

Monterey County Agriculture and Tourism Worker EMobility Network

Technical Appendix

This appendix presents the methodology and assumptions for the expected GHG emissions reductions associated with each component of the proposed project. The appendix first provides a list of assumptions, methodologies, and tools common to all measures, and then a detailed methodology specific to each measure.

GHG Reduction calculation Methodology

In order to calculate GHG reductions we first calculated the total Vehicle Miles Travelled (VMT) reductions and additions associated with each measure, in each year, using the number of vehicles, number of vehicle trips, and length of average vehicle trip.

Yearly emissions reduction were calculated using the following equations:

$$\text{VMT replaced from project measure in}_{\text{year } X} = \text{Number of vehicles replaced} \times \text{Number of vehicle trips} \times \text{Length of average vehicle trip}$$

$$\text{Electric VMT Added from project measure in}_{\text{year } X} = \text{Number of electric vehicles added} \times \text{Number of vehicle trips} \times \text{Length of average vehicle trip}$$

We then used the replaced VMT figure to calculate the reduction in annual emissions associated with the project by using vehicle emissions factors. We assumed that the replaced VMT would have been driven in an average light duty vehicle in the County of Monterey for each year the measure is in place.

$$\text{Annual Emissions reduction from project measure}_{\text{year } X} = \text{VMT replaced by project measure in}_{\text{year } X} \times \text{Monterey County Average light duty vehicle Emissions Factor}_{\text{year } X}$$

Meanwhile, we used the Electric VMT added from the project measure in each year to calculate the emissions associated with electricity usage from the electric vans and cars. It was assumed that the emissions factor for electricity each year was equal to the 2021 EGRID emissions factor for the CAMX region. A standard VMT to kilowatt-hour conversion was used, of approximately 0.39 kWh per mile.

$$\text{Annual GHG emissions from project measure}_{\text{year } X} = \text{Electric VMT added from project measure in}_{\text{year } X} \times \text{VMT to kWh conversion factor} \times \text{2021 EGRID CAMX GHG Emission Factor}$$

The annual emissions from each measure was then subtracted to the corresponding annual emissions reductions in order to calculate a yearly GHG reduction impact for each measure.

$$\text{GHG reduction impact project measure}_{\text{year } X} = \text{Annual Emissions reduction from project measure}_{\text{year } X} - \text{Annual Emissions from project measure}_{\text{year } X}$$

All GHG reduction impacts were then summed up by year and by measure in order to calculate the total impact of the project. All calculations are detailed in attachment A to this appendix.

Models and Tools Used

The team used an excel tool, attached as attachment A, to calculate the yearly GHG reduction impact from each measure according to the GHG Reduction calculation methodology highlighted above. The tool calculates GHG emissions based on the number of vehicle miles a measure is replacing and the number of miles the measure will be adding multiplied by their corresponding emissions factors. The VMT numbers associated with each measure are based on specific measure assumptions relating to the number of trips per day, trip distance, and the number of days and weeks per year the trips will be taken.

The team used the California Air Resources Board EMFAC 2021 tool, which provides specific vehicle fleet composition data by California County and by year, to calculate the carbon intensity of the vehicles being replaced, and the average electricity usage of the EV Vans and EV cars per mile. In all cases, the team assumed that the vehicle being replaced would be an average light duty vehicle in Monterey County, for each year. The team also used the data in EMFAC to estimate a 0.39 kWh per mile conversion factor to calculate the kWh impact of the electric vehicles miles being added as part of the measures. The data pulled from the EMFAC tool is attached to this Appendix as attachment B.

Measure 1: EV Van Rebates for 60 Farmworker/Commuter Vanpools in Disadvantaged Communities **Specific Assumptions.**

For this measure, the team made the following assumptions:

- The rebate will cover 100% of the vehicle cost.
- Each rebate will lead to the creation of a new vanpool.
- Each new vanpool will have 8 passengers. This assumption was made because vans come in two sized, 8 and 15 passengers and the team wanted to be conservative in our assumptions.
- Vans will have an effective useful life of 10 years, from 2025 to 2035.
- Vanpool will operate on average 50 weeks a year, 5 days a week, with 2 one-way trips of 30 miles each day.

Measure 2: Establish 5 EV Carshare hubs with a total of 10 EVs from Pajaro through Salinas Valley **Specific Assumptions.**

For this measure, the team made the following assumptions:

- Vehicles will be purchased and 100% funded as part of the project.
- The Carsharing program will run for a period of 10 years, from 2025 to 2035
- The location of each EV Carshare hub will not impact the VMT reduced and added.
- 50% of the miles being added through the carsharing program would not have occurred using an internal combustion engine. This assumption is made because the low-income population this measure is serving may not have otherwise had access to a vehicle.
- Each trip taken with an EV car share service is replacing a maximum of 1 internal combustion engine vehicle trip. This assumption is made for the same reason as above, and assumes minimal carpooling as part of the car sharing service.
- Carshare vehicles will be used an average of 52 weeks a year, 5 days a week, with 2 trips each day of 35 miles each. These assumptions were made based on a the results of a evaluation study of a existing car share program in the Central Valley of California ¹

Measure 3: Low-income resident EV Purchase Technical Assistance Technical Assumptions.

