ATTACHMENT NO 1:

TULARE COUNTY
RESOURCE MANAGEMENT AGENCY

5961 South Mooney Boulevard
Visalia, CA 93277

2020 ANNUAL REPORT

OF TOTAL GREENHOUSE GAS EMISSIONS FROM
DAIRIES AND FEEDLOTS FOR 2019

April 16, 2021

Prepared by

Tulare County Resources Management Agency
Economic Development & Planning Branch

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I. INTRODUCTION

The 2020 Annual Report of total Greenhouse Gas ("GHG") emissions from dairies and feedlots for 2019 is a requirement of a Stipulated Settlement ("Settlement"). The Settlement became effective August 2, 2019, completely resolving Case No. 272380 - Petition for Writ of Mandate and Complaint for Declaratory and Injunctive Relief, Superior Court, State of California, County of Tulare, Visalia Division, challenging the certification by the County of Tulare of the 2017 Environmental Impact Report for the 2017 Animal Facilities Confinement Plan and related General Plan Amendments Zone Changes, and Dairy and Feedlot Climate Action Plan. The ACFP and Dairy CAP are components of the County's General Plan and are part of the Settlement by and between the Sierra Club, Association of Irritated Residents, and Center for Biological Diversity (collectively "Petitioners" or "Plaintiffs") and the County of Tulare, a political subdivision of the State of California and the Board of Supervisors of the County of Tulare (collectively "County").

A. BACKGROUND

On November 30, 2011, in accordance with the California Environmental Quality Act ("CEQA"), the County of Tulare filed a Notice of Preparation ("NOP") with the California State Clearinghouse in the Governor's Office of Planning and Research as notification that a Draft EIR would be prepared for the 2017 ACFP and 2017 Dairy CAP. The NOP was distributed to involved public agencies and other interested parties for a 30-day public review period. The purpose of the public review period was to solicit comments on the scope and content of the environmental analysis to be included in the EIR.

On February 3, 2016, a Notice of Completion for a Draft EIR for the 2017 ACFP and 2017 Dairy CAP was filed with the State Clearinghouse, together with the requisite number of copies of the Draft EIR to be mailed to affected public agencies and interested parties, indicating a 45-day review period commencing on February 4, 2016, and ending on March 21, 2016.

On February 4, 2016, a Notice of Availability of a Draft EIR was duly published in the Visalia Times-Delta, Porterville Recorder, and Dinuba Sentinel, which are newspapers of general circulation in Tulare County, as well as the Bakersfield Californian and Delano Record in Kern County.

On February 4, 2016, a Notice of Availability of a Draft EIR was posted in the office of the Tulare County Clerk for a 45-day public review period commencing on February 4, 2016 and ending on March 21, 2016.

On September 8, 2017, a copy of the written responses to the timely public comments on the Draft EIR was sent to the commenting public agencies and interested parties in a manner that public agencies and interested parties received it at least 10 days before the Board of Supervisors meeting where the Board was scheduled to act upon the Planning Commission's recommendation to certify the EIR.

On October 12, 2017, a Notice of Availability of a Draft EIR and Notice of Public Hearing was duly published in the Visalia Times-Delta, Porterville recorder, Dinuba Sentinel, Bakersfield Californian, and Delano Record, newspapers of general circulation, for a Planning Commission meeting set for October 25, 2017.

On October 25, 2017, the Planning Commission held a duly notice meeting where staff presented evidence regarding the Final EIR and the Project to the Planning Commission and answered Planning Commission questions, and the Commission held a duly notice public hearing where public testimony was received and recorded regarding the Project and Final EIR.

On October 25, 2017, the Planning Commission reviewed the Final EIR, Findings of Fact, Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Program ("MMRP") for the Project and recommended by Resolution No. 8358 that the Board of Supervisors certify the Final EIR and adopt the Findings of Fact, Statement of Overriding Considerations, and MMRP.

On December 1, 2017, a Notice of Public Hearing was published in the Visalia Times-Delta for a public hearing before the Board at its regular meeting on December 12, 2017.

On December 12, 2017, public testimony was received and recorded at the Board of Supervisors hearing regarding the Project and Final EIR.

On December 12, 2017, after notice and hearing, the Board adopted the 2017 ACFP as the updated Chapter 12 of the Tulare County 2030 General Plan Update, approved and adopted the 2017 Dairy CAP, and approved and certified a Final Environmental Impact Report ("2017 FEIR") and adopted the CEQA Findings of Fact, Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Program ("MMRP") pursuant to CEQA.

The 2017 FEIR formally evaluated the environmental impacts of the 2017 ACFP and 2017 Dairy CAP. The 2017 FEIR was prepared pursuant to CEQA. On December 12, 2017, after notice and hearing, the Board adopted the 2017 ACFP as the updated Chapter 12 of the Tulare County 2030 General Plan Update, approved and adopted the 2017 Dairy CAP, and approved and certified the 2017 FEIR and adopted the CEQA Findings of Fact, Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Program ("MMRP") pursuant to CEQA.

On July 21, 2020, the Tulare County Board of Supervisors adopted Resolution No. 2020-0430 approving an Addendum to the 2017 FEIR for the 2017 ACFP and Dairy CAP, adopted Resolution No. 2020-0431 approving General Plan Amendment No. 20-009 amending the 2017 ACFP and Dairy CAP, and adopted Resolution No. 2020-0446 accepting the Tulare County Planning Commission's recommendation to approve an Addendum to the 2017 FEIR for the 2017 ACFP and Dairy CAP and accepted the Commission's recommendation to approve General Plan Amendment No. 20-009 amending the 2017 ACFP and Dairy CAP.

B. ANNUAL REPORT SUMMARY

Section IV.B. of the Settlement requires the County of Tulare to prepare an Annual Report of total dairy GHG emissions from Fiscal Year ("FY") 2019-FY2024. The Annual Report (see Attachment No. 1) is required to include:

1. Total estimated dairy GHG emissions reduced to date compared to the 1.05 million MT/yr. by 2023 Dairy and Feedlot CAP reduction goal, and the total dairy GHG emissions reduced to date compared to the maximum projected SB 1383 potential target. GHG emissions shall be represented as graphical figures substantially similar to those provided in Attachment B of the Settlement.

   The County's Air Quality Consultant has prepared a GHG Emissions Reduction Report (Exhibit "A") with this information. On February 4, 2021, the County's Air Quality Consultant began preparing an Annual Report of total dairy GHG emissions for 2019. The County's Air Quality consultant completed the Annual Report of total dairy GHG emissions for 2019 on April 14, 2021. The Annual Report of total dairy GHG emissions for 2020 presents the 2019 GHG emissions inventory for dairies and cattle feedlots in Tulare County. It also evaluates the voluntary GHG emission reduction projects implemented at dairies and feedlots since 2013 and quantifies the reductions.

   Maas Energy Works and California Bioenergy indicated that bringing a digester project to full operation has taken longer than originally expected due to several reasons. One reason is that CDFA funding is partial and it has taken time to secure additional funding. Another reason is that permitting is complex and can involve obtaining permits from up to six different agencies. Another reason is that the "hub and spoke" model, where several digesters feed digester gas into a central facility, is complex and components are not always built out simultaneously. Once digester installation is complete, start of operation may be delayed until downstream components are built out. Moreover, the COVID-19 pandemic has resulted in additional delays in the next inventory year, 2020, due to staffing shortages and regulatory agency delays.

   The Annual Report of total dairy GHG emissions for 2019 shows that there were approximately 696,250 additional metric tons per year of CO_2e reductions from solar, digester, and AMMP projects that are planned to become operational after 2019. The complete dairy digester and AMMP project lists, with project descriptions, are included in Appendix B of the Annual Report of total dairy GHG emissions for 2019.

2. Report on the State's measures pursuant to SB 1383, including but not limited to digester funding and the Alternative Manure Management Program ("AMMP").

   RMA staff completed an AMMP Spreadsheet (Exhibit "B") with this information on February 8, 2021. The AMMP Spreadsheet contains thirteen (13) facilities and shows that the CDFA has awarded $8,293,120.00 in funding for improvements at dairies and feedlots in Tulare County. Four (4) of those facilities are operational after completing improvements, four (4) facilities have improvements that are under construction, four (4) facilities have not yet applied for Building Permits, and the status is unknown for one (1) of

the facilities. Once the thirteen (13) facilities are all operating for five (5) years after completing improvements, the Greenhouse Gas (GHG) reductions will total 170,527 $MTCO_2e$.

3. Updated Digester Project list for digesters within the County that lists: 1) the operation name, 2) project title, 3) total project cost, 4) CDFA funding award, additional Federal or State public funding awards, 5) project description, 6) project construction state, 7) location, 8) GHG emission reductions over ten years, and 9) how captured methane is used. The report shall also include any reported problems with completed digesters within the County.

   RMA staff completed the Updated Digester Project List (Exhibit "C") with this information on April 13, 2021. The Updated Digester Project List contains fifty-five (55) Digesters and shows that the CDFA has awarded $80,100,265.00 for Digesters at fifty-two (52) dairies in Tulare County. Three (3) Digesters that are currently operating did not receive CDFA funding. Fifteen (15) Digesters are operational, thirty-six (36) Digesters are under construction, and four (4) Digesters have not yet applied for Building Permits. Once the fifty-five (55) Digesters are all operating for ten (10) years, the Greenhouse Gas (GHG) reductions will total 9,552,543 $MTCO_2e$.

The Settlement requires an Annual Report to be completed by May 1 each year, beginning in 2020, and made available to the public (through the County website). The Settlement requires the County to hold a public meeting on the Annual Report and the Board is required to provide the Annual Report to the public not less than ten (10) calendar days prior to a duly noticed public meeting, where the report is considered by the Board following a staff presentation and opportunity for public comments. It should be noted that the County completed 51 Inspections in 2020 of Dairies and Feedlots, which exceeds the requirement to inspect fifteen (15) percent of the facilities each year on a rolling basis.

C. CEQA FRAMEWORK ANNUAL REPORT

Common Sense Exemption consistent with CEQA and the Guidelines for Implementation of the California Environmental Quality Act ("CEQA Guidelines") pursuant to Title 14, Cal. Code Regulations Section 15061(b) (3). Section 15061(b) (3) states that a project is exempt from CEQA if "The activity is covered by the Common Sense exemption that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA." Preparing the 2020 Annual Report of total dairy GHG emissions from 2019 will not make any physical change to the environment because it only involves gathering information to prepare a written report concerning whether or not the County of Tulare is in compliance with the 2017 Animal Confinement Facilities Plan ("2017 ACFP") and the 2017 Dairy and Feedlot Climate Action Plan ("2017 Dairy CAP").

Categorical Exemption consistent with CEQA and the CEQA Guidelines pursuant to Title 14, Cal. Code Regulations Section 15306, Class 6, pertaining to basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or

major disturbance to an environmental resource. The use of Section 15306 is applicable and appropriate because preparing the 2020 Annual Report of total dairy GHG emissions from 2019 will not make any physical change to the environment because it only involves gathering information to prepare a written report concerning whether or not the County of Tulare is in compliance with the 2017 ACFP and the 2017 Dairy CAP.

