

# APPENDIX B: CITY OF SAN DIEGO GREENHOUSE GAS EMISSIONS INVENTORY METHODOLOGY AND UPDATES

Supplement to 2025 Annual Climate Action Plan Report

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Prepared for the City of San Diego



Prepared by the Energy Policy Initiatives Center



## About EPIC

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## B1 OVERVIEW

This document presents a summary of the greenhouse gas (GHG) emissions estimates for the City of San Diego for calendar years 2019–2024 and the methods used. In this document, the government agency of City of San Diego will be referred to as ‘the City’, and the physical boundaries and activities that occur within them will be referred to as ‘the city’.

This document includes the following sections:

- Section B2 describes the background sources and common assumptions used for the GHG emissions inventory;
- Section B3 provides the 2019–2024 GHG emissions inventory results summary;
- Section B4 provides the methods used to prepare each category of the inventory; and
- Section B5 provides a log of refinements to prior-year (2019–2023) inventory calculations reported in previous Annual Reports. Historical revisions are necessary when improved activity data or more comprehensive emission factor studies for the prior years become available while developing the latest 2024 inventory calculation. Consistent with the Intergovernmental Panel on Climate Change (IPCC) guidance on time-series integrity, this report applies such updates retroactively across all affected years rather than the most recent year alone which would otherwise risk misrepresenting emissions trends. Therefore, emissions estimates for a given year may be different between editions of the Annual Reports as data are updated.<sup>1</sup>

Rounding is used for the final GHG values within the tables and figures throughout the document. Values are not rounded in the intermediary steps in any calculation. Because of rounding, some totals may not equal the values summed in any table or figure.

## B2 BACKGROUND

### B2.1 Greenhouse Gases

The primary GHGs included in the emissions estimates presented here are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O). Each GHG has a different capacity to trap heat in the atmosphere, known as its global warming potential (GWP), which is normalized relative to CO<sub>2</sub> and expressed in carbon dioxide equivalents (CO<sub>2</sub>e). In general, the 100-year GWPs reported by the Intergovernmental Panel on Climate Change (IPCC) are used to estimate GHG emissions. The GWPs used in this inventory are from the IPCC Fourth Assessment Report (AR4),<sup>2</sup> provided in Table 1. The GWPs used in this inventory are consistent with the California statewide GHG inventories and the national GHG inventories.<sup>3</sup>

**Table 1: Global Warming Potentials Used in GHG Emission Inventory & Projections**

Greenhouse Gas	Global Warming Potential
Carbon dioxide (CO <sub>2</sub> )	1
Methane (CH <sub>4</sub> )	25

<sup>1</sup> California Air Resources Board (CARB): [California Greenhouse Gas Emissions for 2000 to 2023. Trends of Emissions and Other Indicators. \(2025\)](#)

<sup>2</sup> [IPCC Fourth Assessment Report: Climate Change 2007: Direct Global Warming Potentials \(2013\).](#)

<sup>3</sup> Some CARB programs, other than the statewide GHG inventory, may use different GWPs. For example, the short-lived climate pollutants (SLCP) strategy uses the 20-year GWP because the SLCP has greater climate impacts in the near-term compared to the long-lived GHGs.

Nitrous oxide (N <sub>2</sub> O)	298
IPCC Fourth Assessment Report, 2013.	

## B2.2 Demographics

California Department of Finance develops population and housing estimates for cities and counties in the State. The population and housing estimates used in the inventory are provided in Table 2.<sup>4</sup>

**Table 2: Population, Housing, and Jobs Estimates within the City of San Diego (2019–2024)**

Year	Population Estimates	Total Housing Estimates (Units)	Occupied Housing Estimates (Units)
2019	1,389,543	545,645	514,548
2020	1,383,020	548,934	515,676
2021	1,376,694	552,410	518,029
2022	1,375,403	558,788	524,566
2023	1,387,001	565,822	531,199
2024	1,394,317	571,542	536,856

2019 population and housing estimates are benchmarked against 2010 census, and 2020 - 2024 population and housing estimates are benchmarked against the 2020 census. Population and housing estimates are updated to reflect the most recent estimates by the California Department of Finance.  
 Housing unit types include single detached units, single attached units, two to four units, five plus, or apartment units, and mobile homes.  
 California Department of Finance 2021, 2025

## B3 SUMMARY OF 2019–2024 GHG EMISSIONS INVENTORY

### B3.1 Greenhouse Gas (GHG) Emissions Inventory

In 2024, total emissions were 8.1 million metric tons of carbon dioxide equivalent (MMT CO<sub>2</sub>e), a 23% reduction from the 2019 baseline and 3% reduction from 2023. GHG emissions by category from San Diego in 2019–2024 are shown in Table 3.

**Table 3: Citywide Greenhouse Gas Emissions (2019 – 2024)**

Emissions Sector	2019 Emissions <sup>1</sup> [MT CO <sub>2</sub> e]	2019 Emissions Revised <sup>2</sup> [MT CO <sub>2</sub> e]	2020 Emissions [MT CO <sub>2</sub> e]	2021 Emissions [MT CO <sub>2</sub> e]	2022 Emissions [MT CO <sub>2</sub> e]	2023 Emissions [MT CO <sub>2</sub> e]	2024 Emissions [MT CO <sub>2</sub> e]
On-Road Transportation	5,805,000	5,854,000	4,650,000	4,683,000	4,628,000	4,674,000	4,637,000
Electricity <sup>3</sup>	2,375,000	2,336,000	2,286,000	1,714,000	1,558,000	1,594,000	1,475,000
Natural Gas <sup>4</sup>	1,911,000	1,912,000	1,827,000	1,918,000	1,730,000	1,800,000	1,710,000
Solid Waste	277,000	277,000	273,000	216,000	212,000	213,000	216,000
Off-Road Transportation (Construction)	70,000	69,000	57,000	57,000	57,000	57,000	57,000

<sup>4</sup> California Department of Finance: [E-4 & E5 Population and Housing Estimates for Cities, Counties, and the State, 2020-2025 with 2020 Census Benchmark](#) (May 2025), accessed May 2025. [E-4 Historical Population Estimates for Cities, Counties, and the State, 2011-2020 with 2010 Census Benchmark](#) (May 2021), accessed May 2025.

Emissions Sector	2019 Emissions <sup>1</sup> [MT CO <sub>2</sub> e]	2019 Emissions Revised <sup>2</sup> [MT CO <sub>2</sub> e]	2020 Emissions [MT CO <sub>2</sub> e]	2021 Emissions [MT CO <sub>2</sub> e]	2022 Emissions [MT CO <sub>2</sub> e]	2023 Emissions [MT CO <sub>2</sub> e]	2024 Emissions [MT CO <sub>2</sub> e]
Equipment Only)							
Water	68,000	61,000	70,000	66,000	65,000	57,000	51,000
Wastewater	26,000	26,000	23,000	24,000	13,000	13,000	12,000
<b>Total Emissions</b>	<b>10,532,000</b>	<b>10,535,000</b>	<b>9,186,000</b>	<b>8,678,000</b>	<b>8,263,000</b>	<b>8,408,000</b>	<b>8,158,000</b>

<sup>1</sup> 2019 Emissions match those reported in the 2022 CAP  
<sup>2</sup> 2019 Emissions updated to reflect best available data. This report will reference the 2019 Revised Emissions for the remainder of this report. These values are the same as in the 2024 Annual Report.  
<sup>3</sup> Historical emissions from electricity have been modified in this Annual Report to incorporate newly public data for direct access electricity customers as well as more granular electricity consumption data received from SDG&E.  
<sup>4</sup> Historical emissions from natural gas have been modified to reflect more granular natural gas consumption data received from SDG&E.  
 Sums may not add up to totals due to rounding. GHG emissions for each category are rounded to the nearest thousand. Values are not rounded in the intermediary steps in the calculation.  
 MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent.  
 Energy Policy Initiatives Center, University of San Diego 2026

This report will reference the 2019 revised emissions for the remainder of the report and will refer to them as the ‘2019 emissions.’ More information on the differences between the methods, data availability, and sources used to calculate GHG emissions in the 2022 CAP and this report are provided in Section B5: Methodology Differences and Data Refinement. Table 4 shows how emissions in each category have changed relative to 2019.

**Table 4: Emissions Change from 2019 Baseline by Emissions Sector (%)**

Emissions Sector	2019	2020	2021	2022	2023	2024
On-Road Transportation	--	-21%	-20%	-21%	-20%	-21%
Electricity	--	-2%	-27%	-33%	-32%	-37%
Natural Gas	--	-4%	0%	-10%	-6%	-11%
Solid Waste	--	-1%	-22%	-23%	-23%	-22%
Off-Road Transportation (Construction Equipment Only)	--	-17%	-17%	-17%	-17%	-17%
Water	--	15%	8%	7%	-7%	-16%
Wastewater	--	-12%	-8%	-50%	-50%	-54%
<b>Total Emissions</b>	--	<b>-13%</b>	<b>-18%</b>	<b>-22%</b>	<b>-20%</b>	<b>-23%</b>

Energy Policy Initiatives Center, University of San Diego 2026

In 2024, total emissions were 8.1 MMTCO<sub>2</sub>e, a 23% reduction from the 2019 baseline and a 3% decrease from 2023. Most citywide emissions reductions can be attributed to changes in the transportation and building energy sectors given their relative emissions scale to other sectors, including: (1) an increase in renewable electricity supplied to the city, (2) a reduction in both natural gas and electricity consumption, (3) a citywide reduction in vehicle miles traveled, and (4) an increase in on-road vehicle efficiency and adoption of electric and plug-in hybrid vehicles. While water and wastewater constitute a

small (1% combined) portion of the city’s overall emissions, the sectors have achieved notable reductions compared to baseline (23% and 54% reduction, respectively).

For more information on GHG changes and CAP performance, refer to Appendix A: Progress Tracking Towards CAP Measures.

### B3.2 Per Capita Greenhouse Gas Emissions

The 2019 – 2024 per capita GHG emissions in the city are given in Table 5. This represents emissions from the seven emissions categories analyzed.

