
APPENDIX F

Air Quality and Greenhouse Gas Emissions Technical Appendix

APPENDIX F-1

CalEEMod Operational Emissions Calculations

“Remarks” for the Correia Family Dairy Farm Expansion Project CalEEMod (v.2022.1.1.26) Model Run

“Remarks” are typically used in California Emissions Estimator Model (CalEEMod) to explain non-default inputs. For the current modeling, this document replaces the “remarks” section of the referenced CalEEMod model to provide more space to both identify non-default inputs and to explain how CalEEMod is used to calculate emissions for the current project. When defaults were retained and no further explanation was necessary, no “remarks” are recorded below. The proposed project increment of increase of operational emissions were estimated as set forth below. Based on project details, only mobile source emissions are included.

Correia Family Dairy Farm Model Run

Land Use

- The General Heavy Industrial land use subtype was used to represent the dairy project, an industrial agriculture project. With implementation of the proposed dairy expansion, new structures would include approximately 474,831 square feet. This analysis uses a conservative estimate of emissions from new structures.

Construction Phase

- The proposed structure construction would occur over multiple phases. Construction modeling was completed separately and can be found in EIR Appendix G, *Health Risk Assessment and Ambient Air Quality Analysis*.

Vehicle Trips

- Animal Confinement Facilities operate 7 days a week. The proposed expanded operations would generate an increase of approximately 10.4 average daily trips (ADTs) (or 0.022 trips per 1,000 square feet). Fleet mix modified to reflect project increase, 38.5 percent auto/light truck and 61.5 percent heavy duty trucks.

Operational Off-Road Equipment

- Calculated separately. See Appendix G.

Area Sources, Energy, Water and Wastewater, Solid Waste

- These rates are not applicable to the proposed dairy, and were not included. Electricity use provided by project applicant and calculated for GHG separately.

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Correia Dairy Detailed Report

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1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Correia Dairy
Operational Year	2026
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.80
Precipitation (days)	25.0
Location	26380 Fahey Rd, Gustine, CA 95322, USA
County	Merced
City	Unincorporated
Air District	San Joaquin Valley APCD
Air Basin	San Joaquin Valley
TAZ	2311
EDFZ	5
Electric Utility	Pacific Gas & Electric Company
Gas Utility	Pacific Gas & Electric
App Version	2022.1.1.29

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
General Heavy Industry	475	1000sqft	10.9	474,831	—	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.4. Operations Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.02	0.02	0.34	0.21	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	0.00	277	277	< 0.005	0.04	0.70	290
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.02	0.02	0.36	0.19	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	0.00	274	274	< 0.005	0.04	0.02	286
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.02	0.02	0.35	0.19	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	0.00	275	275	< 0.005	0.04	0.30	287
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	< 0.005	< 0.005	0.06	0.03	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	0.00	45.5	45.5	< 0.005	0.01	0.05	47.6

2.5. Operations Emissions by Sector, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Sector	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.02	0.02	0.34	0.21	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	—	277	277	< 0.005	0.04	0.70	290

Area	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Waste	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	0.02	0.02	0.34	0.21	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	0.00	277	277	< 0.005	0.04	0.70	290
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.02	0.02	0.36	0.19	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	—	274	274	< 0.005	0.04	0.02	286
Area	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Waste	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	0.02	0.02	0.36	0.19	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	0.00	274	274	< 0.005	0.04	0.02	286
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.02	0.02	0.35	0.19	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	—	275	275	< 0.005	0.04	0.30	287
Area	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Waste	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	0.02	0.02	0.35	0.19	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	0.00	275	275	< 0.005	0.04	0.30	287
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	< 0.005	< 0.005	0.06	0.03	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	—	45.5	45.5	< 0.005	0.01	0.05	47.6
Area	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Waste	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	< 0.005	< 0.005	0.06	0.03	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	0.00	45.5	45.5	< 0.005	0.01	0.05	47.6

4. Operations Emissions Details

4.1. Mobile Emissions by Land Use

4.1.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	0.02	0.02	0.34	0.21	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	—	277	277	< 0.005	0.04	0.70	290
Total	0.02	0.02	0.34	0.21	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	—	277	277	< 0.005	0.04	0.70	290
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	0.02	0.02	0.36	0.19	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	—	274	274	< 0.005	0.04	0.02	286
Total	0.02	0.02	0.36	0.19	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	—	274	274	< 0.005	0.04	0.02	286
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	< 0.005	< 0.005	0.06	0.03	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	—	45.5	45.5	< 0.005	0.01	0.05	47.6
Total	< 0.005	< 0.005	0.06	0.03	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	—	45.5	45.5	< 0.005	0.01	0.05	47.6

4.2. Energy

4.2.1. Electricity Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00

4.2.3. Natural Gas Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00

4.3. Area Emissions by Source

4.3.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Source	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Consumer Product	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.4. Water Emissions by Land Use

4.4.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00

4.5. Waste Emissions by Land Use

4.5.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
General Heavy Industry	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00

Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
-------	---	---	---	---	---	---	---	---	---	---	---	------	------	------	------	------	---	------

4.6. Refrigerant Emissions by Land Use

4.6.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.7. Offroad Emissions By Equipment Type

4.7.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.8. Stationary Emissions By Equipment Type

4.8.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipm ent Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.9. User Defined Emissions By Equipment Type

4.9.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipm ent Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Remove	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.9. Operational Mobile Sources

5.9.1. Unmitigated

Land Use Type	Trips/Weekday	Trips/Saturday	Trips/Sunday	Trips/Year	VMT/Weekday	VMT/Saturday	VMT/Sunday	VMT/Year
General Heavy Industry	10.4	10.4	10.4	3,813	117	117	117	42,775

5.10. Operational Area Sources

5.10.1. Hearths

5.10.1.1. Unmitigated

5.10.2. Architectural Coatings

Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)
0	0.00	712,247	237,416	—

5.10.3. Landscape Equipment

Season	Unit	Value
Snow Days	day/yr	0.00
Summer Days	day/yr	0.00

5.11. Operational Energy Consumption

5.11.1. Unmitigated

Electricity (kWh/yr) and CO2 and CH4 and N2O and Natural Gas (kBTU/yr)

Land Use	Electricity (kWh/yr)	CO2	CH4	N2O	Natural Gas (kBTU/yr)
General Heavy Industry	0.00	204	0.0330	0.0040	0.00

5.12. Operational Water and Wastewater Consumption

5.12.1. Unmitigated

Land Use	Indoor Water (gal/year)	Outdoor Water (gal/year)
General Heavy Industry	0.00	0.00

5.13. Operational Waste Generation

5.13.1. Unmitigated

Land Use	Waste (ton/year)	Cogeneration (kWh/year)
General Heavy Industry	0.00	—

5.14. Operational Refrigeration and Air Conditioning Equipment

5.14.1. Unmitigated

Land Use Type	Equipment Type	Refrigerant	GWP	Quantity (kg)	Operations Leak Rate	Service Leak Rate	Times Serviced
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5.15. Operational Off-Road Equipment

5.15.1. Unmitigated

Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
----------------	-----------	-------------	----------------	---------------	------------	-------------

5.16. Stationary Sources

5.16.1. Emergency Generators and Fire Pumps

Equipment Type	Fuel Type	Number per Day	Hours per Day	Hours per Year	Horsepower	Load Factor
----------------	-----------	----------------	---------------	----------------	------------	-------------

5.16.2. Process Boilers

Equipment Type	Fuel Type	Number	Boiler Rating (MMBtu/hr)	Daily Heat Input (MMBtu/day)	Annual Heat Input (MMBtu/yr)
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5.17. User Defined

Equipment Type	Fuel Type
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5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres
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5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres
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5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)
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6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	30.1	annual days of extreme heat
Extreme Precipitation	1.15	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	0.00	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters

Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	4	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	0	0	0	N/A
Drought	0	0	0	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.

The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.

The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	4	1	1	4
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	N/A	N/A	N/A	N/A
Flooding	1	1	1	2
Drought	1	1	1	2
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.

The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.

The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	62.6
AQ-PM	47.0
AQ-DPM	15.9
Drinking Water	64.7
Lead Risk Housing	60.5
Pesticides	85.1
Toxic Releases	6.56
Traffic	17.9
Effect Indicators	—
CleanUp Sites	58.2
Groundwater	98.8
Haz Waste Facilities/Generators	16.6
Impaired Water Bodies	98.4
Solid Waste	80.0
Sensitive Population	—
Asthma	89.7
Cardio-vascular	63.4
Low Birth Weights	60.1

Socioeconomic Factor Indicators	—
Education	76.9
Housing	16.9
Linguistic	84.9
Poverty	76.1
Unemployment	79.0

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	23.1233158
Employed	15.8475555
Median HI	18.63210574
Education	—
Bachelor's or higher	14.74400103
High school enrollment	100
Preschool enrollment	1.873476197
Transportation	—
Auto Access	65.16104196
Active commuting	33.50442705
Social	—
2-parent households	42.96163223
Voting	40.88284358
Neighborhood	—
Alcohol availability	57.38483254
Park access	26.71628384
Retail density	3.156679071

Supermarket access	38.04696523
Tree canopy	67.0088541
Housing	—
Homeownership	41.92223791
Housing habitability	59.88707815
Low-inc homeowner severe housing cost burden	58.57821122
Low-inc renter severe housing cost burden	76.67137174
Uncrowded housing	36.04516874
Health Outcomes	—
Insured adults	16.01437187
Arthritis	0.0
Asthma ER Admissions	28.1
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	34.4
Cognitively Disabled	48.3
Physically Disabled	50.9
Heart Attack ER Admissions	13.2
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	53.8
Physical Health Not Good	0.0
Stroke	0.0

Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	0.0
SLR Inundation Area	0.0
Children	39.2
Elderly	53.8
English Speaking	12.8
Foreign-born	62.8
Outdoor Workers	4.0
Climate Change Adaptive Capacity	—
Impervious Surface Cover	84.8
Traffic Density	8.3
Traffic Access	0.0
Other Indices	—
Hardship	81.7
Other Decision Support	—
2016 Voting	68.7

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	84.0
Healthy Places Index Score for Project Location (b)	18.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	Yes
Project Located in a Low-Income Community (Assembly Bill 1550)	Yes
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Operations: Vehicle Data	10.4 ADT
Operations: Fleet Mix	Estimated fleet mix
Operations: Architectural Coatings	Freestall barns etc.
Operations: Energy Use	Calculated separately
Operations: Water and Waste Water	n/a
Operations: Solid Waste	n/a
Operations: Refrigerants	n/a
Operations: Consumer Products	n/a
Operations: Landscape Equipment	n/a

APPENDIX F-2

Emissions Calculations

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Herd Breakout

	Existing	Proposed
Milking Cow	1,050	3,000
Dry Cow	120	390
Heifer (15-24 mo)	375	830
Heifer (7-14 mo)	475	1,160
Calves (4-6 mo)	110	415
Calf (under 3 mo)	0	280
Totals	2,130	6,075
Increase		3,945
Mature Cows	1,170	3,390
Support Stock	960	2,685

VOC Emissions from Harvested Acres in Merced County

	tons/day	lbs/year	lbs/acre/yr
Merced Farm	0.81	591,300	1.189
Harvested Acres	497,467		
		lbs/year	tons/year
Acres Existing	999	1,187	0.594
Acres Proposed	841	1,000	0.500
			-0.094

Farm Equipment emissions were calculated using an emissions factor of 1.19 lbs/acre/year of VOC based on an estimated 0.81 tons/day VOC emitted from farming equipment in the County, with 497,467 acres harvested. This emission factor is based on 2017 inventory data and would represent a conservative estimate of emissions.

This emission factor was applied to the existing 398 acres harvested (fields are harvested multiple times a year) and to the proposed 389 acres harvested (fields would be harvested multiple times a year).

California Air Resources Board. CEPAM2019V1.03 Emission Projection Data. 2017 Estimated Annual Average Emissions. Merced County.

Accessed on July 12, 2024 at <<https://ww2.arb.ca.gov/applications/emissions-county>>

United States, Department of Agriculture (USDA). 2017. 2017 Census of Agriculture – County Data: Total Cropland - Harvested Cropland, Acres. Merced County. Accessed on July 12, 2024 at < https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Census_by_State/California/ >

VOC Emissions from Mobile Sources

Emissions	Emissions (lbs/day)	Emissions (tons/yr)
Onsite Mobile Source (Tractors and milk tankers)	0.04	0.007
Traffic		0.01
Tons/Year Total Mobile Source		0.012
Emissions from traffic were estimated using CalEEMod Version 2022.1.1.29, Appendix F-1. See Appendix G for Onsite Mobile Sources such as feed loaders.		

Total VOC Emissions

Emission Source	Existing VOC/ROG Emissions (tons/yr)	Proposed VOC/ROG Emissions (tons/yr)	Increment of Increase with Proposed Expansion
Traffic and Onsite Mobile Source			0.012
Farm Equipment	0.594	0.500	-0.094
Feed and Manure Management	16.24	49.25	33.01
	16.83	49.75	32.93
VOC emissions from traffic were estimated using CalEEMod Version 2022.1.1.29. Onsite truck travel and idling and onsite off-road equipment such as feed loaders VOC emissions are estimated in Appendix G of the EIR. VOC emissions from feed and manure management (including cow housing, liquid manure, and solid manure) were estimated using the SJVAPCD dairy emissions calculator. See Appendix F for calculator emissions and CalEEMod results.			

Herd Breakout

	Existing	Proposed
Milking Cow	1,050	3,000
Dry Cow	120	390
Heifer (15-24 mo)	375	830
Heifer (7-14 mo)	475	1,160
Heifer (4-6 mo)	110	415
Calf (under 3 mo)	0	280
Totals	2,130	6,075

PM Emissions from Cow Housing

	Existing PM ₁₀ Emissions	Proposed PM ₁₀ Emissions	PM ₁₀ Increment of Increase	PM _{2.5} Increment of Increase
Totals (lbs/yr)	6,501	11,682	5,181	591
Tons/Year	3.25	5.84	2.59	0.30

See SJVAPCD Calculator for PM₁₀ Calculation Worksheets and Controls. To generate PM_{2.5} emissions, the PM₁₀ emission results were multiplied by the PM_{2.5} fraction from the livestock fugitive dust profile in the California Emission Inventory Data and Reporting System (CEIDARS) developed by the California Air Resources Board.

