

SB1: COMMUNITY ENERGY EFFICIENCY

Efficiency Retrofits: Greenhouse gas calculations for the efficiency retrofits were estimated using aggregate data from previously completed projects by the sub-awardee Prosperity Works, and their sub-contractor EnergyWorks. Since 2010, EnergyWorks has provided energy efficiency services for over thirty-thousand families in New Mexico. At each home, Energy Works conducts greenhouse gas savings estimates based on the New Mexico Technical Resource Manual for the Calculation of Energy Efficiency Savings (March 24, 2023). This manual is prepared for the New Mexico Public Regulation Commission to measure and verify energy savings of utility-funded energy efficiency programs. Additional savings calculations and assumptions utilize energy saving estimates from the Department of Energy, Environmental Protection Agency, and industry resources. From these technical calculations,^{1 2} we know that on average, efficiency retrofits for low-income single-family homes result in an average annual energy use reductions of 858 kWh and 310 Therms per home.

Education: Greenhouses gas calculations for food waste prevention and education were estimated using research-based approximations for food waste reduction due to educational programming and utilizing the EPA WARM Tool (v.16) to convert short tons of food waste prevented to emissions reductions. According to WRI's residential campaign study,³ it is estimated that participants of food waste education programming demonstrate a 20% reduction in food waste. This, combined with USDA's estimate⁴ that 290 pounds of food is wasted per capita per year, indicates that educational programming could reduce up to 58 pounds (0.029 short tons) of food waste per person per year. Using census data⁵ for the average household size in Albuquerque MSA of 2.4 people, with 53 homes serviced per year during this project (265 homes total), results in 127 people educated per year, 3.68 short tons of source reduction per year and a net reduction of 15.35 metric tons of CO2 equivalent emissions per year. Assumptions made in these calculations include: 1) the program will work with people who are interested in composting, and 2) all of the potential to prevent waste starts after the household is serviced and is maintained for the duration of the project. More research is needed to inform these estimates.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)

Total: 803,134.14 metric tons of CO2 equivalent (MTCO2E)

- Energy efficiency: 802,903.89 MTCO2E
- Food waste prevention and composting: 230.25 MTCO2E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)

Total: 6,157,361.74 MTCO2E

- Energy efficiency: 6,155,596.49
- Food waste prevention and composting: 1,765.25 MTCO2E

For detailed calculations and assumptions, see *GHGcalcs_CityofAlbuquerque*, tab SB1

¹ https://drive.google.com/file/d/1d9Q-QNXto-5DCi9OLEBhJS0KJKCYks_f/view?usp=sharing

² https://drive.google.com/file/d/1UeTpYG5SN8Hr3dM5V8RA9cGXpS9XL_2m/view?usp=sharing

³ <https://www.wri.org/research/making-food-waste-socially-unacceptable>

⁴ https://www.ers.usda.gov/webdocs/publications/43833/43680_eib121.pdf

⁵ <https://censusreporter.org/profiles/31000US10740-albuquerque-nm-metro-area/>

SB2: MULTI-FAMILY DECARBONIZATION

Efficiency Retrofits: Greenhouse gas calculations were estimated using adjusted aggregate data from previously completed projects by the sub-awardee Prosperity Works, and their sub-contractor EnergyWorks as described in measure SB1. This measure assumes proportional energy use reductions (50%) for multi-family households that result in an average annual energy use reductions of 429 kWh and 155 Therms per unit. Emissions factors for CO₂, CH₄, and N₂O were used to calculate GHG emissions from natural gas and electricity use and taken from the EPA Center for Corporate Climate Leadership, GHG Emission Factors Hub, “2023 GHG Emission Factors Hub,”⁶ dated September 2023. Natural gas emissions factors were from Table 1 - Stationary Combustion. Electricity emissions factors were from Table 6 – Electricity, eGRID Subregion AZNM (WECC Southwest), Total Output Emission Factors.

Clean Transportation (e-bike): Greenhouse gas calculations were estimated using research-based national e-bike trends for mode shift. According to McQueen et al,⁷ E-bikes have the potential to reduce car trip mode share by 9.9%, resulting in an average reduction of 0.225 metric tons of CO₂ per person per year (2020). Assuming each unit utilizes their e-bike or scooter and 32 units are serviced per year, we can expect 32 metric tons of CO₂e to be reduced per year. This reduction will compound over the grant period to year resulting in a total of 106 metric tons of CO₂ for the first 5 years. The extended impact assumes that the e-bikes and scooters will retain their utility until 2050.