Exhibits: "A" 2020 Annual Report of total dairy GHG emissions for 2019

"B" Alternative Manure Management Program Spreadsheet

"C" Digester Project List Spreadsheet

ATTACHMENT NO 1:
EXHIBIT A

Tulare County

Dairy and Feedlot Annual GHG Report, 2019

Prepared by:

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April 2021

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List of Acronyms

ACFP	Animal Confined Facilities Plan
ACFP DEIR	Draft Environmental Impact Report for the Animal Confinement Facilities Plan, And Dairy and Feedlot Climate Action Plan
ACR	Annual compliance report
AMMP	Alternative Manure Management Program
AR4	IPCC Fourth Assessment Report
BAU	Business-as-usual
CARB	California Air Resources Board
CDFA	California Department of Food and Agriculture
CEC	California Energy Commission
CEFM	Cattle Enteric Fermentation Model
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
County	County of Tulare
CPUC	California Public Utilities Commission
CSI	California Solar Initiative
Dairy CAP or Dairy and Feedlot CAP	Tulare County Dairy and Feedlot Climate Action Plan
DDRDP	Dairy Digester Research and Development Program
EIR	Environmental Impact Report
FY	Fiscal year
GHG	Greenhouse gas
HFCs	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
kW	Kilowatts
kWh/yr	Kilowatt-hours per year
MBtu/hr	Thousand British thermal units per hour
MT	Metric tons
$MTCO_2e$/year	Metric tons of CO_2e per year
N_2O	Nitrous oxide
NREL	National Renewable Energy Laboratory
RMA	Tulare County Resource Management Agency
SB	Senate Bill
Settlement	Stipulated Settlement
SLCP	Short-lived climate pollutants

Executive Summary

This report presents the greenhouse gas (GHG) emissions inventory for dairies and cattle feedlots in the County of Tulare (County) for calendar year 2019. It also evaluates the voluntary GHG emission reduction projects implemented at dairies and feedlots since 2013. The GHG inventory and evaluation of emission reductions were prepared pursuant to the 2019 Settlement Agreement, entered into by the Sierra Club, Association of Irritated Residents, Center for Biological Diversity, and County of Tulare.

In 2019, the overall operation of Tulare County dairies and feedlots and their support crops produced an estimated 6.30 million metric tons of carbon dioxide equivalent (CO_2e) GHG emissions. This quantity is 16 percent less than the 2013 baseline year emissions and 12 percent less than the previous inventory year (2018) emissions. The reduction in emissions from 2018 to 2019 was primarily associated with a reduction in the dairy cow population and implementation of additional digester projects.

The voluntary emission reduction projects operating at Tulare County dairies and feedlots by the end of 2019 included 58 solar panel projects, 3 solar thermal hot water systems, 12 digester projects, and 3 alternative manure management program (AMMP) projects. These projects provided 162,822 metric tons of CO_2e reductions in calendar year 2019. These reductions constituted 16 percent of the annual emission reductions needed to achieve the Dairy and Feedlot Climate Action Plan (CAP) target by 2023. At the time of this study, the known additional projects scheduled for post-2019 start-up would provide further reductions of up to 696,250 metric tons of CO_2e per year when operational. If realized, these additional future reductions would achieve 82 percent of the 2023 Dairy CAP target.

In 2019, manure management operations at Tulare County dairies and feedlots produced an estimated 5.18 million metric tons of methane CO_2e emissions. This emissions quantity is 10 percent less than 2013 baseline year emissions and 14 percent less than the previous inventory year (2018) emissions. The 2019 emissions are lower than the Senate Bill (SB) 1383 reference trajectory and therefore ahead of schedule. The reduction in emissions from 2018 to 2019 was primarily associated with a reduction in the dairy cow population and implementation of several digester projects. An additional 1.71 million metric tons of methane CO_2e emission reductions are needed by 2030 to reach the SB 1383 goal.

1 Introduction

This report presents the greenhouse gas (GHG) emissions inventory for dairies and cattle feedlots in the County of Tulare for calendar year 2019. This report also documents the voluntary GHG emission reduction projects initiated at dairies and feedlots since 2013 and quantifies the reductions. The estimated 2019 emission reductions are compared to 2013 base year emissions and emission reduction targets set by the Dairy and Feedlot Climate Action Plan ("Dairy CAP" or "Dairy and Feedlot CAP") (Tulare County RMA, 2017a) and Senate Bill (SB) 1383 (Lara, 2016). This report was prepared pursuant to the 2019 Settlement Agreement, entered into by the Sierra Club, Association of Irritated Residents, Center for Biological Diversity, and County of Tulare.

Section 2 of this report provides background information on the Settlement Agreement, Animal Confined Facilities Plan (ACFP), Dairy CAP, and SB 1383. Section 3 provides information concerning the dairy and feedlot animal populations in Tulare County. Section 4 presents the 2013 base year emissions, which provide the benchmark for measuring progress toward the emission reduction targets. Section 5 presents the 2019 business-as-usual (BAU) emissions, which represent what the dairy and feedlot emissions would have been without implementation of the GHG emission reduction projects. Section 6 identifies the voluntary GHG emission reduction projects and presents the estimated emission reductions achieved by those projects. Section 6 also evaluates the progress of the 2019 emission reductions toward meeting the 2023 target set by the Dairy CAP. Section 7 presents the actual 2019 GHG emissions, which result from applying the voluntary emission reductions to the BAU emissions. Section 7 also evaluates the progress of the actual emissions toward meeting the 2030 goal set by SB 1383.

This report presents emissions for four GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and hydrofluorocarbons (HFCs). For the dairy and feedlot industry, CO_2 is a product of fuel combustion by on-road trucks and automobiles, off-road dairy and farming equipment, and power plants providing electricity to the dairies and related equipment (this report generally uses "dairy" to mean dairies and feedlots). Methane is primarily produced from anaerobic manure decomposition and enteric digestion (also called enteric fermentation). N_2O is primarily produced from manure decomposition and the use of nitrogen-based fertilizers, including manure, on dairy support crops. HFCs are used in milk refrigeration systems. They are potent GHGs emitted through normal system leakage.

The combined emissions of all four GHGs evaluated in this report are expressed as carbon dioxide equivalent (CO_2e) emissions. CO_2e is a common metric used to compare emissions of various GHGs. CO_2e represents the amount of CO_2 that would result in an equivalent amount of global warming as another GHG. CO_2e is computed by multiplying the mass of each GHG by its global warming potential (GWP)[1] and summing the products over all GHGs. By definition, CO_2 has a GWP of 1. The GWPs of the remaining three GHGs were obtained from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) (IPCC, 2007). Under AR4 guidance, the GWPs for methane, N_2O, and

[1] GWP is a measurement of how much heat a GHG can trap in the atmosphere, over a specific amount of time, as compared to CO_2. CO_2 is used as a benchmark for this measurement, so its GWP is 1. All other gases are represented in comparison to this value.

HFCs are 25, 298, and 14,800, respectively.[2] The use of AR4 GWPs is consistent with the CARB California 2000-2018 Greenhouse Gas Emission Inventory Program (CARB, 2020a). The GHG emissions in this report are reported in units of metric tons (MT). One MT is equivalent to 1.1 U.S. (short) tons or 2,205 pounds.

2 Background

This section provides background information on the ACFP, Dairy CAP, SB 1383, California's actions related to SB 1383, and the Settlement Agreement.

2.1 Animal Confined Facilities Plan

The ACFP, included in the County's General Plan governing dairies and cattle feedlots, was originally adopted in 2001 and updated in 2017 (Tulare County RMA, 2017c). The 2017 ACFP serves as the guiding document to regulate the County's bovine facilities and projected growth through 2023 in response to statewide climate change regulations and reduction targets. Under the ACFP, the County tracks existing dairies and bovine facilities and defines permitted herd sizes. The ACFP's Conformance Checklist Review serves to streamline the CEQA process for expanding facilities that meet specific eligibility requirements. The ACFP also requires that dairies and feedlots submit Annual Compliance Reports and recommends voluntary, incentivized GHG reduction strategies.

2.2 Dairy and Feedlot CAP

When the County revised the General Plan in 2012 (2030 General Plan Update), it retained the ACFP but provided for a subsequent process to update the ACFP with its own CEQA review and Environmental Impact Report (EIR). Under the General Plan Update, the County directed the preparation of a separate climate action plan as part of the ACFP Update to specifically address dairies and feedlots. The Dairy and Feedlot CAP serves that purpose and is used to implement the ACFP Update and its application to new and expanding dairies and feedlots (Tulare County RMA, 2017a; Tulare County RMA, 2017c).

The Dairy and Feedlot CAP includes estimates of dairy and feedlot GHG emissions for the 2013 baseline year, approaches for reducing GHG emissions in accordance with statewide requirements and reduction targets, and projections through 2023. The CAP sets a reduction target of 1.05 million metric tons of GHG emissions per year by 2023. Section 6.4 tracks the progress of Tulare County dairy and feedlot GHG reductions achieved by year 2019 relative to the CAP target.

2.3 Senate Bill 1383

Short-lived climate pollutants (SLCPs) are powerful climate forcers that have relatively short atmospheric lifetimes. These pollutants include methane, HFCs, and anthropogenic black carbon. SB 1383 authorized the California Air Resources Board (CARB) to set goals for reducing SLCPs and specifically for adopting regulations to reduce methane emissions from dairy and livestock manure

[2] The GWP of 14,800 for HFCs used in this report corresponds to HFC-23. HFC-23 is one of several types of refrigerants used in industrial refrigeration equipment. HFC-23 was conservatively selected as the refrigerant for quantification purposes because of its high GWP.

management operations by 40 percent below 2013 levels by 2030 (CLI, 2016). In adopting such regulations, CARB is directed to coordinate with the California Department of Food and Agriculture (CDFA), the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC). Notably, any regulations to reduce dairy emissions cannot take effect sooner than January 1, 2024, and then only if CARB, in consultation with CDFA, determines the regulations to be technologically feasible, economically feasible, and cost-effective. CARB is also directed to consider livestock and dairy operation research on dairy methane emissions reduction projects, including, but not limited to, scrape manure management systems, solids separation systems, and enteric fermentation; and to consider developing and adopting methane emissions reduction protocols. Section 7.1 tracks the progress of Tulare County dairy and feedlot methane reductions achieved by year 2019 relative to the SB 1383 goal.

2.4 California's Actions Pursuant to SB 1383

The Settlement Agreement requires the County to report on the State's measures pursuant to SB 1383, including but not limited to digester funding and the Alternative Manure Management Program (AMMP). This section describes the State's regulatory framework adopted pursuant to SB 1383 as well as funding and incentive programs.