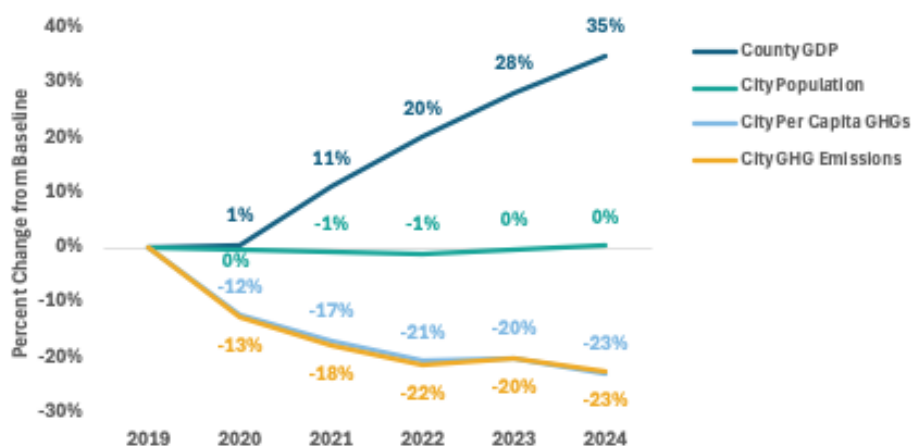
**Table 5: Per Capita GHG Emissions (2019 – 2024)**

Year	2019	2020	2021	2022	2023	2024
Total Emissions (MMTCO <sub>2</sub> e)	10.54	9.19	8.68	8.26	8.41	8.16
Total Population	1,389,543	1,383,020	1,376,694	1,375,403	1,387,001	1,394,317
Per Capita GHG Emissions (MTCO <sub>2</sub> e per capita)	7.58	6.64	6.30	6.01	6.06	5.85
MT CO <sub>2</sub> e = metric tons of carbon dioxide equivalent Per capita emissions are based on six emission categories only and cannot be compared with California statewide per capita emissions or per capita emissions targets. 2019 population is based on 2010 census benchmark. 2020 - 2024 population estimates are based on 2020 census benchmark. Populations are updated with the latest California Department of Finance population estimates. Energy Policy Initiatives Center, University of San Diego 2026						

Figure 2 shows countywide Global Domestic Product (GDP) growth compared to the city population and GHG emissions changes since 2019. County GDP is used as city-specific GDP data is not available. From 2019 to 2024, the per capita GHG emissions in the city reduced 23%, while the population remained largely stable<sup>5</sup>.

<sup>5</sup> Per capita emissions from the city are not comparable to per capita emissions retrieved from the California statewide GHG emissions inventory, as the statewide inventory includes emissions from all economic sectors of the state. These would include emissions from aviation, marine vessels, all offroad equipment categories, industrial fuels, and other combustion fuels.

**Figure 1: Changes in County GDP Compared to Citywide Population and GHG Emissions from 2019 Baseline**



GDP listed is for San Diego County. Population and emissions are for the city.  
 CA Dept of Finance, U.S. Bureau of Economic Analysis, Energy Policy Initiatives Center, University of San Diego 2026

## B4 METHOD TO CALCULATE GHG EMISSIONS INVENTORY

The CAP emissions inventory follows the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (U.S. Community Protocol)<sup>6</sup>, developed by ICLEI USA. It requires a minimum of five basic emissions-generating activities to be included in a Protocol-compliant community-scale GHG inventory. These categories are: electricity, natural gas, on-road transportation, water and wastewater, and solid waste. These categories are generally recognized as being under the collective control and management of the community (in this case, the City government) whereas other emissions-generating activities such as air travel, shipping, or high global warming potential gases are under the control of other public agencies and entities. Allocating emissions from these other emission-generating categories to cities is either not possible due to lack of data or lack of proxy data, or is better handled at a higher geographic level of aggregation. The City’s Climate Action Plan includes the Protocol-compliant emissions categories as well as off-road emissions from construction equipment as an optional additional category.

Different protocols and guidance for reporting GHG emissions exist for individual entities, such as private corporations and local government operations. The Local Government Operations Protocol, developed by ICLEI, CARB, and the Climate Registry (TCR), and the General Reporting Protocol, developed by TCR, are widely used to develop inventories of emissions resulting from the operations of local governments and other public agencies. The method to determine boundaries in the U.S. Community Protocol is different from the method in the Local Government Operations Protocol or the General Reporting Protocol, which depends on the entity’s financial or operational control. This inventory accounts for the emission-generating activities and sources throughout the city limits, as opposed to only those within the City’s financial or operational control (e.g., emissions from City-owned buildings and vehicles).

GHG emissions are calculated by multiplying activity data (e.g., kilowatt-hours of electricity, tons of solid waste) by an emission factor (e.g., pounds of CO<sub>2</sub>e per unit of electricity). The U.S. Community Protocol provides guidance for developing inventories of emissions from sources and activities within a

<sup>6</sup> CARB, ICLEI, and The Climate Registry: [Local Government Operations Protocol](#); the Climate Registry: [General Reporting Protocol Version 3.0](#)

community (e.g., driving, building energy use, solid waste disposal). All activity data and GHG emissions reported in this document are annual values, and all emission factors reported in this document are annual average values, unless stated otherwise.

## B4.1 On-Road Transportation

The emissions associated with on-road transportation are calculated by multiplying the estimated annual vehicle miles traveled (VMT) attributed to city trips (per Origin-Destination method as explained in Section B4.1.1) with the average annual vehicle emission rate in the San Diego region.

### B4.1.1 Vehicle Miles Traveled (VMT)

The San Diego Association of Governments (SANDAG) uses an activity-based model (ABM) to support Regional Transportation Plan development, generating outputs on transportation system performance, including VMT. Every three to five years, SANDAG produces the Regional Growth Forecast, a long-range forecast through 2050 of population, housing, and employment growth, along with VMT forecast for the San Diego region by jurisdiction. The CAP uses the city-specific population, housing, employment, and VMT forecast from the Series 14 Regional Growth Forecast (with a 2016 base year and 2050 forecast horizon) which informed SANDAG's 2021 Regional Plan adopted in December 2021. The VMT estimates and forecast were produced with the ABM2+ model.

As of May 2026, the most recent Regional Growth Forecast is the Series 15 Growth Forecast with a 2022 base year, which informed SANDAG's 2025 Regional Plan<sup>7</sup> adopted in December 2025. The last VMT forecast (with a 2022 base year and 2050 forecast horizon) was produced with the latest model version, ABM3, using land use patterns and transportation networks approved in the 2025 Regional Plan. Although Series 15 jurisdiction-specific data became available to the City in April 2026, this Annual Report maintains a consistent methodology for tracking progress against 2019 emissions. Accordingly, the ABM2+ model<sup>8</sup> with a 2016 base year was retained to calculate 2024 VMT and associated emissions.

SANDAG provides VMT estimates of city trips for specific ABM model base years (2016 for ABM 2+ and 2022 for ABM3) as well as projections for select future years. To monitor progress, these projections (i.e., VMT data other than ABM base year VMT estimates) cannot be used to infer current conditions, additional sources are needed to estimate year-over-year VMT change. Public road and freeway data in the San Diego region from the California Department of Transportation (Caltrans) Highway Performance Monitoring System (HPMS)<sup>9</sup> is used to scale VMT accordingly. Caltrans HPMS was selected because it represents the most comprehensive assessment of VMT on public roads: it is segmented at the jurisdictional level, updated annually, and includes data predating the CAP baseline year of 2019. While HPMS provides a reliable annual indicator of VMT trends, it does not disaggregate travel using the Origin-Destination (O-D) method.<sup>10</sup> The O-D VMT method is the preferred method proposed by the U.S. Community Protocol in *"TR.1 Emissions from Passenger Vehicles"* and *"TR.2 Emissions from Freight and Service Trucks"* that attributes miles traveled to cities and regions based on where trips originate and end (Figure 2).<sup>11</sup>

<sup>7</sup> [2025 Regional Plan](#). SANDAG

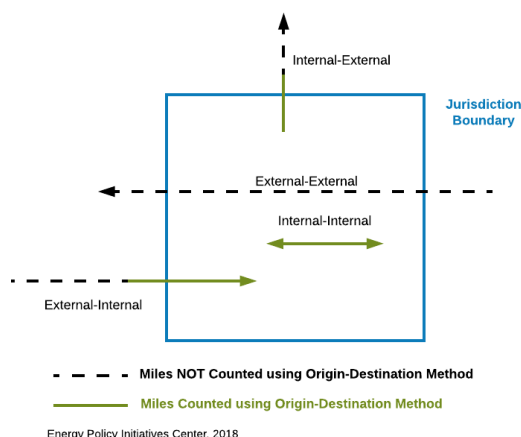
<sup>8</sup> 2016 VMT was provided by SANDAG to City of San Diego (January 2022). SANDAG Activity Based Model 2+ Release v14.2.2, Final 2021 Regional Plan Networks, Policies, and Assumptions, Year 2016, Reference Scenario 458. The forecast in the Final 2021 Regional Plan was based on the Sustainable Communities Strategy land use pattern, which may be different from jurisdictions' general plan land use pattern.

<sup>9</sup> California Department of Transportation: [Highway Performance Monitoring System \(HPMS\) Data](#).

<sup>10</sup> SANDAG (2013): [Vehicle Miles Traveled Calculation Using the SANDAG Regional Travel Demand Model](#). Technical White Paper.

<sup>11</sup> [ICLEI – Local Governments for Sustainability USA](#): U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix D: Transportation and Other Mobile Emission Activities and Sources.

**Figure 2: Components of O-D Method for VMT Calculation**



O-D VMT allocated to the city include all miles traveled for trips that originate and end within city limits (referred to as Internal-Internal), and half of the miles traveled for trips that either begin or end within city limits (referred to as Internal-External), or vice versa (referred to as External-Internal). In accordance with the methodology, VMT from trips that pass through the city but originate and terminate outside its boundaries (referred to as External-External) are excluded from the city’s total VMT. The total average weekday VMT were multiplied by 347 to adjust from average weekday VMT to average annual VMT, which includes weekends.<sup>12</sup>

The average weekday Series 14 O-D VMT estimates for each trip type in 2016 provided by SANDAG and the total VMT allocated to the city based on the ICLEI methodology described above are given in Table 6.<sup>13</sup>

**Table 6: 2016 O-D VMT Estimates by Trip Types and Total VMT provided by SANDAG (2016)**

Year	VMT by Trip Type (Miles/Week day) Internal-Internal (I-I) Trips	VMT by Trip Type (Miles/Weekday) External-Internal/Internal-External (I-E/E-I) Trips	VMT by Trip Type (Miles/Weekday) External-External Trips (Information only, excluded from City VMT)*	Total City VMT (100% * I-I + 50% * I-E/E-I) (Miles per Weekday)	Total City VMT (Miles per Year)
2016	22,264,735	28,279,389	32,824,891	36,404,429	12,632,336,902

\*Though excluded from this analysis, miles from External-External trips (pass-through trips) shown here are the portion only within the city boundary, not from the entire trip.  
 Based on SANDAG Series 14 (Final 2021 Regional Plan) and ABM2+ VMT estimates. The conversion factor from miles per weekday to miles per year is 347.  
 SANDAG 2022, Energy Policy Initiatives Center, University of San Diego 2024

As mentioned previously, annual VMT adjustments are derived from Caltrans HPMS data and are used to scale the O-D 2016 base year data from SANDAG ABM2+. For example, to estimate 2024 O-D VMT, the 2016 O-D VMT was adjusted by the annual rates of increase from 2016 to 2024, as indicated by Caltrans HPMS. Caltrans HPMS estimates VMT across all public roads, including city streets, county

<sup>12</sup> The conversion of 347 weekdays to 365 days per year as used by CARB. [CARB: California’s 2000–2014 Greenhouse Gas Emission Inventory Technical Support Document \(2016 Edition\)](#), p. 41 (September 2016).