Wind Erosion Cropped Fields

	PM Emission Factor (tons/ acre/yr)	PM ₁₀ /PM _{2.5} Emission Factor (tons/acre/yr)	Emission Factor (lbs/ acre/yr)	Existing Acreage	Existing Emissions (tons/year)	Proposed Acreage	Proposed Emissions (tons/year)
PM ₁₀	0.013659	0.0061466	12.3	398	2.45	389	2.39
PM _{2.5} *		0.0010594	2.12	398	0.422	389	0.412
Note: PM _{2.5} Emissions Factor estimated from a comparison of Annual Average Emissions of both PM ₁₀ and PM _{2.5} as found in CARB Almanac Emission Projection Data (Published in 2013). 2012 Estimated Annual Average Emissions. 2012 Emissions Data for Merced County, Dust from Agricultural Lands (Non-Pasture). http://www.arb.ca.gov/ei/emissiondata.htm							
PM Emission Factor found in Methodology for California Air Resources Board, Section 7.12, Windblown Dust - Agricultural Lands, Revised July 1997. http://www.arb.ca.gov/ei/areasrc/index7.htm							

PM Emissions from Mobile Sources

Emissions	PM10 Emissions (lbs/day)	PM2.5 Emissions (lbs/day)	PM10 Emissions (tons/yr)	PM2.5 Emissions (tons/yr)
Onsite Mobile Source (Tractors and milk tankers)	0.01	0.01	0.001825	0.001825
Traffic			0.020	0.010
Tons/Year			0.022	0.012
Emissions from traffic were estimated using CalEEMod Version 2022.1.1.29, Appendix F-1. See Appendix G for Onsite Mobile Sources such as feed loaders.				

Land Preparation and Harvesting

	Crop Type	PM10 Emission Factor (lbs/acre/year)	PM2.5 Emission Factor (lbs/acre/year)	Existing Acreage	Existing PM10 Emissions (tons/year)	Existing PM2.5 Emissions (tons/year)	Proposed Acreage	Proposed PM10 Emissions (tons/year)	Proposed PM2.5 Emissions (tons/year)
Land Preparation	Oats	3.70	0.55	292	0.54	0.08	0	0.00	0.00
	Corn, silage	6.90	0.10	0	0.00	0.00	276	0.95	0.01
	Sudangrass	4.00	0.06	292	0.58	0.01	0	0.00	0.00
	Alfalfa, hay	4.00	0.60	0	0.00	0.00	0	0.00	0.00
	Wheat	3.70	0.06	0	0.00	0.00	276	0.51	0.01
	Walnut	3.13	0.47	0	0.00	0.00	0	0.00	0.00
	Earlage*	6.90	1.03	0	0.00	0.00	0	0.00	0.00
	Almond	3.13	0.47	0	0.00	0.00	0	0.00	0.00
	Sorghum	3.70	0.06	0	0.00	0.00	0	0.00	0.00
	Pistachios	3.13	0.47	0	0.00	0.00	0	0.00	0.00
Total Land Preparation					1.12	0.09		1.46	0.02
Harvesting	Oats	5.80	0.87	292	0.85	0.13	0	0.00	0.00
	Corn, silage	0.17	0.00	0	0.00	0.00	276	0.02	0.00
	Sudangrass	0.00	0.00	601	0.00	0.00	0	0.00	0.00

	Crop Type	PM10 Emission Factor (lbs/acre/ year)	PM2.5 Emission Factor (lbs/ acre/year)	Existing Acreage	Existing PM10 Emissions (tons/year)	Existing PM2.5 Emissions (tons/ year)	Proposed Acreage	Proposed PM10 Emissions (tons/year)	Proposed PM2.5 Emissions (tons/year)
	Alfalfa, hay	0.00	0.00	0	0.00	0.00	0	0.00	0.00
	Wheat	5.80	0.09	0	0.00	0.00	452	1.31	0.02
	Walnut	31.20	0.47	0	0.00	0.00	0	0.00	0.00
	Earlage*	0.17	0.00	0	0.00	0.00	0	0.00	0.00
	Almond	31.20	0.47	0	0.00	0.00	0	0.00	0.00
	Sorghum	5.80	0.09	0	0.00	0.00	0	0.00	0.00
	Pistachios	3.12	0.05	0	0.00	0.00	0	0.00	0.00
Total Harvesting					0.85	0.13		1.33	0.02
Total Farming Operations					1.97	0.22		2.80	0.04
	Notes: CARB PM10 emission factors based on 2012 crop acreage. PM2.5 Emissions Factor estimated from CARB speciation profiles included in resource below.								
	California Air Resources Board, Section 7.4, Agricultural Land Preparation Operations, Revised and updated, April 2016. Section 7.5, Agricultural Harvest Operations, Updated April 2016, Revised March 2017. http://www.arb.ca.gov/ei/areasrc/index7.htm								
	Based on double-cropping, fields would undergo land preparation twice in a year, and therefore the acreage was considered for each occurrence. Harvesting operations would occur multiple times for project fields. Cropping patterns obtained from existing and proposed NMPs.								
	*The ARB sources did not have an emission factor for Earlage. Since Earlage consists of corn grain, cobs, husks, and sometimes stalk, the emission factors for corn were used for this analysis. Similarly, the CARB emission factor for Rye is based on the Crop Profile for Wheat, which was used for this analysis.								

Dry Manure Application PM Emissions

	Emission Factor (lbs/acre/yr)	Existing Acreage	Existing Emissions (tons/year)	Proposed Acreage	Proposed Emissions (tons/year)
PM10	5.07	232	0.59	239	0.61
PM2.5	3.042	232	0.35	239	0.36
	To generate PM _{2.5} emissions, the PM ₁₀ emission results were multiplied by the PM _{2.5} fraction from the livestock waste profile in the California Emission Inventory Data and Reporting System (CEIDARS) developed by the California Air Resources Board.				

Aggregate PM10 and PM2.5

Emission Source	Existing PM ₁₀ Emissions (tons/year)	Proposed PM ₁₀ Emissions (tons/year)	Project Increase PM10 Emissions	Existing PM _{2.5} Emissions (tons/year)	Proposed PM _{2.5} Emissions (tons/year)	Project Increase PM2.5 Emissions
Wind Erosion	2.446	2.391	-0.055	0.422	0.412	-0.010
Farming Operations	1.971	2.797	0.826	0.217	0.042	-0.175
Mobile Source	-	-	0.022			0.012
Animal Movement	3.251	5.841	2.591	0.371	0.666	0.295
Dry Manure Application	0.588	0.606	0.018	0.353	0.364	0.011
Total	8.256	11.635	3.401	1.362	1.483	0.133

Existing Cropped Fields								
Field	Acres Planted	Acres Harvested	Crop	Solid Manure?		Total Planted Acres	Total Harvested Acres	Crop Type
CFD 1-1	7	7	Oats	WW		292	292	oats
	7	7	Sudangrass	WW				corn
		7					0	Alfalfa, hay
CFD1-2	12	12	Oats	WW			0	earlage
	12	12	Sudangrass	WW		292	601	Sudangrass, silage
		12						Almond
CFD1-3	80	80	Oats	WW				Wheat
	80	80	Sudangrass	WW				Sorghum Sudan
		80				106	106	Pasture
		80						
Frontella	40	40	Oats	WW		690	999	
	40	40	Sudangrass	WW				
		40				Summary of overall cropping pattern		
Pavao	90	90	Oats	WW				
	90	90	Sudangrass	WW		292		oats/sudangrass
		90				106		Pasture
Pavao Pasture*	34	34	Pasture	DM		398		Total
Pereira*	72	72	Pasture	DM				
Vieira*	63	63	Oats	DM				
	63	63	Sudangrass	DM				
Total Acres	690	999						

Proposed Cropped Fields								
Field	Acres Planted	Acres Harvested	Crop	Solid Manure?		Total Planted Acres	Total Harvested Acres	Crop Type
CFD 1-1								oats
						276	276	corn
							0	Alfalfa, hay
CFD1-2	8	8	Corn silage	WW			0	earlage
	8	8	Ryegrass silage	WW				Sudangrass, silage
		8						Almond
		8				188	188	Wheat
CFD1-3	80	80	Corn silage	WW		88	264	Ryegrass silage
	80	80	Ryegrass silage	WW		113	113	Pasture
		80						
		80				665	841	
Frontella	40	40	Wheat silage	WW				
	40	40	Corn silage	WW		Summary of overall cropping pattern		
						188		Corn/Wheat
Pavao	85	85	Wheat silage	WW		88		Corn/Ryegrass
	85	85	Corn silage	WW		113		Pasture
						389		Total
Pavao Pasture*	38	38	Pasture	DM				
Percira*	75	75	Pasture	DM				
Vieira*	63	63	Wheat silage	DM				
	63	63	Corn silage	DM				
Total Acres	665	841						

Dry Manure Applied - Existing	
Field Name	Acres
Pavao Pasture*	34
Pereira*	72
Vieira*	63
	63
Total Acres	232

Dry Manure Applied - Proposed	
Field Name	Acres
Pavao Pasture*	38
Pereira*	75
Vieira*	63
	63
Total Acres	239

Farming Equipment: NO_x Emissions from Harvested Acres in Merced County

	tons/day	lbs/year	lbs/acre/yr	tons/year	Increment of Increase
Merced Farm	4.59	3,350,700	6.736		
Total Harvested Acres	497,467				
Harvested Acres Existing	999	6,728.79		3.364	
Harvested Acres Proposed	841	5,664.57		2.832	-0.532

Farm Equipment emissions were calculated using an emissions factor of 6.74 lbs/acre/year of NO_x based on an estimated 4.59 tons/day NO_x emitted from farming equipment in Merced County, with 497,467 acres harvested. This emission factor is based on 2017 inventory data, the latest available, and would represent a conservative estimate of emissions.

This emission factor was applied to the existing 398 acres harvested (fields are harvested multiple times a year) and to the proposed 389 acres harvested (fields would be harvested multiple times a year).

California Air Resources Board. CEPAM2019V1.03 Emission Projection Data. 2017 Estimated Annual Average Emissions.

Merced County. Accessed on July 12, 2024 at <<https://ww2.arb.ca.gov/applications/emissions-county>>

United States, Department of Agriculture (USDA). 2017. 2017 Census of Agriculture – County Data: Total Cropland - Harvested Cropland, Acres. Merced County. Accessed on July 12, 2024 at < https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Census_by_State/California/ >

Table 1. County Summary Highlights: 2017 (continued)

[For meaning of abbreviations and symbols, see introductory text.]

Item	Merced	Modoc	Mono	Monterey	Napa	Nevada	Orange
Farms number	2,337	423	65	1,104	1,866	673	193
Land in farms acres	946,385	571,191	73,031	1,340,142	255,778	52,061	32,401
Average size of farm acres	405	1,350	1,124	1,214	137	77	168
Median size of farm acres	40	239	36	80	11	10	4
Estimated market value of land and buildings:							
Average per farm dollars	5,299,308	2,640,981	2,158,060	8,944,364	6,052,361	574,346	3,205,502
Average per acre dollars	13,086	1,956	1,921	7,368	44,154	7,425	19,094
Estimated market value of all machinery and equipment \$1,000	782,567	82,713	9,143	889,335	175,969	23,051	31,350
Average per farm dollars	334,860	195,540	140,666	805,557	94,303	34,251	162,436
Farms by size:							
1 to 9 acres	384	41	12	276	843	295	130
10 to 49 acres	867	65	24	227	555	253	31
50 to 179 acres	465	81	6	148	256	74	14
180 to 499 acres	284	66	6	138	103	34	11
500 to 999 acres	165	52	2	92	57	11	4
1,000 acres or more	172	118	15	223	52	6	3
Total cropland farms	1,851	319	36	789	1,788	377	147
..... acres	546,460	159,907	7,913	366,709	67,701	4,816	9,564
Harvested cropland farms	1,777	283	30	704	1,753	318	142
..... acres	497,467	115,640	7,591	299,378	60,978	3,313	5,803
Irrigated land farms	1,975	310	47	638	1,749	465	138
..... acres	493,726	142,138	41,736	294,590	60,945	4,952	4,214

CEPAM2019v1.03 Emission Projection Data by EIC

2017 Annual Average Emissions (Tons/Day)

MERCED COUNTY
MISCELLANEOUS PROCESSES
650-FUGITIVE WINDBLOWN DUST

[Download these results \(as a comma delimited file\).](#)

[Start a new query.](#)

EMISSIONS INVENTORY CATEGORY	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5	NH3
650-650-5400-0000 Methodology 650-DUST FROM AGRICULTURAL LANDS (NON-PASTURE) 5400-DUST 0000-SUB-CATEGORY UNSPECIFIED	-	-	-	-	-	12.25	5.57	0.96	-
650-651-5400-0000 Methodology 651-DUST FROM PASTURE LANDS 5400-DUST 0000-SUB-CATEGORY UNSPECIFIED	-	-	-	-	-	2.73	1.24	0.21	-
650-652-5400-0000 Methodology 652-DUST FROM UNPAVED ROADS AND ASSOCIATED AREAS 5400-DUST 0000-SUB-CATEGORY UNSPECIFIED	-	-	-	-	-	0.78	0.46	0.06	-
TOTAL	-	-	-	-	-	15.75	7.26	1.24	-
FARM EQUIPMENT	0.94	0.81	4.91	4.59	0.00	0.29	0.29	0.26	0.00

CEPAM2019v1.03 Emission Projection Data by EIC

2017 Annual Average Emissions (Tons/Day)

MERCED COUNTY
MISCELLANEOUS PROCESSES
620-FARMING OPERATIONS

[Download these results \(as a comma delimited file\).](#)

[Start a new query.](#)

EMISSIONS INVENTORY CATEGORY	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5	NH3
620-614-5400-0000 Methodology 614-TILLING DUST 5400-DUST 0000-SUB-CATEGORY UNSPECIFIED	-	-	-	-	-	9.31	4.23	0.63	-
620-615-5400-0000 Methodology 615-HARVEST OPERATIONS - DUST 5400-DUST 0000-SUB-CATEGORY UNSPECIFIED	-	-	-	-	-	11.17	5.08	0.76	-

NOx Emissions from Mobile Sources

Emissions	Emissions (lbs/ day)	Emissions (tons/ yr)
Onsite Mobile Source (Tractors and milk tankers)	0.24	0.044
Traffic		0.06
Tons/Year		0.10

Emissions from traffic were estimated using CalEEMod Version 2022.1.1.29, Appendix F-1. See Appendix G for Onsite Mobile Sources such as feed loaders.

