assumptions

In prior years, the District used population-based EFs to estimate emissions for this category. In 2008, EPA developed a methodology to estimate the amount of food cooked per device and the weight of food cooked per week (in pounds) and year (in tons), and take a weighted average across restaurant types.

Data on the number of restaurants in the District was based on Dun & Bradstreet data used for the 2002 NEI, adjusted using more current information as well as a growth factor from the U.S. Census Bureau's County Business Pattern statistics for NAICS code 722511 (full-service restaurants) and 722513 (limited-service restaurants):

<http://www.census.gov/econ/cbp/index.html>

A ratio of PM-PRI to PM-CON from the 2008 NEI was used to augment PM estimates.

1.6 CONSTRUCTION DUST

Fugitive dust emissions from construction activity are a function of acreage of soil disturbed.

Source Category	SCC	Pollutant(s)
Construction - Residential	2311010000	PM ₂₅ -PRI, PM ₂₅ -FIL PM ₁₀ -PRI, PM ₁₀ -FIL
Construction - Non-Residential	2311020000	PM ₂₅ -PRI, PM ₂₅ -FIL PM ₁₀ -PRI, PM ₁₀ -FIL
Construction - Road	2311030000	PM ₂₅ -PRI, PM ₂₅ -FIL PM ₁₀ -PRI, PM ₁₀ -FIL

The District accepts EPA defaults for these source categories. Documentation can be found in **Appendices H (residential construction), I (non-residential construction), and J (road construction).**

The District's fugitive dust emissions at 20 DCMR 605 are not considered in emissions calculations for this category.

1.6.1 Residential Construction

Data for this category is based on groupings of 1 unit, 2-unit, 3-unit, 4 units, and 5 or more units. The amount of surface soil removed for basements per unit type is assumed. A duration of 6 to 12 months of construction per unit type is also assumed.

Several U.S. Census Bureau sources of data were used as follows:

- New Privately Owned Housing Units Started by Purpose and Design
- New Privately Owned Housing Units Authorized Unadjusted Units
- Annual county building permit data from the County Level Residential Building Permit database (purchased by EPA)
- Characteristics of New Single-Family Houses Completed, Foundations

Regional variances in soil moisture levels (using Thornthwaite's Precipitation-Evaporation Index) and silt content (using the National Cooperative Soil Survey, Soil Characterization Database) are considered in the calculations.

1.6.2 Non-Residential Construction

U.S. Census Bureau data on the "Annual Value of Construction Put in Place in the U.S." was used for NAICS Code 2362. For the District, there was no need to allocate data by employment. Average acreage disturbed per million dollars in 2014 was estimated to be approximately 1.01 acres per \$1 million.

EPA assumes that there are roughly 11 months of non-residential construction during a year, with regional variances in soil moisture levels and silt content.

1.6.3 Road Construction

For this category, Federal Highway Administration (FHWA) data was collected on spending by state⁷ in several different categories (New Construction, Relocation, Added Capacity, Major Widening, and Minor Widening). Spending was also differentiated by roadway type. For urban roads, the following cost conversions were applied:

- Urban interstates, \$3.8 million per mile
- Urban arterial and collectors, \$4.1 million per mile

EPA assumes that there are roughly 12 months of road construction during a year, with regional variances in soil moisture levels and silt content.

⁷ Highway Statistics, State Highway Agency Capital Outlay 2012, Table SF-12A

1.7 SOLVENTS

The solvents categories account for evaporative emissions of VOCs and HAPs from liquids that contain dissolved substances. VOCs are emitted during application or as the solvent dries.

Source Category		SCC	Employment NAICS or Other Data Source
Non-Industrial Surface Coating	Architectural Coatings	2401001000	Population-Based
Industrial Surface Coating & Solvent Use	Auto Refinishing: SIC 7532	2401005000	4411//, 4412//, 81112/
	Traffic Markings	2401008000	Lane Miles
	Factory Finished Wood: SIC 2426 thru 242 (Wood Products)	2401015000	321 (or 352098 ⁸)
	Wood Furniture	2401020000	337110, 337121, 337122, 337127, 337211, 337212, 337215, 339111
	Metal Furniture: SIC 25	2401025000	337124, 337214, 337127, 337215
	Paper, foil, and film	2401030000	322220
	Metal Can Coating	2401040000	33243
	Sheet, strip, and coil	2401045000	
	Machinery and Equipment: SIC 35	2401055000	3331, 3332, 3333, 33341
	Large Appliances: SIC 363	2401060000	3352
	Electronic and other Electric Coatings	2401065000	331491, 335921, 335929, 335311
	Motor Vehicles	2401070000	3361, 3362, 3363
	Aircraft	2401075000	3364
	Marine	2401080000	3366//, 488390
Railroad		3365, 3369	