On March 24, 2017, CARB adopted the Short-Lived Climate Pollutant Reduction Strategy, outlining future steps for implementing SB 1383 and the need for cooperation between regulatory agencies (CARB, 2017). Of note is SB 1383 direction that CARB and CDFA are to evaluate the dairy sector's progress toward meeting the SLCP 2030 reduction goal on a voluntary basis, and, if sufficient progress has not been attained due to insufficient funding or market or technical barriers, CARB may revise the SLCP Strategy's methane emission reduction goal for dairies to a less stringent level.

In response to this significant contribution to the State's emissions and the requirement of Senate Bill 1383 to work with stakeholders to identify barriers to dairy and livestock GHG emissions reduction projects, CARB, CDFA, CEC, and CPUC convened a Dairy and Livestock GHG Emissions Working Group (Working Group). The Working Group held its first meeting in May 2017 and included participation from dairy industry representatives, environmental justice advocates, public utilities, academics, and other interested stakeholders. At the May 2017 meeting, the Working Group formed three subgroups to develop policy recommendations on the following topics:

- Subgroup #1: Fostering Markets for Non-Digester Projects
- Subgroup #2: Fostering Markets for Digester Projects
- Subgroup #3: Research Needs, Including Enteric Fermentation

The Working Group held additional meetings in January and December 2018. At the December meeting, representatives of the three subgroups presented their recommendations to advance methane emissions reductions at California dairy and livestock operations. These recommendations will inform actions to reduce methane emissions from dairy and livestock operations, help prioritize incentive funding and research, and provide guidance for future policies (CARB, 2021a).

California established several incentive programs to help the dairy industry meet SLCP reduction goals. The centerpiece of these efforts is the following two state-funded incentive programs implemented by the CDFA:

- Dairy Digester Research and Development Program (DDRDP)
- Alternative Manure Management Program (AMMP)

Both programs are funded under California's Climate Investment Program through Cap-and-Trade auction proceeds or the Greenhouse Gas Reduction Fund.

From 2015 through 2020, CDFA awarded $195.5 million to 118 dairy digester projects in California under the DDRDP, with $413.1 million provided in matching funds by grant awardees. The DDRDP projects have an anticipated cumulative statewide GHG reduction of 21.1 million metric tons of CO_2e over ten years, or approximately 2.11 million metric tons of CO_2e annually, and equate to a 21 percent reduction in methane emissions from manure management in California (CDFA, 2021a).

From 2016 through 2020, CDFA has awarded $69.1 million to 117 AMMP projects in California. Approximately $10 million has been provided in matching funds by awardees. The AMMP projects have an anticipated cumulative GHG reduction of approximately 1.13 million metric tons of CO_2e over five years, or approximately 0.23 million metric tons of CO_2e annually, and equate to a 2.2 percent reduction in methane emissions from manure management in California. Unlike digesters which capture methane, AMMP projects are designed to avoid methane production. The AMMP funds a diverse range of manure management practices that provide options to dairy and livestock operations where digesters may not be economically feasible (CDFA, 2021a; CDFA, 2021b).

SB 1383 has also generated considerable interest in reducing enteric methane emissions using cattle diet modification or feed additives. CARB has sponsored various studies to identify potential strategies for California (CARB, 2021a; CARB, 2021b). However, several technical and market barriers such as animal health, commercial availability, consumer acceptance, and cost-effectiveness must be overcome before safe and effective strategies can be widely implemented and tracked (CARB, 2020b). Therefore, this report does not quantify any voluntary reductions in enteric emissions due to diet modification or feed additives.

2.5 Settlement Agreement

On August 2, 2019, a stipulated settlement ("Settlement Agreement") was entered into by the Sierra Club, Association of Irritated Residents, Center for Biological Diversity, and County of Tulare. The Settlement Agreement became effective on August 2, 2019, and completely resolved Case No. 272380 - Petition for Writ of Mandate and Complaint for Declaratory and Injunctive Relief, Superior Court, State of California, County of Tulare, Visalia Division, challenging the certification by the County of Tulare of the Environmental Impact Report for the Animal Facilities Confinement Plan and related General Plan Amendments Zone Changes, and Dairy CAP.

Section IV.B. of the Settlement Agreement requires the County to prepare annual reports of total dairy GHG emissions from fiscal year (FY) 2019 to FY 2024. The annual reports are required to include:

1. The total estimated dairy GHG emissions reduced to date compared to the 1.05 million metric tons per year Dairy CAP reduction target set for 2023, and the total dairy GHG emissions reduced to date compared to the maximum projected SB 1383 potential goal of 40 percent below 2013 methane levels by 2030.

   Sections 6.4 and 7.1 of this report satisfy Item 1.

2. A report on the State's measures pursuant to SB 1383, including but not limited to digester funding and the AMMP.
   Tulare County Resource Management Agency (RMA) staff completed an AMMP List with this information on February 8, 2021. This list, together with Section 2.4 of this report, satisfies Item 2.

3. An updated digester project list for digesters within the County that lists: 1) the operation name, 2) project title, 3) total project cost, 4) CDFA funding award, additional federal or state public funding awards, 5) project description, 6) project construction state, 7) location, 8) GHG emission reductions over ten years, and 9) how captured methane is used. The report must also include any reported problems with completed digesters within the County.
   RMA staff completed the updated digester project list with this information on April 13, 2021. This list, together with Section 6.5 of this report, satisfies Item 3.

3 Animal Population

Cattle population data compiled by the Tulare County RMA served as the basis for the GHG emission estimates for both the 2013 baseline year and the 2019 inventory year. The 2013 Tulare County data were used to generate the baseline year emissions in the Dairy CAP and were represented by 330 reporting facilities (Tulare County RMA, 2017a). Tulare County RMA compiled the 2019 data from the FY 2019 annual compliance reports (ACRs) prepared by the individual dairies and feedlots (J. Garcia-LoBue, S. Roper, and R. Kashiwa, Tulare County RMA, personal communication, March and April 2021). The 2019 data were represented by 281 facilities with non-zero cattle populations.

Table 3-1 presents the 2013 and 2019 cattle population data upon which this report is based. Data for the prior inventory year, 2018, are also included for comparison. The table shows that the reported population of dairy cows decreased in 2019 relative to both 2013 and 2018. The populations of dairy heifers (0-12 months and 12-24 months) increased relative to both 2013 and 2018. The population of dairy calves decreased relative to 2013 but increased relative to 2018. The populations of feedlot cattle and total animals increased relative to 2013 but decreased relative to 2018.

Tulare County is presently working to identify facilities that did not submit reports and to fill in missing 2019 data. Any substantial revisions to the 2019 data made after release of this report will be noted in the subsequent year's GHG emission inventory report.

Table 3-1. Dairy and Feedlot Animal Populations

Year	Dairy Cows[3]	Dairy Heifers 0-12 mos.	Dairy Heifers 12-24 mos.	Dairy Calves	Feedlot Cattle	Total Animals
2013 (baseline year)[1]	543,431	137,985	148,928	65,770	133,886	**1,030,000**
2018 (prior inventory year)[2]	569,140	125,636	167,099	59,636	204,272	**1,125,783**
2019 (current inventory year)[2]	487,382	165,914	183,410	61,871	179,261	**1,077,838**

Legend: mos. = months of age.

Notes:

1. Source: Dairy CAP. Appendix A, Tables A-1 and A-3.
2. Source: Tulare County RMA. Annual compliance reports.
3. Includes milk cows and dry cows.

4 Baseline Year (2013) Emissions

Table 4-1 presents the dairy and feedlot GHG emissions for the 2013 baseline year. The table matches Table 3.7-1 of the *Draft Environmental Impact Report for the Animal Confinement Facilities Plan, And Dairy and Feedlot Climate Action Plan* (ACFP DEIR) (Tulare County RMA, 2017b) and Table 3 of the Dairy CAP. The 2013 GHG emissions represent the baseline to which the actual 2019 emissions are compared in Section 7.

Table 4-1. Dairy and Feedlot 2013 Baseline GHG Emissions

Source Category	CO_2 (MT/yr)	CH_4 (MT/yr)	N_2O (MT/yr)	HFCs (MT/yr)	CO_2e (MT/yr)
Farm Equipment Exhaust	38,054	3	0	0.0	38,129
Farm Agricultural Soil	0	0	2,725	0.0	812,050
Farm Electricity Consumption	79,107	3	1	0.0	79,480
Dairy Equipment Exhaust	99,106	12	0	0.0	99,406
Truck Trips	23,137	0	0	0.0	23,137
Automobile Trips	14,882	3	3	0.0	15,851
Dairy Electricity Consumption	144,792	6	1	0.0	145,335
Dairy Refrigeration	0	0	0	4.3	63,640
Dairy Manure Decomposition	0	123,329	1,385	0.0	3,496,077
Dairy Enteric Digestion	0	98,523	0	0.0	2,463,071
Feedlot Manure Decomposition	0	388	67	0.0	29,598
Feedlot Enteric Digestion	0	9,083	0	0.0	227,068
Total Emissions	**399,078**	**231,350**	**4,182**	**4.3**	**7,492,843**

Legend: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; HFCs = hydrofluorocarbons; CO_2e = carbon dioxide equivalent; MT/yr = metric tons per year.

Source: ACFP DEIR, Table 3.7-1. Consistent with Table 3 of the Dairy CAP.

Table 4-2 presents the 2013 baseline emissions of methane from the manure management source categories (i.e., manure decomposition and enteric digestion). These emissions are a subset of the emissions in Table 4-1. They were used to determine the year 2030 SB 1383 goal, which is defined as 40 percent below 2013 methane emissions by 2030. Therefore, the 2030 SB 1383 goal for Tulare County

dairies and feedlots is 3,470,000 metric tons per year of methane CO_2e from manure management (5,783,068 × 0.6, rounded to the nearest thousand).

Table 4-2. Dairy and Feedlot 2013 Baseline CH_4 Emissions from Manure Management

Source Category	CH_4 (MT/yr)	CO_2e (MT/yr)[(1)]
Dairy Manure Decomposition	123,329	3,083,219
Dairy Enteric Digestion	98,523	2,463,071
Feedlot Manure Decomposition	388	9,710
Feedlot Enteric Digestion	9,083	227,068
Total Emissions	**231,323**	**5,783,068**

Legend: CH_4 = methane; CO_2e = carbon dioxide equivalent; MT/yr = metric tons per year.
Source: ACFP DEIR, Table 3.7-1. Consistent with Table 3 of the Dairy CAP.
Note:
1. Methane emissions are expressed as CO_2e.

5 Business-As-Usual Emissions in 2019

The development of 2019 BAU emissions was the first step in estimating 2019 actual emissions. In this study, BAU represents a hypothetical operating condition consisting of 2019 animal populations coupled with the continuation of 2013 manure management practices. BAU emissions exclude the emission reductions from the voluntary projects implemented at the dairies and feedlots since 2013. Section 6 describes these voluntary projects and quantifies their emission reductions. Section 7 applies the voluntary emission reductions to the BAU emissions to produce the estimated 2019 actual emissions.