Estimated NOx Emissions from Agricultural Activities

	Acres	N2O	N2O	Total NOx Emissions (tons/yr)	
		Annual Average (Metric Tons CO ₂ e/Acre/Year)	Annual Average (tons NOx/acre/year)		
Existing Cropping					
Oats/Silage	292	0.24	0.0009	0.259	
Total				0.259	
Proposed Cropping					
Corn/Silage	88	0.43	0.0016	0.140	
Wheat/Corn	188	0.37	0.0014	0.257	
Total				0.397	
Increment of Increase				0.138	

The Michigan State University's US Cropland Greenhouse Gas Calculator accounts for different cropping systems using USDA county-specific data considering crop type, tillage, fertilizer, and environmental variables to calculate greenhouse gas emissions. Michigan State University's US Cropland Greenhouse Gas Calculator. Accessed on December 11, 2024 at <<http://carboncalculator.kbs.msu.edu/>>

Total NOx Emissions

	Increment of Increase
	tons/yr
Traffic and Onsite Mobile Source	0.10
Farming Equipment	-0.532
Soil Emissions	0.138
Total	-0.290

Alternative 4: Reduced Herd - VOC Emissions

Cow Type	Emission Factor (lbs/head-yr)	No. of Cows			Change	VOC (lbs/head-yr)		Increment of Increase
		Existing	Proposed	Proposed (Reduced Herd)		Existing	Proposed	
Milking Cow	15.8	1,050	3,000	1,920	870	16,590	30,336	
Dry Cow	9.7	120	390	250	130	1,164	2,421	
Heifer (15-24 mo)	6.8	375	830	531	156	2,550	3,612	
Heifer (7-14 mo)	5.9	475	1,160	742	267	2,803	4,380	
Heifer (4-6 mo)	5.4	110	415	266	156	594	1,434	
Calf (under 3 mo)	5.1	0	280	179	179	0	914	
Bull	6.8				0	0	0	
Totals		2,130	6,075	3,888	1,758	23,701	43,098	
Total tons/year						11.85	21.55	9.70
Support stock		960	2,405	1,539				

Herd Reduction Factor	0.64
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Alternative 4: VOC Aggregate

Emission Source	Existing VOC/ROG Emissions	Proposed VOC/ROG Emissions	Increment of Increase with Proposed Expansion
Traffic and Onsite Mobile Source			0.01
Farm Equipment	0.594	0.50	-0.09
Manure Management & Feed	11.85	21.55	9.70
Total	12.44	22.05	9.62

Pre-Project Facility Information

- Does this facility house Holstein or Jersey cows?
Most facilities house Holstein cows unless explicitly stated on the PTO or application.
- Does the facility have an anaerobic treatment lagoon?
- Does the facility land apply liquid manure?
Answering "yes" assumes worst case.
- Does the facility land apply solid manure?
Answering "yes" assumes worst case.
- Is any scraped manure sent to a lagoon/storage pond?
Answering "yes" assumes worst case.

Pre-Project Herd Size							
Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals		
Milk Cows	1,050				1,050		
Dry Cows	116				116		
Support Stock (Heifers, Calves, and Bulls)					0		
Large Heifers	130		130		260		
Medium Heifers			365		365		
Small Heifers			130		130		
Bulls	4				4		
	Calf Hutches				Calf Corrals		Total # of Calves
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Flushed	Scraped	
Calves			205				205

Total Herd Summary	
Total Milk Cows	1,050
Total Mature Cows	1,166
Support Stock (Heifers, Calves, and Bulls)	759
Total Calves	205
Total Dairy Head	2,130

Pre-Project Silage Information			
Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn			
Alfalfa			
Wheat			

Post-Project Facility Information

- Does this facility house Holstein or Jersey cows?
Most facilities house Holstein cows unless explicitly stated on the PTO or application.
- Does the facility have an anaerobic treatment lagoon?
- Does the facility land apply liquid manure?
Answering "yes" assumes worst case.
- Does the facility land apply solid manure?
Answering "yes" assumes worst case.
- Is any scraped manure sent to a lagoon/storage pond?
Answering "yes" assumes worst case.
- Does this project result in an increase or relocation of uncovered surface area for any lagoon/storage pond?

NOTE: An increase in total lagoon/storage pond surface area may result in an increase in H2S emissions. The District's Technical Services Division may need to conduct H2S modeling.

Post-Project Herd Size							
Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals		
Milk Cows	3,000				3,000		
Dry Cows					0		
Support Stock (Heifers, Calves, and Bulls)	2,545			250	2,795		
Large Heifers					0		
Medium Heifers					0		
Small Heifers					0		
Bulls					0		
	Calf Hutches				Calf Corrals		Total # of Calves
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Flushed	Scraped	
Calves				280			280

Total Herd Summary	
Total Milk Cows	3,000
Total Mature Cows	3,000
Support Stock (Heifers, Calves, and Bulls)	2,795
Total Calves	280
Total Dairy Head	6,075

Post-Project Silage Information			
Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn			
Alfalfa			
Wheat			

VOC Mitigation Measures and Control Efficiencies

Milking Parlor			
Measure Proposed?		VOC Control Efficiency (%)	
Pre-Project	Post-Project	Pre-Project	Post-Project
Mitigation Measure(s) per Emissions Point			
Enteric Emissions Mitigations			
☒	☒	10%	10%
(D) Feed according to NRC guidelines			
Total Control Efficiency		10%	10%
Milking Parlor Floor Mitigations			
☒	☒	10%	10%
(D) Feed according to NRC guidelines			
☒	☒	0%	0%
(D) Flush or hose milk parlor immediately prior to, immediately after, or during each milking. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF.			
Total Control Efficiency		10%	10%

Cow Housing			
Measure Proposed?		VOC Control Efficiency (%)	
Pre-Project	Post-Project	Pre-Project	Post-Project
Mitigation Measure(s) per Emissions Point			
Enteric Emissions Mitigations			
☒	☒	10%	10%
Feed according to NRC guidelines			
Total Control Efficiency		10%	10%
Corrals/Pens Mitigations			
☒	☒	10%	10%
Feed according to NRC guidelines			
☒	☒	0%	0%
Dairies: Clean manure from corrals at least four times per year with at least 60 days between cleaning, or clean corrals at least once between April and July and at least once between September and December. Note: If selected for dairies > 999 milk cows, CE is already included in EF. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement). Heifer/Calf Ranches: Scrape corrals twice a year with at least 90 days between cleanings, excluding in-coral mounds. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement).		0%	0%
☒	☒	10%	10%
Scrape, vacuum, or flush concrete lanes in corrals at least once every day for mature cows and every seven days for support stock, or clean concrete lanes such that the depth of manure does not exceed 12 inches at any point or time. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement).			
☒	☒	0%	0%
Implement one of the following: 1) slope the surface of the corals at least 3%, where the available space for each animal is 400 sq ft or less and slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 sq ft; 2) maintain corrals to ensure proper drainage preventing water from standing more than 48 hrs; 3) harrow, rake, or scrape pens sufficiently to maintain a dry surface. Note: If selected for dairies > 999 milk cows, CE already included in EF.			
☒	☒		
Install shade structures such that they are constructed with a light permeable roofing material. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.			
☒	☒	5%	5%
Install all shade structures uphill of any slope in the corral. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.			
☒	☒		
Clean manure from under corral shades at least once every 14 days, when weather permits access into corral. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.			
☒	☒		
Install shade structure so that the structure has a North/South orientation. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.			
☒	☒	0%	0%
Manage corrals such that the manure depth in the corral does not exceed 12 inches at any time or point, except for in-coral mounding. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. The manure facility must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF.			
☒	☒	10%	10%
Knockdown fence line manure build-up prior to it exceeding a height of 12 inches at any time or point. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. The facility must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible.		0%	0%
☒	☒	0%	0%
Use lime or a similar absorbent material in the corral according to the manufacturer's recommendation to minimize moisture in the corrals.		0%	0%
☒	☒		
Apply thymol to the corral soil in accordance with the manufacturer's recommendation.			
Total Control Efficiency		30.75%	30.75%

		Bedding Mitigations		
☒	☒	Feed according to NRC guidelines	10%	10%
☐	☐	Use non-manure-based bedding and non-separated solids based bedding for at least 90% of the bedding material, by weight, for freestalls (e.g. rubber mats, almond shells, sand, or waterbeds).	0%	0%
☒	☒	For a large dairy (1,000 milk cows or larger) or a heifer/calf ranch - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 7 days.	10%	10%
☐	☐	(D) For a medium dairy only (500 to 999 milk cows) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 14 days.	0%	0%
Total Control Efficiency			19.00%	19.00%
		Lanes Mitigations		
☒	☒	Feed according to NRC guidelines	10%	10%
☒	☒	Pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers. Note: No control efficiency at this time.	0%	0%
☒	☒	Dairies: Flush, scrape, or vacuum freestall flush lanes immediately prior to or after, or during each milking; or flush or scrape freestall flush lanes at least 3 times per day. Heifer/Calf Ranches: Vacuum, scrape, or flush freestalls at least once every seven days.	10%	10%
☐	☐	(D) Have no animals in exercise pens or corrals at any time.	0%	0%
Total Control Efficiency			19.00%	19.00%

Liquid Manure Handling				
Measure Proposed?		Mitigation Measure(s) per Emissions Point	VOC Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Lagoons/Storage Ponds Mitigations		
☒	☒	Feed according to NRC guidelines	10%	10%
☐	☐	Use phototropic lagoon	0%	0%
☐	☐	Use an anaerobic treatment lagoon designed according to NRCS Guideline No. 359, or aerobic treatment lagoon, or mechanically aerated lagoon, or covered lagoon digester vented to a control device with minimum 95% control	0%	0%
☒	☒	Remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF.	0%	0%
☐	☐	Maintain lagoon pH between 6.5 and 7.5	0%	0%
Total Control Efficiency			10.00%	10.00%
		Liquid Manure Land Application Mitigations		
☒	☒	Feed according to NRC guidelines	10%	10%
☐	☐	Only apply liquid manure that has been treated with an anaerobic or aerobic treatment lagoon, aerobic lagoon, or digester system	0%	0%
☒	☒	Allow liquid manure to stand in the fields for no more than 24 hours after irrigation. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF.	0%	0%
☐	☐	Apply liquid/slurry manure via injection with drag hose or similar apparatus	0%	0%
Total Control Efficiency			10.00%	10.00%

Solid Manure Handling				
Measure Proposed?		Mitigation Measure(s) per Emissions Point	VOC Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Solid Manure Storage Mitigations		
☒	☒	Feed according to NRC guidelines	10%	10%
☒	☒	LARGE CAFO ONLY: Within 72 hours of removal from housing, either a) remove dry manure from the facility, or b) cover dry manure outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed 24 hours per event.	10%	10%
Total Control Efficiency			19.00%	19.00%
		Separated Solids Piles Mitigations		
☒	☒	Feed according to NRC guidelines	10%	10%
☒	☒	LARGE CAFO ONLY: Within 72 hours of removal from the drying process, either a) remove separated solids from the facility, or b) cover separated solids outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed 24 hours per event.	10%	10%
Total Control Efficiency			19.00%	19.00%
		Solid Manure Land Application Mitigations		
☒	☒	Feed according to NRC guidelines	10%	10%
☒	☒	Incorporate all solid manure within 72 hours of land application. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF. Note: No additional control given for rapid manure incorporation (e.g. BACT requirement).	0%	0%
☐	☐	Only apply solid manure that has been treated with an anaerobic treatment lagoon, aerobic lagoon or digester system.	0%	0%
☐	☐	Apply no solid manure with a moisture content of more than 50%	0%	0%
Total Control Efficiency			10.00%	10.00%

Silage and TMR				
Measure Proposed?		Mitigation Measure(s) per Emissions Point	VOC Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Corn/Alfalfa/Wheat Silage Mitigations		
☒	☒	1. Utilize a sealed feed storage system (e.g. Ag-Bag) for bagged silage, or 2. Cover the surface of silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least 5 mils thick (0.005 inches), multiple plastic tarps with a cumulative thickness of at least 5 mils (0.005 inches), or an oxygen barrier film covered with a UV resistant material within 72 hours of last delivery of material to the pile, and implement one of the following: a) build silage piles such that the average bulk density is at least 44 lb/cu-ft for corn silage and 40 lb/cu-ft for other silage types, as measured in accordance with Section 7.10 of Rule 4570, b) when creating a silage pile, adjust filling parameters to assure a calculated average bulk density of at least 44 lb/cu-ft for corn silage and at least 40 lb/cu-ft for other silage types, using a spreadsheet approved by the District, c) harvest silage crop at > or = 65% moisture for corn; and >= 60% moisture for alfalfa/grass and other silage crops; manage silage material delivery such that no more than 6 inches of materials are uncompacted on top of the pile; and incorporate the applicable Theoretical Length of Chop (TLC) and roller opening for the crop being harvested. <u>For dairies</u> - implement <u>two</u> of the following: <u>For heifer/calf ranches</u> - implement <u>one</u> of the following: <u>Manage Exposed Silage</u>. a) manage silage piles such that only one silage pile has an uncovered face and the uncovered face has a total exposed surface area of less than 2,150 sq. ft., or b) manage multiple uncovered silage piles such that the total exposed surface area of all silage piles is less than 4,300 sq ft. <u>Maintain Silage Working Face</u>. a) use a shaver/facer to remove silage from the silage pile, or b) maintain a smooth vertical surface on the working face of the silage pile <u>Silage Additive</u>: a) inoculate silage with homolactic acid bacteria in accordance with manufacturer recommendations to achieve a concentration of at least 100,000 colony forming units per gram of wet forage or apply propionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at a rate specified by the manufacturer to reduce yeast counts when forming silage pile; or b) apply other additives at specified rates that have been demonstrated to reduce alcohol concentrations in silage and/or VOC emissions from silage and have been approved by the District and EPA.	39.0%	39.0%
Total Control Efficiency*			39.00%	39.00%

*Assumes 25% control for density mitigation measures and 10% each for the two optional measures, resulting in an overall control of 39%. The same conservative control efficiency will be applied to the sealed feed storage system (Ag-Bag).