Source Category		SCC	Employment NAICS or Other Data Source
	Miscellaneous Manufacturing	2401090000	3369//, 339//
	Industrial Maintenance Coatings	2401100000	Population-Based
	Other Special Purpose Coatings	2401200000	Population-Based
Solvent	Degreasing (Industrial/Institutional Cleaning Products)	2415000000	331///, 332///, 333///, 334///, 335///, 336///, 337///, 339///, 441///, 483///, 484///, 485///, 488///, 8111//, 8112//
	Dry Cleaning	2420000000	812320
	Graphic Arts	2425000000	32311/, 322211, 322212, 322216, 322220, 322291, 322229
Consumer & Commercial Solvent Use	Cosmetics and Toiletries/ Personal Care Products	2460100000	Population-Based
	Cleaning Products; Household	2460200000	Population-Based
	Auto Aftermarket	2460400000	Population-Based
	Coatings and Related Products	2460500000	Population-Based
	Adhesives and Sealants	2460600000	Population-Based
	FIFRA Regulated Products	2460800000	Population-Based
	Misc. Products (not otherwise covered)	2460900000	Population-Based
	Cutback Asphalt*	2461021000	
	Emulsified Asphalt*	2461022000	Volume-Based
	Ag Pesticide*	2461850000	

* These categories are not included in the Solvents Tool.

Categories in the chart are shaded if there is no known activity in the District.

EPA in conjunction with Abt Associates developed a Microsoft® Access-based Solvent Emissions Tool⁹ to assist agencies in estimating nonpoint emissions from solvents. The Tool includes an source classification codes (SCCs) crosswalk to help link point and nonpoint SCCs for point source subtraction of emissions or activity data to avoid double-counting of emissions.

The District accepts EPA defaults for the solvents categories. Solvent Emissions Tool documentation can be found in **Appendix K**. Solvents Tool emissions factor documentation can be found in **Appendix L**.

⁹ EPA and Abt Associates, "Solvent Utilization: Documentation for EPA's Nonpoint Emissions Estimation Tool, Solvent Tool Version 1.1 Corrected" (August 2015).

Data and Assumptions

In the Solvents Tool, there are three types of surrogate parameters used in lieu of actual activity data:

- Population, based on the U.S. Census Bureau for July 1, 2013:
<http://www.census.gov/popest/>
- Employment, as listed by North American Industrial Classification Standard (NAICS) code(s) using U.S. Census County Business Patterns (CBP) data for 2013¹⁰:
<http://www.census.gov/econ/cbp/>
- Road miles – Data for traffic paints is typically based on FHWA Highway Statistics per county, but the District is able to obtain more specific information from the District Department of Transportation. (See Section 1.7.3)

ERTAC purchased national-level estimates of solvent usage from the Freedonia Group, an industry market research company, to develop emission factors. EFs were developed by dividing the solvent usage data from the Freedonia Group by either the national population in 2013 or by the national-level employment in certain sectors in 2013. Most EFs based on 2007 data were updated for the 2014 inventory based on 2013 Freedonia data. EFs for a few of the commercial and consumer population-based categories are based on EPA's Emissions Inventory Improvement Program (EIIP) documentation. Other EFs (degreasing, dry cleaning) reference the 2011 NEI.

The District used consumption-based EFs for some categories until the 2011 inventory, when the U.S. Census source of data called the Current Industrial Report (CIR)¹¹ was discontinued. The CIR provided the quantity and value of shipments of certain types of paint, for example. Since Freedonia Group data includes an estimate of the amount of solvents used for surface coating for two categories, architectural and non-architectural coatings, the amount of solvent used for non-architectural coatings was broken down into various source categories using a methodology described in Appendix L.

Some of the shaded categories overlap with EPA control techniques guidelines (CTGs):

Category	Solvents Tool NAICS	CTG NAICS	District Status (as of 2012)
Metal Furniture	337124, 337214, 337127, 337215	Metal furniture coatings: 337124, 337214, 337127, 337215, 337127, 332951, 332116, 332612, 337215, 335121, 335122, 339111, 339114, 337127, 81142	20 DCMR 714
Paper, film, and foil	322220	Paper, film and foil	Negative

¹⁰ Due to concerns with releasing confidential business information, CBP withholds values if it is possible to identify data for individual facilities, and a procedure described in Appendix K is used to estimate data.

¹¹ The previous source of consumption-based data was at: www.census.gov/manufacturing/cir/

Category	Solvents Tool NAICS	CTG NAICS	District Status (as of 2012)
		coatings: 322221, 322222, 322223, 322224, 322225, 322226, 322229, 325992, 326111, 326112, 326113, 32613, 32791, 339944	Declaration
Large appliances	3352	Large appliance coatings: 335221, 335222, 335224, 335228, 333312, 333319; 333415	20 DCMR 714
Motor Vehicles	3361, 3362, 3363	Auto and light-duty truck assembly coatings (not autobody refinishing): 336111, 336112, 336211	Negative Declaration
Marine	3366//, 488390	Fiberglass boat manufacturing materials: 336612	Negative Declaration

In 2011, the District affirmed that there are no sources within four CTG categories: paper, film and foil; motor vehicles; marine; and “flatwood paneling coatings” (NAICS 321211, 321212, 321219, 321999). There does not appear to be overlap between flatwood paneling and either the “wood products” or “wood furniture” Solvents Tool categories.

At 20 DCMR 714, the District adopted a CTG catch-all regulation for three CTG categories: metal furniture, large appliances, and “miscellaneous metal products coatings & plastic parts coatings” (NAICS 331, 332, 333, 334, 336, 482, 811). Miscellaneous coatings has some overlap with the “degreasing” category in the Solvents Tool.