5.1 Quantification Methodology

For the 2019 BAU emissions, this report quantified the same emission source categories as the 2013 baseline categories shown in Table 4-1. Where applicable, the quantification of 2019 BAU emissions generally used the same methodologies and the most recent available equations and variables that CARB used for the California 2000-2018 Greenhouse Gas Emission Inventory Program (CARB, 2020a). The California Greenhouse Gas Emission Inventory Program used methodologies published by the IPCC and U.S. EPA (IPCC, 2006; USEPA, 2013). The BAU emission quantification methodologies are described below. Appendix A includes the detailed calculation tables for all source categories.

5.1.1 Farm Equipment Exhaust

During farming operations for the dairy and feedlot support crops, diesel-powered equipment is used to perform routine tasks such as plowing and crop harvesting. Annual fuel use for the farm equipment was estimated using a factor of 25 gallons per year per acre, from CARB's *Analysis of California's Diesel Agricultural Equipment Inventory according to Fuel Use, Farm Size, and Equipment Horsepower* (CARB, 2018). The 2019 cultivated acreage for support crops was estimated by scaling the 2013 acreage by the relative number of animal units.[3] The 2013 acreage was obtained from Appendix E2 of the ACFP DEIR.

[3] Tulare County defines an animal unit as a common animal denominator, based on feed consumption, where one mature Holstein milking cow (1,400 pounds) represents one animal unit.

Year 2019 emissions were calculated by multiplying the 2019 fuel use by CO_2, methane, and N_2O emission factors obtained from The Climate Registry (TCR, 2020).

5.1.2 Farm Agricultural Soil

Various agricultural soil management practices contribute to greenhouse gas emissions. The use of synthetic and organic fertilizers adds nitrogen to soils, thereby increasing natural emissions of N_2O. Emissions of N_2O from support crop agricultural soil were calculated using equations published by the IPCC (2019). The equations estimate N_2O emissions due to direct emissions from soils, indirect emissions from runoff, and indirect emissions from volatilization and subsequent conversion to N_2O. The emission calculations used the 2019 cultivated acreage described in Section 5.1.1.

5.1.3 Farm Electricity Consumption

The use of electricity by agricultural irrigation pumps for support crops generates indirect GHG emissions from regional power plants burning fossil fuels. Appendix E2 of the ACFP DEIR estimated an average electricity usage rate of 1.59 megawatt-hours per acre per year for agricultural irrigation pumps in the San Joaquin Valley. Year 2019 electricity usage was estimated by multiplying this factor by the 2019 cultivated acreage described in Section 5.1.1. Year 2019 GHG emissions were estimated using U.S. EPA Emissions & Generation Resources Integrated Database (eGRID) emission factors (USEPA, 2021).

5.1.4 Dairy Equipment Exhaust

During dairy and feedlot operations, diesel-powered mobile equipment is used to perform routine tasks such as distribution of cattle feed and corral scraping. Annual equipment usage for 2019 was scaled from the 2013 usage in proportion to the relative number of animal units, except for standby generator usage, which was scaled in proportion to the relative number of facilities. The 2013 equipment usage was obtained from Appendix E2 of the ACFP DEIR. Year 2019 emissions were calculated by converting the equipment usage (in horsepower-hours) to fuel use (in gallons) and multiplying by CO_2, methane, and N_2O emission factors obtained from The Climate Registry (TCR, 2020).

5.1.5 Truck and Automobile Trips

Operation of dairies and feedlots generates a variety of truck trips, including silage trucks, hay trucks, concentrated feed trucks, calf milk replacer trucks, and cattle trucks. The facilities also generate light-duty vehicle trips from employees and visitors (veterinarians, breeders, sales, and delivery). Trips in 2019 were scaled from 2013 in proportion to the number of animal units for trucks and the number of facilities for automobiles. The 2013 trip counts and trip lengths (also assumed for 2019) were obtained from Appendix E2 of the ACFP DEIR. The EMFAC2021 mobile source emission factor program was used to generate truck and automobile exhaust emission factors (CARB, 2021c). The emission factors include contributions from running exhaust, idle exhaust, and starting exhaust. Because EMFAC2021 estimated a small fraction of light-duty vehicle trips were made by electric and hybrid vehicles, the calculation also included regional power plant emissions using eGRID emission factors.

5.1.6 Dairy Electricity Consumption

Electricity is used at dairies for lighting, operation of the milking equipment, operation of electric pumps for water supply, and other uses. The use of electricity by dairy facilities generates indirect GHG emissions from regional power plants burning fossil fuels. Appendix E2 of the ACFP DEIR estimated an

average electricity usage rate of 0.49 megawatt-hours per cow (dairy cows and heifers) per year for dairies in the San Joaquin Valley. Year 2019 electricity usage was estimated by multiplying this factor by the 2019 animal population of dairy cows and dairy heifers (0-12 months and 12-24 months) from Table 3-1. Year 2019 GHG emissions were estimated using eGRID emission factors.

5.1.7 Dairy Refrigeration

Dairies refrigerate milk prior to pick-up by milk trucks. HFC emissions are produced by normal refrigerant leakage from the refrigeration equipment. The Climate Registry (TCR, 2020) lists a default upper bound annual refrigerant loss rate of 25 percent for industrial refrigeration. The total 2019 refrigerant charge was scaled from 2013 in proportion to the number of dairy cows as shown in Table 3-1. The total 2013 refrigerant charge was obtained from Appendix E2 of the ACFP DEIR. The 2019 HFC emissions were estimated by multiplying the total refrigerant charge by the 25 percent loss rate. HFC-23 is one of several types of refrigerants used in industrial refrigeration equipment. HFC-23 was conservatively selected as the refrigerant for quantification purposes because of its high GWP of 14,800.

5.1.8 Manure Decomposition

Manure is primarily composed of organic material and water. Under anaerobic conditions, the organic material is decomposed by anaerobic bacteria. The primary end products of anaerobic decomposition are methane and stabilized organic material. N_2O is also produced during manure storage and treatment.

The key factors affecting methane production from livestock manure are the quantity of manure produced, manure characteristics (which in turn depend on the composition and digestibility of the animal diet), the manure management system, and climate. Production of N_2O during manure storage and treatment occurs via combined nitrification-denitrification of nitrogen contained in the manure. The amount of N_2O released depends on the manure management system, duration of waste management, nitrogen concentration, temperature, volatilization fraction, runoff fraction, biochemical oxygen demand, and other variables.

Emissions associated with manure decomposition were calculated using the methodology developed for the CARB statewide 2000-2018 GHG Emission Inventory, which also reflects the 2006 IPCC Guidelines for National Emission Inventories (CARB, 2020a; IPCC, 2006). The methodology takes into consideration the percent distribution of animals in each type of manure management system and specifies the variables used in emission calculations.

The calculation of 2019 BAU emissions assumed a percent distribution of animals to each type of manure management system that was consistent with the 2013 baseline percent distribution in the CARB Statewide GHG Emission Inventory. Use of the 2013 distribution ensures that the BAU emissions do not inadvertently include any of the voluntary reduction projects implemented after 2013 and quantified in Section 6. Nevertheless, CARB's statewide percent distribution of animals to each manure management system in years 2013 through 2018 (the most recent available statewide emissions year) have not changed.

Methane emissions from manure decomposition were estimated using Equation 1.

Equation 1: $CH_{4,man} = V_{ex} \times B_0 \times MCF \times c_1$

$CH_{4,man}$ = methane emissions from manure [kg CH_4/yr]
V_{ex} = volatile solids excreted [kg VS/yr]
B_0 = maximum methane producing capacity [m^3 CH_4/kg VS]
MCF = methane conversion factor [%]
c_1 = conversion factor representing density of methane at 25°C.

Volatile solids excreted were estimated using Equation 2.

Equation 2: $V_{ex} = VS \times (WMS \times N_{animals})$

VS = volatile solids excreted per animal [kg VS/animal/yr]
$(WMS \times N_{animals})$ = number of animals per waste management system

N_2O emissions from manure decomposition were estimated using Equation 3.

Equation 3: $N_2O = WMS \times N_{aminals} \times N_{excreted} \times [D_{EF} + (V_{frac} \times V_{EF}) + (R_{frac} \times R_{EF})] \times 1.5711$

N_2O = nitrous oxide emissions from manure [kg N_2O/yr]
$N_{excreted}$ = nitrogen excreted per animal [kg N/animal/yr]
D_{EF} = direct nitrogen as N_2O-N [g N_2O-N/g N]
V_{frac} = volatilization fraction of N [fraction]
V_{EF} = indirect nitrogen as N_2O-N [g N_2O-N/g]
R_{frac} = runoff fraction of nitrogen [fraction]
R_{EF} = indirect nitrogen as N_2O-N for runoff N [g N_2O-N/g]

The following factors were obtained from CARB's GHG Emissions Inventory from the most recent emissions inventory year available, 2018: MCF, c_1, B_0, VS, $N_{excreted}$, D_{EF}, V_{frac}, V_{EF}, R_{frac}, R_{EF}.

5.1.9 Enteric Digestion

Enteric digestion (also referred to as fermentation) is a natural part of the digestive process in ruminant animals such as cattle. Microbes in the digestive tract, or rumen, decompose and ferment food, producing methane as a by-product.

Tulare County methane emissions from enteric digestion were estimated by scaling the 2018 CARB statewide enteric methane emissions (2018 being the most recent statewide emissions year available) by the 2019 Tulare County animal counts (see Equation 4). Since CARB uses the IPCC methodology as implemented in the Cattle Enteric Fermentation Model (CEFM), it is appropriate to estimate emissions from enteric digestion by assuming that Tulare County emissions are proportional to the California emissions based on animal population.

Year 2018 statewide animal counts and enteric digestion methane emissions were obtained from the CARB 2000-2018 GHG Inventory using the web-based Inventory Query Tool (CARB, 2021d). Tulare County animal counts for 2019 were obtained the County's ACR reports (see Table 3-1).

Equation 4: $CH_4,ent = CH_{4,ent,CA} \times (Pop_{Tulare}/Pop_{CA})$

$CH_{4,ent}$ = 2019 Tulare County CH_4 emissions from enteric digestion
$CH_{4,ent,CA}$ = Statewide 2018 CH_4 emissions from enteric digestion
Pop_{Tulare} = Tulare County 2019 animal count
Pop_{CA} = Statewide 2018 animal count

5.2 Estimated 2019 BAU Emissions

Table 5-1. presents the dairy and feedlot BAU emissions for 2019. As discussed at the beginning of Section 5, the BAU emissions reflect 2019 animal populations but exclude the emission reductions from voluntary projects implemented at the dairies and feedlots since 2013. These BAU emissions were used in the development of the 2019 actual emissions in Section 7.