		TMR Mitigations		
☒	☒	(D) Push feed so that it is within 3 feet of feedlane fence within 2 hrs of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the cows.	10%	10%
☒	☒	(D) Begin feeding total mixed rations within 2 hrs of grinding and mixing rations. Note: If selected for dairies > 999 milk cows, control efficiency already included in EF.	0%	0%
☐	☐	Feed steam-flaked, dry rolled, cracked or ground corn or other ground cereal grains.	0%	0%
☒	☒	Remove uneaten wet feed from feed bunks within 24 hrs after then end of a rain event.	10%	10%
☐	☐	(D) For total mixed rations that contain at least 30% by weight of silage, feed animals total mixed rations that contain at least 45% moisture.	0%	0%
☒	☒	Feed according to NRC guidelines. Note: If selected for dairies, control efficiency already included in EF.	0%	0%
Total Control Efficiency			19.00%	19.00%

Ammonia Mitigation Measures and Control Efficiencies

Milking Parlor				
Measure Proposed?		Mitigation Measure(s) per Emissions Point	NH3 Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Milking Parlor Floor Mitigations		
☒	☒	Feed according to NRC guidelines	28%	28%
Total Control Efficiency			28%	28%

Cow Housing				
Measure Proposed?		Mitigation Measure(s) per Emissions Point	NH3 Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Corrals/Pens Mitigations		
☒	☒	Feed according to NRC guidelines	28%	28%
☐	☒	Clean manure from corrals at least four times per year with at least 60 days between cleaning, or clean corrals at least once between April and July and at least once between September and December. OR Use lime or a similar absorbent material in the corral according to the manufacturer's recommendation to minimize moisture in the corrals. OR Apply thymol to the corral soil in accordance with the manufacturer's recommendation.	0%	50%
Total Control Efficiency			28%	64%
		Bedding Mitigations		
☒	☒	Feed according to NRC guidelines	28%	28%
☒	☒	Use non-manure-based bedding and non-separated solids based bedding for at least 90% of the bedding material, by weight, for freestalls (e.g. rubber mats, almond shells, sand, or waterbeds). OR For a large dairy only (1,000 milk cows or larger) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 7 days. OR For a medium dairy only (500 to 999 milk cows) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 14 days.	47.7%	47.7%
Total Control Efficiency			62.34%	62.34%
		Lanes Mitigations		
☒	☒	Feed according to NRC guidelines	28%	28%
Total Control Efficiency			28%	28%

Liquid Manure Handling				
Measure Proposed?		Mitigation Measure(s) per Emissions Point	NH3 Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Lagoons/Storage Ponds Mitigations		
☒	☒	Feed according to NRC guidelines	28%	28%
☒	☒	Use phototropic lagoon OR Remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon.	80%	80%
Total Control Efficiency			85.6%	85.6%
		Liquid Manure Land Application Mitigations		
☒	☒	Feed according to NRC guidelines	28%	28%
☐	☐	Only apply liquid manure that has been treated with an anaerobic treatment lagoon	0%	0%
Total Control Efficiency			28.00%	28.00%

Solid Manure Handling				
Measure Proposed?		Mitigation Measure(s) per Emissions Point	NH3 Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Solid Manure Land Application Mitigations		
☒	☒	Feed according to NRC guidelines	28%	28%
☐	☐	Incorporate all solid manure within 72 hours of land application. AND Only apply solid manure that has been treated with an anaerobic treatment lagoon, aerobic lagoon or digester system. AND Apply no solid manure with a moisture content of more than 50%	0%	0%
Total Control Efficiency			28.00%	28.00%

Control Measure	PM10 Control Efficiency
Shaded corrals (milk and dry cows)	16.7%
Shaded corrals (heifers and bulls)	8.3%
Downwind shelterbelts	12.5%
Upwind shelterbelts	10%
Freestall with no exercise pens and non-manure based bedding	90%
Freestall with no exercise pens and manure based bedding	80%
Fibrous layer in dusty areas (i.e. hay, etc.)	10%
Bi-weekly corral/exercise pen scraping and/or manure removal using a pull type manure harvesting equipment in morning hours when moisture in air except during periods of rainy weather	15%
Sprinkling of open corrals/exercise pens	12.5%
Feeding young stock (heifers and calves) near dusk	10%

[illegible]

Pre-Project PM10 Control Efficiencies and Emission Factors																	
	Housing Name(s) or #s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)	
1	Free Stall 1	freestall	support stock	250	250	1.370	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	1.37	
2	Free Stall 2	freestall	milk cows	250	250	1.370	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	1.37	
3	Free Stall 3	freestall	milk cows	800	800	1.370	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	1.37	
4	Corral 1	open corral	large heifers	130	130	8.010	8.3%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	7.35	
5	Corral 2-3	open corral	calves	65	65	1.370	8.3%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	1.26	
6	Corral 4-5	open corral	medium heifers	90	90	10.550	8.3%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	9.67	
7	Corral 6	open corral	medium heifers	90	90	10.550	8.3%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	9.67	
8	Corral 7	open corral	medium heifers	95	95	10.550	8.3%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	9.67	
9	Calf Hutches	on ground hutches	calves	205	205	0.343	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.34	
10	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
11	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
12	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
13	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
14	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
15	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
16	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
17	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
18	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
19	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
20	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
21	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
22	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
23	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
24	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
25	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
26	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
27	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
28	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
29	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
30	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
31	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
32	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
33	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
34	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
35	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
36	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
37	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
38	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
39	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
40	0	0	0	0	0	0.000	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00	
Pre-Project Total # of Cows				2,130				0.0%	0%	0%	0%	0%	0%	0.0%	0%		

Post-Project PM10 Mitigation Measures

Post-Project PM10 Mitigation Measures															
Housing Name(s) or #s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of <u>Each</u> Structure	# of Combined Housing Structures in row	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	
1	Free Stall 1	freestall	milk cows	400	400	1									
2	Free Stall 2	freestall	milk cows	800	800	1									
3	Free Stall 3	freestall	milk cows	400	400	1									
4	Free Stall 4	freestall	milk cows	400	400	1									
5	Free Stall 5	freestall	milk cows	400	400	1									
6	Free Stall 6	freestall	milk cows	400	400	1									
7	Free Stall 7	freestall	support stock	800	800	1									
8	Free Stall 8	freestall	support stock	1,020	1,020	1									
9	Calf Hutches	on ground hutches	calves	280	280	1									
10															
11															
12															
13															
14															
15															
16															
17															
18															
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Post-Project PM10 Mitigation Measures for New Housing Units at an Expanding Dairy															
Housing Name(s) or #s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of <u>Each</u> Structure	# of Combined Housing Structures in row	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	
1	Loafing Barn 1	loafing barn	support stock	250	250	1									
2	Loafing Barn 2	freestall	support stock	925	925	1									
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
Post-Project Total # of Cows			6,075	(The post-project total includes dairy cows already on-site and new cows from the expansion.)											

Post-Project PM10 Control Efficiencies and Emission Factors																
	Housing Name(s) or #s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)
1	Free Stall 1	freestall	milk cows	400	400	1.370	0.0%	0.0%	0%	0%	80%	0%	0%	0%	0%	0.27
2	Free Stall 2	freestall	milk cows	800	800	1.370	0.0%	0.0%	0%	90%	0%	0%	0%	0%	0%	0.14
3	Free Stall 3	freestall	milk cows	400	400	1.370	0.0%	0.0%	0%	0%	0%	0%	15%	0%	0%	1.17
4	Free Stall 4	freestall	milk cows	400	400	1.370	0.0%	0.0%	0%	0%	0%	0%	15%	0%	0%	1.17
5	Free Stall 5	freestall	milk cows	400	400	1.370	0.0%	0.0%	0%	90%	0%	0%	0%	0%	0%	0.14

6	Free Stall 6	freestall	milk cows	400	400	1.370	0.0%	0.0%	0%	0%	0%	0%	15%	0.0%	0%	1.17
7	Free Stall 7	freestall	support stock	800	800	1.370	0.0%	0.0%	0%	0%	80%	0%	0%	0.0%	0%	0.27
8	Free Stall 8	freestall	support stock	1,020	1,020	1.370	0.0%	0.0%	0%	90%	0%	0%	0%	0.0%	0%	0.14
9	Calf Hutches	on ground hutches	calves	280	280	0.343	0.0%	0.0%	0%	0%	0%	0%	0%	0.0%	10%	0.31
10	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
11	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
12	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
13	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
14	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
15	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
16	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
17	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
18	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
19	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
20	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
21	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
22	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
23	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
24	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
25	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
26	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
27	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
28	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
29	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
30	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
31	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
32	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
33	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
34	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
35	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
36	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
37	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
38	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
39	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
40	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
Post-Project PM10 Control Efficiencies and Emission Factors for New Housing Emissions Units																
	Housing Name(s) or #s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)
1	Loafing Barn 1	loafing barn	support stock	250	250	5.280	0.0%	0.0%	0%	90%	0%	0%	0%	0.0%	0%	0.53
2	Loafing Barn 2	freestall	support stock	925	925	1.370	0.0%	0.0%	0%	90%	0%	0%	0%	0.0%	0%	0.14
3	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
4	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
5	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
6	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
7	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
8	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
9	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
10	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
11	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
12	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
13	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00
14	0	0	0	0	0			0.0%	0%	0%	0%	0%	0%	0.0%	0%	0.00

Dairy Emission Factors

			lb/hd-yr Dairy Emissions Factors for Holstein Cows																											
			Milk Cows				Dry Cows				Large Heifers (15 to 24 months)				Medium Heifers (7 to 14 months)				Small Heifers (3 to 6 months)				Calves (0 - 3 months)				Bulls			
			Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled	
		<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	
Milking Parlor	VOC	Enteric Emissions in Milking Parlors	0.43	0.41	0.37	0.37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Milking Parlor Floor	0.04	0.03	0.03	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total	0.47	0.44	0.40	0.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		NH3	0.19	0.19	0.14	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cow Housing	VOC	Enteric Emissions in Cow Housing	3.89	3.69	3.32	3.32	2.33	2.23	2.01	2.01	1.81	1.71	1.54	1.54	1.23	1.17	1.05	1.05	0.69	0.65	0.58	0.58	0.32	0.31	0.28	0.28	1.10	1.04	0.94	0.94
		Corrals/Pens	10.00	6.60	4.57	4.57	5.40	3.59	2.49	2.49	4.20	2.76	1.91	1.91	2.85	1.88	1.30	1.30	1.60	1.04	0.72	0.72	0.75	0.50	0.35	0.35	2.55	1.67	1.16	1.16
		Bedding	1.05	1.00	0.81	0.81	0.57	0.54	0.44	0.44	0.44	0.42	0.34	0.34	0.30	0.28	0.23	0.23	0.17	0.16	0.13	0.13	0.08	0.08	0.06	0.06	0.27	0.25	0.20	0.20
		Lanes	0.84	0.80	0.65	0.65	0.45	0.44	0.35	0.35	0.35	0.33	0.27	0.27	0.24	0.23	0.18	0.18	0.13	0.13	0.10	0.10	0.06	0.06	0.05	0.05	0.21	0.20	0.16	0.16
		Total	15.78	12.09	9.35	9.35	8.75	6.80	5.29	5.29	6.81	5.22	4.06	4.06	4.62	3.56	2.77	2.77	2.59	1.98	1.54	1.54	1.22	0.95	0.74	0.74	4.13	3.16	2.46	2.46
		NH3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	VOC	Enteric Emissions in Cow Housing	41.90	41.90	30.17	15.08	21.20	21.20	15.26	7.63	11.00	11.00	7.92	3.96	7.90	7.90	5.69	2.84	6.00	6.00	4.32	2.16	1.80	1.80	1.30	0.65	15.30	15.30	11.02	5.51
		Bedding	6.30	6.30	2.37	2.37	3.20	3.20	1.20	1.20	1.70	1.70	0.64	0.64	1.20	1.20	0.45	0.45	0.90	0.90	0.34	0.34	0.30	0.30	0.11	0.11	2.30	2.30	0.87	0.87
		Lanes	5.10	5.10	3.67	3.67	2.60	2.60	1.87	1.87	1.30	1.30	0.94	0.94	1.00	1.00	0.72	0.72	0.70	0.70	0.50	0.50	0.20	0.20	0.14	0.14	1.90	1.90	1.37	1.37
		Total	53.30	53.30	36.21	21.13	27.00	27.00	18.34	10.71	14.00	14.00	9.50	5.54	10.10	10.10	6.86	4.02	7.60	7.60	5.16	3.00	2.30	2.30	1.55	0.90	19.50	19.50	13.25	7.74
		Lagoons/Storage Ponds	1.52	1.30	1.17	1.17	0.82	0.71	0.64	0.64	0.64	0.54	0.49	0.49	0.43	0.37	0.33	0.33	0.24	0.21	0.19	0.19	0.11	0.10	0.09	0.09	0.40	0.33	0.30	0.30
		Liquid Manure Land Application	1.64	1.40	1.26	1.26	0.89	0.76	0.69	0.69	0.69	0.58	0.53	0.53	0.47	0.40	0.36	0.36	0.26	0.22	0.20	0.20	0.12	0.11	0.10	0.10	0.42	0.35	0.32	0.32
Liquid Manure Handling	VOC	Total	3.16	2.70	2.43	2.43	1.71	1.47	1.32	1.32	1.33	1.13	1.02	1.02	0.90	0.77	0.69	0.69	0.51	0.43	0.38	0.38	0.24	0.21	0.18	0.18	0.82	0.68	0.61	0.61
		Lagoons/Storage Ponds	8.20	8.20	1.18	1.18	4.20	4.20	0.60	0.60	2.20	2.20	0.32	0.32	1.50	1.50	0.22	0.22	1.20	1.20	0.17	0.17	0.35	0.35	0.05	0.05	3.00	3.00	0.43	0.43
		Liquid Manure Land Application	8.90	8.90	6.41	6.41	4.50	4.50	3.24	3.24	2.30	2.30	1.66	1.66	1.70	1.70	1.22	1.22	1.30	1.30	0.94	0.94	0.37	0.37	0.27	0.27	3.23	3.23	2.33	2.33
	VOC	Total	17.10	17.10	7.59	7.59	8.70	8.70	3.84	3.84	4.50	4.50	1.97	1.97	3.20	3.20	1.44	1.44	2.50	2.50	1.11	1.11	0.72	0.72	0.32	0.32	6.23	6.23	2.76	2.76
		Solid Manure Storage	0.16	0.15	0.12	0.12	0.09	0.08	0.07	0.07	0.07	0.06	0.05	0.05	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.04	0.04	0.03	0.03
		Separated Solids Piles	0.06	0.06	0.05	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02
Solid Manure Handling	VOC	Solid Manure Land Application	0.39	0.33	0.30	0.30	0.21	0.18	0.16	0.16	0.16	0.14	0.12	0.12	0.11	0.09	0.08	0.08	0.06	0.05	0.05	0.05	0.03	0.03	0.02	0.02	0.10	0.08	0.07	0.07
		Total	0.61	0.54	0.47	0.47	0.33	0.29	0.25	0.25	0.26	0.23	0.20	0.20	0.17	0.15	0.13	0.13	0.10	0.09	0.07	0.07	0.05	0.04	0.04	0.04	0.16	0.14	0.12	0.12
		Solid Manure Storage	0.95	0.95	0.95	0.95	0.48	0.48	0.48	0.48	0.25	0.25	0.25	0.25	0.18	0.18	0.18	0.18	0.13	0.13	0.13	0.13	0.04	0.04	0.04	0.04	0.35	0.35	0.35	0.35
		Separated Solids Piles	0.38	0.38	0.38	0.38	0.19	0.19	0.19	0.19	0.10	0.10	0.10	0.10	0.07	0.07	0.07	0.07	0.05	0.05	0.05	0.05	0.02	0.02	0.02	0.02	0.14	0.14	0.14	0.14
	NH3	Solid Manure Land Application	2.09	2.09	1.50	1.50	1.06	1.06	0.76	0.76	0.55	0.55	0.40	0.40	0.39	0.39	0.28	0.28	0.30	0.30	0.22	0.22	0.09	0.09	0.06	0.06	0.76	0.76	0.55	0.55
		Total	3.42	3.42	2.83	2.83	1.73	1.73	1.43	1.43	0.90	0.90	0.75	0.75	0.64	0.64	0.53	0.53	0.48	0.48	0.40	0.40	0.15	0.15	0.12	0.12	1.25	1.25	1.04	1.04

Silage and TMR (Total Mixed Ration) Emissions (µg/m²-min)					
Feed Storage and Handling	VOC	Silage Type	Uncontrolled	EF1	EF2
		Corn Silage	34,681	21,155	21,155
		Alfalfa Silage	17,458	10,649	10,649
		Wheat Silage	43,844	26,745	26,745
		TMR	13,056	10,575	10,575

Assumptions: 1) Each silage pile is completely covered except for the front face and 2) Rations are fed within 48 hours.