<sup>13</sup> The 2016 data used here are different from (1-3% lower) the 2016 data used in the San Diego Climate Action Plan update 2022, which were from SANDAG ABM2+ Release v14.2.1, Draft 2021 Regional plan (October 2020).

roads, state highways, roads maintained by state and federal agencies, freeways, etc. It is derived using both real-time traffic detectors and short-term traffic counts, as well as jurisdictional reporting. Annual changes in the HPMS VMT for the full San Diego region were applied to the city's 2016 O-D VMT data (Table 6), as VMT across the full region was determined to be more representative of I-E/E-I trips. The estimated daily VMT and annual rate of increase or decrease from 2016 to 2024 from Caltrans HPMS data are provided in Table 7.<sup>14</sup>

**Table 7: San Diego Region Daily VMT Derived from the Caltrans Highway Performance Monitoring System**

Year	San Diego Region Daily VMT (thousand miles/day)	Annual Rate of Increase (%)
2016	79,622	-
2017	81,253	2.0%
2018	82,618	1.7%
2019	86,136	4.3%
2020	68,650	-20.3%
2021	71,151	3.6%
2022	71,954	1.1%
2023	74,422	3.4%
2024	75,736	1.8%

Caltrans Highway Performance Monitoring System Public Roads Data, 2016 – 2024, Energy Policy Initiatives Center, University of San Diego 2026

#### B4.1.2 Average Annual Vehicle Emission Rate

The average annual vehicle emission rate expressed in grams of CO<sub>2</sub>e per mile driven (g CO<sub>2</sub>e/mile) is derived from the statewide mobile source emissions model EMFAC2021 developed by CARB.<sup>15</sup> CARB released EMFAC2025 version 2.1.0 in March 2026, refining emission factors for historical inventory years as well as projections for the future vehicle population. Every time CARB develops a new emissions model, the EPA approves of the use of the model for various uses including air quality conformity analyses and State Implementation Plan programs. As of May 2026, EMFAC2025 has not received EPA approval. The emissions model may change again before it is approved by the EPA, which is why this current version of the model has not been integrated into the inventory. Once the new model is approved, integrating the updated emission factors would require editing all emission factors dating back to the baseline year to maintain a consistent time-series of data and avoid misrepresenting trends. That being said, the emissions factor trends in EMFAC 2021 and EMFAC 2025 v2.1.0 for historical years are quite similar.

To obtain vehicle emission factors from EMFAC2021, the model was run in the 'default activity mode' to generate the total VMT, per CARB's default estimate, and total vehicle GHG emissions by vehicle class, model year, and fuel types for the San Diego region.<sup>16</sup> GHG emissions were then divided by CARB's default estimate of region-wide VMT to get a emissions per mile (emissions factor) for each vehicle class and fuel type. That emissions factor was then applied to the VMT obtained through the process

<sup>14</sup> Caltrans: 2024 [HPMS Data](#) released November 2025

<sup>15</sup> CARB: Emission FACTors model, [EMFAC2021 v1.0.1](#), released on April 30, 2021, downloaded on August 30, 2021. CARB published an updated version, [EMFAC2021 v1.0.2](#), on May 2, 2022. The updates fixed bugs that were not related to GHG emissions.

<sup>16</sup> *Id.*

documented in Section B4.1.1. This document assumes that the city has the same distribution of vehicle class and fuel types as the San Diego region.

### B4.1.3 Total Emissions from On-Road Transportation

Total estimated VMT, average vehicle emission rates, and corresponding GHG emissions from on-road transportation from 2019–2024 are given in Table 8.

**Table 8: VMT, Emission Rate, and GHG Emissions from On-Road Transportation (2019–2024)**

Year	Total VMT (Million Miles/year)	Average Vehicle Emission Rate (g CO <sub>2</sub> e/mile)	GHG Emissions (MMT CO <sub>2</sub> e)
2019	13,666	428	5.85
2020	10,892	427	4.65
2021	11,288	415	4.68
2022	11,416	405	4.63
2023	11,807	396	4.67
2024	12,016	386	4.64

GHG emissions for each category are rounded. Values are not rounded in the intermediary steps in the calculation.  
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## B4.2 Electricity

Emissions from electricity consumed within the city were estimated using the Built Environment (BE.2) method from the U.S. Community Protocol, by multiplying electricity use by the annual city-specific electricity emission factor.<sup>17</sup>

### B4.2.1 Electricity Use

Annual metered electricity sales data within the city for 2021-2024 were provided by the local utility, San Diego Gas & Electric (SDG&E) broken down by customer class: (1) residential and (2) commercial and industrial.<sup>18</sup> The electricity sales data do not include the electricity sales to San Diego County Regional Airport Authority, San Diego Unified Port Authority and District Tenants, and the military.

In 2019 and 2020, the electricity sales included the sales to SDG&E bundled customers<sup>19</sup> and Direct Access (DA) customers.<sup>20</sup> In March 2021, San Diego Community Power (SDCP), a community choice aggregator (CCA), started serving customers within the San Diego region, including those within the City of San Diego. By the end of 2021, eligible SDG&E bundled commercial and industrial customers were enrolled in SDCP automatically with the option to opt-out (return to SDG&E) or opt-up to an SDCP product with a higher percentage of renewable electricity. In early 2022, residential accounts were automatically enrolled in SDCP with the same options to opt-out or opt-up. In 2024, SDCP added another rate tier for all customer types, “Power Base” that customers were able to opt-in to.

<sup>17</sup> ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix C: Built Environment Emission Activities and Sources.

<sup>18</sup> Electricity sales were provided to EPIC by SDG&E (January 2026). 2019–2020 data provided by SDG&E previously were not updated.

<sup>19</sup> SDG&E Bundled customers include any customer who received both their electric delivery and electric generation from SDG&E.

<sup>20</sup> Direct Access customers include customers who purchase retail electricity from a competitive provider called an electricity Service Provider (ESP), instead of from a regulated electric utility. Definition from CPUC, [Direct Access Program](#).

The way in which electricity sales data has been provided by SDG&E has changed throughout the years due to data privacy protocols. The 2019 and 2020 electricity use per customer class provided by SDG&E have the same format, with bundled and DA customers' electricity use identified separately. For data year 2021, when SDCP started its operations, within each customer class, only total non-bundled electricity use was provided by SDG&E without differentiating DA or SDCP electricity consumption; but in data year 2022, within each customer class, SDG&E provided a breakout for SDCP electricity consumption but not for DA electricity consumption. For those years, the 2020 percentage of electricity consumption used by DA customers was used as a proxy to break out DA consumption from the result of the electricity consumption. In 2021 participation rate provided by the SDCP was used to estimate consumption via SDCP customers. For data year 2023, SDG&E provided electricity use by customer class and by energy provider, matching the 2019 and 2020 format. For this appendix, data years 2022-2024 and partial data year 2021 were received with bundled, DA, and SDCP consumption separated. This allows for historical year inventories to be updated with more accurate electricity consumption data by energy provider and for consistent electricity consumption data to be used throughout the time-series, providing for more accurate emissions calculation and comparison based on the electric suppliers and their renewable contents across inventory years 2019-2024.

The electricity sales were then adjusted by (1) a loss factor<sup>21</sup> of 0.085<sup>22</sup> to account for transmission and distribution losses; and (2) subtracting electricity use associated with moving water within the city limits, which is allocated to the water supply emissions category.

The adjusted net energy for load (electricity sales + losses) is provided in Table 9.

#### **B4.2.2 City-Specific Electricity Emission Factor**

For a given year, the city-specific electricity emission factor, expressed in pounds of CO<sub>2</sub>e per Megawatt-hour (lbs CO<sub>2</sub>e/MWh), is estimated based on the specific mix of bundled power, DA power, and SDCP power, if any, in the city and their respective emission factors. Emission factors from grid electricity suppliers are sourced from the California Energy Commission (CEC) Power Source Disclosure (PSD) Program. The CEC PSD Program, under the requirements of Assembly Bill (AB) 1110 (Ting, Chapter 656, Statutes of 2016), requires retail electric providers to disclose GHG emissions intensity (i.e., electricity emission factor) separately from unbundled renewable energy credits, starting in 2021 for 2020 procurements. The emission factors for SDG&E and SDCP for years 2020–2024 are provided directly in the power content labels reported under the CEC PSD Program and listed in Table 9.

The 2019 SDG&E bundled emission factors were calculated using Federal Energy Regulatory Commission (FERC) Form 1<sup>23</sup> data, the California Energy Commission (CEC) Power Source Disclosure (PSD) Program<sup>24</sup> data on SDG&E-owned and purchased power, and U.S. EPA Emissions and Generating Resource Integrated Database (eGRID) 2019 Edition<sup>25</sup> on specific power plant emissions. The 2019 SDG&E bundled

<sup>21</sup> The transmission and distribution loss factor is used to scale end-use demand or retail sales to produce net energy for load. L. Wong, [A Review of Transmission Losses in Planning Studies](#), CEC Staff Paper (August 2011).

<sup>22</sup> California Energy Commission (CEC): [California Energy Demand 2015–2025 Final Forecast Mid-Case Final Baseline Demand Forecast Forms](#), SDG&E Mid. The transmission and distribution loss (T&D) factor is calculated based on the ratio of net energy for load (total sales + net losses) and total sales from SDG&E Form 1.2 Mid. While T&D losses fluctuate, 1.085 is used as a constant for all jurisdictions regionally.

<sup>23</sup> FERC: [Form 1 – Electric Utility Annual Report](#).

<sup>24</sup> CEC: [Power Source Disclosure Program](#) under Senate Bill 1305. The SDG&E annual power source disclosure reports in 2019 were provided to EPIC by CEC staff. SDG&E [2019 Power Content Label](#), version October 2020. The CEC PSD Program, under the requirements of Assembly Bill (AB) 1110 (Ting, Chapter 656, Statutes of 2016), requires retail electric providers to disclose GHG emissions intensity (i.e., electricity emission factor) and unbundled renewable energy credits, starting in 2021 for 2020 procurements. Starting in 2021, the GHG emissions intensity reported by retail electric providers for the PSD Program will be used directly to calculate GHG emissions from the electricity category.

<sup>25</sup> U.S. EPA. [eGRID 2019 Edition](#), released on February 23, 2021.

emission factor calculated using the sources above is 633 lbs CO<sub>2</sub>e/MWh, with 31% eligible renewable, also shown in Table 9.