Table 5-1. Dairy and Feedlot 2019 Business-as-Usual GHG Emissions

Source Category	CO_2 (MT/yr)	CH_4 (MT/yr)	N_2O (MT/yr)	HFCs (MT/yr)	CO_2e (MT/yr)[(1)]
Farm Equipment Exhaust	39,176	2	0	0.0	39,310
Farm Agricultural Soil	0	0	932	0.0	277,638
Farm Electricity Consumption	50,166	4	0	0.0	50,389
Dairy Equipment Exhaust	112,170	5	1	0.0	112,555
Truck Trips	20,822	0	3	0.0	21,812
Automobile Trips	11,216	1	1	0.0	11,418
Dairy Electricity Consumption	84,281	6	1	0.0	84,657
Dairy Refrigeration	0	0	0	4.9	72,358
Dairy Manure Decomposition	0	110,987	1,451	0.0	3,207,103
Dairy Enteric Digestion	0	90,471	0	0.0	2,261,775
Feedlot Manure Decomposition	0	482	92	0.0	39,598
Feedlot Enteric Digestion	0	11,203	0	0.0	280,083
Total Emissions	**317,830**	**213,161**	**2,481**	**4.9**	**6,458,696**

Legend: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; HFCs = hydrofluorocarbons; CO_2e = carbon dioxide equivalent; MT/yr = metric tons per year.

Notes:

1. BAU emissions reflect 2019 dairy and feedlot cattle populations coupled with 2013 baseline year manure management practices. Emission calculations used methodologies consistent with the CARB California Greenhouse Gas Emission Inventory Program. BAU emissions exclude the voluntary GHG reduction projects implemented since the baseline year (see Table 6-1).

6 Emission Reductions Achieved in 2019

This section presents the GHG emission reductions associated with projects implemented at Tulare County dairies and feedlots from 2013 through 2019. The projects consist of solar panels, solar thermal hot water systems, dairy digesters, and AMMP projects.

6.1 Emission Reduction Projects

The Tulare County RMA provided a list of 58 solar panel projects and 3 solar thermal hot water systems that were operating as of December 2019 (Jason Garcia-LoBue, Tulare County RMA, personal communication, March 24, 2021). The list of Tulare County solar projects is included in Appendix B.

CDFA maintains lists of dairy digester projects in California for which it has awarded grant funds annually since 2016 (CDFA, 2021a). Digester installers Maas Energy Works and California Bioenergy were contacted to identify which Tulare County digester projects had begun operating by the end of 2019 and were therefore providing emission reductions. The digester installers indicated that 12 digester projects were operational by the end of 2019. The projects are identified in Appendix B.

The CDFA also maintains lists of AMMP projects in California for which it has awarded grant funds annually since 2016 (CDFA, 2021b). AMMP projects are non-digester manure management practices that result in reduced GHG emissions. For example, converting from flushed feed lanes and anaerobic lagoons to scraped feed lanes and solar dried manure substantially reduces methane emissions. Tulare County RMA determined that three Tulare County projects were operational by the end of 2019. The operational AMMP projects are identified in Appendix B.

6.2 Quantification Methodology

GHG emission reductions associated with the 58 solar panel projects were quantified using the California Air Resources Board's (CARB's) Benefits Calculator Tool for the Low-Income Weatherization Program (CARB, 2020e). Calculations were made for a single hypothetical 1000 kW project, and the corresponding emission reductions were scaled by actual project size for each of the dairy projects. One of the inputs required by the Benefits Calculator Tool is annual system output in kW-hours per year (kWh/yr). System output was quantified using the National Renewable Energy Laboratory (NREL) PVWatts Calculator (NREL, 2021). The inputs to the Benefits Calculator Tool and PVWatts Calculator were developed in consultation with Tulare County RMA staff and CARB's Quantification Methodology document (CARB, 2019). The outputs from the Benefits Calculator Tool and PVWatts Calculator are included in Appendix B.

Emission reductions associated with the three solar thermal hot water systems were determined using CARB's *Greenhouse Gas Quantification Methodology for the Low-Income Weatherization Program: Single-Family Energy Efficiency and Solar Photovoltaics Multi-Family Energy Efficiency and Renewables* (CARB, 2019). This methodology provides an average annual GHG reduction rate of 0.68 metric tons of CO2e per year (MTCO2e/year) per residential system in California, developed by the California Solar Initiative (CSI)-Thermal Program (CSI, 2020). According to Tulare County RMA staff, the three dairy projects are approximately residential-sized.

Emission reductions from the 12 dairy digester projects and 3 AMMP projects that were operational by the end of 2019 were estimated by the grant fund award recipients using CARB's CCI Quantification, Benefits, and Reporting Materials (CARB, 2021e).

6.3 Estimated Emission Reductions

Table 6-1 summarizes the estimated 5-year, annual, and calendar year 2019 GHG emission reductions from Tulare County dairies and feedlots by project category. Total calendar year 2019 reductions are less than the annual reductions because some projects became operational during 2019 and therefore had partial-year reductions. The estimated emission reductions by individual project are presented in Appendix B.

Table 6-1. Dairy and Feedlot GHG Emission Reductions from Solar, Digester, and AMMP Projects Operating in 2019

Project Type	5-Year CO_2e Reductions (MT/5-yrs)[1]	Annual CO_2e Reductions (MT/yr)	CY 2019 CO_2e Reductions (MT/yr)[2]
Solar Panels	-90,773	-18,155	-18,155
Solar Thermal Hot Water Systems	-10	-2	-2
Digesters	-1,162,172	-232,434	-134,183
Alternative Manure Management Program	-58,949	-11,790	-10,482
Total	**-1,311,904**	**-262,381**	**-162,822**

Legend: CO_2e = carbon dioxide equivalent; MT/5-yrs = metric tons per five years; MT/yr = metric tons per year; CY = calendar year.

Notes:

1. Reductions are shown as negative values.
2. CY 2019 reductions are less than the annual reductions because some projects became operational during 2019 and therefore had partial-year reductions.

6.4 Progress Toward the Dairy CAP Target

Table 6-2 shows the progress of the voluntary GHG emission reductions from Tulare County dairies and feedlots compared to the Dairy CAP target of 1.05 million metric tons of CO2e reductions by 2023. The first table column shows the year. The second column shows the accumulation of emission reductions needed each year to meet the 2023 target, assuming a linear trend that started in 2017. This trajectory is merely a guide to serve as a reference for assessing the rate of progress of the emission reductions.

The third column in Table 6-2 shows the actual calendar year emission reductions achieved by year for the Tulare County dairies and feedlots. The 2019 value was obtained from Table 6-1. The 2017 and 2018 values were obtained from Appendix B; they differ slightly from the values in the prior year's report (Tulare County RMA, 2020) due to some corrections in the operational start dates for some of the solar panel and AMMP projects (see Appendix B, Tables B.2 and B.5).

The fourth table column shows the deviation of the actual emission reductions from the reference trajectory in the second column. The data show that the actual emission reductions in 2019 are not as great as the reference trajectory and therefore behind schedule (hence the negative number). Section 6.5 describes some of the challenges responsible for the delayed start of some digester and AMMP projects at Tulare County dairies and feedlots. At the time of this analysis, data show that there are

696,250 additional metric tons of annual CO_2e reductions from solar, digester, and AMMP projects that are planned to become operational after 2019. If fully realized, these additional future reductions would achieve 82 percent of the 2023 target.

The fifth table column shows the additional emission reductions needed by 2023 to reach the Dairy CAP target. The last table column shows the percent of the Dairy CAP target that has been achieved. As of 2019, approximately 16 percent of the needed emission reductions have been achieved. Each subsequent version of this annual GHG emissions inventory report will populate an additional year of data in the table.

Table 6-2. Progress of GHG Emission Reductions in Relation to the 2023 Dairy CAP Target

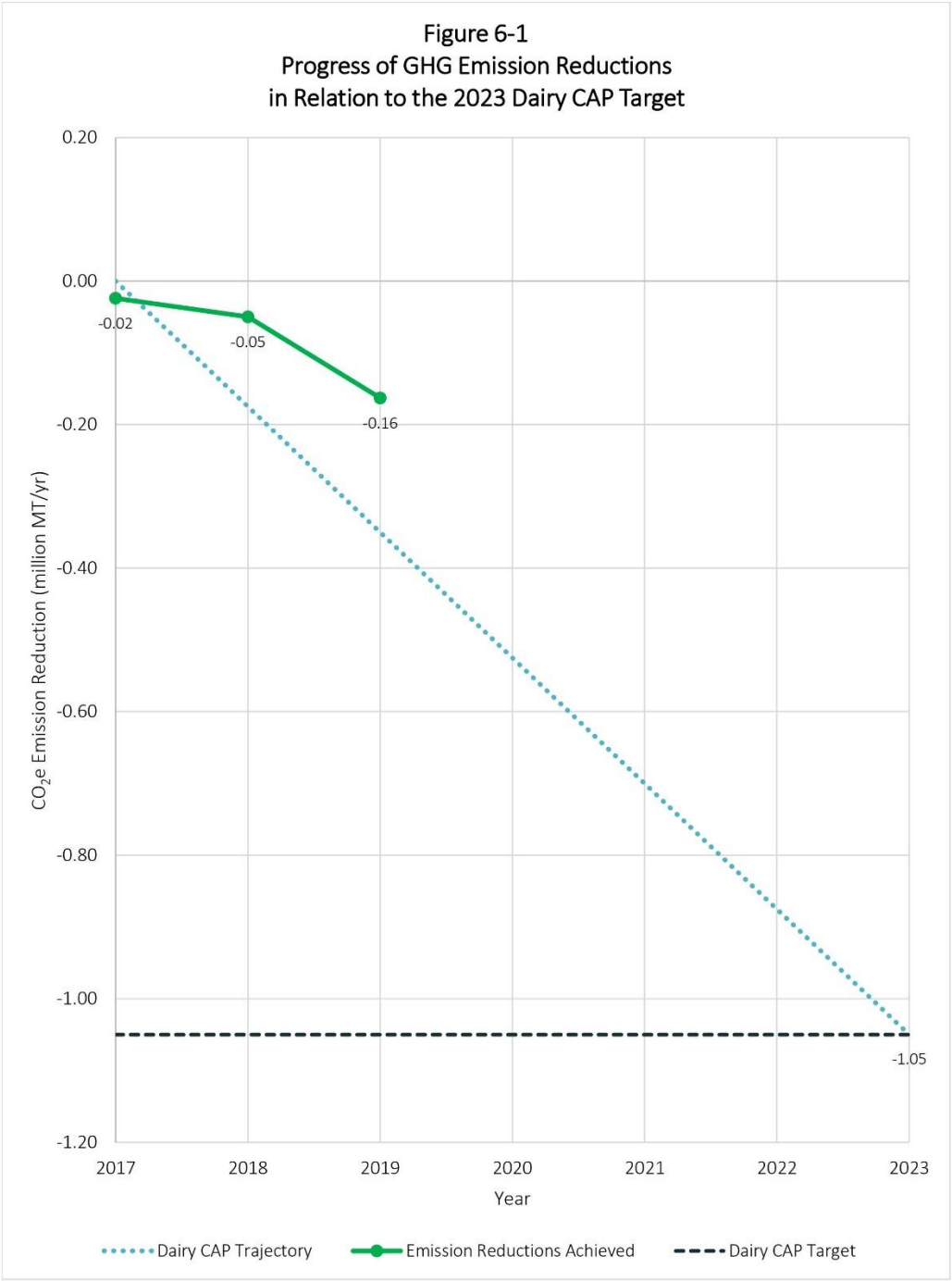
Year	Dairy CAP Emission Reduction Trajectory (MT CO_2e/yr)[1][2]	Actual Emission Reductions Achieved (MT CO2e/yr)[1][3]	Deviation from the Target Trajectory (MT CO2e/yr)[4]	Additional Reductions Needed to Reach the 2023 Target (MT CO2e/yr)[1]	Percent of Target Reached
2017	0	-23,990	23,990	-1,026,010	2%
2018	-175,000	-49,964	-125,036	-1,000,036	5%
2019	-350,000	-162,822	-187,178	-887,178	16%
2020	-525,000	TBD	TBD	TBD	TBD
2021	-700,000	TBD	TBD	TBD	TBD
2022	-875,000	TBD	TBD	TBD	TBD
2023	-1,050,000	TBD	TBD	TBD	TBD

