Metropolitan Wastewater Management Commission

partners in wastewater management

Greenhouse Gas Inventory Report for FY 2024-2025

October 2025

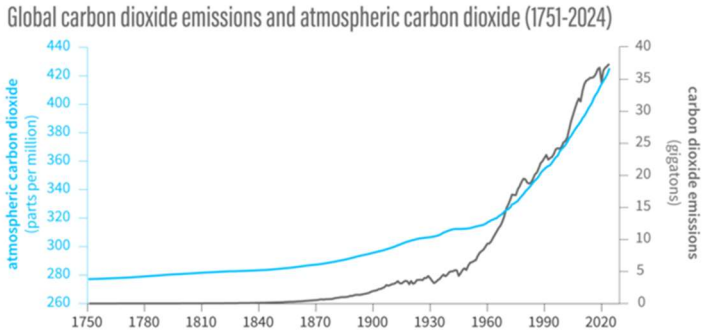
Introduction

This report presents the results of an inventory conducted to quantify the Greenhouse Gas (GHG) emissions for fiscal year 2024-2025 from the regional wastewater treatment plant, Biosolids Management Facility (BMF), and regional pump stations serving the Eugene-Springfield Metro Area in Lane County, Oregon — facilities that are operated and managed through partnership in the MWMC. The inventory also includes emissions data for wastewater pump stations that are owned independently by the cities of Eugene and Springfield.

The data gathering and analytical framework applied by staff to produce this report quantifies the GHG emissions resulting from MWMC activities in FY 2024-2025 that contribute to increasing global CO_2 levels and other GHGs such as methane and nitrous oxide. The framework also quantifies the MWMC activities that are beneficial to our environment—those which reduce, sequester, or offset GHG emissions.

Page 5 of the report outlines MWMC's contribution of information towards community action planning for local and regional GHG emissions reduction. The Appendix to the report describes the GHG methodology, illustrates the GHG emissions totals, and provides more detailed support to explain the FY 2024-2025 results.

Recorded Change in Global CO_2 Levels



Global CO_2 Measurement: ~427ppm (May 2024)

Source: National Oceanic and Atmospheric Administration, NOAA Climate.gov image, based on Mauna Loa monthly mean data from NOAA Global Monitoring Lab.

Observations recorded at Mauna Loa Observatory in Hawaii showing monthly average carbon dioxide measurements since 1958 in parts per million (ppm). The highest monthly value recorded each year at the station occurs in May, which hit just under 427 ppm in 2024, a new record.

To date, the MWMC Board has not established GHG emissions reduction targets; therefore, this report only provides a general overview, or inventory, of the GHG emissions generated in FY 2024-2025 at MWMC facilities and not an evaluation of progress toward reducing GHG emissions.

Significant Changes in the FY 2024-2025 Report

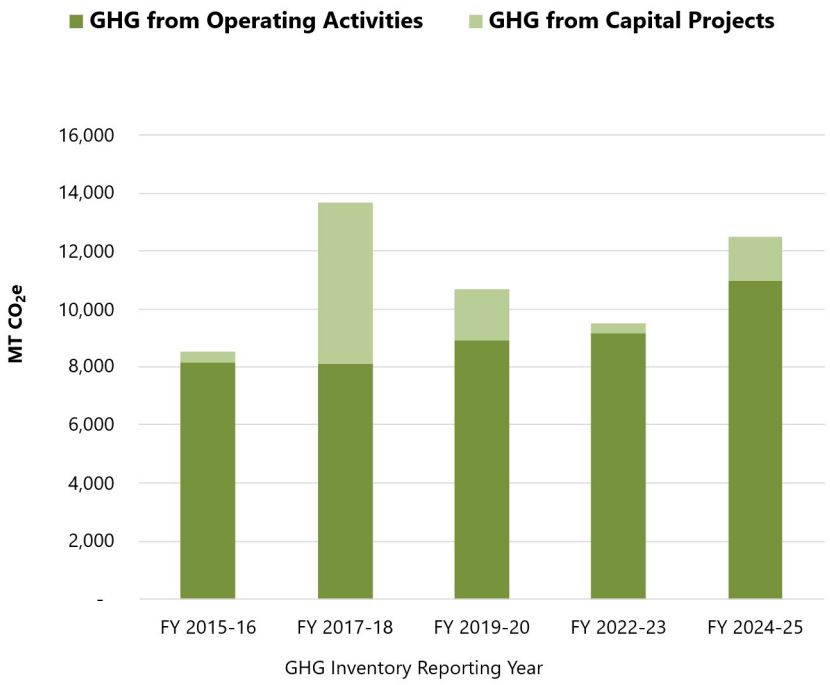
The initial GHG emissions report for MWMC facilities was prepared and presented to commissioners in 2012, which included data gathered for calendar year 2010. Since that time, GHG emissions inventories have been prepared in every other fiscal year (biennially) and presented to the MWMC Board in the intervening years. The previous GHG emissions inventory reported on data from FY 2022-2023 and was presented to the board in December 2023.

