2020 National Emissions Inventory Technical Support Document: Waste Disposal – Publicly-Owned Treatment Works

EPA-454/R-23-001kk
March 2023

2020 National Emissions Inventory Technical Support Document: Waste Disposal - Publicly-Owned Treatment Works

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Air Quality Assessment Division
Research Triangle Park, NC

Contents

List of Tables

37.1.1 Waste Disposal - Publicly-Owned Treatment Works

37.2 Sector Descriptions and Overview

This source category, Publicly Owned Treatment Works (POTW), includes treatment works owned by a state, municipality, city, town, special sewer district, or other publicly owned and financed entity as opposed to a privately (industrial) owned treatment facility. The definition includes intercepting sewers, outfall sewers, sewage collection systems, pumping, power, and other equipment. The wastewater treated by these POTWs is generated by industrial, commercial, and domestic sources [ref 1]. The SCC that EPA uses for estimated nonpoint emissions is 2630020000; the SCC description is "Waste Disposal, Treatment, and Recovery; Wastewater Treatment; Public Owned; Total Processed".

37.3 EPA-developed estimates

The calculations for estimating the emissions from POTWs involve multiplying the wastewater flow rate by emissions factors for VOCs, NH3, and 53 HAPs.

37.3.1 Activity data

The activity data for this source category is the wastewater flow rate. The EPA Clean Watersheds Needs Survey provides flow rate by facility and estimates the national POTW flow rate in 2012 for all facilities as 32,822 million gallons per day (MMGD) [ref 2]. The nationwide flow rate includes Puerto Rico and the US Virgin Islands. To estimate flow rates in 2020, facility-level daily flow rates in 2012 are multiplied by the ratio of 2020 to 2012 population in the county where the facility resides [ref 3]. County-level annual 2020 wastewater flow rates are calculated by summing the daily flow rates for all POTWs within the county and multiplying by 365 days in a year.

$$FR_{c,2020} = \sum_{f=1}^{n} FR_{f,2012} \times 365 \times \frac{P_{c,2020}}{P_{c,2012}} \quad (1)$$

Where:

$FR_{c,2020}$ = The annual wastewater flow rate of county *c* in 2020
$FR_{f,2012}$ = The daily wastewater flow rate at facility *f* in 2012
$P_{c,2020}$ = Total population of county *c* in 2020
$P_{c,2012}$ = Total population of county *c* in 2012

37.3.2 Allocation procedure

For a given county, county-level wastewater flow rates are calculated by summing the flow rates for all POTWs within the county.

37.3.3 Emission factors

Emissions factors for POTWs are provided in the "Wagon Wheel Emission Factor Compendium" on the 2020 NEI Supporting Data and Summaries site. The ammonia emissions factor was obtained from an EPA

report [ref 4] and the VOC emissions factor was based on a TriTAC study [ref 5]. Emissions factors for HAPs were derived using 1996 area source emissions estimates that were provided by Bob Lucas [ref 6] and the 1996 nationwide flow rate [ref 7]. These HAP emissions factors were then multiplied by the 2008 to 2002 VOC emissions factor ratio (0.85/9.9) to obtain the final HAP emissions factors applied in the 2020 inventory.

37.3.4 Controls

There are no controls assumed for this category.

37.3.5 Emissions

Emissions are estimated by multiplying an emissions factor by the county flow rate. A conversion factor was used to convert pounds to tons.

$$E_{p,c,2020} = FR_{c,2020} \times EF_p \times \frac{1\ ton}{2000\ lbs.} \quad (2)$$

Where:

$E_{p,c,2020}$ = Nonpoint emissions in 2020 of pollutant *p* in county *c*, in tons
$FR_{c,2020}$ = Flow rate in 2020 in county *c*, in MMGY
EF_p = Emissions factor for pollutant *p*, in lbs. per MMGAL

37.3.6 Point source subtraction

The county-level flow rates include all facilities reported as POTWs in the EPA Clean Watersheds Needs Survey. In some cases, SLT agencies might include facilities under their point source inventory reporting. In these cases, SLT agencies have two options for submitting state-level point source data to EPA for point source subtraction:

- **Option A:** County-level flow rates associated with POTWs reported as point sources; or
- **Option B:** County-level emissions of VOC and NH3 for POTWs reported as point sources.

37.3.7 Example calculations

Table 37-1 lists sample calculations to determine the benzene emissions for nonpoint source POTWs. The values in these equations are demonstrating program logic and are not representative of any specific NEI year or county.

Table 37-1: Sample calculations for VOC emissions for nonpoint source POTWs

Eq. #	Equation	Values	Result
1	$FR_{c,2020} = \sum_{f=1}^{n} FR_{f,2012} \times 365 \times \frac{P_{c,2020}}{P_{c,2012}}$	$2.866\ MMGD \times 365\ days \times \frac{55{,}504\ people}{54{,}927\ people}$	1,057.07 MMGY

Eq. #	Equation	Values	Result
2	$E_{p,c,2020} = FR_{c,2020} \times EF_p \times \frac{1\ ton}{2000\ lbs.}$	$1{,}057.07 MMGY \times 0.00673\ lb/MMG \times \frac{1\ ton}{2000\ lbs.}$	0.003557 tons benzene per year

37.3.8 Improvements/Changes in the 2020 NEI

No changes were made to methods for the 2020 NEI. Activity data was updated to reflect best available data for the NEI cycle. There were 49 HAPs removed from the Wagon Wheel that are now calculated in EIS using HAP augmentation from VOC. The only remaining HAPs calculated in the Wagon Wheel tool are Tetrachloroethylene, Methyl Chloroform, Methylene Chloride.

37.3.9 Puerto Rico and U.S. Virgin Islands

Emissions from Puerto Rico are calculated using the same method described above. For the U.S. Virgin Islands, emissions are not multiplied by the ratio of 2020 to 2012 population since 2020 Census Data does not exist for the U.S. Virgin Islands.

37.4 References

1. U.S. EPA, 64FR57572, National Emission Standards for Publicly Owned Treatment Works, Final Rule, 40 CFR Part 63, 26 October 1999.
2. U.S. Environmental Protection Agency, Clean Watersheds Needs Survey 2012 Data and Reports, Detail Report.
3. U.S. Census Bureau. Total Population, American Community Survey.
4. Stephen M. Roe, Melissa D. Spivey, Holly C. Lindquist, Kirstin B. Thesing, and Randy P. Strait, E.H. Pechan & Associates, Inc., Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources – Draft Final Report, prepared for U.S. Environmental Protection Agency, Emission Inventory Improvement Program, April 2004.
5. Prakasam Tata, Jay Witherspoon, Cecil Lue-Hing (eds.), VOC Emissions from Wastewater Treatment Plants: Characterization, Control, and Compliance, Lewis Publishers, 2003, p. 261.
6. Memorandum from Bob Lucas, U.S Environmental Protection Agency to Greg Nizich, U.S. Environmental Protection Agency, "Review of Baseline Emissions Inventory," 16 October 1998.
7. U.S. Environmental Protection Agency, Facilities Database (Needs Survey) - Frequently Asked Questions, accessed 30 April 2019.

United States Environmental Protection Agency	Office of Air Quality Planning and Standards Air Quality Assessment Division Research Triangle Park, NC	Publication No. EPA-454/R-23-001kk March 2023