DA emission factors are not supplied directly by the PSD program, nor does the data exist to understand exactly which Energy Service Providers (ESPs) the DA customers located in San Diego are procuring power from. In the absence of detailed data, DA emission factors are estimated, when possible, based on the weighted average of all statewide ESPs generation and the corresponding annual emissions. The data required for this calculation was not published with the remaining PSD reports until 2021. Starting in data year 2021, the standard statewide annual average emission factor was calculated using the emission factors of all electric service providers in that year based on their PSD reports and power content labels.<sup>26</sup> For data years before 2021 (2019 and 2020), DA emission factors are linearly interpolated between an estimated 2014 California Public Utilities Commission (CPUC) emission factor (836 lbs CO<sub>2</sub>e/MWh, based on a 2014 CPUC Decision D.14-12-037)<sup>27</sup> and the calculated 2021 DA emission factor. In data year 2023, the DA emission factor calculation was not possible due to data confidentiality issues in the PSD Program. However, the standard statewide annual average emission factor for data year 2024 was calculated again using the previous method (for data year 2021 and 2022 DA emission factors). This annual report updates the 2023 DA emission factor based on average values from 2022 to 2024 for the missing confidential pieces of information from 2023 data. All DA emission actors are shown in Table 9.

The city-specific electricity emission factors are provided in Table 9. This metric is calculated using a weighted average of net energy for load (electricity sales + losses) by electricity provider and the annual emission factor for that electricity provider.

### B4.2.3 Total Emissions from Electricity

Emissions are calculated by multiplying the adjusted net energy for load (electricity sales + losses) and the corresponding city-specific electricity emission factor. The net energy for San Diego’s load (electricity sales + losses), electricity emission factors, and corresponding GHG emissions from the electricity category for 2019-2024 are shown in Table 9.

**Table 9: Net Energy for Load, Emission Factor, and GHG Emissions from Electricity Category (2019–2024)**

Year	SDG&E Bundled Emission Factor (lbs CO <sub>2</sub> e/MWh)	SDCP Power On Emission Factor (lbs CO <sub>2</sub> e/MWh)	SDCP Power Base Emission Factor (lbs CO <sub>2</sub> e/MWh)	SDCP Power 100 Emission Factor (lbs CO <sub>2</sub> e/MWh)	DA Energy Service Provider Emission Factor (lbs CO <sub>2</sub> e/MWh)	Net Energy for Load (electricity sales + losses) <sup>1</sup> (MWh)	City-Specific Emission Factor (lbs CO <sub>2</sub> e/MWh) <sup>2</sup>	GHG Emissions (MT CO <sub>2</sub> e) <sup>4</sup>
2019	633	n/a	n/a	n/a	735	7,934,303	649	2,336,000
2020	636	n/a	n/a	n/a	702	7,810,499	645	2,286,000
2021	504	378	n/a	0	668	7,548,576	501	1,714,000
2022	508	375	n/a	0	641	7,742,843	444	1,558,000
2023 <sup>3</sup>	537	460	n/a	0	579	7,490,087	469	1,594,000
2024	663	442	672	0	447	7,431,403	438	1,475,000

<sup>26</sup> CEC: [Annual Power Content Label for 2021](#) and [Annual Power Content Label for 2022](#).

<sup>27</sup> CPUC: [Decision 14-12-037](#), December 18, 2014 in Rulemaking 11-03-012 (filed March 24, 2011). The recommended emission factor is 0.379 MT CO<sub>2</sub>e/MWh (836 lbs CO<sub>2</sub>e/MWh). The recommended emission factor has not changed since 2014. However, all electric service suppliers must meet the Renewables Portfolio Standards in the target years.

n/a indicates that the rate tier was not available in this year.

1. The net energy for load does not include the net energy for load from San Diego County Regional Airport Authority, San Diego Port Authority and District tenants, and the military. 2022 and 2023 historical values have been updated based on more granular electricity sales data received from SDG&E, as described in Section B4.2.1. For the purposes of calculating a city-specific emissions factor, this column includes energy load from the water sector.

2. City-Specific emission factors are for electricity consumed within the City of San Diego city limits only. The city-specific emission factors are not the same as the emission factors of SDG&E bundled electricity, and do not represent citywide emission factors of other jurisdictions in the San Diego region.

3. Not all statewide direct energy service provider emission factors were available in the 2024 Annual Report. This Annual Report revises the 2023 DA emission factor to an estimate based on 2022 and 2024 values.

4. 2022 and 2023 historical values have been updated based on more granular electricity sales data received from SDG&E, as described in Section B4.2.1. Additionally, emissions from water energy have been updated to reflect updated data from water utilities

GHG emissions for each category are rounded. Values are not rounded in the intermediary steps in the calculation.

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### B4.3 Natural Gas

Emissions from natural gas use in San Diego were estimated using method Built Environment (BE.1) from the U.S. Community Protocol, by multiplying the natural gas use (the activity) and the natural gas emission factor each year.<sup>28</sup>

#### B4.3.1 Natural Gas Use

Annual natural gas sales were provided for years 2021-2024 by SDG&E. The annual natural gas sales for each year were broken down by customer class: (1) residential, and (2) commercial and industrial.<sup>29</sup> Natural gas sales data does, in some cases, include the natural gas used as a transportation fuel if the gas is purchased from SDG&E through standard delivery and compressed on-site into Compressed Natural Gas (CNG). The natural gas sales data do not include the sales to San Diego County Regional Airport Authority, San Diego Unified Port Authority and District Tenants, and the military. Additionally, natural gas that is purchased through SDG&E standard delivery and is then used for utility-scale energy generation is excluded from the natural gas sector and included in the electricity generation emission factors. For natural gas that is purchased through SDG&E standard delivery and used on-site for electricity generation, those emissions are included in the natural gas sector.

#### B4.3.2 Natural Gas Emission Factor

The natural gas emission factor is based on the heat content of the fuel and the fuel's CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions. The heat content of fuel and the emissions from CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O were based on the CARB statewide inventory.<sup>30</sup> The natural gas emission factor is given in Table 10.

#### B4.3.3 Total Emissions from Natural Gas

To estimate emissions from the combustion of natural gas, end-use sales were multiplied by the emission factor. The total natural gas end-use and corresponding GHG emissions from the natural gas category for 2019-2024 are given in Table 10.

<sup>28</sup> [ICLEI—Local Governments for Sustainability USA](#): U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix C: Built Environment Emission Activities and Sources.

<sup>29</sup> Natural gas sales were provided to EPIC by SDG&E (January 2026). 2019–2020 data provided by SDG&E previously were not updated.

<sup>30</sup> CARB: [GHG Current California Emission Inventory Data](#).

**Table 10: Natural Gas End-Use and GHG Emissions from Natural Gas Category (2019-2024)**

Year	Residential Natural Gas End-Use (Million Therms)	Non-Residential Natural Gas End-Use <sup>1</sup> (Million Therms)	Total Natural Gas End-Use (Residential + Non-Residential) (Million Therms)	Natural Gas Emission Factor (Million MT CO <sub>2</sub> e/Million Therms)	GHG Emissions (MT CO <sub>2</sub> e)
2019	220	131	351	0.00545	1,912,000
2020	205	130	335	0.00545	1,827,000
2021	217	134	352	0.00545	1,918,000
2022	198	119	317	0.00545	1,730,000
2023	202	128	330	0.00545	1,800,000
2024	196	118	314	0.00545	1,710,000

1. Commercial and industrial natural gas end-use are combined under non-residential end-use because for certain customers, they may switch between commercial and industrial customer class (or vice versa) from one year to the next due to the demand in that year. The natural gas sales do not include the sales to San Diego County Regional Airport Authority, San Diego Unified Port District, and the military. GHG emissions for each category are rounded to the nearest thousand. Values are not rounded in the intermediary steps in the calculation. 2022 and 2023 historical values have been updated based on more granular historical data received from SDG&E. SDG&E 2020-2026, Energy Policy Initiatives Center, University of San Diego 2026

#### B4.4 Off-Road Transportation (Construction Equipment Only)

The emissions from gasoline and diesel fuel use for construction vehicles and equipment were estimated based on CARB off-road models. While the CARB model includes many off-road equipment types, the smallest data area available is at the County-level. As limited methods exist to scale the data to the city-level, only construction related equipment and its emissions are covered here as they are considered the most relevant off-road emissions source in the city. Common equipment types are excavators, off-highway tractors, and paving equipment. CARB’s OFFROAD Emissions Inventory is the main model for estimating off-road transportation emissions.<sup>31</sup>

Due to the lack of jurisdiction-specific data from CARB models, the construction equipment emissions from CARB model outputs for the San Diego region were scaled to the city based on the ratio of regional and citywide construction jobs<sup>32</sup>. The ratio and the corresponding GHG emissions from the off-road transportation category for 2019-2024 are given in Table 11.

<sup>31</sup> CARB: OFFROAD2021 (v1.0.6) Emissions Inventory, all adopted rules -exhaust. Downloaded on May 20, 2024. An updated OFFROAD model (v1.1.3) was released in February 2025 that resulted in very minor County-wide emissions from construction equipment. To maintain a consistent time-series for modeled data, v1.0.6 is maintained.

<sup>32</sup> SANDAG Series 14 Jobs estimates are used to estimate the percent of construction jobs in the city compared to countywide. While Series 15 jobs data is available for year 2022, Series 14 estimates are used to maintain a consistent times-series of data.

**Table 11: GHG Emissions from Off-Road Transportation (Construction Equipment Only) Category (2019 - 2024)**

Year	GHG Emissions from Construction Equipment within San Diego Region (MT CO <sub>2</sub> e)	Construction Jobs Ratio (City of San Diego/San Diego Region)	GHG Emissions from Construction Equipment within City of San Diego (MT CO <sub>2</sub> e)
2019*	177,000	39%	69,000
2020	145,000	39%	57,000
2021	145,000	39%	57,000
2022	145,000	39%	57,000
2023	145,000	40%	57,000
2024	144,000	40%	57,000

\*Emissions from 2019 have been updated since the 2022 CAP to reflect updates to the underlying CARB model. CARB OFFROAD2021 (v1.0.6), Energy Policy Initiatives Center, University of San Diego 2026

### B4.5 Solid Waste

Emissions from the decomposition of organic material in waste disposed at landfills were estimated using method Solid Waste (SW.4) from the U.S. Community Protocol, by multiplying the amount of waste disposed by the city in 2019 and an emission factor for mixed solid waste.<sup>33</sup> This represents the immediate and all future emissions from decay of this waste.

#### B4.5.1 Solid Waste Disposal

Solid waste disposal is the waste disposed by the city in landfills, including landfills located inside and outside of the city boundary. The vast majority of the waste (over 90%) from the city is disposed at West Miramar Sanitary Landfill (Miramar Landfill), Otay Landfill, and Sycamore Landfill.<sup>34</sup> The remaining amount is disposed at other landfills in California.<sup>35</sup>

The total waste disposal from the city was 1,631,407 short tons (1,479,988 metric tons) in 2024, 4% higher than in 2019. The total and per-capita solid waste disposal are given in Table 13.

#### B4.5.2 Mixed Solid Waste Emission Factor

The emission factor of mixed solid waste depends on the percentage of each waste type within the waste stream disposed in a landfill. Inventory years 2021 and after use CalRecycle’s statewide waste characterization study to determine the emissions from a pound of landfilled waste.<sup>36</sup> Inventory years previous to CalRecycle’s study year of 2021 uses the City of San Diego’s 2012–2013 Waste Characterization Study, conducted at Miramar Landfill, which is the most recent waste characterization study done by the City.<sup>37</sup> Only the CH<sub>4</sub> emissions from waste degradation are included in this category because they represent a direct and human-caused (anthropogenic) climate impact. Emissions from other gases, including CO<sub>2</sub> emissions from waste degradation are considered biogenic and not included in this category. Biogenic CO<sub>2</sub> is considered part of the short-term carbon cycle (i.e., it results from

<sup>33</sup> ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix E: Solid Waste Emission Activities and Sources.