Included in this report is an accounting of the biogas produced at the treatment plant, conditioned as Renewable Natural Gas (RNG), and marketed and sold through partnership with NW Natural, to show the environmental benefit of commodifying the biologically produced methane from the anaerobic digesters.

GHG Emissions Inventory Summary

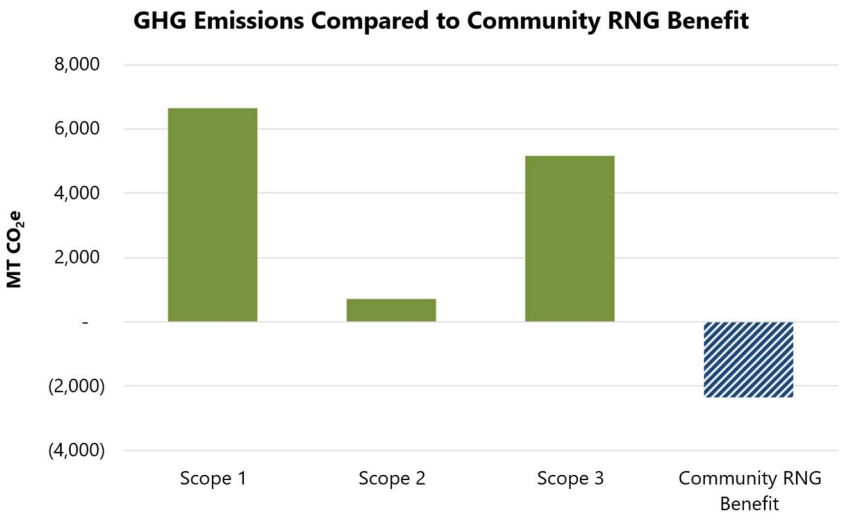
A summary of the GHG emissions from operational activity in FY 2024-2025 is illustrated in Figure 1 below. The benefits from activity during the same timeframe are illustrated in Figures 2 and 3.

Figure 1 – Grand Total GHG Emissions[1]



FY 2024-2025 grand total emissions were 12,510 MT CO_2e, the third highest volume of GHG emissions since reporting began in 2012. Compared to prior inventory results, emissions from capital projects (mostly construction related) were 359% higher, while emissions specific to operations and maintenance (O&M) were 20% higher than in the prior reporting period. The operating increase was largely driven by an uptick in emissions from treatment and biosolids processing and supply-chain related emissions (See Scope 1 and Scope 3 on the following pages).

Figure 2 – Community Benefit of RNG



By applying the emissions factor for compressed natural gas (CNG), the closest comparable emissions factor for Renewable Natural Gas (RNG), the assumed benefit from the community purchasing RNG marketed by NW Natural was -2,356 MT CO_2e.

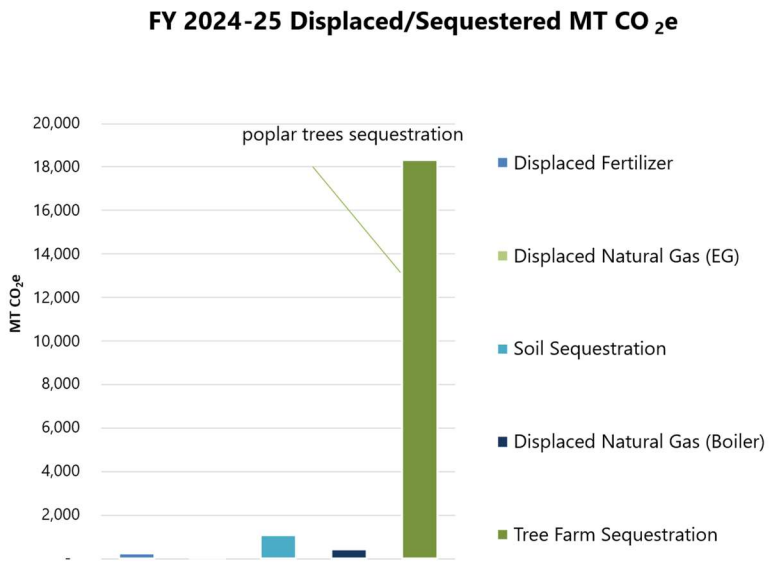
Referring then to the federal EPA equivalencies calculator, -2,356 MT CO_2e is roughly equal to the elimination of 2.6 million pounds of coal burned for one year.

[1] Emissions data and methodology detail provided in the Appendix.

Figure 3 – Environmental Benefits at Biocycle Farm

Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide (CO_2) in a variety of natural and engineered locations, such as in the soil, forests, wetlands, and oceans, or injected into depleted underground reservoirs, mines, aquifers, geologic cavities, or in storage facilities at industrial carbon capture sites.

Carbon displacement refers to activities that totally replace or greatly reduce the need for fossil fuels such as coal, oil, and gas with alternatives that produce little or no greenhouse gas emissions.