Legend: MT CO_2e/yr = metric tons of carbon dioxide equivalent per year; TBD = to be determined in a future analysis.
Notes:

1. Reductions are shown as negative values.
2. The Dairy CAP trajectory assumes a linear path from 2017 to 2023. The value of -1,050,000 MT/yr in year 2023 is the Dairy CAP target.
3. CY 2019 emission reductions were obtained from Table 6-1. CY 2017 and 2018 emissions were obtained from Appendix B. Emissions for projects that began operating part-way through the year reflect only that portion of the year the projects operated.
4. A positive value means ahead of schedule; a negative value means behind schedule.

Figure 6-1 shows the progress of the Tulare County dairies and feedlots toward meeting the 2023 Dairy CAP target in graphical format. The short line near the top left of the figure shows the actual emission reductions by year. The diagonal dotted line represents the reference trajectory that would meet the target by 2023. The horizontal dashed line across the bottom of the figure represents the Dairy CAP target.

Figure 6-1
Progress of GHG Emission Reductions
in Relation to the 2023 Dairy CAP Target



6.5 Emission Reduction Project Challenges

The Settlement Agreement requires that the County identify any reported problems with installed digesters. Although specific problems were not reported on the CDFA database, conversations with the digester installers, Maas Energy Works and California Bioenergy, indicated that, of 53 Tulare County digester projects currently included in the CDFA database, 12 were operational by the end of 2019.

Maas Energy Works and California Bioenergy indicated that bringing a digester project to full operation has taken longer than originally expected due to several reasons. One reason is that CDFA funding is partial and it has taken time to secure additional funding. Another reason is that permitting is complex and can involve obtaining permits from up to six different agencies. Another reason is that the "hub and spoke" model, where several digesters feed digester gas into a central facility, is complex and components are not always built out simultaneously. Once digester installation is complete, start of operation may be delayed until downstream components are built out. Moreover, the COVID-19 pandemic has resulted in additional delays in the next inventory year, 2020, due to staffing shortages and regulatory agency delays.

At the time of this analysis, data show that there are 696,250 additional metric tons of annual CO_2e reductions from solar, digester, and AMMP projects that are planned to become operational after 2019. The complete solar, digester, and AMMP project lists, with project descriptions, are included in Appendix B.

7 Actual Emissions in 2019

This section presents the 2019 actual GHG emissions from Tulare County dairies and feedlots and compares the emissions to the 2030 SB 1383 goal. Table 7-1 presents the estimated actual dairy and feedlot GHG emissions for calendar year 2019. The emissions were determined by subtracting the calendar year 2019 emission reductions in Table 6-1 from the 2019 BAU emissions in Table 5-1.

Table 7-1. Dairy and Feedlot 2019 Actual GHG Emissions

Source Category[(1)]	CO_2 (MT/yr)	CH_4 (MT/yr)	N_2O (MT/yr)	HFCs (MT/yr)	CO_2e (MT/yr)
Farm Equipment Exhaust	39,176	2	0	0.0	39,310
Farm Agricultural Soil	0	0	932	0.0	277,638
Farm Electricity Consumption	50,166	4	0	0.0	50,389
Dairy Equipment Exhaust	112,170	5	1	0.0	112,555
Truck Trips	20,822	0	3	0.0	21,812
Automobile Trips	11,216	1	1	0.0	11,418
Dairy Electricity Consumption	66,125	6	1	0.0	66,500
Dairy Refrigeration	0	0	0	4.9	72,358
Dairy Manure Decomposition	0	105,200	1,451	0.0	3,062,438
Dairy Enteric Digestion	0	90,471	0	0.0	2,261,775
Feedlot Manure Decomposition	0	482	92	0.0	39,598
Feedlot Enteric Digestion	0	11,203	0	0.0	280,083
Total Emissions	**299,674**	**207,374**	**2,481**	**4.9**	**6,295,874**

Legend: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; HFCs = hydrofluorocarbons; CO_2e = carbon dioxide equivalent; MT/yr = metric tons per year.

Notes:

1. Emission reductions from solar panels and solar thermal hot water systems were subtracted from the BAU dairy electricity consumption CO_2 emissions. Emission reductions from digesters and AMMP projects were subtracted from the BAU dairy manure decomposition methane emissions.

Table 7-2 compares the 2019 actual GHG emissions to the 2013 baseline emissions. The table shows that, from 2013 to 2019, the total CO_2e emissions decreased by 1,196,969 metric tons per year. Some source categories increased emissions while others decreased emissions. Some of the emissions changes since 2013 are primarily a result of changes in animal populations. For example, the decreases in emissions from dairy manure decomposition and dairy enteric digestion reflect decreases in the dairy cow population (see Table 3-1). Other emissions changes are partially a result of the effects of climate change-related regulations. For example, the decreases in emissions from farm and dairy electricity consumption reflect a decrease in carbon intensity factors from the electric utilities (PG&E and Edison) in response to the California Renewables Portfolios Standard (CPUC, 2020).[4] Additionally, the decrease in automobile emissions reflect the effects of California's Low Carbon Fuel Standard (CARB, 2020c) and Greenhouse Gas Vehicle Emission Standards (CARB, 2020d).

Finally, some emissions changes are a result of changes in quantification methodologies rather than actual emissions changes. Specifically, the 2019 emissions of N_2O from farm agricultural soil are substantially lower than the 2013 emissions in part because of updated IPCC emission factors for direct emissions, indirect runoff, and indirect volatilization (IPCC, 2019). A portion of the CO_2e increase from dairy refrigeration resulted from a GWP revision for HFC-23 from 11,700 to 14,800 (IPCC, 2007).

[4] The Renewables Portfolio Standard mandates that 20 percent of electricity retail sales must be served by renewable resources by 2017, 60 percent by 2030, and 100 percent from carbon-free resources by 2045 (CPUC, 2020).

Table 7-2. Comparison of 2019 Actual GHG Emissions to 2013 Baseline GHG Emissions

Source Category	2013 Baseline CO_2e Emissions (MT/yr)	2019 Actual CO_2e Emissions (MT/yr)	2019 Actual minus 2013 Baseline CO_2e Emissions (MT/yr)
Farm Equipment Exhaust	38,129	39,310	1,181
Farm Agricultural Soil	812,050	277,638	-534,412
Farm Electricity Consumption	79,480	50,389	-29,091
Dairy Equipment Exhaust	99,406	112,555	13,149
Truck Trips	23,137	21,812	-1,325
Automobile Trips	15,851	11,418	-4,433
Dairy Electricity Consumption	145,335	66,500	-78,835
Dairy Refrigeration	63,640	72,358	8,718
Dairy Manure Decomposition	3,496,077	3,062,438	-433,639
Dairy Enteric Digestion	2,463,071	2,261,775	-201,297
Feedlot Manure Decomposition	29,598	39,598	10,000
Feedlot Enteric Digestion	227,068	280,083	53,015
Total Emissions	**7,492,843**	**6,295,874**	**-1,196,969**

Legend: CO_2e = carbon dioxide equivalent; MT/yr = metric tons per year.

Table 7-3 presents the estimated dairy and feedlot methane emissions for calendar year 2019 from the manure management source categories only. These methane emissions are a subset of the GHG emissions shown in Table 7-1. They were used in the assessment of progress toward the 2030 SB 1383 goal (see Section 7.1).

Table 7-3. Dairy and Feedlot 2019 Actual CH_4 Emissions from Manure Management

Source Category	CH_4 (MT/yr)	CO_2e (MT/yr)[(1)]
Dairy Manure Decomposition	105,200	2,630,008
Dairy Enteric Digestion	90,471	2,261,775
Feedlot Manure Decomposition	482	12,062
Feedlot Enteric Digestion	11,203	280,083
Total Emissions	**207,357**	**5,183,929**

Legend: CH_4 = methane; CO_2e = carbon dioxide equivalent; MT/yr = metric tons per year.

Note:

1. Methane emissions are expressed as CO_2e.

Table 7-4 compares the 2019 actual methane emissions to the 2013 baseline methane emissions for the manure management source categories only (isolating methane from manure management is consistent with SB 1383). The 2019 emissions include the reductions from the 12 digesters and 3 AMMP projects that were operational by the end of 2019. The table shows that, from 2013 to 2019, methane emissions from manure management decreased by 599,139 metric tons per year (as CO_2e). This emissions decrease is primarily a result of the decrease in dairy cow population relative to 2013 (see Table 3-1).

Table 7-4. Comparison of 2019 Actual CH_4 Emissions to 2013 Baseline CH_4 Emissions from Manure Management

Source Categories[1]	2013 Baseline CH_4 Emissions (MT CO_2e/yr)[2]	2019 Actual CH_4 Emissions (MT CO_2e/yr)[2]	2019 Actual minus 2013 Baseline CH_4 Emissions (MT CO_2e/yr)[2]
Dairy Manure Decomposition	3,083,219	2,630,008	-453,210
Dairy Enteric Digestion	2,463,071	2,261,775	-201,297
Feedlot Manure Decomposition	9,710	12,062	2,353
Feedlot Enteric Digestion	227,068	280,083	53,015
Total Emissions	**5,783,068**	**5,183,929**	**-599,139**

Legend: CH_4 = methane; MT CO_2e/yr = metric tons of carbon dioxide equivalent per year.

Notes:

1. Consistent with SB 1383, this table includes only methane emissions from manure decomposition and enteric digestion.
2. Methane emissions are expressed as CO_2e.