PM ₁₀ Emission Factors (lb/hd-yr)		
Type of Cow	Dairy EF	Source
Cows in Freestalls	1.37	Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy
Milk/Dry in Loafing Bams	2.73	SJVAPCD
Heifers/Bulls in Loafing Bams	5.28	SJVAPCD
Calves in Loafing Bams	0.69	SJVAPCD
Milk/Dry in Corrals	5.46	Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy
Support Stock (Heifers/Bulls) in Open Corrals	10.55	Based on a USDA/UC Davis report quantifying dairy and feedlot emissions in Tulare & Kern Counties (April '01)
Large Heifers in Open Corrals	8.01	SJVAPCD
Calf (under 3 mo.) open corrals	1.37	SJVAPCD
Calf on-ground hutches	0.343	SJVAPCD
Calf above-ground flushed	0.069	SJVAPCD
Calf above-ground scraped	0.206	SJVAPCD

The controlled PM₁₀ EF will be calculated based on the specific PM₁₀ mitigation measures, if any, for each freestall, corral, or calf hutch area. See the PM Mitigation Measures for calculations.

Dairy Emission Factors

Note: Jersey cows will be assumed to generate 71% of the amount of VOC and NH3 emissions as a Holstein cow.			lb/hd-yr Dairy Emissions Factors for Jersey Cows																													
			Milk Cows				Dry Cows				Large Heifers (15 to 24 months)				Medium Heifers (7 to 14 months)				Small Heifers (3 to 6 months)				Calves (0 - 3 months)				Bulls					
			Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled			
			<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2		
Milking Parlor	VOC	Enteric Emissions in Milking Parlors	0.31	0.29	0.26	0.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		Milking Parlor Floor	0.03	0.02	0.02	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		Total	0.34	0.31	0.28	0.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		NH3 Total	0.13	0.13	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cow Housing	VOC	Enteric Emissions in Cow Housing	2.76	2.62	2.36	2.36	1.66	1.58	1.43	1.43	1.29	1.22	1.09	1.09	0.87	0.83	0.75	0.75	0.49	0.46	0.41	0.41	0.23	0.22	0.20	0.20	0.78	0.74	0.66	0.66		
		Corrals/Pens	7.10	4.69	3.25	3.25	3.83	2.55	1.77	1.77	2.98	1.96	1.36	1.36	2.02	1.33	0.92	0.92	1.14	0.74	0.51	0.51	0.53	0.36	0.25	0.25	1.81	1.19	0.82	0.82		
		Bedding	0.75	0.71	0.58	0.58	0.40	0.39	0.31	0.31	0.31	0.30	0.24	0.24	0.21	0.20	0.16	0.16	0.12	0.11	0.09	0.09	0.06	0.05	0.04	0.04	0.19	0.18	0.14	0.14		
		Lanes	0.60	0.57	0.46	0.46	0.32	0.31	0.25	0.25	0.25	0.24	0.19	0.19	0.17	0.16	0.13	0.13	0.10	0.09	0.07	0.07	0.04	0.04	0.03	0.03	0.15	0.14	0.12	0.12		
		Total	11.20	8.58	6.64	6.64	6.21	4.83	3.76	3.76	4.83	3.71	2.88	2.88	3.28	2.53	1.97	1.97	1.84	1.40	1.09	1.09	0.86	0.67	0.52	0.52	2.93	2.24	1.74	1.74		
		NH3	Enteric Emissions in Cow Housing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Liquid Manure Handling	VOC	Corrals/Pens	29.75	29.75	21.42	10.71	15.05	15.05	10.84	5.42	7.81	7.81	5.62	2.81	5.61	5.61	4.04	2.02	4.26	4.26	3.07	1.53	1.28	1.28	0.92	0.46	10.86	10.86	7.82	3.91	
			Bedding	4.47	4.47	1.68	1.68	2.27	2.27	0.86	0.86	1.21	1.21	0.45	0.45	0.85	0.85	0.32	0.32	0.64	0.64	0.24	0.24	0.21	0.21	0.08	0.08	1.63	1.63	0.61	0.61	
			Lanes	3.62	3.62	2.61	2.61	1.85	1.85	1.33	1.33	0.92	0.92	0.66	0.66	0.71	0.71	0.51	0.51	0.50	0.50	0.36	0.36	0.14	0.14	0.10	0.10	1.35	1.35	0.97	0.97	
			Total	37.84	37.84	25.71	15.00	19.17	19.17	13.02	7.60	9.94	9.94	6.74	3.93	7.17	7.17	4.87	2.85	5.40	5.40	3.67	2.13	1.63	1.63	1.10	0.64	13.85	13.85	9.41	5.50	
			Lagoons/Storage Ponds	1.08	0.92	0.83	0.83	0.58	0.50	0.45	0.45	0.45	0.39	0.35	0.35	0.31	0.26	0.24	0.24	0.17	0.15	0.13	0.13	0.08	0.07	0.06	0.06	0.28	0.23	0.21	0.21	
			Liquid Manure Land Application	1.16	0.99	0.89	0.89	0.63	0.54	0.49	0.49	0.49	0.42	0.37	0.37	0.33	0.28	0.25	0.25	0.19	0.16	0.14	0.14	0.09	0.08	0.07	0.07	0.30	0.25	0.22	0.22	
NH3		Total	2.24	1.92	1.73	1.73	1.21	1.04	0.94	0.94	0.94	0.80	0.72	0.72	0.64	0.55	0.49	0.49	0.36	0.30	0.27	0.27	0.17	0.15	0.13	0.13	0.58	0.48	0.43	0.43		
		Lagoons/Storage Ponds	5.82	5.82	0.84	0.84	2.98	2.98	0.43	0.43	1.56	1.56	0.22	0.22	1.07	1.07	0.15	0.15	0.85	0.85	0.12	0.12	0.25	0.25	0.04	0.04	2.13	2.13	0.31	0.31		
		Liquid Manure Land Application	6.32	6.32	4.55	4.55	3.20	3.20	2.30	2.30	1.63	1.63	1.18	1.18	1.21	1.21	0.87	0.87	0.92	0.92	0.66	0.66	0.26	0.26	0.19	0.19	2.29	2.29	1.65	1.65		
		Total	12.14	12.14	5.39	5.39	6.18	6.18	2.73	2.73	3.20	3.20	1.40	1.40	2.27	2.27	1.02	1.02	1.78	1.78	0.79	0.79	0.51	0.51	0.22	0.22	4.42	4.42	1.96	1.96		
		Solid Manure Handling	VOC	Solid Manure Storage	0.11	0.11	0.09	0.09	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.02	0.02
				Separated Solids Piles	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
Solid Manure Land Application	0.28			0.23	0.21	0.21	0.15	0.13	0.11	0.11	0.12	0.10	0.09	0.09	0.08	0.07	0.06	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.07	0.06	0.05	0.05		
Total	0.43			0.38	0.33	0.33	0.23	0.21	0.18	0.18	0.18	0.16	0.14	0.14	0.12	0.11	0.09	0.09	0.07	0.06	0.05	0.05	0.03	0.03	0.03	0.03	0.11	0.10	0.09	0.09		
NH3	Solid Manure Storage		0.67	0.67	0.67	0.67	0.34	0.34	0.34	0.34	0.18	0.18	0.18	0.18	0.13	0.13	0.13	0.13	0.09	0.09	0.09	0.09	0.03	0.03	0.03	0.03	0.25	0.25	0.25	0.25		
	Separated Solids Piles		0.27	0.27	0.27	0.27	0.13	0.13	0.13	0.13	0.07	0.07	0.07	0.07	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.01	0.01	0.01	0.01	0.10	0.10	0.10	0.10		
	Solid Manure Land Application		1.48	1.48	1.07	1.07	0.75	0.75	0.54	0.54	0.39	0.39	0.28	0.28	0.28	0.28	0.20	0.20	0.21	0.21	0.15	0.15	0.06	0.06	0.05	0.05	0.54	0.54	0.39	0.39		
	Total		2.43	2.43	2.01	2.01	1.23	1.23	1.02	1.02	0.64	0.64	0.53	0.53	0.45	0.45	0.38	0.38	0.34	0.34	0.28	0.28	0.11	0.11	0.09	0.09	0.89	0.89	0.74	0.74		

Silage and TMR (Total Mixed Ration) Emissions (µg/m²-min)					
Feed Storage and Handling	VOC	Silage Type	Uncontrolled	EF1	EF2
		Com Silage	34,681	21,155	21,155
		Alfalfa Silage	17,458	10,649	10,649
		Wheat Silage	43,844	26,745	26,745
		TMR	13,056	10,575	10,575

Assumptions: 1) Each silage pile is completely covered except for the front face and 2) Rations are fed within 48 hours.

PM ₁₀ Emission Factors (lb/hd-yr)		
Type of Cow	Dairy EF	Source
Cows in Freestalls	1.37	Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy
Milk/Dry in Loafing Bams	2.73	SJVAPCD
Heifers/Bulls in Loafing Bams	5.28	SJVAPCD
Calves in Loafing Bams	0.69	SJVAPCD
Milk/Dry in Corrals	5.46	Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy
Support Stock (Heifers/Bulls) in Open Corrals	10.55	Based on a USDA/UC Davis report quantifying dairy and feedlot emissions in Tulare & Kern Counties (April '01)
Large Heifers in Open Corrals	8.01	SJVAPCD
Calves (under 3 mo.) in open corrals	1.37	SJVAPCD
Calves on-ground hutches	0.343	SJVAPCD
Calves above-ground flushed	0.069	SJVAPCD
Calves above-ground scraped	0.206	SJVAPCD

The controlled PM₁₀ EF will be calculated based on the specific PM₁₀ mitigation measures, if any, for each freestall, corral, or calf hutch area. See the PM Mitigation Measures for calculations.

Pre-Project Potential to Emit (PE1)

Pre-Project Herd Size					
Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows	1,050	0	0	0	1,050
Dry Cows	116	0	0	0	116
Support Stock (Heifers, Calves and Bulls)	0	0	0	0	0
Large Heifers	130	0	130	0	260
Medium Heifers	0	0	365	0	365
Small Heifers	0	0	130	0	130
Bulls	4	0	0	0	4
	Calf Hutches			Calf Corrals	
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Total # of Calves
Calves	0	0	205	0	205

Silage Information				
Feed Type	Maximum # Open Piles	Maximum Height (ft)	Maximum Width (ft)	Open Face Area (ft^2)
Corn	0	0	0	
Alfalfa	0	0	0	
Wheat	0	0	0	

Milking Parlor				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	1.1	416	0.4	144

Cow Housing						
Cow	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Total	34.6	12,617	122.5	44,655	17.7	6,501

Liquid Manure Handling						
Cow	VOC		NH3		H2S	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	7.0	2,552	21.8	7,968	0.3	124
Dry Cows	0.4	153	1.2	446	0.0	7
Support Stock (Heifers, Calves and Bulls)	0.0	0	0.0	0	0.0	0
Large Heifers	0.7	264	1.4	513	0.0	8
Medium Heifers	0.7	253	1.4	526	0.0	8
Small Heifers	0.1	50	0.4	144	0.0	2
Calves	0.1	38	0.2	65	0.0	1
Bulls	0.0	2	0.0	11	0.0	0
Total	9.1	3,312	26.5	9,673	0.4	151

Solid Manure Handling				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	1.3	490	8.2	2,977
Dry Cows	0.1	29	0.5	166
Support Stock (Heifers, Calves and Bulls)	0.0	0	0.0	0
Large Heifers	0.1	51	0.5	194
Medium Heifers	0.1	49	0.5	194
Small Heifers	0.0	10	0.1	51
Calves	0.0	7	0.1	26
Bulls	0.0	0	0.0	4
Total	1.7	637	9.9	3,612

Feed Handling and Storage		
	Daily PE (lb-VOC/day)	Annual PE (lb-VOC/yr)
Corn Emissions	0.0	0
Alfalfa Emissions	0.0	0
Wheat Emissions	0.0	0
TMR	42.4	15,489
Total	42.4	15,489

Total Daily Pre-Project Potential to Emit (lb/day)							
Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0.0	0.0	0.0	0.0	1.1	0.4	0.0
Cow Housing	0.0	0.0	17.7	0.0	34.6	122.5	0.0
Liquid Manure	0.0	0.0	0.0	0.0	9.1	26.5	0.4
Solid Manure	0.0	0.0	0.0	0.0	1.7	9.9	0.0
Feed Handling	0.0	0.0	0.0	0.0	42.4	0.0	0.0
Total	0.0	0.0	17.7	0.0	88.9	159.3	0.4

Total Annual Pre-Project Potential to Emit (lb/yr)							
Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	416	144	0
Cow Housing	0	0	6,501	0	12,617	44,655	0
Liquid Manure	0	0	0	0	3,312	9,673	151
Solid Manure	0	0	0	0	637	3,612	0
Feed Handling	0	0	0	0	15,489	0	0
Total	0	0	6,501	0	32,471	58,084	151

Calculations for milking parlor:

Annual PE = (# milk cows) x (EF1 lb-pollutant/hd-yr)

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

Calculations for cow housing:

See detailed calculations under Cow Housing Calculations worksheet.

Calculations for liquid manure and solid manure handling:

Annual PE = [(# milk cows) x (EF1 lb-pollutant/hd-yr)] + [(# dry cows) x (EF1 lb-pollutant/hd-yr)] + [(# large heifers) x (EF1 lb-pollutant/hd-yr)] + [(# medium heifers) x (EF1 lb-pollutant/hd-yr)] + [(# small heifers) x (EF1 lb-pollutant/hd-yr)] + [(# calves) x (EF1 lb-pollutant/hd-yr)] + [(# bulls) x (EF1 lb-pollutant/hd-yr)]

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

The H2S emission factor is assumed to be 10% of the NH3 lagoon/storage pond(s) emission factor, for each respective herd size.