The benefits from MWMC activities as either CO_2 sequestration or displacement were a total of -20,091 MT CO_2e in FY 2024-2025, which is a large increase over FY 2022-2023. The Biocycle Farm gained poplar tree biomass due to the replanting of Management Unit 3 (MU3) and tree growth nearing maturity on MU1 and MU2. Total carbon sequestration from all trees at the Biocycle Farm was -18,335 MT CO_2e for FY 2024-2025, which is nearing the optimal sequestration potential.

CLIMATE BENEFITS FROM MWMC ACTIVITIES

While wastewater treatment activities generally contribute to GHG emissions, some activities have reduced GHG emissions at MWMC facilities for the community. The activities at MWMC facilities with less environmental impact were from the processing and commodification of RNG, emissions displacement *(*e.g., less need for conventional fertilizer at Biocycle Farm, displaced need for conventional natural gas), and carbon sequestration (e.g., CO_2 captured by the soil and poplar trees at the Biocycle Farm).

The following benefits of MWMC operational activities are explained for reference only.

Displaced GHG Emissions

- **Displaced Community Consumption of Conventional Natural Gas (-2,356 MT CO_2e)**
  Total GHG emissions produced from MWMC activity in FY 2024-2025 was 12,510 MT CO_2e and it's important to note that the GHG emissions also included operational activity that resulted in the production of Renewable Natural Gas (RNG), which in turn provided a downstream community benefit. However, as pertaining to GHG emissions accounting protocol, since the RNG is marketed through NW Natural, the community RNG benefit cannot be applied to offset the emissions from

MWMC activity in FY 2024-2025. In short, the community benefit of RNG does not subtract from the GHG emissions accounting because MWMC is still consuming fossil natural gas, selling the conditioned biogas to NW Natural, and earning revenue from the sale of RIN credits (Renewable Identification Numbers).

- **Displaced Conventional Natural Gas for Process Heating from Boiler (-409 MT CO_2e)**
  The boiler is engineered to be fueled with either conventional natural gas or conditioned biogas (i.e., from the RNG) to reduce the need for flaring the valuable biogas at the waste-gas burner. For most of the year, the boiler is fueled with conventional natural gas, as the goal is for maximum uptime from the RNG facility while also sustaining optimal heating for the digesters. During times when the RNG facility is taken out of service and undergoing maintenance, the plant's boiler for heating the anaerobic digesters is run on biogas. Therefore, conventional (fossil) natural gas is displaced with renewable biogas to fuel the boiler when the RNG facility is offline.

- **Displaced Conventional Natural Gas for Supplementary Process Heating (-48 MT CO_2e)**
  The plant's 800KW engine generator (EG) is also sometimes brought into service when the RNG facility is offline, which thereby displaces the use of conventional natural gas with biogas from the anaerobic digesters. At those times, the EG is fueled with biogas and used to supplement the boiler to provide optimal digester heating.

  Another passive benefit of running the EG is the generation of some electricity, thereby displacing some of the need for purchased electricity from EWEB. For the FY 2024-2025 reporting period, by aggregating those short periods of runtime, the EG produced roughly 662,911 kilowatt hours (kWh) of electricity, which reduced the total electricity expenditure by $65,265.32 , which is a cost savings benefit when running the EG on biogas and a marginal GHG emissions reduction benefit since displacing some of the need for fossil natural gas.

- **Displaced Conventional Fertilizer (-229 MT CO_2e)**
  At the Biocycle Farm, the substitution of biosolids for conventional fertilizer as a soil amendment displaces the emissions that would have otherwise been created in the production, shipping, and storage of conventional fertilizers.

Carbon Sequestration

- **Carbon Sequestration by the Soil (-1,070 MT CO_2e)**
  When biosolids are applied to soil, a proportion of the organic carbon remains trapped and therefore increases the health and sequestration potential of the existing soil.

- **Carbon Sequestration by Biocycle Poplar Trees (-18,335 MT CO_2e)**
  The Biocycle farm has been in operation since 2004 when Management Unit #1 (MU1) was planted with 35,000 trees. Two subsequent units were planted for a total of 88,000 trees as of 2008. Comparing the three management units, MU3 is the largest in area and contains more trees than either MU1 or MU2.

  Accounting for all biomass on the farm in FY 2024-2025, the total sequestration by the growth of poplar trees was -18,335 MT CO_2e. Projecting out to the next reporting timeframe (i.e., the FY 2026-2027 report), it is likely that the total MT CO_2e sequestration from biomass at the Biocycle Farm will be less than presently, assuming that the trees on MU1 and MU2 will be harvested in

that timeframe. MU3 will begin to sequester more CO_2 as that unit grows into a larger biomass of trees, but probably not enough growth to compensate for the scheduled loss of biomass on MU1 and MU2 from harvesting.

RECENT AND UPCOMING GREENHOUSE GAS REDUCTION ACTION ITEMS

The following GHG emissions reduction related activities are currently underway or being discussed for future action.

MWMC is currently contributing innovative and significant climate action projects on a regional scale that align with the goals and intent of the regionwide sustainability efforts established by the governing bodies of partner agencies.