For this measure, the team made the following assumptions:

- The program will enable participants to purchase an EV 5 years earlier than they otherwise would have been able to
- The measure will be active for 5 years and enable the purchase of 20 EVs per year.
- Each EV will drive the average mileage for light duty vehicles in Monterey County each year

¹ 8 Rodier, C., Harold, B., & Zhang, Y. (2022). A Before and After Evaluation of Shared Mobility Projects in the San Joaquin Valley. UC Davis: National Center for Sustainable Transportation. <http://dx.doi.org/10.7922/G2CZ35GV>
Retrieved from <https://escholarship.org/uc/item/7nr194n7>

Monterey County Agriculture and Tourism Worker EMobility Network Technical Appendix
Attachment A: Measure GHG Impact Calculations

Measure GHG impact 2025-2035 in metric tons of CO2e *													
	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2030 Cumulative Local Reductions	2035 Cumulative Local Reductions
Measure 1 *	-620	-2,412	-2,349	-2,286	-2,232	-2,175	-2,131	-2,085	-2,048	-2,010	-1,986	-12,072	-22,332
Measure 2 *	-8	-15	-14	-13	-12	-12	-11	-10	-10	-10	-9	-73	-123
Measure 3 *	-34	-131	-190	-236	-229	-165	-107	-52	0	0	0	-984	-1,144
Total	-662	-2557	-2552	-2535	-2472	-2352	-2249	-2148	-2058	-2020	-1995	-13,130	-23,600

* See technical appendix narrative for a detailed discussion of assumptions

Detailed measure GHG impact Calculations												
2025* GHG impact calculations, in metric tons of CO2e **												
	# of Equipment	trips/ day	trip distance	total miles/ person /day	Total miles / day	total miles replaced /year	Total miles added /year	GHG reduction / VMT replaced	GHG reductions	kWh added	GHG emissions from kWh added	Total GHG impact
Measure 1*	30	2	30	60	1,800	1,800,000	225,000	0.0003561	-641	86,869	21	-620
Measure 2*	10	2	35	70	700	45,500	91,000	0.0003561	-16	35,134	8	-8
Measure 3*	20					129,335	129,335	0.0003561	-46	49,934	12	-34
TOTAL												-662

* It is assumed that GHG reduction will begin On July 1st 2025, since ramp up time will be needed as well as delivery time for vehicles.
 **See technical appendix narrative for a detailed discussion of assumptions

2026 GHG impact calculations, in metric tons of CO2e *												
	# of Equipment	trips/day	trip distance	total miles/person/day	Total miles / day	total miles replaced /year	Total miles added /year	GHG reduction / VMT replaced	GHG reductions	kWh added	GHG emissions from kWh added	Total GHG impact
Measure 1*	60	2	30	60	3,600	7,200,000	900,000	0.0003466	-2,495	347,474	84	-2,412
Measure 2*	10	2	35	70	700	91,000	182,000	0.0003466	-32	70,267	17	-15
Measure 3*	40					516,623	516,623	0.0003466	-179	199,459	48	-131
TOTAL												-2,557
* See technical appendix narrative for a detailed discussion of assumptions												

2027 GHG impact calculations, in metric tons of CO2e												
	# of Equipment	trips/ day	trip distance	total miles/ person /day	Total miles / day	total miles replaced /year	Total miles added /year	GHG reduction / VMT replaced	GHG reductions	kWh added	GHG emissions from kWh added	Total GHG impact
Measure 1*	60	2	30	60	3,600	7,200,000	900,000	0.0003379	-2,433	347,474	84	-2,349
Measure 2*	10	2	35	70	700	91,000	182,000	0.0003379	-31	70,267	17	-14
Measure 3*	60					774,241	774,241	0.0003379	-262	298,921	72	-190
TOTAL												-2,552
* See technical appendix narrative for a detailed discussion of assumptions												

Monterey County Agriculture and Tourism Worker EMobility Network Technical Appendix Attachment B: CARB EMFAC 2021 Data

EMFAC 2021 County of Monterey 2025 data			
vehicle class	averageCO2e/ mile	average EV electricity usage / mile	average yearly miles / vehicle
average LDA	0.0002919	0.38608253	13,387.31
Average LDT1	0.00039007	0.38608253	11,023.14
Average LDt2	0.00039065	0.38608253	13,022.29
Average MDV	0.00048812	0.38608253	12,153.75
Average light d	0.0003561	0.38608253	12,933.49