Clean Transportation (EV chargers): Greenhouse gas calculations were estimated using AFLEET Charging and Fueling Infrastructure (CFI) Emissions Tool version 1.1. For 8 Level 2 chargers. This project estimates four (4) Level 2 EV charging ports (or two dual port chargers) installed annually from 2026-2029 for a total of sixteen (16) Level 2 EV charging ports installed by 2030. This component assumes that the utilization rates for years 2-3 will be low to account for slow adoption of EVs in low-income households, but scales to high in years 4 and beyond as most charging is done at home.

Education: Greenhouses gas calculations for food waste prevention and education were estimated using research-based approximations described in SB1. This component assumes the average household size remains constant in multi-family units and that 32 units will be serviced each year.

Waste Diversion: Greenhouse gas calculations for composting were estimated with EPA WARM (v.16) using a preliminary, conservative estimate from a small, local food waste collection company, Little Green Bucket. Based on their experience, Albuquerque households generate on average 3.8 lbs of compostable food waste per week, which is more conservative than another estimate where 186 members diverted on average 35.325 pounds of food waste per household each month (Lancaster Community Composting Co-ops).⁸ This component assumes seven sites will be built during the grant period with one added year 1 and two added years 2-4. It is also assumed that each site will have 32 households participating per site, resulting in 3.16 short tons per site. To calculate emissions, this component utilized EPA WARM Tool, version 16, to convert annual emissions saved by composting. Green waste diverted to this system is not taken into account in this GHG calculation since some of the green waste may already be composted at a regional compost facility instead of landfilled.

⁶ <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

⁷ <https://www.sciencedirect.com/science/article/abs/pii/S1361920920306696>

⁸ <https://drive.google.com/file/d/1qPMZafXmDDJR6uxrwAKubAHEZvS42EsS/view>

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)

Total estimated GHG reduction = 243,581.21 MTCO₂E

- Efficiency Retrofits: 242,386.08 MTCO₂E
- Clean Transportation E-Bike: 481.13 MTCO₂E
- Clean Transportation EV Charger: 261.72 MTCO₂e
- Education: 126.15 MTCO₂E
- Waste Diversion: 263.13 MTCO₂E
- Policy: More research needed.
- Jobs: None anticipated.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)

Total estimated GHG reduction = 1,867,698.68 MTCO₂E

- Efficiency Retrofits: 1,858,293.28 MTCO₂E
- Clean Transportation E-Bike: 3,685.63 MTCO₂E
- Clean Transportation EV: 2,910.70 MTCO₂E
- Education: 967.15 MTCO₂E
- Waste Diversion: 1,841.93 MTCO₂E
- Policy: More research needed.
- Jobs: None anticipated.

For detailed calculations and assumptions, see *GHGcalcs_CityofAlbuquerque*, tab SB2.

SB3: COMMUNITY CENTER EFFICIENCY & EDUCATION

Efficiency Retrofits: Greenhouse gas calculations for the efficiency retrofits were estimated using aggregate data from engineering calculations⁹ by contractor Yearout Energy Services, a full-service contractor for energy systems. At three qualifying sites, Yearout calculated estimated CO₂e reductions based on the New Mexico Technical Resource Manual for the Calculation of Energy Efficiency Savings (March 24, 2023). From these technical calculations, we know that on average, efficiency retrofits for community centers may result in a reduction of 64.65 MTCO₂E per center per year. For more information see supplemental report: SB3_GHG Calculation Report_CABQ.

Education: Greenhouses gas calculations for food waste prevention and education were estimated using research-based approximations described in SB1 and SB2. This component assumes the average class size is 10 and each site will receive one workshop per year starting in year 1. This component also assumes that the average reduction in food waste post programming is 100% in year 1, 75% in year 2, and 50% in years 3 and beyond.