- Further implementation of the Renewable Natural Gas (RNG) Program. The goal is for the RNG facility to condition 100% of the biogas generated at the wastewater treatment plant for transmission and distribution by NW Natural, which would reduce the need for flaring.

Current operational activity in support of GHG reduction:

- Compliance with the ISO 14001 standard, Environmental Management System (EMS) at Eugene Wastewater Division. The stated goal of the EMS program is to reduce energy use, reduce the volume of solid waste, and rely less on non-renewable vehicle fuels. A significant objective met in FY 2024-2025 toward the goal included the diversion of 15.5 tons of reusable material from the landfill by coordinating with BRING Recycling during the cleanout of the former WPCF Operations Building in April 2025 as preparation for the MWMC's Administration Building Improvements project (P80104).

Community Partners: Lane County, City of Springfield, City of Eugene

MWMC's community partners have publicly stated their intent to reduce GHG emissions within their respective jurisdictions, have implemented the following directives, and are achieving some success:

- Incorporating energy efficient technologies and green building design into new capital construction and refurbishment of buildings.
- Purchasing from local service and material providers when possible.
- Reducing vehicle miles traveled by promoting teleconferencing (e.g., webinars, conference calls, online seminars) or utilizing bus, bike, or other low-carbon transportation options.
- Expanding urban tree canopy cover through new and replacement tree planting.
- Replacing end-of-life gasoline and diesel fleet vehicles with electric, hybrid-electric, and other low emission or zero emission fleet vehicles.
- Lane County's Climate Action Plan for Operations, including specific emissions reduction targets through purchase of Renewable Energy Credits (RECs) and other purchased carbon offsets, and a goal to reduce overall GHG emissions by 72% by 2040. In 2023, the county approved the CleanLane Resource Recovery Facility, which will divert 80,000 tons of landfill waste annually, produce biogas for beneficial reuse, and cut overall methane emissions.
- City of Springfield's comprehensive planning to implement the Climate Friendly and Equitable Communities (CFEC) administrative rules for land use, transportation, and community development, particularly for Glenwood Riverfront, Downtown Springfield, and Mohawk areas.

- City of Eugene's Climate Recovery Ordinance (CRO) with emissions reduction targets of 7.6% per year until year 2100. As of 2024 reporting, City of Eugene's operating GHG emissions have dropped by 24% and community-wide emissions have dropped by 11% since 2010.
- EWEB Rebate program has enabled over 1,200 homes to receive energy-efficient heat pump upgrades, and the SUB rebate and low-interest loan programs encourage energy-efficient upgrades in homes, including heat pumps, smart thermostats, electric vehicle chargers, improved insulation and weatherization, window upgrades, duct sealing, and more.

CONTACT INFORMATION & ADDITIONAL RESOURCES

City of Eugene staff James McClendon, Yashara Lund, and Tim Arciszewski conducted the FY 2024-25 inventory of MWMC's greenhouse gas emissions. Support on the preparation of the emissions inventory was provided by Sharon Olson (WW Technical Analyst, retd.) and Claudia Denton at Parametrix (previously Good Company), a leading provider of professional consultation and services for climate and sustainability planning in the public and private sectors.

For more information, call or email:
James McClendon, 541-682-8608 JMcclendon@eugene-or.gov
Yashara Lund, 541-682-8607 YLund@eugene-or.gov
Tim Arciszewski, 541-682-8603 TArciszewski@eugene-or.gov

Appendix

GREENHOUSE GAS ACCOUNTING: EMISSIONS SCOPES

The main sources of emissions from MWMC facilities include wastewater treatment process emissions, conventional natural gas usage, electricity usage, and supply chain purchases.

GHG emissions are categorized into three Scopes according to the protocol, defined as follows:

- **Scope 1** emissions are direct emissions which originate from equipment and facilities owned and operated by MWMC, primarily from fossil fuel combustion and wastewater treatment processes.
- **Scope 2** emissions are indirect emissions from purchased energy, such as electricity.
- **Scope 3** emissions are all other indirect emissions that result from the activities at the MWMC facilities, in which the direct sources are controlled by other entities or service providers, such as construction contractors for capital projects, manufacture and transport of supply-chain related purchases, solid waste disposal, employee commute, business travel, and energy transmission and distribution losses (T&D).

GREENHOUSE GAS ACCOUNTING: METHODOLOGY

The inventory used for this FY 2024-2025 GHG report follows the Local Government Operations Protocol (LGOP), which was developed jointly by The Climate Registry and affiliated organizations.[2] The LGOP protocol only requires the reporting of emissions in Scopes 1 and 2 as defined by the World Resources Institute. This inventory has been expanded to include several additional Scope 1 process emission sources specific to biosolids management as well as shared emission categories from Scope 3. The use of these tools to measure additional emissions sources has enabled a more accurate inventory of GHG emissions from MWMC facilities.