1.7.1 Architectural Surface Coatings¹²

Architectural coatings include paints, enamels, varnishes, lacquers, and other product finishes used to protect substrates and surfaces. They can be either solvent-based or water-based and typically contribute a substantial amount of VOC emissions to the inventory.

The Solvents Tool assumes VOC emissions limits for architectural coatings based on the OTC Architectural and Industrial Maintenance (AIM) Phase I model rule, which accounts for the use of both water- and solvent-based coatings. The EFs from 2010 were held constant, so they do not assume VOC emissions limits that account for the District’s adoption of Phase II AIM rules at 20 DCMR 773-779, which became effective in 2012. Also, further adjustments were made to the District’s NEI data for developing emissions inventories with no controls for use in the 2008

¹² U.S. EPA. Emission Inventory Improvement Program, Technical Report Series Volume 3: Area Sources, Chapter 3: “Architectural Surface Coatings” (November 1995), found at: <http://www3.epa.gov/ttn/chief/eiip/techreport/volume03/index.html>.

ozone NAAQS maintenance plan by excluding the OTC Phase I model rule credits applicable for this source category.

1.7.2 Auto Refinishing¹³

Autobody refinishing occurs primarily at small auto body shops when repairing worn or damaged automobiles, trucks, and other vehicles. Steps can include vehicle preparation, primer application, topcoat application, and spray equipment cleaning. Lacquers and enamels are usually applied with hand-operated spray guns and are dried or cured in low-temperature ovens or at ambient temperatures. Coating of new cars is not included in this category.

The employment-based EFs used in the Solvents Tool apply to all three SCCs¹⁴, and may overestimate emissions for states with autobody refinishing rules and underestimate emissions for states without rules.

The Solvents Tool incorporates the District's adoption of OTC's 2002 Mobile Equipment Repair and Refinishing (MERR) model rule at 20 DCMR 718, but does not account for the more updated adoption of OTC's 2009 Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations (MVMERR) model rule, finalized in the District in February 2016. Also, further adjustments were made to the District's NEI data for developing emissions inventories with no controls for use in the 2008 ozone NAAQS maintenance plan by excluding the OTC model rule credits applicable for this source category.

1.7.3 Surface Coatings – Traffic Markings¹⁵

Traffic paints are used to mark highway center lanes, edge stripes, and directional marks on surfaces using a variety of solvent- and water-based paints, thermoplastics, preformed tapes, and alkyd or chlorinated rubber resins. Emissions depend on the marking material used and the frequency of application.

The District is able to obtain data from DDOT on the number of miles of thermoplastic traffic markings actually installed, and chooses not to adopt Solvents Tool estimates based on total lane miles in the jurisdiction, which are much higher. There are no controls for this category.

¹³ U.S. EPA. Emission Inventory Improvement Program, Technical Report Series Volume 3: Area Sources, Chapter 13: "Autobody Refinishing" (March 2005), found at: <http://www3.epa.gov/ttn/chief/eiip/techreport/volume03/index.html>.

¹⁴ SCC 81112 only is used when states assume that most employees at auto dealerships work in sales, not a auto refinishing, since car dealerships can have paint booths in case cars are damaged during transit.

¹⁵ U.S. EPA. Emission Inventory Improvement Program, Technical Report Series Volume 3: Area Sources, Chapter 14: "Traffic Markings" (May 1997), found at: <http://www3.epa.gov/ttn/chief/eiip/techreport/volume03/index.html>.

1.7.4 Wood Furniture

There are only “adjusted employment” estimates for the Wood Furniture category. There does not appear to be any overlap between the CTG “flatwood paneling” category and either the “wood products” or “wood furniture” Solvents Tool categories.

1.7.5 Surface Coatings – Marine Coatings, Miscellaneous Manufacturing, Industrial Maintenance Coatings, and Other Special Purpose Coatings

Industrial surface coatings are applied during the manufacture of a wide variety of products and in maintenance operations at industrial facilities. There is very little manufacturing and industry in the District. Most facilities in these categories would be considered point sources. Area source estimates for industrial surface coatings are employment-based.

The Solvents Tool includes only “adjusted employment” estimates for the Marine Coatings category. There is some overlap between marine coatings and the CTG “fiberglass boat manufacturing materials” category (NAICS 336612), which the District submitted a negative declaration for in 2011.

It is presumed that any railroad coatings that may be applied at a rail yard are covered by “miscellaneous manufacturing” estimates, which are employee-based.

Estimates for industrial maintenance coatings and special purpose coatings are population-based.

The Solvents Tool assumes VOC emissions limits for industrial surface coatings based on the District’s adoption of OTC’s Phase I AIM rule, but it does not assume VOC emissions limits that account for the District’s adoption of Phase II AIM rules, which became effective in 2012. Also, further adjustments were made to the District’s NEI data for developing emissions inventories with no controls for use in the 2008 ozone NAAQS maintenance plan by excluding the OTC Phase I model rule credits applicable for this source category.

1.7.6 Solvent Cleaning (Degreasing)¹⁶

Solvent cleaning, also called degreasing, usually occurs at auto repair stations or manufacturing facilities. It is the cleaning of parts of machines using solvents. There are two types of cleaning machines – batch or in-line “continuous” machines – that clean parts by immersion or rinsing. Solvent may be used in non-vapor liquid form (cold cleaning) or heated to above its boiling point (vapor cleaning).