<sup>34</sup> CalRecycle: [Disposal Reporting System \(DRS\): Jurisdiction Disposal and Alternative Daily Cover \(ADC\) Tons by Facility](#).

<sup>35</sup> CalRecycle [RDRS Report 2: Jurisdiction Disposal and Beneficial Reuse by Destination](#), accessed April 2026

<sup>36</sup> CalRecycle: [2021 Disposal-Facility-Based Characterization of Solid Waste in California](#) (DRRR-2024-1737). Published May 30, 2024.

<sup>37</sup> City of San Diego: [Waste Characterization Study 2012–2013 Final Report](#) (2014), accessed November 4, 2019.

recently living biological material that itself took up carbon from the atmosphere). Biogenic carbon is excluded from anthropogenic inventories, in accordance with ICLEI methodology.

The EPA Waste Reduction Model (WARM) is used to determine the emission factor of each waste type. WARM is a lifecycle GHG model to assess and compare waste management options (e.g., landfilling, recycling, source reduction, composting), through the lifecycle of waste materials (from material extraction to disposal). However, under the U.S Community Protocol, only emissions from the disposal and associated degradation of waste are included. Therefore, only the landfill emission factors in EPA WARM are used in the calculation. WARM reports the landfill CH<sub>4</sub> emission factor of each waste material in MT CO<sub>2</sub>e/short ton, with and without Landfill Gas (LFG) recovery.

The mixed solid waste emission factor is given in Table 12. The landfill emission factors without LFG recovery are identified here; the LFG recovery is applied later.

**Table 12: Mixed Solid Waste Emission Factor Comparison: 2021 Statewide Study and 2013 Regional Study**

Waste Component	CH <sub>4</sub> without Landfill Gas Recovery (WARM v15) (MT CO <sub>2</sub> e/short ton disposed) <sup>3</sup>	Pre-2021 Waste Distribution (%) <sup>1</sup>	2021 – 2024 Waste Distribution (%) <sup>2</sup>
Paper		16.8%	15.5%
<i>Corrugated Containers/Cardboard</i>	2.36	5.0%	7.4%
<i>Newspaper</i>	0.94	0.8%	0.3%
<i>Magazine</i>	1.08	0.6%	0.4%
<i>Mixed Paper (general)</i>	2.14	10.4%	5.7%
Plastic	0	8.9%	13.7%
Glass	0	1.7%	2.3%
Metal	0	3.5%	4.9%
Organics		38.9%	28.9%
<i>Food</i>	1.62	15%	9.2%
<i>Tree (Branches)</i>	1.3	5.3%	1%
<i>Leaves and Grass</i>	0.59 (leaves)	6.8%	2.2%
<i>Trimming</i> s	0.73	3.5%	2.8%
<i>Mixed Organics</i>	0.53	8.3%	13.0%
Electronics	0	0.6%	0.9%
Construction & Demolition Inerts	0	24.6%	12.0%
Household Hazardous Waste	0	0.2%	0.3%
Special Waste	0	3.1%	5.2%
Mixed Residue	0	1.6%	16.9%
<b>Mixed Waste Emission Factor (MT CO<sub>2</sub>e/short ton)</b>		<b>0.785</b>	<b>0.589</b>
<small>1 City of San Diego 2014.                  2 CalRecycle 2021 Statewide Waste Characterization Study</small>			

Waste Component	CH <sub>4</sub> without Landfill Gas Recovery (WARM v15) (MT CO <sub>2</sub> e/short ton disposed) <sup>3</sup>	Pre-2021 Waste Distribution (%) <sup>1</sup>	2021 – 2024 Waste Distribution (%) <sup>2</sup>
3 EPA Waste Reduction Model (WARM) Version 15 (May 2019). A minor update to the emission factor of food waste has been published in WARM v16. To maintain a consistent time-series of data and document progress from waste reduction and diversion efforts primarily, WARM v15 is used.			

### B4.5.3 Total Emissions from Solid Waste Disposed in Landfills

The mixed waste emission factor given in Table 12 is the emission factor without landfill gas collection. Landfill gas collection systems are in place at Miramar, Otay, and Sycamore landfills; however, site-specific methane studies are not available to estimate the landfill gas capture rate. Instead, a 75% default capture rate of CH<sub>4</sub> emissions from landfills, from the U.S. Community Protocol, is applied in the emissions calculation. The total and per-capita solid waste disposal and the corresponding GHG emissions for 2019 are given in Table 13.

**Table 13: Solid Waste Disposal into Landfills and Associated GHG Emissions (2019–2024)**

Year	Citywide Solid Waste Disposal (Short Tons/Year)	Per Capita Solid Waste Disposal (lbs/person/day) <sup>1</sup>	GHG Emission Factor (MT CO <sub>2</sub> e/Short Ton)	Oxidation Rate <sup>2</sup>	Total GHG Emissions (MT CO <sub>2</sub> e)	Default CH <sub>4</sub> Capture Rate	Remaining Emissions (MT CO <sub>2</sub> e)
2019	1,569,447	6.19	0.785	10%	1,108,000	75%	277,000
2020	1,543,627	6.12	0.785	10%	1,090,000	75%	273,000
2021	1,631,802	6.49	0.589	10%	864,000	75%	216,000
2022	1,596,546	6.36	0.589	10%	846,000	75%	212,000
2023	1,607,277	6.35	0.589	10%	851,000	75%	213,000
2024	1,631,407	6.41	0.589	10%	864,000	75%	216,000

GHG emissions for each category are rounded. Values are not rounded in the intermediary steps in the calculation.

<sup>1</sup> Informational, based on total waste disposal and population estimates. Population estimates are from California Department of Finance as shown in Table 2. Previous iterations of the Annual Report reported these values in kg/person/day. This Annual Report modifies the units to lbs/person/day to be consistent with CalRecycle tracking.

<sup>2</sup> The oxidation rate is a default estimate of methane that is oxidized and not emitted, therefore only 90% of total methane emissions are produced per the ICLEI Community Protocol.

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### B4.5.4 Estimating Emissions from Previously Disposed Solid Waste (Not Reported in Inventory)

The Community Protocol recognizes that there are emissions from waste previously disposed in landfills located within the city boundary (i.e., in-boundary landfills). The emissions from waste-in-place can be reported optionally in addition to emissions from waste disposal. The Protocol provides a separate method to estimate emissions from past disposal (waste-in-place). The City of San Diego has two active landfills and four closed landfills within its boundary. Emissions from waste already in place in the two active and four closed landfills are tracked separately here and are not included in the reported value for solid waste emissions in the city GHG emissions total.

For landfills that were required to report GHG emissions through the Environmental Protection Agency’s Mandatory Greenhouse Gas Reporting Program (EPA MRR), including West Miramar, Sycamore, and

North Miramar Landfills, the reported values are used directly.<sup>38</sup> For the landfills not subject to EPA MRR, emissions were calculated based on the Landfill Emissions Tool developed by CARB using the first order decay model recommended by the IPCC.<sup>39</sup> As of May 2026, the EPA has not released MRR or other data under the Greenhouse Gas Reporting Rule (GHGRP) for data year 2024. The EPA has proposed to eliminate these reporting obligations under Executive Order 14192.

The solid waste emissions inventory accounts for GHG emissions associated with waste generated and disposed of by city residents and businesses in the current inventory year, regardless of where that waste is ultimately disposed. This approach captures the projected lifetime methane emissions attributable to material disposed in a given year. However, because the city also hosts active landfills within its boundaries, emissions from those facilities are presented as a separate informational item. These in-boundary landfill emissions represent current-year releases from waste that has accumulated at the landfill over many years. Because the two estimates reflect fundamentally different accounting boundaries—one based on where waste is generated, the other on where it physically decomposes—they cannot be directly summed and are reported separately to avoid double-counting.

The emissions from San Diego landfills are given in Table 14.

**Table 14: Emissions from In-boundary Landfills (Information Only, Not Reported in GHG Inventory)**

Landfill, Status	2019 Landfill Emissions (MT CO <sub>2</sub> e)	2020 Landfill Emissions (MT CO <sub>2</sub> e)	2021 Landfill Emissions (MT CO <sub>2</sub> e)	2022 Landfill Emissions (MT CO <sub>2</sub> e)	2023 Landfill Emissions (MT CO <sub>2</sub> e)	2024 Landfill Emissions (MT CO <sub>2</sub> e) <sup>5</sup>
West Miramar Sanitary Landfill, Active <sup>1</sup>	154,932	198,685	152,566	141,544	115,295	Data not available
Sycamore Landfill, Active <sup>1</sup>	86,057	87,168	107,175	155,748	105,269	Data not available
North Miramar Sanitary Landfill, Closed in 1983 <sup>1</sup>	2,974	2,211	3,420	3,210	3,564	Data not available
South Chollas Sanitary Landfill, Closed in 1981 <sup>2</sup>	n/a	n/a	n/a	n/a	n/a	n/a
Arizona Street Landfill, closed in 1974 <sup>3</sup>	9,598	9,408	9,222	9,039	8,860	8,685
Mission Bay Landfill #1 <sup>4</sup>	5,530	5,420	5,313	5,104	5,104	5,003
<b>Total</b>	<b>259,091</b>	<b>302,892</b>	<b>277,696</b>	<b>314,645</b>	<b>238,092</b>	<b>Not available</b>
1.Source: EPA MRR 2.Discontinued reporting to EPA MRR in 2015 3.CARB Landfill Emission Tool (CARB LET) result using waste received before closing 4.CARB LET result using operational period 1952-1959 and waste-in-place at the end of 1990 5.EPA MRR data not available for CY2024 n/a = not available Landfill emissions reported in EPA MRR were estimated from methane recovery, destruction and other factors. The emissions may differ from modeled methane generation and from previous versions. <b>CARB 2026, EPA 2024, Energy Policy Initiatives Center, University of San Diego 2026</b>						

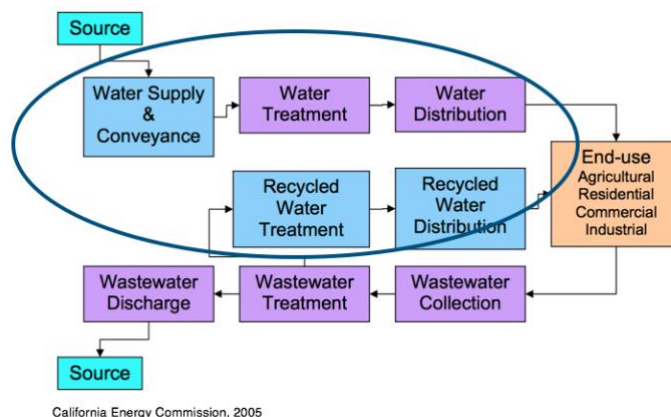
<sup>38</sup> EPA: [2019 Greenhouse Gas Emissions from Large Facilities](#), accessed November 10, 2020.