The protocols and methods used to account for the additional Scope 1 and Scope 3 emissions sources are documented in Parametrix's Carbon Calculator (G3C) and the G3C-Wastewater module, which are used to calculate emissions specifically for this inventory. The additional Scope 1 emissions sources were estimated using either the LGOP (for emissions associated with denitrification and discharge of effluent) or the Canadian Ministers of the Environment's *Biosolids Emissions Assessment Model (BEAM)* for emissions associated with biosolids storage, drying and land application.

Displaced emissions from conventional natural gas are calculated to be the same as an equal quantity of natural gas purchased from NW Natural. BEAM was used to estimate benefits associated with displaced conventional fertilizer and soil carbon sequestration from land application of biosolids. Carbon sequestration by poplar trees at the Biocycle Farm was calculated using the methodology specified by the Climate Action Reserve's *Urban Forest Protocol*.[3]

[2] The Local Government Operations (LGO) Protocol was developed in collaboration among The Climate Registry (TCR), the California Air Resources Board (CARB), the California Climate Action Registry (CCAR, now the Climate Action Reserve), and ICLEI Local Governments for Sustainability. The LGO Protocol follows the same format as The Climate Registry's General Reporting Protocol (GRP).

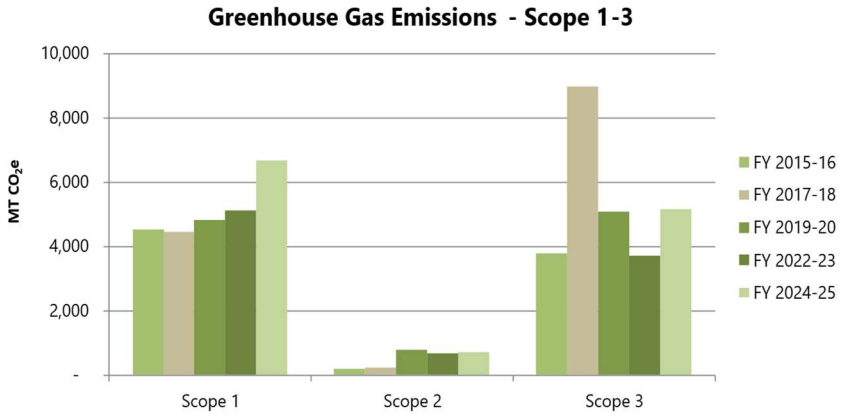
[3] Climate Action Reserve (CAR) Urban Forest Protocol can be found at http://www.climateactionreserve.org/how/protocols/urban-forest/

GREENHOUSE GAS ACCOUNTING: SUMMARY OF INVENTORY DETAILS

Scope 1 emissions include process related emissions from wastewater treatment and biosolids processing, which increased in FY 2024-2025 in comparison to the previous reporting years, amounting to 6,658 MT CO_2e or an increase of 30% as shown in Figure 1.

Scope 2 emissions are the result of consuming electricity and are the lowest of the three scopes for FY 2024-2025 and in all reporting years. Scope 2 emissions were 699 MT CO_2e, an increase of 3% from FY 2022-2023. Emissions from electricity are calculated according to the Market Based emissions factor for Scope 2 electricity (i.e., based on the local utilities providing the electricity) instead of the Location Based emissions factor (i.e., an average for the electric grid region of western North America known as the Northwest Power Pool).

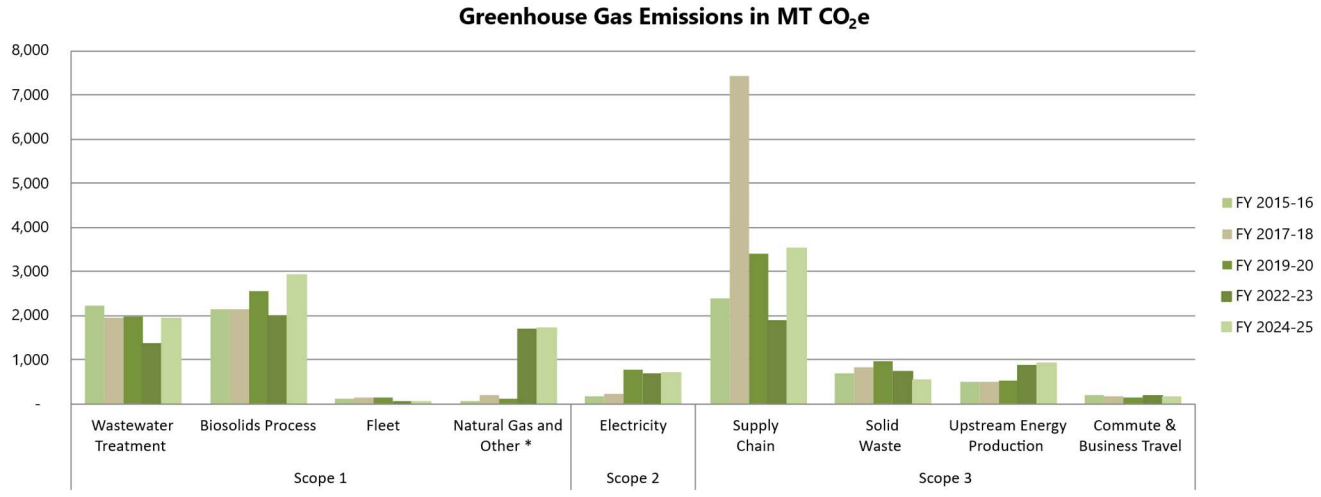
Figure 1 - MWMC Facilities Emissions by Scope