¹⁶ U.S. EPA. Emission Inventory Improvement Program, Technical Report Series Volume 3: Area Sources, Chapter 6: “Solvent Cleaning” (September 1997), found at: <http://www3.epa.gov/ttn/chief/eiip/techreport/volume03/index.html>.

The Solvents Tool uses EFs from the 2011 NEI. It does not include VOC emissions limits that account for the District's adoption of solvent cleaning regulations at 20 DCMR 763-771, which became effective in 2012. Also, further adjustments were made to the District's NEI data for developing emissions inventories with no controls for use in the 2008 ozone NAAQS maintenance plan by excluding the OTC model rule credits applicable for this source category.

In 2011, estimates for the District were removed by EPA because they were considered double-counting with the point source sector.

1.7.7 Dry Cleaning¹⁷

Dry cleaning operations use solvents instead of water to prevent wrinkles and the shrinkage of fabrics. Emissions are influenced by the type of machine, some of which contain filters or other add-on controls, and the type of solvent.

The Solvents Tool uses EFs from the 2011 NEI. It is not clear whether the EFs assume VOC emission limits from the District's regulations on petroleum distillate organic solvents at 20 DCMR 706. In 2008, ERTAC removed the use of perchloroethylene (perc) from the EF when EPA no longer defined perc as a VOC. The District's rules on perc at 20 DCMR 707 were repealed in 2012, and requirements were moved to the air toxics regulations at 20 DCMR Chapter 14.

1.7.8 Graphic Arts¹⁸

Graphic arts operations are used to print newspapers, magazines, books, money, and other printed materials. There are six basic types of printing:

- Rotogravure, when an image is etched or engraved below the surface of a plate or cylinder;
- Flexographic, when an image is raised from the surface of a plate with a rubber image carrier;
- Offset lithographic, characterized by a planographic printing press, when an image goes from an ink-covered plate to a rubber-coated cylinder to a substrate;
- Letterpress, when a paper web is printed on both sides, one at a time, using heatset inks;
- Screen, when inks are forced through a stencil where image areas are porous; and
- Plateless, which includes electronic (laser printers) and electrostatic (xerographic copiers), magnetic, thermal (fax machines), and ink jet printing.

¹⁷ U.S. EPA. Emission Inventory Improvement Program, Technical Report Series Volume 3: Area Sources, Chapter 4: "Dry Cleaning" (May 1996), found at: <http://www3.epa.gov/ttn/chief/eiip/techreport/volume03/index.html>.

¹⁸ U.S. EPA. Emission Inventory Improvement Program, Technical Report Series Volume 3: Area Sources, Chapter 7: "Graphic Arts" (November 1996), found at: <http://www3.epa.gov/ttn/chief/eiip/techreport/volume03/index.html>.

Printing can occur on various substrates. Technology dictates the types of inks and coatings and defines emissions and controls available. As more small companies transition to digital printing, and as inks are reformulated and the industry becomes more efficient, the EFs become lower and the category contributes fewer VOCs.

When the District proposed Phase II VOC regulations, public comments from the Printing and Graphics Association Mid-Atlantic (PGAMA) indicated that there were 1539 workers in offset lithographic printing alone in the District in 2010. For the 2011 inventory, the District used employee estimates from the U.S. Bureau of Labor Statistics (BLS) for “printing press operators,” “print binding and finishing workers,” and “prepress technicians and workers”:
www.bls.gov/oes/current/oes_dc.htm

They added up to 1340 employees, a comparable number compared to EPA employee estimates. Then, the District subtracted point source emissions.

For the 2014 NEI, the Solvents Tool allows for employee-based or population-based activity data. EFs used in both approaches are based on 2013 Freedomia solvent usage data. The EF for 2014 is much higher than the EF for 2011. Instead of taking default Solvents Tool estimates for this category, the District referred to the BLS definitions for the employment categories used in 2011:

- Prepress technicians and workers, “Format and proof text and images submitted by designers and clients into finished pages that can be printed. Includes digital and photo typesetting. May produce printing plates.” (See <http://www.bls.gov/oes/current/oes515111.htm>)
- Printing press operators, “Set up and operate digital, letterpress, lithographic, flexographic, gravure, or other printing machines. Includes short-run offset printing presses.” (See <http://www.bls.gov/oes/current/oes515112.htm>)
- Print binding and finishing workers, “Bind books and other publications or finish printed products by hand or machine. May set up binding and finishing machines.” (See <http://www.bls.gov/oes/current/oes515113.htm>)

It was decided to replace Solvent Tool employment data with 2014 BLS data for only one of the three categories used in 2011 – printing press operators. There were 650 “Printing press operators” in the District in 2014. Then, the Solvents Tool was run using the employment-based mode and point source emissions (7.98 tons VOCs in 2014) were subtracted from the general printing and publishing category (SCC 40500597) to account for emissions from two large printing operations in the District – the U.S. Bureau of Engraving and Printing and the U.S. Government Printing Office. The results are comparable to estimates prior to 2011.