Calculations for silage emissions:

Annual PE = (EF1) x (area ft²) x (0.0929 m²/ft²) x (8,760 hr/yr) x (60 min/hr) x 2.20E-9 lb/µg

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

Calculation for TMR emissions:

Annual PE = (# cows) x (EF1) x (0.658 m³) x (525,600 min/yr) x (2.20E-9 lb/µg)

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

Calves are not included in TMR calculation.

Major Source Emissions (lb/yr)					
Permit	NOx	SOx	PM10	CO	VOC
Milk Parlor	0	0	0	0	0
Cow Housing	0	0	0	0	0
Liquid Manure	0	0	0	0	1,595
Solid Manure	0	0	0	0	0
Feed Handling	0	0	0	0	0
Total	0	0	0	0	1,595

Post-Project Potential to Emit (PE2)

Post-Project Herd Size							
Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals		
Milk Cows	3,000	0	0	0	3,000		
Dry Cows	0	0	0	0	0		
Support Stock (Heifers, Calves, and Bulls)	2,545	0	0	250	2,795		
Large Heifers	0	0	0	0	0		
Medium Heifers	0	0	0	0	0		
Small Heifers	0	0	0	0	0		
Bulls	0	0	0	0	0		
	Calf Hutches			Calf Corrals		Total # of Calves	
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Flushed		Scraped
Calves	0	0	0	280	0	0	280

Silage Information				
Feed Type	Maximum # Open Piles	Maximum Height (ft)	Maximum Width (ft)	Open Face Area (ft*2)
Corn	0	0	0	
Alfalfa	0	0	0	
Wheat	0	0	0	

Milking Parlor				
	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows				
Total	3.3	1,188	1.1	410

Cow Housing						
	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Total	105.4	38,546	208.6	75,992	6.6	2,378

Liquid Manure Handling						
Cow	VOC		NH3		H2S	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	20.0	7,290	62.4	22,766	1.0	354
Dry Cows	0.0	0	0.0	0	0.0	0
Support Stock (Heifers, Calves, and Bulls)	7.8	2,837	15.1	5,514	0.2	89
Large Heifers	0.0	0	0.0	0	0.0	0
Medium Heifers	0.0	0	0.0	0	0.0	0
Small Heifers	0.0	0	0.0	0	0.0	0
Calves	0.1	52	0.2	89	0.0	1
Bulls	0.0	0	0.0	0	0.0	0
Total	27.9	10,179	77.7	28,369	1.2	444

Solid Manure Handling				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	3.8	1,401	23.3	8,504
Dry Cows	0.0	0	0.0	0
Support Stock (Heifers, Calves, and Bulls)	1.5	545	5.7	2,085
Large Heifers	0.0	0	0.0	0
Medium Heifers	0.0	0	0.0	0
Small Heifers	0.0	0	0.0	0
Calves	0.0	10	0.1	35
Bulls	0.0	0	0.0	0
Total	5.4	1,957	29.1	10,624

Feed Handling and Storage		
	Daily PE (lb-VOC/day)	Annual PE (lb-VOC/yr)
Corn Emissions	0.0	0
Alfalfa Emissions	0.0	0
Wheat Emissions	0.0	0
TMR	127.7	46,629
Total	127.7	46,629

Total Daily Post-Project Potential to Emit (lb/day)							
Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0.0	0.0	0.0	0.0	3.3	1.1	0.0
Cow Housing	0.0	0.0	6.6	0.0	105.4	208.6	0.0
Liquid Manure	0.0	0.0	0.0	0.0	27.9	77.7	1.2
Solid Manure	0.0	0.0	0.0	0.0	5.4	29.1	0.0
Feed Handling	0.0	0.0	0.0	0.0	127.7	0.0	0.0
Total	0.0	0.0	6.6	0.0	269.7	316.6	1.2

Total Annual Post-Project Potential to Emit (lb/yr)							
Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	1,188	410	0
Cow Housing	0	0	2,378	0	38,546	75,992	0
Liquid Manure	0	0	0	0	10,179	28,369	444
Solid Manure	0	0	0	0	1,957	10,624	0
Feed Handling	0	0	0	0	46,629	0	0
Total	0	0	2,378	0	98,498	115,396	444

Calculations for milking parlor:

Annual PE = (# milk cows) x (EF2 lb-pollutant/hd-yr)

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

Calculations for cow housing:

See detailed calculations under Cow Housing Calculations worksheet.

Calculations for liquid manure and solid manure handling:

Annual PE = [(# milk cows) x (EF2 lb-pollutant/hd-yr)] + [(# dry cows) x (EF2 lb-pollutant/hd-yr)] + [(# large heifers) x (EF2 lb-pollutant/hd-yr)] + [(# medium heifers) x (EF2 lb-pollutant/hd-yr)] + [(# small heifers) x (EF2 lb-pollutant/hd-yr)] + [(# calves) x (EF2 lb-pollutant/hd-yr)] + [(# bulls) x (EF2 lb-pollutant/hd-yr)]

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

The H2S emission factor is assumed to be 10% of the NH3 lagoon/storage pond(s) emission factor, for each respective herd size.

Calculations for silage emissions:

Annual PE = (EF2) x (area ft²) x (0.0929 m²/ft²) x (8,760 hr/yr) x (60 min/hr) x 2.20E-9 lb/µg

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

Calculation for TMR emissions:

Annual PE = (# cows) x (EF2) x (0.658 m³) x (525,600 min/yr) x (2.20E-9 lb/µg)

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

Calves are not included in TMR calculation.

Major Source Emissions (lb/yr)					
Permit	NOx	SOx	PM10	CO	VOC
Milk Parlor	0	0	0	0	0
Cow Housing	0	0	0	0	0
Liquid Manure	0	0	0	0	4,901
Solid Manure	0	0	0	0	0
Feed Handling	0	0	0	0	0
Total	0	0	0	0	4,901

APPENDIX F-3

Greenhouse Gas Emissions Model Methodology and Calculations

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GREENHOUSE GAS EMISSIONS QUANTIFICATION: METHODOLOGY AND CALCULATIONS

As set forth in CEQA Guidelines Section 15064.4(c), the lead agency has discretion to select the model or methodology it considers most appropriate to enable decision makers to intelligently take into account the project's incremental contribution to climate change. Where direct quantification of emissions is not possible, they may be described qualitatively.

For the purposes of this Environmental Impact Report, the proposed dairy expansion project estimated calculations include greenhouse gas (GHG) emissions that occur at the project dairy farm, but it does not account for the full production system of the dairy beyond the farm boundaries, nor does it include any soil carbon sequestration in the field. More complicated models are useful for understanding farm processes and their interacting effects on overall greenhouse gas emissions, and they can assist in the development and evaluation of mitigation strategies for reducing emissions and improving overall sustainability of dairy farms¹. However, in order to provide a more direct estimate for decision support, this assessment uses a simpler method based on emission factors and basic calculator models available to estimate GHG emissions from the animals, manure management, lagoons, energy use at the dairy, vehicle use and trucking, and from cropping activities. These simpler emission methodologies generally result in larger overall GHG emissions since they do not include emission sinks that are used in life cycle assessment methodologies.

The proposed dairy project includes increased solid manure exported offsite to be applied to cropland in the area. This analysis assumes animal wastes used as fertilizer would replace all or a portion of existing synthetic fertilizers used on existing cropland, and no feature of general best practices in the San Joaquin Valley would require the application of greater amounts of fertilizer than those currently used. Therefore, it is assumed that N₂O emissions from offsite agricultural fields would not change dramatically, and the GHG emissions from exported manure applied to offsite fields are not included in this analysis.

Listed below are the GHG emission sources and calculation methodologies used for this analysis.

GHG Emissions from the Dairy: Enteric Emissions, Lagoons, Manure Spreading and Storage

The San Joaquin Valley Air Pollution Control District Dairy Calculator (Rev. January 6, 2020, updated with CARB emission factors from the Year 2021 GHG Inventory) was used to estimate GHG emissions from the existing and proposed herd, including emissions from the lagoon, manure spreading, solid manure storage, and enteric emissions. The calculator uses GHG emission factors by animal type to determine CH₄ and N₂O emissions from these sources, and converting the emissions into carbon dioxide (CO₂) equivalents (see calculations included in this appendix).

¹ Rotz, A. 2018. Modeling greenhouse gas emissions from dairy farms. J. Dairy Sci. 101:6675–6690. July 01, 2018. Accessed at: <<https://doi.org/10.3168/jds.2017-13272>>

GHG Emissions from Energy Use

Based on annual energy use provided by the project applicant, a factor for energy use per cow per year was developed. This per cow factor was used to calculate estimated energy use for the proposed expanded herd. Because there are energy efficiencies that occur with a larger herd size, this is considered a conservative estimate methodology.

GHG Emissions from Mobile Sources

GHG emissions from vehicle trips (employee trips, milk tanker trucks, commodities transport, solid manure transport, etc.) and off-road equipment sources (feed loading, bedding delivery, manure scraping, manure loading, and feed delivery) were estimated using CalEEMod Version 2022.1.1.29

GHG Emissions from Agricultural Activities

The two major greenhouse gases from field crop agriculture are carbon dioxide (CO₂) and nitrous oxide (N₂O). Carbon dioxide is emitted through fossil fuel use on and off the farm, from activities such as vehicle use and fertilizer production. It can also be emitted or sequestered (stored) in the soil. Whether or not soil carbon sequestration occurs depends on the type of land and the farming practices, for example, soil tillage and plant residue management. Nitrous oxide is a very powerful greenhouse gas and is emitted primarily through soil management activities such as nitrogen fertilizer application. The Michigan State University's US Cropland Greenhouse Gas Calculator accounts for different cropping systems using USDA county-specific data considering crop type, tillage, fertilizer, and environmental variables to calculate greenhouse gas emissions. The dairy existing and proposed crop types and acreage were used to estimate the change in GHG emissions from project site cropland with implementation of the expansion.

Michigan State University's US Cropland Greenhouse Gas Calculator. Accessed at <http://carboncalculator.kbs.msu.edu/>

Energy Use at the Correia Dairy

Energy Use	kWh/mo	kWh/d	kWh/yr	cows	kWh/yr/cow
Average		770	954,797	2,130	448.26
Estimated Proposed			2,723,189	6,075	
kWh/yr/cow				448.26	
Increase			1,768,392		

Greenhouse Gas Emission Rates for Electricity Use

eGrid State	Average Output Emission Rate (lb CO ₂ e/MWh)	Average Output Emission Rate (lb CO ₂ e/kWh)
California	401.178	0.401178

Source: eGRID2023. Released 1/17/2025. Accessed at: <<https://www.epa.gov/energy/emissions-generation-resource-integrated-database-eGRID>>

GHG Emissions from Energy Consumption

	Herd Count	Average Electricity Use (kWh/yr)	GHG Emission Rate (lbs CO ₂ e/kWh)	GHG Emissions (lbs CO ₂ e/yr)	GHG Emissions (metric tons CO ₂ e/yr)
Electricity Use	2,130	954,797	0.401178	383,044	174
Expansion Projection	6,075	2,723,189	0.401178	1,092,483	496
Increment of Increase	3,945	1,768,392	-	709,440	322

GHG Emissions from the Dairy - Enteric emissions, lagoons, manure spreading and storage

	Existing Total Emissions (metric tons/yr)	Proposed Total Emissions (metric tons/yr)	Increment of Increase
Tons/Year	12,578	35,556	22,978

GHG emissions from the herd were estimated using emissions factors from the CARB. See GHG Calculation Worksheet

GHG Emissions from Agricultural Activities

	Acres	Soil	N2O	Fuel	Fertilizer	Total GHG Emissions (metric tons CO ₂ e/yr)
		Annual Average (Metric Tons CO ₂ e/Acre/Year)				
Existing Cropping						
Oats /Silage	292	0.10	0.24	0.05	0.02	119.72
Total						119.72
Proposed Cropping						
Corn/Silage	88	-0.05	0.43	0.05	0.03	40.48
Wheat/Corn	188	-0.09	0.37	0.05	0.02	65.8
Total						106.28
Change						-13.44

The Michigan State University's US Cropland Greenhouse Gas Calculator accounts for different cropping systems using USDA county-specific data considering crop type, tillage, fertilizer, and environmental variables to calculate greenhouse gas emissions. Michigan State University's US Cropland Greenhouse Gas Calculator. Accessed on December 11, 2024 at <<http://carboncalculator.kbs.msu.edu/>>

<u>Greenhouse Gas Emission Avoided by Solar</u>					
eGrid State	Average Output Emission Rate (lb CO ₂ e/MWh)	Average Output Emission Rate (lb CO ₂ e/kWh)	Energy generated in 2022 (kWh) (provided by applicant)	lb CO ₂ e	Metric tons CO ₂ e
California	401.178	0.401178	464,339.165	186,283	84
Source: eGRID2023. Released 1/17/2025. Accessed at: < https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid >					

Base Scenario for Merced County, CA

					Greenhouse Gas Costs CO2 equivalents (Mt/ac/year)				
Year	Crop	Yield	Tillage	Fertilizer	Soil	N2O	Fuel	Fertilizer	Total
1	oats	58.0 bu/ac	conventional	66.1 lb N/ac	0.14	0.14	0.05	0.01	0.34
2	silage	14.7 t/ac	conventional	142.0 lb N/ac	0.07	0.35	0.05	0.03	0.50 Remove
Annual Average:					0.10	0.24	0.05	0.02	0.42

Add another year to the rotation

Remove last year

Recalculate

Reset

Scenario 1 for Merced County, CA [Delete](#)

					Greenhouse Gas Costs CO2 equivalents (Mt/ac/year)				
Year	Crop	Yield	Tillage	Fertilizer	Soil	N2O	Fuel	Fertilizer	Total
1	corn	148.3 bu/ac	conventional	142.0 lb N/ac	-0.18	0.50	0.05	0.03	0.40
2	silage	14.7 t/ac	conventional	142.0 lb N/ac	0.08	0.35	0.05	0.03	0.51 Remove
Annual Average:					-0.05	0.43	0.05	0.03	0.45

Add another year to the rotation

Remove last year

Recalculate

Reset

Scenario 2 for Merced County, CA [Delete](#)

					Greenhouse Gas Costs CO2 equivalents (Mt/ac/year)				
Year	Crop	Yield	Tillage	Fertilizer	Soil	N2O	Fuel	Fertilizer	Total
1	wheat	40.2 bu/ac	conventional	66.1 lb N/ac	-0.00	0.24	0.05	0.01	0.30
2	corn	148.3 bu/ac	conventional	142.0 lb N/ac	-0.18	0.50	0.05	0.03	0.40 Remove
Annual Average:					-0.09	0.37	0.05	0.02	0.35

Add another year to the rotation

Remove last year

Recalculate

Reset

Environmental Conditions

Air Temperature 47.9 to 74.8 F
Precipitation 12.16 in

Percent Clay 22 %

Bulk Density 1.5 g/cm³
Initial Soil Carbon 0.5 %

Total Greenhouse Gas Emissions

	Increased Herd (metric tons CO ₂ e/yr)	Increased Mobile Source* (metric tons CO ₂ e/yr)	Increased Electricity (metric tons CO ₂ e/yr)	Increased Farming Emissions (metric tons CO ₂ e/yr)	GHG Emissions (metric tons CO ₂ /yr)
Correia Dairy Expansion	22,978	47.6	322	-13.44	23,334

*GHG emissions from mobile sources were estimated using CalEEMod Version 2022.1.1.29.