Scope 3 emissions result from the purchase of goods and services for operational activity, capital projects, travel, solid waste disposal, and upstream energy production. Scope 3 emissions were 5,153 MT CO_2e for FY 2024-2025, an increase of 39% from FY 2022-2023 but nearly the same as the Scope 3 emissions from the FY 2019-2020 reporting period (5,079 MT CO_2e), which is an indication of recent MWMC activity moving into a phase of more intensive asset rehabilitation and capital construction (e.g., Plant Switchgear project, Administrative and Operations Building project, RNG facility enhancements, AMCP projects).

For the FY 2024-2025 reporting timeframe, the Scope 3 category of activity is the second largest source of emissions at MWMC facilities after Scope 1. Wastewater treatment and the biosolids processes are currently and historically the greatest source of GHG emissions (Scope 1).

Figure 2 - Overview of the MWMC Facilities' Greenhouse Gas Emissions



* Other sub-category represents emissions from natural gas, refrigerants, and non-fleet fuels.

Scope 1 – Direct Emissions Details

Wastewater Treatment and Biosolids Process Emissions

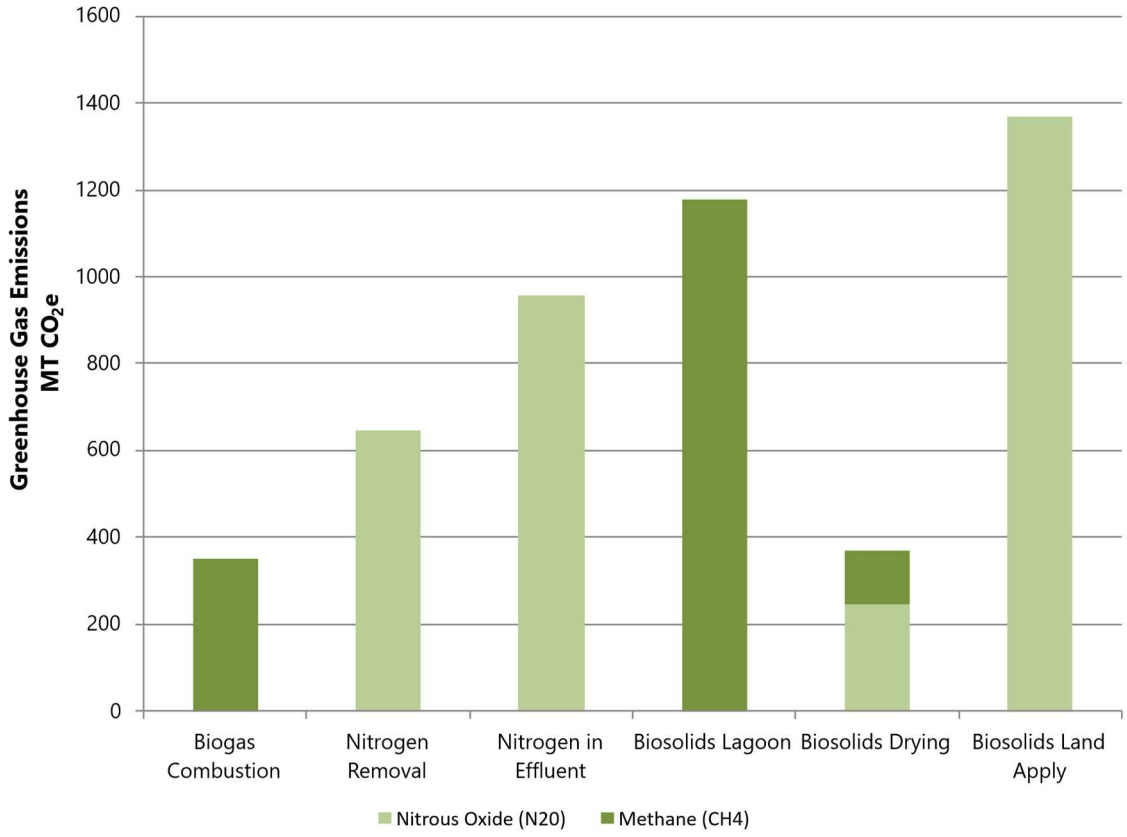
GHG inventory protocol for the accounting of greenhouse gas emissions distinguishes human-caused emissions (anthropogenic) from the greenhouse gases stemming from natural processes (biogenic).