There is some overlap between the Solvents Tool graphic arts category and two CTG categories: lithographic and letterpress printing (NAICS 323110, 323119) and flexible packaging and printing (NAICS 322221, 326112, 322223, 3265111, 322224, 322225, 332999; 326111). The CTG requirements are incorporated into the District’s regulations, but the Solvents Tool does not assume VOC emissions limits from the District’s regulation on intaglio, flexographic, and

rotogravure printing at 20 DCMR 710, or the offset lithographic and letterpress printing at 20 DCMR 716, which were revised in 2012. Also, further adjustments were made to the District's NEI data for developing emissions inventories with no controls for use in the 2008 ozone NAAQS maintenance plan by excluding the OTC model rule credits applicable for this source category.

1.7.9 Commercial & Consumer Products¹⁹

Commercial and consumer solvents serve as propellants, aid in drying, and act as co-solvents and cleaning agents. This category includes personal care, household, and automotive aftermarket products, coatings and related products, adhesives and sealants, FIFRA-regulated products, and miscellaneous products.

The Solvents Tool estimates emissions for this category based on population. It does not assume VOC emissions limits from the District's consumer products regulations at 20 DCMR 719-737, which were revised in 2012. Also, further adjustments were made to the District's NEI data for developing emissions inventories with no controls for use in the 2008 ozone NAAQS maintenance plan by excluding the OTC model rule credits applicable for this source category.

1.7.10 Asphalt Paving and Roofing²⁰

Asphalt is used to pave, seal, and repair the surface of roads, parking lots, driveways, roofs, and runways. Asphalt cement, a composite binder or semi-solid residual left from petroleum refining after volatile chemical fractions have distilled off, is blended with a mineral aggregate. Asphalt cement thinned with petroleum distillates or diluents is called cutback asphalt, and asphalt cement thinned with water and emulsifying agents are called emulsified asphalts.

Source Category	SCC
Cutback asphalt*	2461021000
Emulsified asphalt	2461022000

*Cutback asphalt is banned during ozone season except for roofing

The manufacture, mixing, storage, use, or application of cutback asphalt is banned during ozone season at 20 DCMR 709, except for purposes of roofing or if the Mayor determines the ban is unreasonable. EPA assumes that no cutback asphalt is used in the District.

¹⁹ U.S. EPA. Emission Inventory Improvement Program, Technical Report Series Volume 3: Area Sources, Chapter 5: "Consumer and Commercial Solvent Use" (August 1996), found at: <http://www3.epa.gov/ttn/chief/eiip/techreport/volume03/index.html>.

²⁰ U.S. EPA. Emission Inventory Improvement Program, Technical Report Series Volume 3: Area Sources, Chapter 17: "Asphalt Paving" (April 2001), found at: <http://www3.epa.gov/ttn/chief/eiip/techreport/volume03/index.html>.

The District accepts EPA default estimates for VOCs and HAPs for this category. Documentation can be found in **Appendix M**.

Data & Assumptions

Emissions estimates for this category have not been revised since 2008. They are volume-based. In 2008, EPA purchased data on emulsified asphalt usage from an Asphalt Usage Survey from the Asphalt Institute:
www.asphaltinstitute.org

No controls for this category are assumed.

DRAFT

1.8 PORTABLE FUEL CONTAINERS (PFCs)

Portable fuel containers (PFCs, or gas cans) are consumer products used to store and transport fuel from gasoline service stations to homes and businesses for use by a wide variety of gasoline-powered equipment.

Source Category	SCC
portable fuel containers, residential, permeation	2501011011
portable fuel containers, residential, evaporation (includes diurnal losses)	2501011012
portable fuel containers, residential, spilling during transport	2501011013
portable fuel containers, residential, refilling at the pump, vapor displacement	2501011014
portable fuel containers, residential, refilling at the pump, spillage	2501011015
portable fuel containers, commercial, permeation	2501012011
portable fuel containers, commercial, evaporation (includes diurnal losses)	2501012012
portable fuel containers, commercial, spilling during transport	2501012013
portable fuel containers, commercial, refilling at the pump, vapor displacement	2501012014
portable fuel containers, commercial, refilling at the pump, spillage	2501012015

There are several sources of PFC emissions²¹:

- **Permeation**, which occurs after fuel has been stored in a can long enough for fuel molecules to infiltrate and saturate the can material;
- **Evaporation** (including diurnal loss), produced when stored fuel vapors escape through openings in a gas can subjected to daily fluctuations in ambient temperature;
- **Spilling during transport**, which occurs when fuel escapes or is spilled from a gas can during transit; and
- **Refilling at the pump**, when vapor escapes or when fuel is spilled from a gas can during refueling.

Vapor displacement and spillage while refueling nonroad equipment are included in EPA's nonroad inventory.

The District accepts EPA defaults for VOCs and HAPs for this category. Documentation can be found in **Appendix N**. The methodology is based on the regulatory impact analysis done for EPA's MSAT2 rule. EPA's defaults do not consider the District's adopted OTC's Phase II rules for PFCs at 20 DCMR 751-758, which became effective in 2012. Also, further adjustments were made to the District's NEI data for developing emissions inventories with no controls for use in the 2008 ozone NAAQS maintenance plan by excluding the OTC Phase I model rule credits applicable for this source category.