Waste Diversion: Greenhouse gas calculations for composting were estimated using the methodology described in SB2. This component assumes only 14 community centers will be suitable for composting and that the 14 sites will be built in accordance with the implementation schedule of three (3) sites in year 1, 3, and 4, four (4) sites in year 2, and one (1) site in year 5.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)

⁹ <https://drive.google.com/file/d/1R1XwjRvjtEpumcZAKT-OMagZoyyNgRt-/view?usp=sharing>

Total: 3,733.58 MTCO₂E

- Energy Efficiency: 3,167.95 MTCO₂E
- EV Charging: 74.62 MTCO₂E
- Food waste prevention: 212.39 MTCO₂E
- Composting: 278.62 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)

Total: 27,833.78 MTCO₂E

- Energy Efficiency: 23,895.64
- EV Charging: 571.30 MTCO₂E
- Food waste prevention: 1,467.39 MTCO₂E
- Composting: 1,983.46 MTCO₂E

For detailed calculations and assumptions, see *Supplemental Attachment_GHG Calculations*, tab SB3

SB4: LOS POBLANOS OPEN SPACE

Incinerating Toilets: Greenhouses gas calculations for diverted sewage production as a result of incinerating toilets were based on the average emissions the local water treatment plant emits to process one gallon of water. Assumptions in this component include the average volume of sewage produced on site with regular porta potties.

Solar Arrays: Greenhouses gas calculations for displaced energy usage as a result of installed solar panels were based on the total kW capacity using the PV Watts tool and EPA GHG Equivalencies Calculator. This component assumes standard module type, fixed array type with 14% system losses and 20 degrees of tilt. For the first array (3.43 kW canopy), the Azimuth is 100.5, for the second (13.72 kW canopy), it is 196.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)

Total: 94.11 MTCO₂E

- Toilets: 4.61 MTCO₂E
- Solar Arrays: 89.50 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)

Total: 518.53 MTCO₂E

- Toilets: 23.03 MTCO₂E
- Solar Arrays: 495.50 MTCO₂E

For detailed calculations and assumptions, see *Supplemental Attachment_GHG Calculations*, tab SB3.

RE1: COLLEGE SOLAR CANOPIES

Solar Arrays: Greenhouses gas calculations for displaced energy usage as a result of installed solar panels were based on the kW capacity per site using the PV Watts tool and EPA GHG Equivalencies Calculator. This component assumes standard module type, fixed array type with 14% system losses, 20 degrees of tilt, an Azimuth of 180 degrees, and that the arrays will be constructed in descending order of size starting in year 1.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)*

Total: 1,571.50 MTCO₂E

- Array 1 (180 kW): 994.50 MTCO₂E
- Array 2 (85 kW): 424.00 MTCO₂E
- Array 3 (42 kW): 153.00 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)*

Total: 9,131.50 MTCO₂E

- Array 1 (180 kW): 5,414.50 MTCO₂E
- Array 2 (85 kW): 2,544.00 MTCO₂E
- Array 3 (42 kW): 1,173.00 MTCO₂E

For detailed calculations and assumptions, see *GHGcalcs_CityofAlbuquerque*, tab SB4.

CT1: TRANSIT-ORIENTED DEVELOPMENT

EV Chargers: Greenhouses gas calculations for this measure were calculated based on the anticipated use of CPRG funded EV chargers using AFLEET CFI Emissions Tool version 1.1. Assumptions in this component include: All chargers will be installed in year 2 (12 level 2 chargers and 2 DC fast chargers) and utilization rates for Level 2 chargers will begin as moderate from years 2-4 and scale to high in year 5 to allow for adoption of light-duty electric vehicles. For the DC fast chargers, it is assumed that utilization rates will remain high, as the City's electric buses will be utilizing the chargers at this major transportation hub.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)*

Total: 489.34 MTCO₂E

- 12 Level 2 Chargers: 278.4 MTCO₂E
- 2 DC Fast Chargers: 211.19 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)*

Total: 3,532.03 MTCO₂E

- 12 Level 2 Chargers: 2,264.88 MTCO₂E
- 2 DC Fast Chargers: 1,267.16 MTCO₂E

For detailed calculations and assumptions, see *GHGcalcs_CityofAlbuquerque*, tab CT1.

CT3: MULTIMODAL RAIL TRAIL

Mode shift: Greenhouses gas calculations for this measure were calculated based on a mode shift analysis for the CPRG funded segment of the 7-mile loop. Methodology developed by researchers at the Institute for Transportation Studies at the University of California-Davis were replicated¹⁰ to more effectively quantify emissions reductions associated with improvements in bikeway infrastructures. This measure assumes that the trail development will result in only the substitution of light-duty passenger vehicles and relies on Strava data to estimate the total number of cyclists in the area.