Anthropogenic GHG emissions are associated with human activities dependent on the combustion of fossil fuels such as the burning of oil, coal, and gas, and process emissions from industrial activities resulting in methane and nitrous oxide released from the treatment of wastewater.

Biogenic emissions are part of the natural biogeochemical cycling of carbon. Biogenic emissions are carbon dioxide from the combustion of non-fossilized, biologically based materials such as biogas and biofuels (e.g., biodiesel) and natural processes such as the decomposition of organic materials.

For FY 2024-2025, wastewater treatment and biosolids process emissions accounted for 73% of the total Scope 1 emissions at 4,871 MT CO_2e, comprised of 34% methane and 66% nitrous oxide. As shown in Figure 3, nitrous oxide emissions in FY 2024-2025 were comparatively greater in volume than methane in the MWMC lagoons, even though methane is widely considered the largest source of anthropogenic GHG emissions from the biosolids lagoon process in the United States[4].

Figure 3 - MWMC Facilities Anthropogenic Emissions for FY 2024-25



[4] Wastewater lagoons in the US are significant contributors of methane emissions, contributing approximately 2,300,000 metric tons per year. See Harper, L.A. "Methane emissions from an anaerobic swine lagoon." Journal of Atmospheric Environment. Retrieved 2 November 2011.

Scope 2 – Indirect Emissions Details, Electricity

Electricity Emissions

Scope 2 emissions resulting from the consumption of electricity increased by 3.3% between the FY 2022-2023 inventory and the FY 2024-2025 inventory period. The Market Based emissions factor has been applied to all inventories from 2010 to 2025 for the comparisons between reporting years.

The market-based emissions factor for this report is specifically for Eugene Water and Electric Board (EWEB), which distributes electricity primarily from the Bonneville Power Administration (BPA), whose electricity is mostly generated from low-carbon sources such as hydropower and wind. There are only two MWMC facilities using electricity purchased from Springfield Utility Board (SUB), which include Glenwood Pump Station and the old Springfield Treatment Plant Site (aka Springfield Pump Station, or Heron Park location), so for the FY 2024-2025 GHG emissions inventory, the EWEB emissions factor was used for clarity in the calculations and reporting. Both EWEB and SUB emissions factors are shown in Table 1 for comparison only.

Electricity Use Emission Factors

Which emissions factor is used to calculate GHG emissions from electricity use is a significant assumption in the accounting protocol. An emissions factor is a representation of the carbon intensity per unit of electricity (e.g., MT CO_2e per megawatt hour).

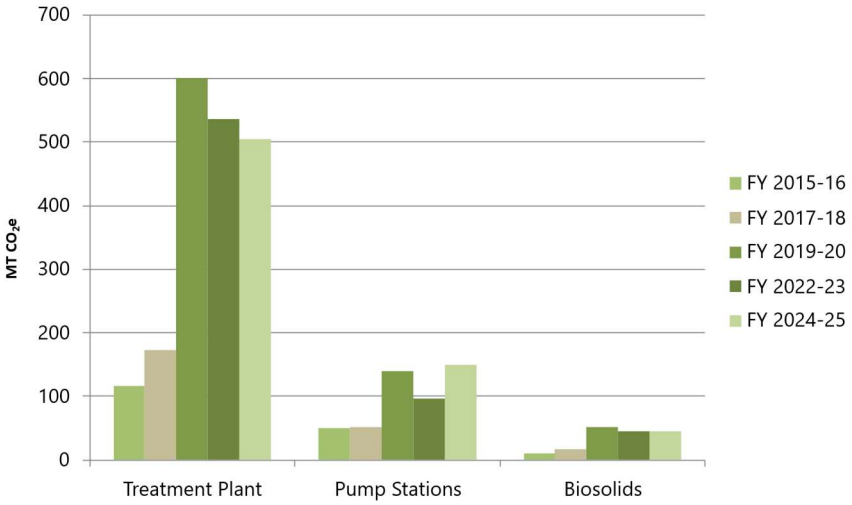
Emissions factors change from year to year because they are largely influenced by the water year and the amount of hydroelectricity available from Bonneville Power Administration and utility-owned generation resources. Emissions are also influenced by on-site electricity generation, any credit sales, and more complex protocol guiding emissions factors and calculations. Throughout FY 2024-2025, the MWMC facilities consumed 1,347 megawatt hours (MWh) more electricity than in the prior reporting period, and the GHG emissions from electricity consumed increased by 3.3% over FY 2022-2023, at 699 MT CO_2e compared to 677 MT CO_2e.

Table 1 – Market Based Emissions Factors for EWEB and SUB

	EWEB MT CO_2e / MWh	SUB MT CO_2e / MWh	MWMC Facilities Total Consumption in MWh
FY 15-16	0.010	0.012	17,122
FY 17-18	0.015	0.012	16,384
FY 19-20	0.055	0.020	15,557
FY 22-23	0.030	0.010	17,840
FY 24-25	0.036	0.017	19,187

As shown in Figure 4, the regional treatment plant location continues to be the largest source of Scope 2 emissions among all MWMC facilities, and electricity usage has been increasing year over year even though the emissions from electricity usage at the treatment plant have fallen over the past two reporting periods. Also important to note that the RNG facility came into service prior to the FY 2022-2023 emission inventory so there are now two full inventory periods of emissions data for the treatment plant with the RNG facility in service.