²¹ MDE 2005

1.9 GASOLINE DISTRIBUTION

Gasoline can spill onto the ground and vapors can escape into the atmosphere throughout the supply chain: from the refinery to the ultimate consumer at a gasoline service station. Emissions are influenced by factors such as temperature, barometric pressure, and Reid vapor pressure, which affect the evaporation rate of gasoline.

Source Category	SCC
Gasoline Distribution Stage I; Tank Trucks in Transit	2505030120
Pipeline Gasoline	2505040120
Gasoline Distribution Stage I; Bulk Terminals	2501050120
Gasoline Distribution Stage I; Bulk Plants	2501055120
Gasoline Distribution Stage I; Gasoline Service Station Unloading Submerged filling	2501060051
Gasoline Distribution Stage I; Gasoline Service Station Unloading Splash filling	2501060052
Gasoline Distribution Stage I; Gasoline Service Station Unloading Balanced Submerged filling	2501060053
Gasoline Distribution Stage II; Gasoline Service Stations, Stage 2	2501060100
Gasoline Distribution Stage I; Underground storage tank, breathing and emptying	2501060201
Aviation Gasoline Distribution: Stage I	2501080050
Aviation Gasoline Distribution: Stage II	2501080100

The District accepts EPA defaults for Stage I and Stage 2 emissions during gasoline distribution. **Stage II emissions are now estimated in the MOVES onroad model.**

The District accepts EPA defaults for aviation gas emissions. Documentation is available at **Appendix O (Stage I) and Appendix P (Stage II).**

1.9.1 Gasoline Distribution, Stage I²²

Stage I is the displacement of gas vapors from storage tanks during the transfer of gas from tank trucks at a service station.

Emissions are calculated for:

²² U.S. EPA. Emission Inventory Improvement Program, Technical Report Series Volume 3: Area Sources, Chapter 11: "Gasoline Marketing" (April 2001) and "Draft 1999 National VOC Inventory for Gasoline Distribution" (April 2003), found at: <http://www3.epa.gov/ttn/chief/eiip/techreport/volume03/index.html>.

- **Bulk terminals and plants**, which are intermediate distribution and storage points between terminals and dispensing outlets (usually point sources; NAICS 42471);
- **Tank trucks in transit**, which can leak and develop pressure in tanks thermal effects on vapor and liquid; if a tank is poorly sealed and the air becomes saturated with gasoline vapor, pressure can increase and venting may occur;
- **Tank truck unloading**, which is affected by whether the storage tank at a service station is equipped with submerged, splash, or balance filling apparatuses; and
- **Underground storage tank breathing**, which occurs when gasoline is drawn out of the tank into pump lines and air moves into the tank, causing gas to evaporate and emitting vapors.

There are no bulk terminals or plants in the District.

Activity data is based on FHWA monthly motor fuel sales reported by states²³, for example: www.fhwa.gov/policyinformation/motorfuel/jan12/jan12.pdf

Emissions can be reduced by the use of onroad vapor recovery (ORVR) systems and Stage I technology. Stage I emissions are regulated in the District at 20 DCMR 704. According to the rules, only submerged fill pipes are allowed, and at least 90% by weight of organic compounds in the vapors displaced must be captured.

1.9.2 Gasoline Distribution, Stage II

Stage II is the displacement of gas vapors from vehicle gas tanks during refueling. Emissions can occur due to spillage of gas or pre-fill and post-fill nozzle drip. Stage II controls are designed to capture vapors that would otherwise escape at the pump nozzle and recirculate them back into the underground tank.

Stage II emissions are regulated in the District at 20 DCMR 705.

1.9.3 Aviation Gas – Stage I & II

Aviation gas is the only aviation fuel that contains lead as a knock-out component. It is used for small reciprocating, piston-engine crafts in civil aviation. It is not the same as jet fuel, which is used for most aircraft (military, commercial, helicopters, etc.). Emissions occur during the Stage I process when aviation gas is shipped to airports and is filled into bulk terminals, and then into tanker trucks. Vapors get displaced during the transfer of gasoline from tank trucks to storage tanks, and vice versa. Stage II emissions occur during the transfer of fuel from tanker trucks into general aviation aircraft that causes vapors displacement into the atmosphere.

²³ The same data can be provided by the District's OCFO at DPW (the gas taxing agency), since they supply the data using DPW 551M forms to FHWA.

The amount of aviation gas consumed was obtained by EPA from EIA SEDS. In 2013, only one thousand barrels (42,000 gallons) of aviation gas was consumed in the District.

It was then allocated to counties using landings and take-offs (LTO) data from the Federal Aviation Administration (FAA) Terminal Area Forecasts, which suggests that there were 72 LTOs in the District in 2012 from the following heliports:

Heliport Locations	
Bolling Air Force Base	Sibley Memorial Hospital
Children's Hospital	South Capitol Street
Georgetown University Hospital	Spirit of Washington
Metropolitan Complex	Steuart Office Pad
MPD 2 nd District	U.S. Park Police Eagle's Nest
MPD 3 rd District	Walter Reed Emergency
MPD 5 th District	Washington Post
National Presbyterian Church	Washington Hospital Center

The pollutant code for tetraethyl lead was retired. EPA only accounts for the emissions of elemental lead.