<sup>39</sup> CARB: [Landfill gas tool](#), released September 24, 2021, download date: January 9, 2023. Results may differ from the previous v1.3 tool released in 2011. Tool reports CO<sub>2</sub>e of CH<sub>4</sub> using 21 as CH<sub>4</sub> GWP; recalculated by EPIC using 25 as CH<sub>4</sub> GWP.

## B4.6 Water

Emissions from water use in a jurisdiction result from the energy required to move water from origin sources to end-use customers, including upstream supply and conveyance, water treatment, and water distribution, as circled in Figure 3. The energy used to move and treat water supplies used in the city is primarily electricity but may include natural gas or other fuels.

**Figure 3: Segments of the Water Cycle**



Emissions from water were estimated using the method Wastewater and Water (WW.14) from the U.S. Community Protocol, based on the water use, water source types, energy intensities per unit of water, and the electricity emission factor associated with the energy use.<sup>40</sup> Emissions associated with water end-use, such as water heating and cooling, are included in the electricity and natural gas categories, not in this water category, as data are not available to separate out those values.

Water agencies developing their own GHG inventories would not follow the U.S. Community Protocol because the U.S. Community Protocol is specifically for community-wide inventories, not for other types of entities. Therefore, the scope and boundary of emissions included in this sector are different from those of a water agency's GHG inventory. For example, the water agencies may account only the emission generating activities within their operational or financial control in their GHG inventories.

### B4.6.1 Water Use

The City of San Diego is a member agency of the water wholesaler in the San Diego region, the San Diego County Water Authority (SDCWA). The City of San Diego delivers potable and recycled water within the city boundary, and also sells water to or treats water for neighboring water agencies and cities, such as the City of Del Mar, South Bay Irrigation Water District, and the California American Water Company (CalAm).<sup>41</sup>

The potable water supply sources for the City of San Diego include (1) water purchased from the San Diego County Water Authority (SDCWA), either directly delivered to one of the City's treatment plants or stored in various reservoirs; (2) local supply including groundwater and captured local runoff from

<sup>40</sup> [ICLEI – Local Governments for Sustainability USA](#): U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix F: Wastewater and Water Emission Activities and Sources.

<sup>41</sup> California American Water Company (CalAm)'s service area in San Diego region includes Cities of Imperial Beach and Coronado, and portions of the City of Chula Vista. California American Water: [2020 Urban Water Management Plan](#), Southern Division – San Diego County District (2021).

rainfall within the City's nine reservoirs; (3) recycled water for non-potable use; and (4) the Phase 1 Pure Water San Diego Program (potable reuse) which is approved, permitted, and in progress.<sup>42</sup> Recycled water is produced at the City's North City Water Reclamation Plant (North City WRP) and South Bay Water Reclamation Plant (South Bay WRP) and is used for non-potable uses, such as landscape irrigation.

The potable water supplied to city customers (excluding sales to other water agencies) and the percentage of water from each source, as well as total recycled water supplied are provided in Table 15.<sup>43</sup>

**Table 15: Water Supplied and Supply Source (2019–2024)**

Year	Potable Water: Imported SDCWA Treated	Potable Water: Imported SDCWA Untreated	Potable Water: Local Surface Reservoir	Potable Water: Local Groundwater Basin	Total Potable Water Supplied (Acre-Feet)	Recycled Water Supply (Acre-Feet)
2019	10%	77%	14%	0.1%	161,472	7,999
2020	12%	73%	14%	0.1%	166,742	8,842
2021	8%	84%	7%	0.3%	161,995	8,586
2022	6%	86%	8%	0.3%	171,984	10,012
2023	10%	66%	23%	0.3%	155,215	8,675
2024	11%	57%	32%	0.3%	164,159	8,472

Percentages may not add up to totals due to rounding. Potable water supplied (acre-feet) is the City of San Diego's water production excluding sales to other water agencies.  
**City of San Diego Public Utilities Department 2026, Energy Policy Initiatives Center, University of San Diego 2026**

**B4.6.2 Energy Intensity of Water**

The energy used to produce and distribute water from each water source is different due to the different raw source type and its location. The energy intensity of water, or the energy needed to move one unit of water through each segment of the water-use cycle (water supply and conveyance, water treatment, and water distribution) individually, expressed in kWh per acre foot (kWh/Acre-foot), is described below.

Upstream Supply and Conveyance – This is defined as supply and conveyance of water from the raw sources to the local service area. The upstream supply and conveyance energy use for SDCWA untreated water consists of conveyance of water from the State Water Project and the Colorado River through Metropolitan Water District's (MWD) and SDCWA's service area. The energy use associated with upstream supply and conveyance for SDCWA treated water consists of that associated with SDCWA untreated water and water treatment before the water is delivered to City of San Diego's service area. The water may be treated at MWD or SDCWA's water treatment plants (WTPs). The City does not have operational control over the upstream supply and conveyance. Upstream energy intensity of water supplied is shown in Table 16.

<sup>42</sup> City of San Diego, [2025 Urban Water Management Plan](#), Section 4 Water Supplies (2026).

<sup>43</sup> Recycled water sales, water production at each of City's water treatment plants (WTPs) from each water source and sales to other agencies (City of Del Mar and CalAm) were provided by City of San Diego from 2017 to 2019. Water sale to City of Del Mar is from the imported raw water treated in City of San Diego's WTPs. The water sale to CalAm (excluding CalAm's service area in City of San Diego's South Bay area) is from local water treated in WTPs. Starting in 2021, water sales to South Bay Irrigation District is from a mixture of local supply and imported water treated in Otay WTP. Recycled water was produced at the City's North City Water Reclamation Plant and provided to City customers only.

**Table 16: Components of Average Upstream Energy Intensity for SDCWA Member Agencies**

Water System Segment	FY 2018 and 2019 Average Energy Intensity (kWh/Acre-Foot) <sup>4</sup>	CY 2023 Energy Intensity (kWh/Acre-Foot) <sup>5</sup>
MWD delivered untreated <sup>1</sup>	1,767	2709.2
SDCWA conveyance <sup>2</sup>	-33.4	31.8
<b>SDCWA Untreated Subtotal</b>	<b>1,733</b>	<b>2,741</b>
SDCWA treatment	110.0	140.1
SDCWA distribution <sup>3</sup>	9.4	17.5
<b>SDCWA Treated Total</b>	<b>1,853</b>	<b>189</b>
<p>MWD - Metropolitan Water District, SDCWA - San Diego County Water Authority, UWMP - Urban Water Management Plan. "Upstream" refers to moving water from the original source to SDCWA's member agency's service area or first connection point</p> <p><sup>1</sup>Includes conveyance from the State Water Project &amp; Colorado River water to MWD's distribution system, and distribution from MWD to MWD's member agencies. 2018-2019 data source: MWD UWMP 2020 Appendix 10.</p> <p><sup>2</sup>Conveyance of raw water supplies to the water treatment plants or to member agency connections (negative value means hydro-electric generation by SDCWA).</p> <p><sup>3</sup>Distribution of treated water from SDCWA's Twin Oaks Water Treatment Plant to SDCWA's member agencies.</p> <p><sup>4</sup>All FY 2018-2019 data comes from the 2020 MWD UWMP and 2020 SDCWA UWMP</p> <p><sup>5</sup>CY 2023 data is sourced from the City of San Diego 2025 UWMP</p> <p><b>San Diego County Water Authority:</b> 2025 Urban Water Management Plan (<b>March 2026</b>), <a href="#">2020 Urban Water Management Plan (March 2021)</a>; <b>Metropolitan Water District of Southern California:</b> <a href="#">2020 Urban Water Management Plan (June 2021)</a>, <b>City of San Diego:</b> 2025 Urban Water Management Plan (<b>May 2026</b>), <b>Energy Policy Initiatives Center, University of San Diego 2026</b></p>		

Local Supply and Conveyance – This is defined as supply and conveyance of local surface and groundwater within the water agency service area to water treatment plants, such as pumping water from local surface water reservoirs to nearby water treatment plants. Due to the way data is provided, the local supply and conveyance energy intensity is combined with local water treatment energy intensity.

Local Potable Water Treatment – This is the energy used for water treatment plant operations. The energy intensity depends on the source water quality, the treatment level, and capacity and efficiency of the associated WTP. The City of San Diego owns three WTPs: Alvarado, Miramar, and Otay WTP that treat raw water to potable levels. The WTPs treat both imported untreated SDCWA water and local water. Both Alvarado and Otay WTP have on-site behind-the-meter PV systems. The PV systems are connected to the raw water pump stations at Alvarado and Otay WTP that pump water to and from the WTPs to the nearby reservoirs. Because the water conveyance and treatment operations are connected, the local water conveyance and treatment energy intensity are combined and given in Table 17.

**Table 17: Local Water Conveyance and Treatment Energy Intensity (2019–2024)**

Combined Miramar, Otay and Alvarado WTPs	2019	2020	2021	2022	2023	2024
Water Treated (Acre-Feet) <sup>1</sup>	152,586	153,389	162,374	169,185	146,273	152,640
Total Treatment + Conveyance Energy Use (kWh) <sup>2</sup>	11,519,163	11,442,957	12,055,042	15,297,562	15,975,577	14,377,358
Total Treatment + Conveyance Energy Intensity (kWh/Acre-Foot) <sup>3</sup>	75	85	No data	105	126	123
Solar Production (kWh) <sup>4</sup>	2,272,785	2,172,498	No data	2,138,351	1,588,996	1,717,268
Net Treatment + Conveyance Energy Use (kWh) <sup>5</sup>	9,255,955	9,279,866	No data	13,159,211	14,386,581	12,660,090
<b>Net Treatment + Conveyance Energy Intensity (kWh/Acre-Foot)<sup>6</sup></b>	<b>61</b>	<b>60</b>	<b>60</b>	<b>78</b>	<b>98</b>	<b>83</b>

1.Total water treated at three WTPs  
 2.Total electricity consumption including treatment plant operation, lake pump stations and electricity generated at Alvarado and Otay on-site PV systems  
 3.Total Energy Intensity (total electricity divided by water treated)  
 4.Annual electricity generated Alvarado and Otay on-site PV systems  
 5.Net electricity purchase from the grid (SDG&E). Total electricity consumption minus solar production.  
 6.Net Energy Intensity (net energy divided by water treated)  
**City of San Diego Public Utilities Department 2026, Energy Policy Initiatives Center, University of San Diego 2026**

Starting in March 2019, not all the solar generated at Otay Lake Pump Station (OLPS) is used solely by the pump station. The excess solar generation goes to the grid and is shared with other City accounts. The solar generation share allocated to the OLPS was available for 2020 but not for 2021, therefore, the 2020 energy intensity was used as a proxy for 2021. Data was available all other inventory years.