7.1 Progress Toward the SB 1383 Goal

Table 7-5 shows the progress of the Tulare County dairies and feedlots toward meeting the SB 1383 goal of 40 percent below 2013 methane levels by 2030 for manure management operations. The first table column shows the year. The second column shows the progression of year-to-year emissions needed from 2017 to 2030 to meet the 2030 goal of 3,470,000 metric tons, assuming a linear trend. This trajectory is merely a guide to serve as a reference for assessing the rate of progress of the actual emissions. It is the same trajectory that was established in the prior year's report (Tulare County RMA, 2020).

The third column in Table 7-5 shows the BAU emissions by year for the Tulare County dairies and feedlots. Its purpose is to show what the dairy and feedlot emissions would be without the voluntary emission reduction projects described in Section 6. The values for 2017 and 2018 were quantified in the prior year's report.

The fourth table column shows the actual emissions by year for the Tulare County dairies and feedlots. The 2019 emissions include the reductions from the 12 digesters and 3 AMMP projects that operated in that year. The values for 2017 and 2018 were quantified in the prior year's report.

The fifth table column shows the deviation of the actual methane emissions from the reference trajectory in the second column. The data show that the 2019 actual emissions are lower than the SB 1383 reference trajectory and therefore ahead of schedule (hence the positive number in the fifth column). The reduction in the dairy cow population and implementation of additional digester projects are the primary reasons that the 2019 methane emissions are ahead of schedule. Moreover, at the time of this analysis, data show that there were approximately 694,060 additional metric tons of annual CO_2e reductions from digester and AMMP projects that are planned to begin operating sometime after 2019.

The last column in Table 7-5 shows the additional methane emission reductions needed by 2030 to meet the SB 1383 goal. Each subsequent version of this annual GHG emissions inventory report will populate an additional year of data in the table.

Table 7-5. Progress of CH_4 Emissions in Relation to the 2030 SB 1383 Goal

Year	SB 1383 Emissions Trajectory (MT CO_2e/yr)[1][2]	BAU Emissions (MT CO_2e/yr)[1]	Actual Emissions (MT CO_2e/yr)[1]	Deviation of Actual from Goal Trajectory (MT CO_2e/yr)[3]	Additional Reductions Needed to Reach 2030 Goal (MT CO2e/yr)[4]
2017	6,050,406	6,050,406	6,039,528	10,879	-2,569,528
2018	5,852,000	6,050,406	6,017,583	-165,583	-2,547,583
2019	5,653,000	5,328,594	5,183,929	469,071	-1,713,929
2020	5,455,000	TBD	TBD	TBD	TBD
2021	5,256,000	TBD	TBD	TBD	TBD
2022	5,058,000	TBD	TBD	TBD	TBD
2023	4,859,000	TBD	TBD	TBD	TBD
2024	4,661,000	TBD	TBD	TBD	TBD
2025	4,462,000	TBD	TBD	TBD	TBD
2026	4,264,000	TBD	TBD	TBD	TBD
2027	4,065,000	TBD	TBD	TBD	TBD
2028	3,867,000	TBD	TBD	TBD	TBD
2029	3,668,000	TBD	TBD	TBD	TBD
2030	3,470,000	TBD	TBD	TBD	TBD

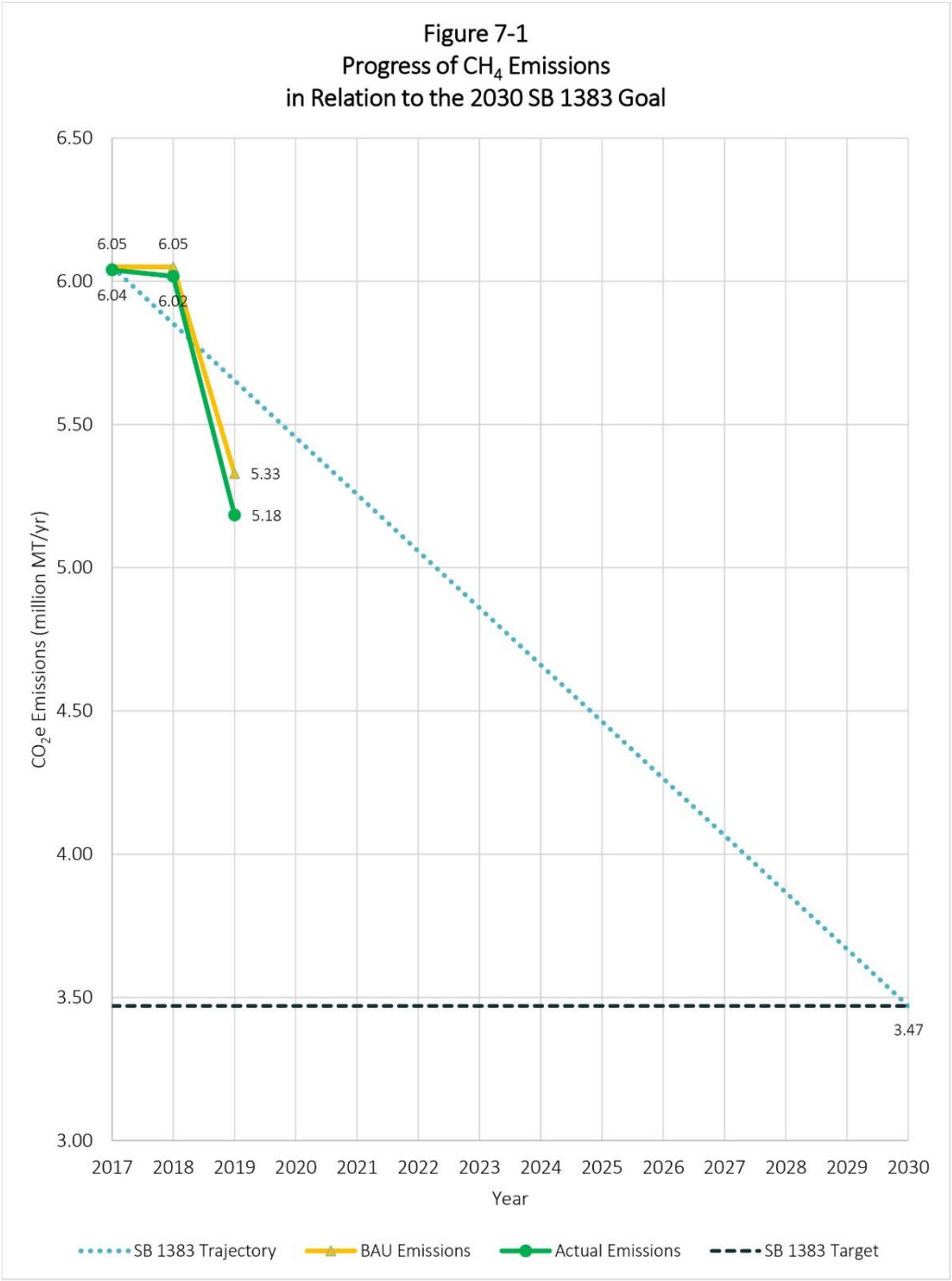
Legend: MT CO_2e/yr = metric tons of carbon dioxide equivalent per year; TBD = to be determined in a future analysis.

Notes:

1. Emissions are methane presented as CO_2e; manure decomposition and enteric digestion emissions only.
2. The SB 1383 trajectory assumes a linear path from 2017 to 2030. The value of 3,470,000 MT/yr in year 2030 is the SB 1383 goal of 40 percent below the 2013 baseline emissions.
3. A positive value means ahead of schedule; a negative value means behind schedule.
4. Reductions are shown as negative values.

Figure 7-1 shows the progress of the Tulare County dairies and feedlots toward meeting the SB 1383 goal in graphical format. The two short lines near the top left of the figure show the BAU methane emissions by year (higher line) and actual methane emissions by year (lower line). The diagonal dotted line represents the reference trajectory that would meet the goal by 2030. The horizontal dashed line across the bottom of the figure represents the SB 1383 goal, which is 40 percent below 2013 methane emissions.

Figure 7-1
Progress of CH_4 Emissions
in Relation to the 2030 SB 1383 Goal



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Appendix A – 2019 Business-As-Usual Emission Calculations

Appendix A - Annual GHG Emission Calculations

Table A.1
Dairy and Feedlot 2019 Business-As-Usual Emissions

Source Category	CO_2 (MT/yr)	CH_4 (MT/yr)	N_2O (MT/yr)	HFCs (MT/yr)	CO_2e (MT/yr)
Farm Equipment Exhaust	39,176	2	0	0.0	39,310
Farm Agricultural Soil	0	0	932	0.0	277,638
Farm Electricity Consumption	50,166	4	0	0.0	50,389
Dairy Equipment Exhaust	112,170	5	1	0.0	112,555
Truck Trips	20,822	0	3	0.0	21,812
Automobile Trips	11,216	1	1	0.0	11,418
Dairy Electricity Consumption	84,281	6	1	0.0	84,657
Dairy Refrigeration	0	0	0	4.9	72,358
Dairy Manure Decomposition	0	110,987	1,451	0.0	3,207,103
Dairy Enteric Digestion	0	90,471	0	0.0	2,261,775
Feedlot Manure Decomposition	0	482	92	0.0	39,598
Feedlot Enteric Digestion	0	11,203	0	0.0	280,083
Total Emissions	**317,830**	**213,161**	**2,481**	**4.9**	**6,458,696**

Notes:

1. BAU emissions reflect 2019 actual dairy and feedlot cattle populations. BAU emissions also reflect the use of manure management systems in the same proportions as the 2013 baseline year. Emission calculations used methodologies consistent with the most recent available CARB California GHG Emission Inventory (year 2018). BAU emissions exclude the GHG reduction projects implemented by the dairies and feedlots since the 2013 baseline year.
2. CO_2e was quantified using global warming potentials from the IPCC fourth assessment report (AR4), which are consistent with the CARB California GHG Emission Inventory.

Table A.2
Dairy and Feedlot Emission Reductions from Solar, Digester, and AMMP Projects Operating in 2019

Project Type	5-Year CO_2e Reductions (MT/5-yrs)[1]	Annual CO_2e Reductions (MT/yr)	CY 2019 CO_2e Reductions (MT/yr)[2]
Solar Panels	-90,773	-18,155	-18,155
Solar Thermal Hot Water Systems	-10	-2	-2
Digesters	-1,162,172	-232,434	-134,183
Alternative Manure Management Program	-58,949	-11,790	-10,482
Total	**-1,311,904**	**-262,381**	**-162,822**

Notes:

1. Reductions are shown as negative values.

2. Calendar year (CY) 2019 reductions are less than the annual reductions because some projects became operational during 2019 and therefore had partial-year reductions.

Table A.3
Progress of GHG Emission Reductions in Relation to the 2023 Dairy CAP Target

Year	Dairy CAP Emission Reduction Trajectory (MT CO_2e/yr)[1][2]	Actual Emission Reductions Achieved (MT CO2e/yr)[1][3]	Deviation from Trajectory (MT CO2e/yr)[4]	Additional Reductions Needed to Reach 2023 Target (MT CO2e/yr)[1]	Percent of Target Reached
2017	0	-23,990	23,990	-1,026,010	2%
2018	-175,000	-49,964	-125,036	-1,000,036	5%
2019	-350,000	-162,822	-187,178	-887,178	16%
2020	-525,000	TBD	TBD	TBD	TBD
2021	-700,000	TBD	TBD	TBD	TBD
2022	-875,000	TBD	TBD	TBD	TBD
2023	-1,050,000	TBD	TBD	TBD	TBD

Legend: TBD = To be determined in a future analysis.