DRAFT

1.10 WASTE DISPOSAL & MISCELLANEOUS

Additional waste disposal miscellaneous source categories emit VOCs and other pollutants.

Source Category	SCC
Open Burning - Yard Waste - Leaves	2610000100
Open Burning - Yard Waste - Brush	2610000400
Open Burning - Land Clearing Debris	2610000500
Open Burning - Household Waste	2610030000
Landfills: Muni Dump/Crush/Spread New Material	2620030001
Publically Owned Treatment Works (POTW)	2630020000
Waste Disposal: Total All Processes	2650000000
Waste Disposal: Shredding	2650000002
Charcoal Grilling: Residential	2810025000
Cremation - Human	2810060100
Dental Preparation and Use	2850001000
General Laboratory Activities	2851001000
Lamp Breakage (Landfill emissions)	2861000000
Lamp (Fluorescent) Recycling	2861000010

The shaded categories are not inventoried in the District. Open burning is banned at 20 DCMR 604.

The District has not inventoried the following categories since before 2007: Bakeries, Breweries, Composting, Incineration, LUSTs, and MSWLs. In 2014, EPA discontinued inventories for structure and vehicle fires.

The District accepts EPA's defaults for charcoal grilling and dental categories, but provided emissions estimates for POTWs.

1.10.1 Publicly Owned Treatment Works (POTWs)

POTWs are wastewater treatment plants owned by a state, municipality, city, or town. Wastewater is collected and treated to be reused or discharged into surrounding waterways. While the wastewater is held and treated, VOCs due to contaminants and byproducts in the water are released into the air.

There is one large POTW in the District operated by the District of Columbia Water and Sewer Authority, the Blue Plains Wastewater Treatment Plant. According to the DC Water website, Blue Plains has the capacity to treat over 370 million gallons of water per day (MGD).²⁴

²⁴ <https://www.dcwater.com/about/facilities.cfm>

1.10.2 Residential Charcoal Grilling

Residential charcoal grilling is a new category for the District in 2014. Emissions include emissions from the burning of charcoal, and all types of outdoor meat grilling. Combustion emissions from gas barbeques are not included.

The District accepts EPA defaults for this category. Documentation on backyard barbeques can be found at **Appendix Q**.

1.10.3 Dental Amalgams

The dental category estimates mercury emissions from materials used to restore teeth and prepare amalgams at a dentist's office. EPA estimates allocate national mercury usage by the dental industry to counties by business patterns. They assume that 2 percent of mercury (Hg) used by dentists is emitted.

In 2008, EPA used 1995 data due to budget constraints. Since there are dental offices in the city, the District accepts EPA defaults for this category.

DRAFT

2.0 MARINE, AIR, AND RAIL (MAR)

Marine, air, and railroad emissions are part of the “nonroad” sector but are not inventoried using EPA’s traditional NONROAD model, so must be calculated separately by states.

Source Category	SCC
Marine	2505020000
Air (point)	2275087000
Air (nonpoint)	2275050011 2275050012
Line haul locomotives, Class I operations (CSX)	2285002006
Line haul locomotives, Passenger trains (Amtrak)	2285002008
Line haul locomotives, Commuter lines (MARC, VRE)	2285002009
Yard locomotives (“switchers”)	2285002010

There are no nonpoint marine or air emissions in the District. Rail emissions are based on diesel consumption by locomotives.

Emissions in and around railyards can be due to locomotive engines, cargo handling equipment, and other associated modes of transportation. EPA estimates emissions for this category under the assumption that switchers are the single largest source of air emissions in railyards.²⁵ There is one Class I railyard in the District operated by CSX along Benning Road that is inventoried as a point source.

2.1 Marine²⁶

This marine category is for emissions from ocean-going ships and barges used to transport petroleum liquids. Activities include petroleum vessel loading and ballasting (when materials are used to stabilize a ship in the water), which typically occur in urban coastal areas and inland waterways, and evaporative losses while in transit. The category does not include emissions from fuel consumed by vessels while in transit or in port.

Ocean-bearing marine vessels very rarely, if ever, travel near the District, and there are no marine ports, so this category is not applicable in the District.

2.2 Air

²⁵ Locomotive Emission Inventories for the United States from ERTAC Rail (Bergin, Michelle S; Matthew Harrell, and Mark Janssen), found at: <http://www3.epa.gov/ttnchie1/conference/ei20/session8/mbergin.pdf>

²⁶ U.S. EPA. Emission Inventory Improvement Program, Technical Report Series Volume 3: Area Sources, Chapter 12, “Marine Vessel Loading, Ballasting, and Transit” (April 2001), found at: <http://www3.epa.gov/ttn/chief/eiip/techreport/volume03/index.html>.

Air emissions include emissions due to aircraft exhaust, the use of auxiliary power units, and ground support for all planes that use any fuel located at an airport or heliport. Also, EPA estimates lead emissions during flights (above 3000 feet and outside of the LTO cycle).

The District has no airports, but there are heliports at hospitals and police stations that are inventoried by EPA as point sources. There are no nonpoint air emissions for this category.