Local Potable Water Distribution – This is defined as the energy required to move treated water from water treatment plants to end-use customers. Distribution energy use includes energy use for water pump stations and/or pressure reduction stations, water storage tanks, etc. Local distribution energy intensity depends on the service area’s geological conditions, such as the elevation the water is pumped to/from, the pump station’s energy efficiency, and whether a pump station is offline for maintenance or repair, which would cause water to be pumped to other pressure zones and rerouted back. The City of San Diego’s water service area has some areas with gravity-fed system (no energy needed) and some areas that use water pumping. The citywide water distribution energy intensity is given in Table 18.

**Table 18: Local Water Distribution Energy Intensity (2019–2024)**

Citywide Water Distribution	2019	2020	2021	2022	2023	2024
Total Water Moved (Acre-Feet)	168,014	173,787	174,952	179,695	162,145	170,734
Distribution Pump Stations Energy Use (kWh)	25,340,506	26,614,233	27,273,076	27,185,368	25,969,218	27,030,009

Citywide Water Distribution	2019	2020	2021	2022	2023	2024
<b>Water Distribution Energy Intensity (kWh/Acre-Foot)</b>	<b>151</b>	<b>153</b>	<b>156</b>	<b>151</b>	<b>160</b>	<b>158</b>
The energy intensities are the citywide water distribution system energy intensities, and do not represent the energy intensity of a specific area or pressure zone within the City. 1.Total City of San Diego water production from all water sources (including sales to other water agencies) 2.Electricity use at water pump stations excluding lake pump stations 3.Citywide water distribution energy intensity <b>City of San Diego 2026, Energy Policy Initiatives Center, University of San Diego 2026</b>						

**Local Recycled Treatment and Distribution** – This is energy required to treat recycled water (tertiary treatment, in addition to conventional wastewater treatment) and deliver it to end-use customers. In the City, the recycled water is delivered to customers in purple pipes, separated from the potable water distribution system. The recycled water energy intensity from the City’s UWMP voluntary reporting is 38 kWh/Acre-Foot<sup>44</sup> (used for inventory years 2019-2022), and 6,605 kWh/Acre-Foot<sup>45</sup> (used for inventory years 2023-2024) . The intensity includes energy use for tertiary treatment at WTPs and for recycled water distribution.

**B4.6.3 Total Emissions from Water**

To convert the energy intensity of water to GHG emissions per unit of water, the electricity emission factor associated with the energy use is applied. For upstream energy use, a California-wide average emission factor from EPA eGRID is applied.<sup>46</sup> For local (i.e., not upstream of the San Diego region) energy use, including potable water conveyance and treatment, distribution, and recycled water treatment and distribution, SDG&E’s bundled electricity emission factor is applied for 2019 and 2020 because SDG&E was the electricity supplier. SDCP electricity emission factors were applied for 2021 through 2024 because municipal accounts were switched to SDCP in 2021. The electricity emission factors are given in Table 19.

**Table 19: Electricity Emission Factors for Water-Energy Intensities (2019–2024)**

Year	Electricity Emission Factors for Water-Energy Intensities: Upstream (WECC-California from eGRID) (lbs CO <sub>2</sub> e/MWh) <sup>1</sup>	Electricity Emission Factors for Water-Energy Intensities: Local (SDG&E or SDCP) <sup>2</sup> (lbs CO <sub>2</sub> e/MWh)
2019	455	633 (SDG&E bundled)
2020	515	636 (SDG&E bundled)
2021	534	378 (SDCP) <sup>2</sup>
2022	499	0 (SDCP Power 100)
2023	438	0 (SDCP Power 100)
2024	438 <sup>1</sup>	0 (SDCP Power 100)
1.EPA eGRID did not estimate emission factors for the CAMX region for data year 2024. Values from 2023 are used as a proxy.		

<sup>44</sup> City of San Diego, [2020 Urban Water Management Plan](#), Table 7-5 Energy Intensity for Wastewater and Recycled Water, released June 2021.

<sup>45</sup> City of San Diego, [2025 Urban Water Management Plan](#), Table 7-6 Energy Intensity for Wastewater and Recycled Water, released May 2026.

<sup>46</sup> The Western Electricity Coordinating Council (WECC) CAMX (eGRID Subregion) emission rates from eGRID were used as representative of the average California electricity emission rate for upstream electricity. U.S. EPA. [eGRID2019](#), released February 23, 2021; [eGRID2020](#), re-released January 30, 2023; [eGRID2021](#), released January 30, 2023; [eGRID2022](#) released Feb 26, 2024.

2.SDG&E bundled emission factor is different from City-specific electricity emission factor, which is based on percentages of electricity sales to SDG&E bundled and DA customers, SDG&E and DA emission factors.  
**EPA 2024, Energy Policy Initiatives Center, University of San Diego 2026**

For upstream supply and conveyance emissions, the volume of water from SDCWA (treated and untreated) was multiplied by the upstream energy intensities (Table 16) and the upstream electricity emission factor (Table 19). Because the electricity use and GHG emissions associated with upstream supply and conveyance are outside the city boundary and would not be included in the electricity category, they are accounted for in the water category.

For local conveyance and treatment emissions, the volume of water treated at three WTPs and delivered within the city (excluding sales to other agencies) was multiplied by the net water treatment energy intensity (Table 17) and local grid electricity emission factor (Table 19). Because WTPs are located within San Diego, the electricity use associated with water treatment is included in the electricity category for San Diego. Therefore, electricity and GHG emissions associated with water treatment occur within the city boundary and have been subtracted from the electricity category, as they are accounted for in the water category.

For local water distribution emissions, total water within the city (excluding sales to other agencies) was multiplied by the water distribution energy intensity (Table 18) and local grid electricity emission factor (Table 19). Electricity and GHG emissions associated with water distribution occur within the city boundary and have been subtracted from the electricity category, as they are accounted for in the water category.

For recycled water treatment and distribution emissions, total recycled water supplied was multiplied by the recycled water energy intensity (38 kWh/Acre-Foot) and local grid electricity emission factor (Table 19). Electricity and GHG emissions associated with recycled water treatment and distribution occur within the city boundary and have been subtracted from the electricity category, as they are accounted for in the water category.

The total potable and recycled water supplied and the corresponding GHG emissions from the water category are given in Table 20.

**Table 20: Water Supplied and GHG Emissions from the Water Category (2019–2024)**

Year	Potable Water Supplied (Acre-Feet)	Recycled Water Supplied (Acre-Feet)	Upstream GHG Emissions (MT CO <sub>2</sub> e) <sup>1</sup>	Local GHG Emissions (MT CO <sub>2</sub> e) <sup>2</sup>	Total GHG Emissions (MT CO <sub>2</sub> e)
2019	161,472	7,999	51,000	10,000	61,000
2020	166,742	8,842	59,000	11,000	70,000
2021	161,995	8,586	64,000	2,000	66,000
2022	171,984	10,012	65,000	0	65,000
2023 <sup>1</sup>	155,215	8,675	57,000	0	57,000
2024	164,159	8,472	51,000	0	51,000

GHG emissions for each category are rounded to the nearest thousands. Values are not rounded in the intermediary steps in the calculation.  
<sup>1</sup> Upstream emissions have been updated since the 2024 Annual Report to incorporate newly released water energy intensity data from water agency's 2025 Urban Water Management Plans.

2 Local emissions have been updated from the 2024 Annual Report to reflect that all City facilities receive power from SDCP Power 100 starting in April 2021.  
**Energy Policy Initiatives Center, University of San Diego 2026**

### B4.7 Wastewater

The emissions from wastewater generated by San Diego were estimated by multiplying the total amount of wastewater generated in 2024 and the emission factor of the wastewater treatment processes. Unlike the water category, in which the GHG emissions result from the energy used to move and treat water, wastewater-related GHG emissions include only “*process, stationary and fugitive GHG emissions,*” as described in U.S Community Protocol “WW.1 – WW.14.”<sup>47</sup>

#### B4.7.1 Wastewater Generation

Wastewater generated in the city is conveyed to the City of San Diego Metropolitan Sewerage System (Metro System). The Metro System collects and treats wastewater from 12 partner agencies. Wastewater collected by the Metro System is treated at one of the three wastewater treatment plants (WWTPs): Point Loma WWTP, North City WRP, and South Bay WRP.<sup>48</sup>

It is assumed that the percentage of City of San Diego’s wastewater treated at each WWTP is the same as that of the entire Metro System. The City’s wastewater generation and the percentage treated at each WWTP are given in Table 21.

**Table 21: City of San Diego Wastewater Generation (2019–2024)**

Year	% of Wastewater Treated at Point Loma WWTP	% of Wastewater Treated at South Bay WRP	% of Wastewater Treated at North City WRP	Wastewater Flow to Metro System Average Million Gallons per Day (MGD)	Wastewater Flow to Metro System Million Gallons per Year
2019	86%	4%	10%	105	38,241
2020	86%	4%	10%	105	38,192
2021	87%	4%	9%	103	37,591
2022	88%	4%	8%	101	36,865
2023	88%	4%	8%	107	39,143
2024	88%	4%	8%	104	38,028

Sums may not add up to totals due to rounding.  
 WWTP – wastewater treatment plant; WRP – water reclamation plant.  
**City of San Diego 2026, Energy Policy Initiatives Center, University of San Diego 2026**

#### B4.7.2 Wastewater Emission Factor

Point Loma WWTP and North City WRP both report plant operation GHG emissions to CARB under the Mandatory GHG Reporting Regulation (MRR) program;<sup>49</sup> South Bay WRP falls under the threshold for mandatory reporting<sup>50</sup>. The reported GHG emissions include three components: (1) direct CO<sub>2</sub> from combustion of anaerobic digester gas; (2) CH<sub>4</sub> and N<sub>2</sub>O emissions from digester gas combustion; and (3)

<sup>47</sup> ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Version 1.2 (2019), Appendix F: Wastewater and Water Emission Activities and Sources.

<sup>48</sup> City of San Diego, [2025 Urban Water Management Plan](#), Section 1 (2026). Some of the North City WRP’s flow (non-tertiary flow) is conveyed to Point Loma WWTP for discharge.

<sup>49</sup> CARB: [Mandatory GHG Reporting – Reported Emissions](#). CARB MRR uses 21 as the CH<sub>4</sub> GWP, therefore the CO<sub>2</sub>e for CH<sub>4</sub> in this report is recalculated using 25 as the CH<sub>4</sub> GWP to be consistent with other categories in the inventory.

<sup>50</sup> Industrial sources that emit more than 10,000 MT CO<sub>2</sub>e are required to report under CARB’s MRR.

operational fossil fuel emissions assuming complete combustion. Direct CO<sub>2</sub> from combustion of anaerobic digester gas is considered biogenic and is not included in this inventory in accordance with ICLEI Community Protocol guidelines on biogenic emissions.