GHG emissions from the herd were estimated using emissions factors from the CARB. See GHG Calculation Worksheet

Conversion Factors			
1 megawatt-hour (MWh)		1,000 kilowatt-hour (kWh)	
1 short ton		2,000 pounds (lb)	
1.10231 short ton		1 metric ton	
2.2046 lb		1 kilogram (kg)	

Uncontrolled GHG Emissions Factors (lbs/hd-yr)						
Animal Type	CH4 (Anaerobic Digester Lagoon)	CH4 (Lagoon)	CH4 (Manure Spreading)	CH4 (Solid Manure Storage)	CH4 (Enteric)	CO2 Equivalent Multiplier for CH4
Milk Cows	180.93	322.94	4.99	39.95	318.14	25
Dry Cows	180.93	322.94	4.99	39.95	318.14	25
Support Stock*	54.87	97.94	1.55	--	144.56	25
Large Heifers	54.87	97.94	1.55	--	144.56	25
Medium Heifers	54.87	97.94	1.55	--	95.76	25
Small Heifers	54.87	97.94	1.55	--	95.76	25
Calves	--	--	--	--	25.59	25
Bulls*	54.87	97.94	1.55	--	144.56	25

Uncontrolled GHG Emissions Factors (lbs/hd-yr)						
Animal Type	N2O (Anaerobic Digester Lagoon)	N2O (Lagoon)	N2O (Manure Spreading)	N2O (Solid Manure Storage)	N2O (Enteric)	CO2 Equivalent Multiplier for N2O
Milk Cows	2.3914	4.20	0.55	4.22	0	298
Dry Cows	2.3914	4.20	0.55	4.22	0	298
Support Stock*	1.01	1.78	0.24	--	0	298
Large Heifers	1.01	1.78	0.24	--	0	298
Medium Heifers	1.01	1.78	0.24	--	0	298
Small Heifers	1.01	1.78	0.24	--	0	298
Calves	--	--	--	--	0	298
Bulls*	1.01	1.78	0.24	--	0	298

*Emission factors for Support Stock and Bulls assumed to be the same as Large Heifers. Where there are no emission factor provided beyond dairy cows by the GHG Inventory, none are used. For anaerobic digester lagoons, emission factors for support stock are scaled from the dairy cow emission factor.

1 short ton = 0.9072 metric ton

Global warming potential of CH4 = 25
Global warming potential of N2O = 298

CO2e from CH4 = [CH4 lagoon + CH4 manure spreading + CH4 solid manure storage + CH4 enteric] x 25 x 0.9072 metric tons/short tons + 2000 lb/ton

CO2e from N2O = [N2O lagoon + N2O manure spreading + N2O solid manure storage + N2O enteric] x 298 x 0.9072 metric tons/short tons + 2000 lb/ton

Note: CO2 equivalent emissions are calculated using Global Warming Potential values from the Fourth Assessment Report of the IPCC consistent with that used in the California's Greenhouse Gas Inventory (2023 Edition).

Emission factors obtained from Documentation of California's 2000-2021 GHG Inventory, Year 2021. <https://ww2.arb.ca.gov/applications/california-ghg-inventory-documentation>.

Pre-Project CO2e Emissions

Pre-Project Lagoon CO2e Emissions from CH4 (metric tons/yr)				
Animal Type	Number of Cows	CH4 (Lagoon) (lb/hd-yr)	CO2e Multiplier	CO2e Lagoons (metric tons/yr)
Milk Cows	1,050	322.94	25	3,845
Dry Cows	116	322.94	25	425
Support Stock	0	97.94	25	-
Large Heifers	260	97.94	25	289
Medium Heifers	365	97.94	25	405
Small Heifers	130	97.94	25	144
Calves	205	--	--	--
Bulls	4	97.94	25	4

Pre-Project Lagoon CO2e Emissions from N2O (metric tons/yr)				
Animal Type	Number of Cows	N2O (Lagoon) (lb/hd-yr)	CO2e Multiplier	CO2e Lagoons (metric tons/yr)
Milk Cows	1,050	4.20	298	596
Dry Cows	116	4.20	298	66
Support Stock	0	1.78	298	-
Large Heifers	260	1.78	298	63
Medium Heifers	365	1.78	298	88
Small Heifers	130	1.78	298	31
Calves	205	--	--	--
Bulls	4	1.78	298	1

Total Pre-Project CO2e Emissions (metric tons/yr)			
Animal Type	CO2e from CH4	CO2e from N2O	Total
Milk Cows	8,168	1,273	9,442
Dry Cows	902	141	1,043
Support Stock	0	-	-
Large Heifers	720	71	791
Medium Heifers	808	100	908
Small Heifers	288	35	323
Calves	59	-	59
Bulls	11	1	12
Total			12,578

Pre-Project Non-Lagoon CO2e Emissions from CH4 (metric tons/yr)						
Animal Type	Number of Cows	CH4 (Manure Spreading) (lb/hd-yr)	CH4 (Solid Manure Storage) (lb/hd-yr)	CH4 (Enteric) (lb/hd-yr)	CO2e Multiplier	CO2e Non-Lagoons (metric tons/yr)
Milk Cows	1,050	4.99	39.95	318.14	25	4,323
Dry Cows	116	4.99	39.95	318.14	25	478
Support Stock	0	1.55	--	144.56	25	-
Large Heifers	260	1.55	--	144.56	25	431
Medium Heifers	365	1.55	--	95.76	25	403
Small Heifers	130	1.55	--	95.76	25	143
Calves	205	--	--	25.59	25	59
Bulls	4	1.55	--	144.56	25	7

Pre-Project Non-Lagoon CO2e Emissions from N2O (metric tons/yr)						
Animal Type	Number of Cows	N2O (Manure Spreading) (lb/hd-yr)	N2O (Solid Manure Storage) (lb/hd-yr)	N2O (Enteric) (lb/hd-yr)	CO2e Multiplier	CO2e Non-Lagoons (metric tons/yr)
Milk Cows	1,050	0.55	4.22	0	298	677
Dry Cows	116	0.55	4.22	0	298	75
Support Stock	0	0.24	--	0	298	-
Large Heifers	260	0.24	--	0	298	8
Medium Heifers	365	0.24	--	0	298	12
Small Heifers	130	0.24	--	0	298	4
Calves	205	--	--	0	298	-
Bulls	4	0.24	--	0	298	0

Post-Project CO2e Emissions

Post-Project Lagoon CO2e Emissions from CH4 (metric tons/yr)				
Animal Type	Number of Cows	CH4 (Lagoon) (lb/hd-yr)	CO2e Multiplier	CO2e Lagoons (metric tons/yr)
Milk Cows	3,000	322.94	25	10,986
Dry Cows	0	322.94	25	-
Support Stock	2,795	97.94	25	3,104
Large Heifers	0	97.94	25	-
Medium Heifers	0	97.94	25	-
Small Heifers	0	97.94	25	-
Calves	280	--	25	-
Bulls	0	97.94	25	-

Post-Project Lagoon CO2e Emissions from N2O (metric tons/yr)				
Animal Type	Number of Cows	N2O (Lagoon) (lb/hd-yr)	CO2e Multiplier	CO2e Lagoons (metric tons/yr)
Milk Cows	3,000	4.20	298	1,703
Dry Cows	0	4.20	298	-
Support Stock	2,795	1.78	298	673
Large Heifers	0	1.78	298	-
Medium Heifers	0	1.78	298	-
Small Heifers	0	1.78	298	-
Calves	280	--	298	-
Bulls	0	1.78	298	-

Total Post-Project CO2e Emissions (metric tons/yr)			
Animal Type	CO2e from CH4	CO2e from N2O	Total
Milk Cows	23,338	3,638	26,977
Dry Cows	0	-	-
Support Stock	7,735	763	8,498
Large Heifers	0	-	-
Medium Heifers	0	-	-
Small Heifers	0	-	-
Calves	81	-	81
Bulls	0	-	-
Total			35,556

Post-Project Non-Lagoon CO2e Emissions from CH4 (metric tons/yr)						
Animal Type	Number of Cows	CH4 (Manure Spreading) (lb/hd-yr)	CH4 (Solid Manure Storage) (lb/hd-yr)	CH4 (Enteric) (lb/hd-yr)	CO2e Multiplier	CO2e Non-Lagoons (metric tons/yr)
Milk Cows	3,000	4.99	39.95	318.14	25	12,352
Dry Cows	0	4.99	39.95	318.14	25	-
Support Stock	2,795	1.55	--	144.56	25	4,631
Large Heifers	0	1.55	--	144.56	25	-
Medium Heifers	0	1.55	--	95.76	25	-
Small Heifers	0	1.55	--	95.76	25	-
Calves	280	--	--	25.59	25	81
Bulls	0	1.55	--	144.56	25	-

Post-Project Non-Lagoon CO2e Emissions from N2O (metric tons/yr)						
Animal Type	Number of Cows	N2O (Manure Spreading) (lb/hd-yr)	N2O (Solid Manure Storage) (lb/hd-yr)	N2O (Enteric) (lb/hd-yr)	CO2e Multiplier	CO2e Non-Lagoons (metric tons/yr)
Milk Cows	3,000	0.55	4.22	0	298	1,935
Dry Cows	0	0.55	4.22	0	298	-
Support Stock	2,795	0.24	--	0	298	90
Large Heifers	0	0.24	--	0	298	-
Medium Heifers	0	0.24	--	0	298	-
Small Heifers	0	0.24	--	0	298	-
Calves	280	--	--	0	298	-
Bulls	0	0.24	--	0	298	-

Change in CO2e Emissions

Change in CO2e Emissions (metric tons/yr)			
Animal Type	Pre-Project CO2e	Post-Project CO2e	Change
Milk Cows	9,442	26,977	17,535
Dry Cows	1,043	-	(1,043)
Support Stock	0	8,498	8,498
Large Heifers	791	-	(791)
Medium Heifers	908	-	(908)
Small Heifers	323	-	(323)
Calves	59	81	22
Bulls	12	-	(12)
Total			22,978

APPENDIX F-4

Proposed Greenhouse Gas Emissions Threshold

GREENHOUSE GAS EMISSIONS THRESHOLD FOR THE PROPOSED DAIRY EXPANSION PROJECT

Introduction

The California Environmental Quality Act (CEQA) requires agencies to identify a project's potentially significant effects on the environment, and to mitigate significant effects whenever feasible. This includes the potential environmental effects of greenhouse gas (GHG) emissions. CEQA encourages public agencies to adopt "thresholds of significance" to use in determining the significance of environmental effects. A threshold of significance is an identifiable quantitative, qualitative, or performance level of a particular environmental effect. Exceedance of a threshold of significance would normally result in a determination that the project would have a significant environmental impact. Conversely, non-exceedance of a significance threshold would normally result in a determination that project would not have a significant environmental impact. In regards to thresholds of significance for GHG emissions, CEQA Guidelines Section 15064.7(c) states that a lead agency "may consider thresholds of significance previously adopted or recommended by other public agencies or recommended by experts, provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence." Lead agencies have the discretion to identify appropriate thresholds and analysis methodologies, and they may choose to review a project's environmental impacts using more than one threshold of significance. The California Air Resources Board (CARB) has established preliminary approaches to establishing significance thresholds, and the San Joaquin Valley Air Pollution Control District (SJVAPCD) has issued guidance for evaluating project-level GHG effects.

In determining the significance of a project's impacts, the lead agency may consider a project's consistency with the State's long-term climate goals or strategies, or with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction of greenhouse gas emissions, provided that substantial evidence supports the agency's analysis of how those goals or strategies address the project's incremental contribution to climate change and its conclusion that the project's incremental contribution is consistent with those plans, goals, or strategies (CEQA Guidelines Section 15064.4 (b)(3).) The legislative or regulatory programs establish standards that are independent of the impact analysis described in the CEQA Guidelines (see provisions beginning with Section 15126). The 2022 Scoping Plan Update is the State program for GHG emission reductions. While the 2022 Scoping Plan identifies various actions and concepts that would lead to an increase in climate-smart agricultural management actions, at this stage it does not include regulatory requirements that would reduce greenhouse gas emissions; the authority to reduce GHG emissions via measures relating to agricultural lands largely lies with state, regional, and local agencies, along with the Legislature and its budgeting choices (CARB 2022). At this time, there is no regional or Merced County greenhouse gas reduction plan or climate action plan. Therefore, there is no local, regional, or statewide plan regulating global warming by which the proposed project can be measured.

Threshold Options

In December of 2018, the Governor's Office of Planning and Research (OPR) released *CEQA and Climate Change* (OPR 2018), a discussion draft update to a 2008 advisory, suggesting relevant ways to address climate change in CEQA analyses. The document considers various approaches to

performing a climate change analysis, including some of the methods that a lead agency may use in selecting appropriate significance thresholds. A lead agency may choose to review a project's environmental impacts using more than one threshold of significance. Several threshold options included in the advisory include:

- a significance threshold based on efficiency;
- compliance with State goals
- consistency with relevant regulations, plans, policies, and regulatory programs
- numeric/quantitative threshold

Additional thresholds considered by OPR in a recent webinar on GHG emissions analysis include a net-zero threshold and a zero threshold. A lead agency may choose to review a project's environmental impacts using more than one threshold of significance. Regardless of which threshold or combination of thresholds the lead agency uses, the agency must support its analysis and significance determination with substantial evidence. (CEQA Guidelines Section 15064.7.)

Numeric Thresholds Previously Adopted or Recommended

United States Environmental Protection Agency (EPA)

EPA's Final Mandatory GHG Reporting Rule became effective December 29, 2009. The rule requires reporting of GHG emissions from large sources and suppliers in the United States, and is intended to collect accurate and timely emissions data to inform future policy decisions. Under the rule, suppliers of fossil fuels or industrial greenhouse gases, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons per year (mt/yr) or more of GHG emissions are required to submit annual reports to EPA. EPA estimates that the reporting rule will cover about 85 percent of GHG emissions in the United States.