2.3 Railroad

The railroad sector accounts for emissions from locomotives that operate on diesel fuel. There are two main categories of locomotives: line-hauls, which are used to move freight trains between cities over relatively long distances, and switchers, which operate within railyards. Emissions tend to be concentrated in densely populated urban areas.

The District receives activity data directly from railroad staff. Fuel use has been estimated for portions of track located inside the District of Columbia based on information such as the number of trips per train per day, mileage of tracks within the District, approximation of gallons per mile, and the number of days the trains run per year.

Emissions are estimated by the District using EFs from the ERTAC Rail process, a subset of the 2008 ERTAC process. In 2008, ERTAC Rail was able to get confidential fleet mix data based on Tier rating per Class I company. Locomotive engines are certified to meet or exceed the emission standard for each Tier, and Tiers are based on the year an engine was built and determines allowable emission limits. ERTAC Rail also obtained system-wide line-haul fuel consumption and gross ton-mile data, which can vary by railroad carrier depending on fleet mix, system terrain, speeds, loading and weighting of cargo, train type, and operating practices. Link-level line-haul GIS layer activity datasets were also available, so that weighted emission factors could be developed.

Documentation on the ERTAC Rail process can be found in Appendices R, S, and T. The District accepts EPA's temporary allocations of emissions to shapefiles for use in Geographical Information Systems (GIS). Emission inventories related to the switchyard locomotives and commuter rail operations were estimated separately.

2.3.1 Class I Line Hauls

Class I line haul operations have minimum operating revenues of \$401.1 million. The only Class I operation in the District is CSX, which operates and maintains nearly 70 miles of track (a single

main track, other main track, yard tracks and sidings) as of December 31, 2014. Approximately 18 miles of track are for diesel trains²⁷.

Fuel consumption and emissions vary based on local terrain, fleet mixes, track grade, speed, alternative duty-cycles, and freight tonnage generally measured in millions of gross tons (MGT).

2.3.2 Class I Passenger Trains

Line haul passenger trains are excluded from EPA's Class I inventories because they have different characteristics. Amtrak (the National Railroad Passenger Corporation) runs diesel trains²⁸ on roughly 12.5 miles of CSX-owned tracks outside of Union Station, the only Amtrak terminal in the city, and within the Ivy City Rail Yard, a large Amtrak maintenance facility²⁹. Since Amtrak operates a daily service, emission estimates were scaled to 7 days a week or 365 days a year to achieve the daily value.

2.3.3 Class II Locomotives

Line haul commuter trains are regional Class II operations that have at least 350 route miles or revenues of roughly \$40 million. There are two that operate in the District:

- Maryland Transit Administration, or MARC – Operates diesel trains on roughly 13 miles of track within the District:
 - Brunswick Line – 5 miles, 18 trains
 - Camden Line – 5 miles, 18 trains
 - Penn Line – 3 miles, 16 trains
- Virginia Railway Express, or VRE – Operates diesel trains on roughly 3.3 miles of track:
 - Manassas Line – 3.3 miles, 18 trips per day
 - Fredericksburg Line, 22 trips per day

MARC operates every day of the week while VRE serves only during the week Monday-Friday. Since MARC reduces its service during the weekend, daily emission estimates were scaled to 6 days a week or 312 days for the year for both MARC and VRE. The trains operate at a rate of approximately 2 gallons per mile, with an additional 10 percent cushion added for idling between trips.

2.3.4 Class III Locomotives

²⁷ See CSX website at: <https://www.csx.com/index.cfm/about-us/state-information/washington-d-c/> (found January 2016).

²⁸ Amtrak trains along a third route up north are electrified.

²⁹ Amtrak does contract work for MARC's electric locomotives at Ivy City Yard, and Metro's Brentwood maintenance facility is located there. See "Heavy Rail Systems in D.C." at <http://www.belowthecapital.org/rail/> (January 2016).

Switchers are shortline Class III operations that have less than 350 route miles and less than \$40 million in revenue, including “switching and terminal” companies. CSX has indicated they operate roughly 7 or 8 switchers, depending on the business cycle in a given year. Amtrak also operates switchers, which are tracked between Union Station and the Ivy City Yard. Since switchers operate every day of the week, emission estimates were scaled to 7 days a week or 365 days for the year.

DRAFT

4.0 OZONE SEASON DAY EMISSIONS

Ozone season day emissions account for temporal variation in emissions throughout the year from seasonal differences. Emissions are also estimated by frequency of operation during the week. Ozone season day emissions were estimated for CO, NO_x, and VOCs based on the following equation:

Typical Ozone

$$\text{Season Daily Emissions} = \frac{(\text{Annual tons/yr})(2000 \text{ lb/ton})(\text{SAF/peak ozone season as \% of yr})}{\text{Operating schedule as in (days/week)(weeks/year)}}$$

Seasonal adjustment factors (SAFs) for 2011 were developed and shared by the Maryland Department of the Environment (MDE). For SCCs where there was no SAF, an SAF was developed based on other MDE SAFs.

$$\text{SAF} = \frac{\text{Emissions per year}}{(\text{Operating days/week}) (\text{Operating weeks/year})}$$

EPA's methods used to include heating degree days (HDD) to spatially apportion to counties. HDD calculations are not necessary for the District, since it is one single jurisdiction, except possibly for seasonal calculations.