¹⁰ <https://sfftp.cabq.gov/link/msM8SI18jXE/>

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)*

Total: 46.48 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)*

Total: 356.37 MTCO₂E

For detailed calculations and assumptions, see *GHGcalcs_CityofAlbuquerque*, tab CT1

CT5: TRANSIT ELECTRIC VEHICLES

EV Chargers: Greenhouses gas calculations for this measure were calculated based on the anticipated use of CPRG funded EV chargers using AFLEET CFI Emissions Tool version 1.1. Assumptions in this component include: Ten (10) DC fast chargers will be installed in year 1 and ten (10) will be installed in year 2. All chargers will have a high utilization rate due to the high usage of fleet vehicles.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)

Total: 2,375.55 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)

Total: 12,933.37 MTCO₂E

For detailed calculations and assumptions, see *GHGcalcs_CityofAlbuquerque*, tab CT5

CT6: MUNICIPAL FLEET ELECTRIFICATION

EV Chargers: Greenhouses gas calculations for this measure were calculated based on the anticipated use of CPRG funded EV chargers using AFLEET CFI Emissions Tool version 1.1. Assumptions in this component include: Utilization rates begin as low in year 1 and scale up to high in year 3, and the project will see an installation rate of three (3) level 2 stations per year for a total of fifteen (15) chargers and three (3) level 3 chargers per year for a total of three chargers.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)

Total: 363.42 MTCO₂E

- 15 Level 2 Chargers: 200.49 MTCO₂E
- 3 DC Fast Chargers: 162.93 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)

Total: 2,705.77 MTCO₂E

- 15 Level 2 Chargers: 1,690.09 MTCO₂E
- 3 DC Fast Chargers: 1,015.68 MTCO₂E

For detailed calculations and assumptions, see *GHGcalcs_CityofAlbuquerque*, tab CT6

CT12: DC FAST CHARGERS

EV Chargers: Greenhouses gas calculations for this measure were calculated based on the anticipated use of CPRG funded EV chargers using AFLEET CFI Emissions Tool version 1.1. Assumptions in this component include: Utilization rates begin as moderate in year 2 and scale to high in year 5, and the project will see a 100% installation rate in year 2.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)

Total: 489.34 MTCO₂E

- 12 Level 2 Chargers: 278.14 MTCO₂E
- 2 DC Fast Chargers: 211.19 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)

Total: 3,532.03 MTCO₂E

- 12 Level 2 Chargers: 2,264.88 MTCO₂E
- 2 DC Fast Chargers: 1,267.16 MTCO₂E

For detailed calculations and assumptions, see *GHGcalcs_CityofAlbuquerque*, tab CT12.

WR1: FOOD WASTE PREVENTION & COMPOSTING

Education: Greenhouses gas calculations for behavior change from educational workshops were estimated with EPA WARM (v.16) by using NRDC's estimate of average weight of food waste generated by employee (1.5 short tons per employee per year) and assumes that 25% of that waste is mitigated post programming. It also assumes the average class size is 10 and each site will receive one workshop per year starting in year 1.

Technical Services: Greenhouse gas calculations for behavior change from educational workshops were estimated with EPA WARM (v.16) using NRDC's estimate of average weight of food waste generated by employee (1.5 short tons per employee per year) and assumes that food waste will be prevented 40 weeks out of the year at a rate of 90% during the year of technical service and 75% for the years after technical assistance.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)

Total: 871.74 MTCO₂E

- Education: 362.90 MTCO₂E
- Technical Services: 508.84 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)

Total: 5,429.14 MTCO₂E

- Education: 2,391.90 MTCO₂E
- Technical Services: 3,037.24 MTCO₂E

For detailed calculations and assumptions, see *GHGcalcs_CityofAlbuquerque*, tab WR1.

WR2: TRIBAL LANDFILL DIVERSION

Food Waste Diverted: Greenhouse gas calculations for food waste diverted due to infrastructure investments were estimated with EPA WARM (v.16) by using actual data for number of people serviced per site and estimates of 1 pound per day¹¹ of food waste generation (due to strong cultural importance of food and feast days) and a 1/3 ratio of browns to food waste by weight. This component also assumes a 25% diversion rate in year 1 and 100% diversion rate in years 2-5.