The wastewater treatment emission factor (MT CO<sub>2</sub>e/million gallons) at Point Loma WWTP and North City WRP are calculated by dividing the reported GHG emissions by the plants’ wastewater flows, as shown in Table 22. Because the exact emissions are not known for South Bay WRP, a weighted average of annual flow and emissions are calculated from Point Loma WWTP and North City WRP and applied to the additional flow treated at South Bay WRP.

**Table 22: Emission Factors at Wastewater Treatment Plant (2019–2024)**

Year	Point Loma WWTP Annual Flow (million gallons)	Point Loma WWTP GHG Emissions (MT CO <sub>2</sub> e)	Point Loma WWTP Wastewater Emission Factor (MT CO <sub>2</sub> e/million gallon)	North City WRP Annual Flow (million gallons)	North City WRP GHG Emissions (MT CO <sub>2</sub> e)	North City WRP Wastewater Emission Factor (MT CO <sub>2</sub> e/million gallon)
2019	52,571	15,955	0.30	5,905	17,733	3.0
2020	52,122	17,403	0.33	5,858	13,503	2.3
2021	51,556	17,289	0.34	5,074	13,503	2.7
2022	53,546	15,072	0.28	4,873	3,815	0.8
2023	55,060	21,450	0.39	5,170	72	0.01
2024	55,225	18,887	0.34	4,938	86	0.02

WWTP – wastewater treatment plant; WRP – water reclamation plant.  
 On average 99% of the emissions from Point Loma WWTP and 98% of emissions from North City WRP are biogenic.  
**City of San Diego 2026, Energy Policy Initiatives Center, University of San Diego 2026**

**B4.7.3 Total Emissions from Wastewater**

To calculate GHG emissions, the wastewater emission factor derived from Point Loma WWTP and North City WRP was applied to the total wastewater flow into all three plants. The total wastewater flow, the citywide weighted average wastewater emission factors, as well as the corresponding GHG emissions are given in Table 23. In 2022, there was a sharp decrease in emissions associated with wastewater treatment. This is because the on-site power plants using landfill gas at the North City Water Reclamation Plant were decommissioned that year.

**Table 23: Wastewater Generated and GHG Emissions from Wastewater Category (2019–2024)**

<b>Year</b>	<b>Total Wastewater Generated (Million Gallons/year)</b>	<b>Wastewater Emission Factor<sup>1</sup> (MT CO<sub>2</sub>e/ Million Gallon)</b>	<b>GHG Emissions (MT CO<sub>2</sub>e)</b>
2019	38,241	0.67	26,000
2020	38,192	0.60	23,000
2021	37,591	0.63	24,000
2022	38,865	0.34	13,000
2023	39,143	0.34	13,000
2024	38,028	0.30	12,000
<p><sup>1</sup>Weighted average emission factor of wastewater treated at three wastewater treatment plants in City of San Diego.                      GHG emissions for each category are rounded to the nearest thousand. Values are not rounded in the intermediary steps in the calculation.  <b>Energy Policy Initiatives Center, University of San Diego 2026</b></p>			

## B5 METHODOLOGY DIFFERENCES AND DATA REFINEMENT

Table 24 provides a log of refinements to prior-year inventory calculations reported in this Annual Report as well as previous Annual Reports. Historical revisions are necessary when improved activity data or more comprehensive emission factor studies become available. Consistent with IPCC guidance on time-series integrity, this report applies such updates retroactively across all affected years rather than the most recent year alone which would otherwise risk misrepresenting emissions trends. This approach to revise historical inventories also follows the approach used by the California Air Resources Board (CARB) when updating the California statewide GHG inventory.<sup>51</sup> “No change” indicates that no method or data changes occurred since the 2022 CAP.

**Table 24: Methodology Differences and Data Refinements of Annual GHG Inventory**

Category	Category Detail	2019 Inventory (Used for 2022 CAP)	2019–2024 Inventory (This Annual Report)
Electricity	Activity (kWh)	Requested data from SDG&E by customer class, service provider, and rate schedule for customers with City of San Diego town code	<p><u>2019–2020</u>: No change</p> <p><u>2021</u>: Data requested from SDG&amp;E by customer class within City of San Diego town code. No service provider or rate schedule available. Direct access and San Diego Community Power customer electricity use were estimated.</p> <p><u>2022</u>: Data requested from SDG&amp;E by customer class within City of San Diego town code. No service provider or rate schedule available. Direct access customer electricity use was estimated based on previous year’s data. SDCP consumption data provided.</p> <p><u>2023</u>: Data requested from SDG&amp;E by customer class within City of San Diego town code. Received data disaggregated by service provider (SDG&amp;E, SDCP, Direct Access)</p> <p>2024: Received 2022-2024 and partial data year 2021 activity data including breakouts for customer class as well as service provider (DA, CCA, and SDG&amp;E). Given the newly provided service-provider disaggregated data received in 2023, historical year’s activity data was requested for this Annual Report.</p>

<sup>51</sup> California Air Resources Board (CARB): [California Greenhouse Gas Emissions for 2000 to 2023. Trends of Emissions and Other Indicators](#). (2025)

Category	Category Detail	2019 Inventory (Used for 2022 CAP)	2019-2024 Inventory (This Annual Report)
	Emission Factor (lbs CO <sub>2</sub> e/MWh)	Created a weighted average emission factor based on a) SDG&E kWh procured from each fuel type at each facility/power plant and the emission factor of electricity generation at each facility/power plant ( <a href="#">EPA eGRID2019</a> database specific plant level emission factor) for SDG&E's purchased power.	<p><u>2020-2022</u>: Used the SDG&amp;E and San Diego Community Power emission factors reported under CEC's power source disclosure program.</p> <p><u>2023</u>: Updated the Direct Access emission factor using newly publicly provided statewide emissions factor for all direct Energy Service Providers throughout the state. Previously used a 2016 CPUC default factor for all direct access energy. Updated past years with newly available data. Only available up to date year 2022</p> <p><u>2024</u>: Updated Direct Access emission factor for data year 2023 using 2022 and 2024 data to estimate (Data year 2023 still censored due to confidentiality reasons for select Energy Service Providers. <i>More information in Section B4.2.2</i>)</p>
Natural Gas	Activity (Therms)	Requested data from SDG&E by customer class, service provider, and rate schedule for customers with City of San Diego town code	<p><u>2020</u>: No change</p> <p><u>2021-2022</u>: Data requested from SDG&amp;E by customer class within City of San Diego town code. No service provider or rate schedule available.</p> <p><u>2023</u>: Data requested from SDG&amp;E by customer class within City of San Diego town code. Received data disaggregated by service provider (SDG&amp;E, On-Site Generation, Direct Access)</p> <p><u>2024</u>: Received more granular 2022-2024 and partial data year 2021 activity data including breakouts for customer type and service provider.</p>
	Emission Factor (MT CO <sub>2</sub> e / Therm)	Natural gas emission factor in California based on California Air Resources Board statewide inventory	No change

Category	Category Detail	2019 Inventory (Used for 2022 CAP)	2019-2024 Inventory (This Annual Report)
Transportation	Activity (VMT)	<p>Applied annual average VMT rate of increase from 2016-2019 HPMS data to 2016 VMT estimates.</p> <p>2016 VMT estimates were provided by SANDAG using Series 14 Forecast and ABM2+ from the Draft 2021 Regional Plan</p>	<p><u>2020</u>: Applied annual average VMT rate of increase from 2016-2019 HPMS data to 2016 VMT estimates provided by SANDAG using Series 14 Forecast and ABM2+ from the Final 2021 Regional Plan</p> <p><u>2021</u>: Applied the VMT 2019 to 2021 percent increase from PeMS data to 2019 VMT estimates, due to a delay in release of HPMS data (i.e., was not available at time of inventory publication)</p> <p><u>2022</u>: Applied HPMS data to 2016 VMT estimates to years 2021 and 2022</p> <p><u>2023</u>: No change</p> <p><u>2024</u>: No change</p>
	Emission Factor (g CO <sub>2</sub> e/mile)	<p>San Diego region emission rate per vehicle class from <u>EMFAC2021</u> with model default assumptions on vehicle mix, travel activities, etc.</p>	<p>No change</p> <p><i>Note: EMFAC 2025 model was not incorporated into inventory estimates as the updated model has not yet been approved by the EPA. More information in Section B4.1.2</i></p>
Water	Activity (acre-feet)	<p>Potable and recycled water supplied to City of San Diego (water production) separated into wholesale water (from San Diego County Water Authority) and local water (surface and groundwater)</p> <p>Removed water purchased by Del Mar and CalAm service area not in the City</p>	<p>No change</p>
	Emission Factor (energy intensity - kWh/acre-foot)	<p>Local energy intensity based on water treatment plants and lake pump stations electricity consumption, all other water pump stations and facilities electricity consumption</p> <p>Upstream supply energy intensity calculated based on Metropolitan Water District and SDCWA 2015 Urban Water Management Plan</p>	<p><u>2020-2023</u>: Upstream energy intensity of water uses FY 2018-2019 energy intensity estimates from the 2020 Metropolitan Water District and San Diego County Water Authority Urban Water Management Plans</p> <p><u>2024</u>: Upstream energy intensity for 2023 and 2024 updated to reflect CY 2023 estimates sourced from the City of San Diego 2025 Urban Water Management Plan</p>

Category	Category Detail	2019 Inventory (Used for 2022 CAP)	2019–2024 Inventory (This Annual Report)
	Electricity Emission Factor (lbs CO <sub>2</sub> e/MWh)	Upstream: eGRID 2016	<p><u>2019</u>: eGRID2019  <u>2020</u>: eGRID2020  <u>2021</u>: eGRID2021  <u>2022</u>: eGRID2022  <u>2023</u>: eGRID2023  <u>2024</u>: eGRID data not available due to EPA program pause</p>
Wastewater	Activity (gallons)	City of San Diego's annual average flow (MGD) entering into Metropolitan Sewerage System (include Point Loma WWTP, South Bay WRP and North City WRP)	No change
	Emission Factor (MT CO <sub>2</sub> /gallon)	Calculated by dividing Point Loma WWTP and North City WRP GHG Emission reported in CARB Mandatory GHG Reporting by Point Loma WWTP and North City WRP total flow	No change
Solid Waste	Activity (tons)	Annual waste disposed tonnage provided by City of San Diego Environmental Services Department	<p><u>2019–2020</u>: No change  <u>2021</u>: Used 2020 waste tonnage due to a delay in reported data  <u>2022</u>: Updated 2021 waste tonnage with City's primary data. No other change  <u>2023</u>: No change  <u>2024</u>: No change</p>
	Emission Factor (MT CH <sub>4</sub> /tons)	Emission factor for each waste component from EPA WARM Model Version 15 (2019 version) and waste components from City of San Diego waste characterization study 2012–2013	<p><u>2019 – 2021</u>: No change  <u>2021-2023</u>: Updated post-2021 data with 2021 statewide waste characterization study.  <u>2024</u>: No change  <i>Note: EPA WARM Model v16 not incorporated into this inventory as the slight changes to the emission factors to food waste would not reflect trends related to progress but instead would require full time-series adjustment of underlying assumptions. More information in Section B4.5.2.</i></p>