EMFAC 2021 County of Monterey 2026 data			
vehicle class	averageCO2e/ mile	average EV electricity usage / mile	average yearly miles / vehicle
average LDA	0.00028371	0.38608253	13,378.02
Average LDT1	0.0003819	0.38608253	11,039.39
Average LDt2	0.00038097	0.38608253	12,985.12
Average MDV	0.0004785	0.38608253	12,098.04
Average light d	0.00034657	0.38608253	12,915.58

EMFAC 2021 County of Monterey 2027 data			
vehicle class	averageCO2e/ mile	average EV electricity usage / mile	average yearly miles / vehicle
average LDA	0.0002767	0.38608253	13,355.79
Average LDT1	0.00037466	0.38608253	11,049.59
Average LDt2	0.00037178	0.38608253	12,968.74
Average MDV	0.00046828	0.38608253	12,084.46
Average light d	0.00033787	0.38608253	12,904.01

EMFAC 2021 County of Monterey 2028 data			
vehicle class	averageCO2e/ mile	average EV electricity usage / mile	average yearly miles / vehicle
average LDA	0.00026892	0.38608253	13,395.39
Average LDT1	0.00036855	0.38608253	11,027.99
Average LDt2	0.00036358	0.38608253	12,933.26
Average MDV	0.00045948	0.38608253	12,047.21
Average light d	0.00032912	0.38608253	12,912.47

EMFAC 2021 County of Monterey 2029 data			
vehicle class	averageCO2e/ mile	average EV electricity usage / mile	average yearly miles / vehicle
average LDA	0.00026311	0.38608253	13,363.70
Average LDT1	0.0003606	0.38608253	11,072.61
Average LDt2	0.00035552	0.38608253	12,909.96
Average MDV	0.00045016	0.38608253	12,035.56
Average light d	0.00032157	0.38608253	12,895.33

EMFAC 2021 County of Monterey 2030 data			
vehicle class	averageCO2e/ mile	0.38608253	average yearly miles / vehicle
average LDA	0.00025652	0.38608253	13,394.76
Average LDT1	0.00035359	0.38608253	11,099.03
Average LDt2	0.00034729	0.38608253	12,908.26
Average MDV	0.00044187	0.38608253	12,011.10
Average light d	0.00031366	0.38608253	12,911.99

EMFAC 2021 County of Monterey 2031 data			
vehicle class	averageCO2e/ mile	average EV electricity usage / mile	average yearly miles / vehicle
average LDA	0.00025173	0.38608253	13,360.71
Average LDT1	0.00034753	0.38608253	11,114.93
Average LDt2	0.00034102	0.38608253	12,857.01
Average MDV	0.00043473	0.38608253	11,972.48
Average light d	0.00030757	0.38608253	12,879.04

EMFAC 2021 County of Monterey 2033 data			
vehicle class	averageCO2e/ mile	average EV electricity usage / mile	average yearly miles / vehicle
average LDA	0.00024284	0.38608253	13,332.14
Average LDT1	0.00033604	0.38608253	11,158.12
Average LDt2	0.00032921	0.38608253	12,788.95
Average MDV	0.00042038	0.38608253	11,944.80
Average light d	0.00029613	0.38608253	12,850.41

EMFAC 2021 County of Monterey 2035 data			
vehicle class	averageCO2e/ mile	average EV electricity usage / mile	average yearly miles / vehicle
average LDA	0.00023595	0.38608253	13,298.02
Average LDT1	0.00032381	0.38608253	11,297.69
Average LDt2	0.00032157	0.38608253	12,640.43
Average MDV	0.00040881	0.38608253	11,909.46
Average light d	0.00028742	0.38608253	12,798.00

EMFAC 2021 County of Monterey 2032 data			
vehicle class	averageCO2e/ mile	average EV electricity usage / mile	average yearly miles / vehicle
average LDA	0.00024649	0.38608253	13,376.42
Average LDT1	0.00034253	0.38608253	11,105.65
Average LDt2	0.00033501	0.38608253	12,816.19
Average MDV	0.00042733	0.38608253	11,955.89
Average light d	0.00030128	0.38608253	12,876.74

EMFAC 2021 County of Monterey 2034 data			
vehicle class	averageCO2e/ mile	average EV electricity usage / mile	average yearly miles / vehicle
average LDA	0.00023861	0.38608253	13,346.45
Average LDT1	0.00032936	0.38608253	11,243.17
Average LDt2	0.00032377	0.38608253	12,768.53
Average MDV	0.00041448	0.38608253	11,921.65
Average light d	0.00029082	0.38608253	12,854.80