AREA SOURCE EMISSIONS FOR CALENDAR YEAR 2023
METHODOLOGY DOCUMENTATION
COMPOSTING - SOLID WASTE (UNSPECIFIED) - GREENWASTE

DESCRIPTION OF CATEGORY

This category estimates the area source emissions of VOC and NH3 from greenwaste composting operations. Greenwaste composting operations produce a finished compost involving the active phase biodegradation and subsequent curing phase of greenwaste materials. Greenwaste composting is microbiological decomposition of greenwaste by itself, or in combination with foodwaste, or up to 20 percent manure, per pile volume basis.

CES	EIC	Name
90473	199-170-0240-0115	COMPOSTING - SOLID WASTE (UNSPECIFIED) - GREENWASTE

METHODOLOGY AND ASSUMPTIONS

Emission methodology has not been updated since the last emissions inventory. VOC and NH3 emissions from greenwaste composting operations are estimated based on the methodology developed in the Annual Emission Reporting (AER) guideline document for greenwaste composting operations (South Coast AQMD, 2023) and based on South Coast AQMD Rule 1133.3 requirements (South Coast AQMD, 2011).

Controlled Emission Factors

This section comes from the 2023 AER guideline report. VOC and NH3 emissions can be estimated using equation $\boldsymbol{Emission} = \boldsymbol{Throughput} \times \boldsymbol{Controlled\ Emission\ Factor}$

(**1**) when the emissions are being controlled prior to be released to the atmosphere.

$$\boldsymbol{Emission} = \boldsymbol{Throughput} \times \boldsymbol{Controlled\ Emission\ Factor} \quad (1)$$

Where,

- *Emission*: VOC or NH3 emissions expressed in pounds per year (lb/yr).
- *Throughput*: Mass of foodwaste, manure, and greenwaste in tons per year (ton/yr) as received by a facility and processed through composting.
- *Controlled Emission Factor (EF_c)*: These are factors determined based on the types of emission control that exists at the facility such as best management practices (BMPs) or additional South Coast AQMD approved control system as described below.

i) *Best Management Practices*: The BMPs are defined as when greenwaste composting piles are covered with at least six inches of finished compost within 24 hours of initial pile formation, and not turned for the first seven days of active phase composting. In addition, for the first fifteen days

of initial pile formation and within six hours before turning, the top half of the pile is kept wet to a depth of at least three inches.

ii) *Add-On Control*: South Coast AQMD approved emission control system is used for greenwaste composting piles (i.e., biofiltration, etc.)

The controlled emission factors are listed under Table 1 for BMPs or add-on control.

Table 1. Controlled Emission Factors for Greenwaste Composting Operations

Control Method	VOC EFc (lbs/ton of throughput)	NH3 EFc (lbs/ton of throughput)
Best Management Practices (BMPs)	2.97*	0.57**
Add-On Control	1.27***	0.29***

* This value assumes 40% control applied to the active phase only
** This value assumes 20% control applied to the active phase only
*** This value assumes 80% control applied to the active phase only

Activity Data

Throughput is updated with the 2023 actual annual throughput the facilities reported to the South Coast AQMD under the Rule 1133 Registration/Annual Update requirements. If the 2023 throughput data was not readily available for the facility, the 2022 total actual throughput was used as a substitute.
If throughput data was not readily available for the facility (22 facilities total, all using BMPs), an estimation of throughput was calculated based on the composting facility acreage as reported to the CalRecycle Solid Waste Information System (SWIS, 21 facilities). If SWIS data was not available (one facility), composting facility acreage was estimated using publicly-available satellite image tools.
A total of 13 composting facilities using BMPs reported to South Coast AQMD under the Rule 1133 requirements for years 2023 or 2022, reporting a total of 223,912.3 tons of composting feedstock used. The total acreage of these 13 composting facilities using BMPs is 212.8. The calculated composting tonnage per acre is determined to be approximately 1,000 tons per acre. On a facility-by-facility basis, composting tonnage per acre varied from as little as 84 tons per acre to as much as 13,761 tons per acre.
Using this conversion factor of 1,000 tons per acre, estimates of composting feedstock were calculated for the other 22 composting facilities using BMPs that did not recently report to South Coast AQMD under the Rule 1133 requirements.
The following assumptions are made in calculating emissions for this area source category:

- The total actual throughput data provided by each greenwaste composting facility as reported in the Rule 1133 Registration/Annual Update database is accurate.
- The record on the greenwaste composting operations reported to Rule 1133 Registration/Annual Update is comprehensive and is the best resource available.
- The total acreage for each greenwaste composting facility as reported to SWIS or estimated by satellite image tools is accurate.

The number of facilities conducting greenwaste composting operations and the throughput of greenwaste composting operations has increased substantially from when last reported in the 2022 AQMP, then based on 2018 data. The reason for this increase is believed to be associated with substantial implementation of California Senate Bill 1383 (SB 1383) regarding short-lived climate pollutants. SB 1383 set a target to reduce organic waste, including greenwaste, sent to landfills by 75% by 2025 and the increase in the number of composting facilities and greenwaste composting throughput is a result of increased diversion of greenwaste from landfills to composting facilities.

SUMMARY AND NEW EMISSIONS

Total Throughput and Emission Factors

Facilities' annual actual throughput comes from C/Y 2022-2023 Rule 1133 database. Total facility throughput by county and control method with VOC and NH3 emission factors for greenwaste composting operations are given in Table 2.

Table 2. County-Specific and Process-Specific Throughput and VOC and NH3 Emission Factors for Greenwaste Composting Operations

County	Control Method	# of Facilities	Throughput (tons/year)	EFVOC (lbs/ton of throughput)	EFNH3 (lbs/ton of throughput)
Los Angeles	BMPs	7	39,335	2.97	0.57
Orange	BMPs	9	79,508	2.97	0.57
Riverside*	BMPs	7	69,722	2.97	0.57
Riverside*	Add-On Control	1	28,425	1.27	0.29
San Bernardino	BMPs	12	224,947	2.97	0.57
San Bernardino	Add-on Control	1	74,750	1.27	0.29

* South Coast Air Basin only.

VOC and NH3 Emissions

Total VOC and NH3 emissions in the South Coast Air Basin are estimated in Table 3 using controlled emissions factors shown in Table 2.

Table 3. Total VOC and NH3 Emissions in the South Coast Air Basin

County (Control Method)	Throughput (tons/year)	EFVOC (lbs/ton)	EFNH3 (lbs/ton)	VOC (tons/year)	NH3 (tons/year)
Los Angeles (all)	39,335	2.97	0.57	58.41	11.21
Orange (all)	79,508	2.97	0.57	118.07	22.66
Riverside (all)	98,147	N/A	N/A	121.59	23.99
(BMPs)	69,722	2.97	0.57	103.54	19.87
(Add-On Control)	28,425	1.27	0.29	18.05	4.12
San Bernardino (all)	299,698	N/A	N/A	381.51	74.95
(BMPs)	224,947	2.97	0.57	334.05	64.11
(Add-On Control)	74,750	1.27	0.29	47.47	10.84
South Coast Air Basin	516,687	N/A	N/A	679.58	132.81

Table 4. Emissions and Throughput for Base Year 2023 (for the South Coast Air Basin)

	2022 AQMP*		Prospective SIP/AQMP**	
Throughput (tons)	186,465		516,687	
Pollutant	VOC	NH3	VOC	NH3
Emissions (tpy)	212	42	680	133
Emissions (tpd)	0.58	0.12	1.86	0.36

* Prior to substantial implementation of SB 1383

** After substantial implementation of SB 1383

REFERENCES

1. https://www.aqmd.gov/docs/default-source/planning/annual-emission-reporting/guidecalcgreenwaste.pdf?sfvrsn=6.
2. South Coast AQMD, Final Staff Report for Proposed Rule 1133.3 – Emission Reductions for Greenwaste Composting Operations, July 2011.