For manure management systems, such as on a dairy, the animal population threshold level below which facilities are not required to report emissions is 3,200-cow dairy herd, which represents a conservative estimate of the 25,000 mt/yr CO₂e equivalent (CO₂e) threshold level. Facilities that meet or exceed these populations will need to conduct an analysis to determine if they emit more than 25,000 mt/yr CO₂e. While congress restricted EPA from expending any funds in fiscal years 2010 through 2024 for the purpose of implementing the manure management section of the rule, this did not change the requirements of the rule, and facilities that meet the threshold size are advised to keep the appropriate records.

California Air Resources Board

The California Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (California Mandatory Reporting Rule) (17 CCR, Section 95100-95157), approved in 2007, is similar to the U.S. EPA Mandatory Reporting Rule in that it requires certain large emitters and suppliers to report their GHG data on an annual basis; however, the California emissions threshold is lower at only 10,000 metric tons of CO₂e per year. The California Mandatory Reporting Rule excludes GHG emissions related to livestock manure management systems and agricultural irrigation pumps.

San Joaquin County Air Pollution Control District (SJVAPCD)

To assist Lead Agencies, project proponents, permit applicants, and interested parties in assessing and reducing the impacts of project specific GHG on global climate change, the SJVAPCD adopted the following guidance on December 17, 2009: *Guidance for Valley Land-use Agencies in Addressing*

GHG Emission Impacts for New Projects under CEQA and the policy: *District Policy – Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency* (SJVAPCD 2009). The guidance and policy rely on the use of performance-based standards, otherwise known as Best Performance Standards (BPS) to assess significance of project specific greenhouse gas emissions on global climate change during the environmental review process, as required by CEQA. Use of BPS is a method of streamlining the CEQA process of determining significance and is not a required emission reduction measure. Projects implementing BPS would be determined to have a less than cumulatively significant impact. Otherwise, demonstration of a 29 percent reduction in GHG emissions, from business-as-usual, is required to determine that a project would have a less than cumulatively significant impact. The guidance does not limit a lead agency's authority in establishing its own process and guidance for determining significance of project related impacts on global climate change.

Projects complying with BPS would not require specific quantification of GHG emissions and would be determined to have a less than significant cumulative impact for GHG emissions. Projects not complying with Best Performance Standards would require quantification of GHG emissions and demonstration that GHG emissions have been reduced or mitigated by 29 percent, as targeted by CARB's AB 32 Scoping Plan. Furthermore, quantification of GHG emissions would be required for all projects for which the lead agency has determined that an Environmental Impact Report is required, regardless of whether the project incorporates BPS. (SJVAPCD 2009)

Best performance standards for GHG emissions have not yet been developed for all sources of GHG emissions. Given that understanding and regulation of GHG emission sources and mitigations is evolving, the SJVAPCD staff expects the development of BPS to be an ongoing effort. Consistent with CEQA Guidelines Section 15064(h)(3), for projects implementing best performance standards, or their equivalent, the District would conclude that the project's incremental contribution to the cumulative impact on global climatic change is not cumulatively considerable. (SJVAPCD 2009)

The following bullet points illustrate the SJVAPCD's process for evaluating GHG significance. Project impact can be reduced by:

- Using any combination of District approved GHG Emission Reduction Measures to meet BPS
- Complying with an approved GHG plan or mitigation program
- Reducing GHG emissions by at least 29 percent.

The SJVAPCD has developed illustrative examples for potential BPS. At this stage, these illustrative BPS should not be considered District-approved standards, but rather provide an opportunity for public input into the development of BPS and ultimate development of final BPS. The illustrative BPS now being proposed for livestock operations include that all operations shall utilize all three following control measures:

- (1) All ruminant animal feed shall include at least six percent cottonseed, or, upon SJVAPCD approval, based on sufficient demonstration that use of cottonseed is not feasible, an equivalent substitute (estimated to generate a 12 percent reduction in methane emissions from this source);

- (2) Manure from animal housing areas for mature cows shall be removed and transferred into appropriate treatment facilities at least four times a day and at least once a day for all other animals (estimated to generate a 7.1 percent reduction in methane emissions from this source); and
- (3) Collected manure shall be treated anaerobically in digesters or covered lagoons, designed and operated per NRCS standards, with captured methane used for energy recovery in a method that displaces current or required fossil fuel use, such as, but not limited to, injection into natural gas pipeline, or powering mobile equipment. Taking the effect of the CO₂ produced from the combustion of CH₄ into account, an overall reduction of 63.5 percent of fugitive CH₄ emissions can be achieved by the use of properly designed and controlled anaerobic treatment as a BPS. (SJVAPCD 2009)

Although permit requirements for many livestock farms took effect in 2004, the particular BPS proposed, with the exception of frequent manure removal from livestock housing areas, have never been implemented as mandatory permit requirements. Instead, many other control measures aimed at reducing VOC and PM₁₀ emissions have been applied with greater emphasis. Until these BPS are finalized, the following conditions would be most applicable according to the SJVAPCD:

- In order to minimize Greenhouse Gas emissions and optimize equipment efficiency, all equipment shall be operated in accordance with manufacturer specifications and approved design specifications.
- All ruminant animal feed shall include at least 6 percent cottonseed.
- Manure from animal housing areas shall be removed and transferred into appropriate treatment facilities at least four times a day for mature cows and at least once a day for all other animals. (SJVAPCD 2009)

The illustrative BPS proposed by the SJVAPCD for farming operations and the application of manure to cropland include that all operations shall utilize the following control measure:

- (1) Manure shall be incorporated into soil within 24 hours after application. In a report entitled “Recommendations to the San Joaquin Valley Air Pollution Control Officer Regarding Best Available Control Technology for Dairies in the San Joaquin Valley”, the Dairy Permitting Advisory Group (DPAG) concluded that VOC emissions could be reduced by 29 to 58 percent by the prompt incorporation of manure into soil after application to land. Based on this information, this BPS assumes a similar benefit as far as the reduction of CH₄ emissions is concerned. However due to the lack of data, the lower control efficiency of 29 percent of methane emissions from this source will be used.

The California Attorney General (AG) has expressed opposition to SJVAPCD strategy, claiming it leaves a number of unanswered questions, and the AG’s office issued a letter dated November 4, 2009 stating that the proposed approach would “not withstand legal scrutiny and may result in significant lost opportunities for the Air District and local governments to require mitigation of GHG emissions.” The AG noted several deficiencies, primarily that the SJVAPCD does not discuss a particular environmental objective that would be achieved by implementing the proposed thresholds, such as meeting a GHG emissions reduction trajectory consistent with that set forth in AB 32 and Executive Order S-03-05 within the Air District’s jurisdiction. Also, the BPS are described as

“illustrative” only, and it is not possible at this time to determine whether the BPS ultimately adopted will reduce GHG emissions in the San Joaquin Valley and, if so, by how much. Further, the threshold does not take into account the need for new development to be more GHG-efficient than existing development to achieve AB 32 goals, given that past and current sources of emissions, which are substantially less efficient than this average, will continue to exist and emit. The AG also points out that the SJVAPCD proposal appears to award emission reduction “points” for undertaking mitigation measures that are already required by local or state law and could offer an incentive to project proponents to artificially inflate the hypothetical project to show that the proposed project is, by comparison, GHG-efficient. Most importantly, the AG noted that according to the SJVAPCD guidance, any project employing certain, as of yet unidentified, mitigation measures would be considered to not result in a significant level of GHG emissions or a significant impact, regardless of the project’s total GHG emissions, which could be very large.

Because of the uncertain direction of legal opinion, and because BPS for dairies and agricultural operations have not been adopted and are illustrative only, this EIR does not use project compliance with BPS as a threshold of significance.

Comparison of Non-Zero Significance Thresholds

In efforts to identify a numeric threshold that could be appropriate for this analysis, a survey of several California Air Quality Management Districts’ CEQA guidance was completed. The table below summarizes significance thresholds and mandatory reporting thresholds as set forth by the EPA, the CARB, the SJVAPCD, Sacramento Metropolitan Air Quality Management District (SMAQMD), South Coast Air Quality Management District (SCAQMD), and the Bay Area Air Quality Management District (BAAQMD). None of the Air District guidance contain any numeric thresholds or guidance specific to agricultural activities.

Comparison of Numeric Thresholds						
Category	EPA	CARB	SCAQMD	SJVAPCD	SMAQMD	BAAQMD
	(Mandatory Reporting)					
Construction	--	--	--	--	1,100 mt/yr CO _{2e}	--
Industrial/ Stationary Sources Operation	25,000 mt/yr CO _{2e}	10,000 mt/yr CO _{2e}	10,000 mt/yr CO _{2e}	BPS	10,000 mt/yr CO _{2e}	10,000 mt/yr CO _{2e}
Dairy/Agricultural Project	25,000 mt/yr CO _{2e}	10,000 mt/yr CO _{2e}	--	BPS	--	--

t/yr = metric tons per year; CO_{2e} = carbon dioxide equivalents

The EPA’s Mandatory GHG Reporting Rule threshold of 25,000 mt/yr CO_{2e} represents a reporting threshold and not a threshold of significance specifically, and it is estimated to capture approximately 85 percent of the U.S emissions of GHGs and capture all large sources of GHG emissions. This is very similar to the CARB goal of emissions capture of 90 percent to meet AB 32 goals.

Except for EPA, no other agency has established any adopted thresholds for agricultural or dairy uses at this time (January 2025). Because SJVAPCD BPS for dairies and agricultural operations have not been adopted and are illustrative only, application of BPS as a threshold is not possible at this time. The EPA’s reporting threshold of 25,000 mt/yr of CO_{2e} represents a conservative value that

would capture many large emitters of GHGs. However, the EPA's 25,000 mt/yr CO₂e is a permit threshold that represents emissions from the entire facility and not just the increment of increase. To identify dairies with significant increases in GHG emissions, Merced County has selected a numeric screening threshold for when the increment of increase of GHG emissions is greater than 10,000 mt/yr CO₂e (used by SCAQMD, SMAQMD, and BAAQMD for industrial stationary sources).

Consistency with Relevant Policies as a Threshold

Many statewide and regional GHG emission reduction strategies have few or limited regulations specific to agriculture. The Short-Lived Climate Pollutant Reduction Strategy (SLCP Strategy) (2017) lays out a range of options to accelerate SLCP emission reductions in California, including regulations, incentives, and other market-supporting activities. California will aim to reduce methane emissions from dairy manure management by 75 percent in 2030. To accomplish this, the State will encourage and support near-term actions by dairies to reduce emissions through market support and financial incentives. As set forth in the 2017 Scoping Plan, no state regulatory requirements were to go into effect prior to 2024 requiring dairy sector methane reductions to meet the state's GHG reduction goals. The reduction of methane emissions from dairy operations will continue to be voluntary, though one of the 2022 Scoping Plan strategies includes consideration of regulation development for methane mitigation strategies beyond complimentary incentives for dairy and livestock operations in order to meet 2030 GHG emission targets. However, CARB is only authorized to implement these regulations provided that they are determined technologically and economically feasible, cost-effective, and include provisions to minimize and mitigate potential leakage (CARB 2022).

In recognition of the need for public funding sources to subsidize voluntary dairy methane emissions reduction projects, funds from the Cap-and-Trade Program are allocated to the Greenhouse Gas Reduction Fund to be administered by California Department of Food and Agriculture (CDFA) to support such projects. CDFA receives funding from California Climate Investments to support projects that reduce methane emissions from dairy and livestock operations, such as dairy digesters and manure management systems. Additional programs within the agricultural sector that aim to reduce emissions and sequester carbon include the Healthy Soils Program, and the State Water Efficiency and Enhancement Program. These programs support manure management practices that complement each other – Dairy Digester Research and Development Program (DDRDP) incentivizes the installation of anaerobic digesters on dairies to capture and use methane produced from manure for renewable energy, such as electricity or fuel, and Alternative Manure Management Program (AMMP) incentivizes projects that could include installation of mechanical manure solids separation on dairies with flush systems, or conversion to dry manure management practices, such as scrape or vacuum systems, combined with composting or solar drying of manure. DDRDP and AMMP practices are not mutually exclusive, and in most cases are complementary. Together, the programs offer a range of strategies to reduce GHG emissions from manure management on California dairy and livestock operations. This is important due to the variation in size, location, and management styles of dairies and livestock operations across the state (CDFA 2024).

CARB has stated that a combination of dairy digesters, alternative manure management, enteric strategies, and overall dairy herd population decreases will be needed to meet the 2030 target (CDFA 2024; CARB 2022a). The DDRDP supports manure management practices that reduce GHG emissions and provide additional benefits, such as renewable energy through electricity, renewable

natural gas, and hydrogen and compost production, through anaerobic digesters on California dairy operations. For additional information on commercially available anaerobic digester systems eligible for grant funding, see: <https://www.cdfa.ca.gov/oefi/ddrdp/>

The AMMP supports several project types for which there are methods to quantify greenhouse gas (GHG) emission reductions. Examples include pasture-based management, alternative manure treatment and storage practices, solid separation, and conversion from a flush to scrape manure collection system, among others. For a list of manure management practices eligible for grant funding through the AMMP, see: <https://www.cdfa.ca.gov/oefi/ammp/>

Identified EIR Threshold

In accordance with CEQA Guideline Section 15064.4, Determining the Significance of Impacts from Greenhouse Gas Emissions, a lead agency should determine the amount of GHG emissions resulting from a project, which may be determined by either using a model or methodology to quantify GHG emissions or by relying on a qualitative analysis or performance-based standards. Additionally, a lead agency may consider: (1) whether the project would increase or reduce GHG emissions as compared to the existing environmental setting; (2) whether the project's emissions exceed a threshold of significance that the lead agency has determined applies to the project; or (3) the extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions.

Merced County has not established significance criteria for GHG emissions. For the construction phase of the project, this analysis uses the commonly adopted numeric threshold for land use projects of 1,100 metric tons CO₂e per year of GHG emissions. For operational emissions, the EIR uses a combination of significance thresholds, including a numeric screening threshold, and consistency with voluntary Scoping Plan methane mitigation strategies:

- The increment of increase of the project's operational GHG emissions would be greater than 10,000 mt/yr of CO₂e.
- However, if the dairy implements a voluntary Scoping Plan methane mitigation strategy for dairy and livestock operations, such as dairy digesters and alternative manure management systems, then the project's contribution to GHG emissions would be considered less than significant.

This threshold would only be applicable to dairies, and would not apply to industrial, commercial, residential, or other development types.

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