Figure 4 - Emissions from Electricity Consumption – Scope 2

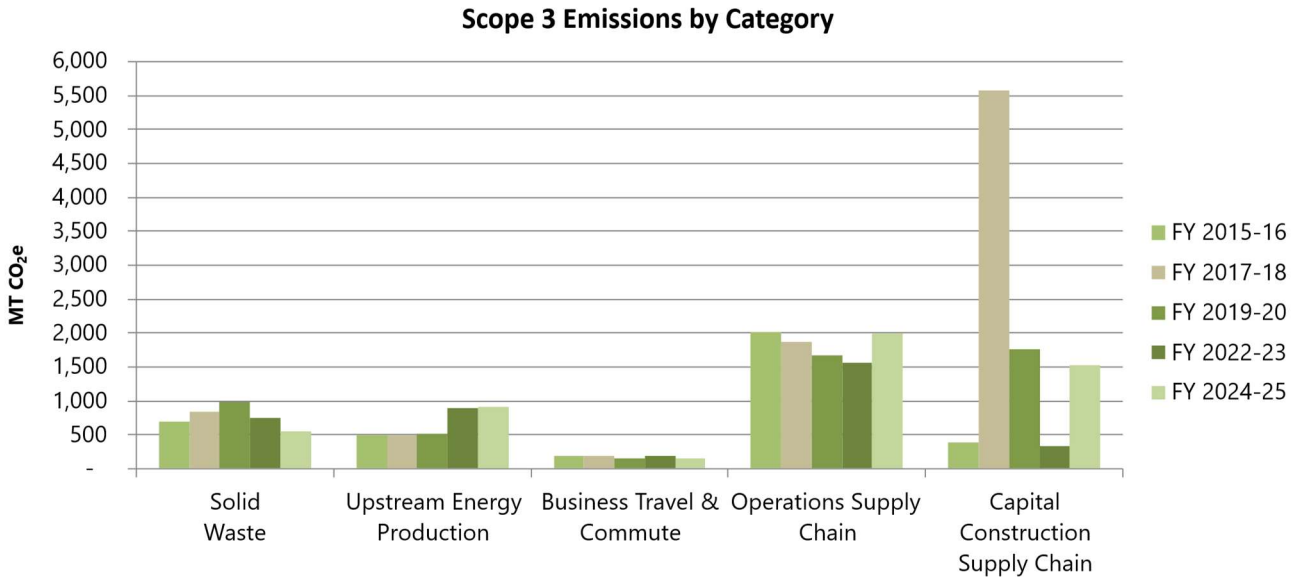


Scope 3 – Indirect Emissions Details, Supply Chain

Scope 3 emissions are from the purchase of goods and services for operating activity, capital construction, travel, solid waste disposal, and upstream energy production. Total Scope 3 emissions were 5,153 MT CO_2e in FY 2024-2025, an increase of 39% from FY 2022-2023.

The emissions sub-categories for Scope 3 are illustrated in Figure 5. These are the emissions resulting from the production, delivery, and use of construction materials, fuels and energy products, and all other supplied goods and services. Scope 3 emissions also include emissions from business travel in non-MWMC vehicles and the landfilling of solid waste, which for FY 2024-2025 decreased by 25%.

Figure 5 - Categories of Indirect Emissions – Scope 3



The increase in GHG emissions from operations (O&M) activity was largely due to Equipment Replacement, Major Rehabilitation, Major Capital, and other capital outlay projects managed by Eugene Wastewater staff. To a lesser extent, there were also higher supply-chain related GHG emissions indirectly caused by greater expenses for process chemicals, computer equipment and

software, fleet service, materials and supplies, and contractual services. Operations supply-chain emissions increased 27% in FY 2024-2025 over the prior reporting period.

The capital construction category includes all capital construction emissions during the reporting period FY 2024-2025. Construction activities that utilize concrete, steel, and other building materials create a substantial GHG emissions impact. Other emissions are produced mainly from purchases for capital construction and improvements to buildings and treatment facilities. Due to the scope and scale of CIP projects in progress during the FY 2024-2025 period, emissions from capital construction supply chain increased 359%.

Upstream energy production includes emissions from supply chain purchases of energy products consumed at MWMC facilities. Scope 1 and Scope 2 accounts for GHG emissions from combusting fossil fuels and electricity generation (i.e., tailpipe emissions). Scope 3 emissions from upstream energy result from the extraction, transportation, refinement, and distribution of energy products used in MWMC-owned equipment or used up- or downstream from the generation of electricity consumed by MWMC facilities and equipment. For example, methane leakage during natural gas extraction and transport falls under the category of upstream energy production within Scope 3. Upstream energy emissions in FY 2024-2025 increased 3% over the prior reporting period.