Green Waste Diverted: Greenhouse gas calculations for green waste diverted due to infrastructure investments were estimated with EPA WARM (v.16) by using estimates of green waste generation (informed by above) and a 50% split ratio of yard trimmings and branches by weight. This component also assumes a 25% diversion rate in year 1 and 100% diversion rate in years 2-5 due to implementation schedule for being operational by Q3 2025 and to account for time for community members to learn about and start using the system. It is also assumed that once operational, the Pueblo of San Felipe will maintain operations of the facility.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)

Total: 12,588.34 MTCO₂E

- Food Waste: 12,329.21 MTCO₂E
- Green Waste: 259.13 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)

Total: 71,827.54 MTCO₂E

- Food Waste: 70,349.01 MTCO₂E
- Green Waste: 1,478.53 MTCO₂E

For detailed calculations and assumptions, see *GHGcalcs_CityofAlbuquerque*, tab WR2.

WR3: MUNICIPAL GREEN WASTE

Green Waste Diverted: Greenhouse gas calculations for green waste diverted due to infrastructure investments were estimated with EPA WARM (v.16) by using estimates of green waste generation of 5 tons per month and a ratio of 5% yard trimmings, 5% grass, 10% leaves, and 80% branches by weight. This component also assumes a 100% diversion rate from years 1-5 as green waste will be stored and prepared a month before the grant period.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)

Total: 120.80 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)

Total: 604.00 MTCO₂E

For detailed calculations and assumptions, see *GHGcalcs_CityofAlbuquerque*, tab WR3.

¹¹ <https://www.ars.usda.gov/news-events/news/research-news/2018/food-waste-resonates-beyond-the-trash-bin/>

CN1: COUNTY GREEN STORMWATER INFRASTRUCTURE

Tree Planting: Greenhouse gas calculations for green stormwater infrastructure development are made by using USDA Forest Service’s i-Tree Planting Calculator tool.¹² Estimates were based on median values for the 9 arid-adapted trees available in the i-Tree tool that are listed on the Bernalillo County Green Stormwater Infrastructure Plant List.¹³ Estimates include both sequestered carbon and avoided carbon from reductions in energy use in adjacent buildings. Estimates only reflect trees and do not include the greenhouse gas reductions associated with shrubs, grasses, and perennials planted in green stormwater infrastructure features. It is assumed that all 240 street trees will be planted in year 2, will have a 3% mortality rate, a diameter breast height of 2 inches, and will be located directly west of buildings within 0-19 feet. The shaded buildings are assumed to be built between 1950-1980 and both heated and cooled.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)

Total: 129.56 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)

Total: 777.34 MTCO₂E

For detailed calculations and assumptions, see *Supplemental Attachment_GHG Calculations*, tab CN1.

CN3: TREE PLANTING INVENTORY

Tree Planting: Greenhouse gas calculations for the impact of tree inventory data were made by conducting two scenarios using USDA Forest Service’s i-Tree Planting Calculator tool. The first estimate assumes a 10% attrition rate for no data-management system. The second estimate assumes a 1% attrition rate for the implementation of a data-management system. Both estimates retain the following constant variables: All trees planted a diameter breast height of 2 inches, and will be located directly north of buildings (to mitigate the fact that future tree plantings will be a mix of urban shade trees and park trees) and within 0-19 feet of buildings built between 1950-1980 that are both heated and cooled. It is also assumed that the data management system will be utilized in year 2 for the future planting of 50,000 trees per year. The greenhouse gas estimates are derived from taking the difference of these two scenarios per tree per year and applying the net savings by each new tree planted starting year 2.

Estimate of the Cumulative GHG Emission Reductions (2025 – 2030)

Total: 3,398.74.71 MTCO₂E

Estimate of the Cumulative GHG Emission Reductions (2025 – 2050)

Total: 30,588.64 MTCO₂E

For detailed calculations and assumptions, see *GHGcalcs_CityofAlbuquerque*, tab CN3.

¹² <https://www.itreetools.org/>

¹³ <https://www.bernco.gov/wp-content/uploads/BernCo-GSI-Plant-List.pdf>