Notes:

1. Reductions are shown as negative values.
2. The Dairy CAP trajectory assumes a linear path from 2017 to 2023.
3. CY 2019 emission reductions were obtained from Table A.2. CY 2017 and 2018 emission reductions were obtained from Appendix B, Tables B.2, B.3, B.4, and B.5.
4. A positive value means ahead of schedule; a negative value means behind schedule.

Table A.4
Dairy and Feedlot 2019 Actual GHG Emissions

Source Category	CO_2 (MT/yr)	CH_4 (MT/yr)	N_2O (MT/yr)	HFCs (MT/yr)	CO_2e (MT/yr)
Farm Equipment Exhaust	39,176	2	0	0.0	39,310
Farm Agricultural Soil	0	0	932	0.0	277,638
Farm Electricity Consumption	50,166	4	0	0.0	50,389
Dairy Equipment Exhaust	112,170	5	1	0.0	112,555
Truck Trips	20,822	0	3	0.0	21,812
Automobile Trips	11,216	1	1	0.0	11,418
Dairy Electricity Consumption	66,125	6	1	0.0	66,500
Dairy Refrigeration	0	0	0	4.9	72,358
Dairy Manure Decomposition	0	105,200	1,451	0.0	3,062,438
Dairy Enteric Digestion	0	90,471	0	0.0	2,261,775
Feedlot Manure Decomposition	0	482	92	0.0	39,598
Feedlot Enteric Digestion	0	11,203	0	0.0	280,083
Total Emissions	**299,674**	**207,374**	**2,481**	**4.9**	**6,295,874**

Notes:
1. Emission reductions from Table A.2 were applied to the BAU emissions from Table A.1 to produce the 2019 Actual Emissions. Emissions reductions from solar panels and solar thermal hot water systems were applied to the Dairy Electricity Consumption CO2 emissions. Emission reductions from digesters and AMMP projects were applied to the Dairy Manure Decomposition CH4 emissions.

Table A.5
Dairy and Feedlot 2019 Actual CH_4 Emissions from Manure Management

Source Category	CH_4 (MT/yr)	CO_2e (MT/yr)
Dairy Manure Decomposition	105,200	2,630,008
Dairy Enteric Digestion	90,471	2,261,775
Feedlot Manure Decomposition	482	12,062
Feedlot Enteric Digestion	11,203	280,083
Total Emissions	**207,357**	**5,183,929**

Table A.6
Progress of CH_4 Emissions in Relation to the 2030 SB 1383 Goal

Year	SB 1383 Emissions Trajectory (MT CO_2e/yr)[1][2]	BAU Emissions (MT CO_2e/yr)[1][3]	Actual Emissions (MT CO_2e/yr)[1][4]	Deviation from Target Trajectory (MT CO_2e/yr)[5]	Additional Reductions Needed to Reach 2030 Target (MT CO2e/yr)[6]
2017	6,050,406	6,050,406	6,039,528	10,879	-2,569,528
2018	5,852,000	6,050,406	6,017,583	-165,583	-2,547,583
2019	5,653,000	5,328,594	5,183,929	469,071	-1,713,929
2020	5,455,000	TBD	TBD	TBD	TBD
2021	5,256,000	TBD	TBD	TBD	TBD
2022	5,058,000	TBD	TBD	TBD	TBD
2023	4,859,000	TBD	TBD	TBD	TBD
2024	4,661,000	TBD	TBD	TBD	TBD
2025	4,462,000	TBD	TBD	TBD	TBD
2026	4,264,000	TBD	TBD	TBD	TBD
2027	4,065,000	TBD	TBD	TBD	TBD
2028	3,867,000	TBD	TBD	TBD	TBD
2029	3,668,000	TBD	TBD	TBD	TBD
2030	3,470,000	TBD	TBD	TBD	TBD

Legend: ND = no data; TBD = To be determined in a future analysis.
Notes:

1. Emissions are CH_4 presented as CO_2e. Manure decomposition and enteric digestion emissions only.
2. The SB 1383 trajectory assumes a linear path from 2017 to 2030. The 2017 BAU emissions were used as the 2017 trajectory starting point. The trajectory value of 3,470,000 MT/yr in year 2030 is the SB 1383 target (40 percent below the 2013 baseline emissions). Trajectory values after 2017 were rounded to the nearest thousand.
3. BAU 2017 emissions were not directly quantified. For the purposes of graphing the SB 1383 progress, BAU 2017 emissions were assumed to be equal to BAU 2018 emissions, which were quantified.
4. Actual 2017 emissions were not directly quantified. For the purposes of graphing the SB 1383 progress, actual 2017 emissions were assumed to equal 2017 BAU emissions minus the reduction from one digester project that began operating in 2017 (see Appendix B, Table B.4; emissions reflect number of digester operating days in 2017).
5. A positive value means ahead of schedule; a negative value means behind schedule.
6. Reductions are shown as negative values.

Table A.7
Dairy and Feedlot Animal Population

Year	Dairy Cows[1]	Dairy Heifers 0-12 mos.	Dairy Heifers 12-24 mos.	Dairy Calves	Feedlot Cattle	Total Animals
2013 (baseline year)[2]	543,431	137,985	148,928	65,770	133,886	**1,030,000**
2018 (prior inventory year)[3]	569,140	125,636	167,099	59,636	204,272	**1,125,783**
2019 (current inventory year)[3]	487,382	165,914	183,410	61,871	179,261	**1,077,838**

Notes:

1. Includes milk cows and dry cows.
2. Source: *County of Tulare Dairy and Feedlot Climate Action Plan* . August 2017. Appendix A, Tables A-1 and A-3.
3. Source: Tulare County Resource Management Agency. ACR and dairy vs feedlot breakdown.

Table A.8
No. of Active Dairy and Feedlot Animal Confined Facilities

Year	No. of Facilities
2013 (baseline year)[1]	330
2018 (prior inventory year)[2]	283
2019 (current inventory year)[2]	281

Notes:

1. Source: Tulare County RMA. *Draft EIR for the Animal Confinement Facilities Plan, and Dairy and Feedlot Climate Action Plan* . January 2016. Appendix G, Page 1-2.
2. Source: Tulare County Resource Management Agency. Includes all facilities that reported non-zero herd sizes.

Table A.9
Dairy and Feedlot Animal Units

Year	Total Animal Units
2013 (baseline year)[1]	741,040
2018 (prior inventory year)[2]	745,337
2019 (current inventory year)[2]	707,131

Notes:

1. Source: Tulare County RMA. *Draft EIR for the Animal Confinement Facilities Plan, and Dairy and Feedlot Climate Action Plan* . January 2016. Appendix G, Page 1-2.
2. Source: Tulare County Resource Management Agency.

Table A.10
California 2018 Dairy Cattle Population

Dairy Cows	Dairy Heifers 0-12 mo	Dairy Heifers 12-24 mo	Dairy Calves
1,741,577	218,090	513,097	891,443

Notes:
Used in annual emission calculations for Enteric (dairies and feedlots) and Manure Management (feedlots only).
Source: CARB 2000-2018 GHG Inventory Query Tool, 13th Edition. Most recent year available (2018).
Available at: https://www.arb.ca.gov/app/ghg/2000_2018/ghg_sector.php. Accessed April 2021.

Table A.11
California 2018 Total Cattle Population

Cattle Type	Total Population	Dairy Cows Population	Dairy Heifers Population	Feedlot
Beef calves	264,965			264,965
Beef cows	670,000			670,000
Beef replacements 0-12 months	26,590			26,590
Beef replacements 12-24 months	61,676			61,676
Bulls	70,000			70,000
Dairy calves	891,443		891,443	
Dairy cows	1,741,577	1,741,577		
Dairy replacements 0-12 months	218,090		218,090	
Dairy replacements 12-24 months	513,097		513,097	
Heifer feedlot	174,028			174,028
Heifer stockers	113,678			113,678
Steer feedlot	287,478			287,478
Steer stockers	260,137			260,137
Total dairy population:	**3,364,207**	1,741,577	1,622,630	1,928,552
Total feedlot population:	**1,928,552**			
Total population:	**5,292,759**			

Notes:
Used in annual emission calculations for Enteric (dairies and feedlots) and Manure Management (feedlots only).
Source: CARB 2000-2018 GHG Inventory Query Tool, 13th Edition. Most recent year available (2018).
Available at: https://www.arb.ca.gov/app/ghg/2000_2018/ghg_sector.php. Accessed April 2021.

Table A.12
2019 Tulare Dairy and Feedlot Herd Counts

Facility Type	Cows in Milk	Mature Bulls[1]	Dry Cows	Heifers/Bulls 1-2 yrs	Heifers/Bulls 3 months - 1 yr	Calves under 3 months	Total
Dairies	415,268	0	72,114	183,410	165,914	61,871	898,577
Feedlots	3,208	1,282	8,718	17,192	63,059	85,802	179,261
Total	**418,476**	**1,282**	**80,832**	**200,602**	**228,973**	**147,673**	**1,077,838**

Note:
1. For emission calculation purposes, all mature bulls were assigned to the feedlot category even if they were reported on a dairy.

Table A.13
Emission Factors for Diesel Farm Equipment

Emission Factor (kg/gal)		
CO_2 [1]	CH_4 [2]	N_2O [2]
10.21	4.14E-04	8.28E-05

Notes:
1. The CO2 emission factor is from The Climate Registry, 2020 Emission Factors, Table 1.1.
2. CH_4 and N_2O emission factors were scaled from the CO_2 emission factor in proportion to the emission factors from The Climate Registry, 2020 Emission Factors. Table 1.9 for CH_4 and N_2O.

Table A.14
2019 Emissions Associated with Farm Equipment

2013 Cultivated Acres	2019 Cultivated Acres [1]	Fuel Usage Factor (gal/yr per acre) [2]	2019 Fuel Use (gal/yr) [1]	2019 Annual Emissions (metric ton/yr)			
				CO_2	CH_4	N_2O	CO_2e
160,839	153,479	25	3,836,981	39,176	1.6	0.3	39,310

Notes:
1. The 2019 cultivated acreage was scaled from 2013 in proportion to the total number of animal units.
2. Source: CARB, 2018. *Analysis of California's Diesel Agricultural Equipment Inventory according to Fuel Use, Farm Size, and Equipment Horsepower* . October 3. Available: https://ww3.arb.ca.gov/msei/ordiesel/agfuelstudy2018.pdf. Accessed July 2020. Figure 3.3: Fuel per Acre, by Commodity. Hay, Forage, Pasture, Row Crops.

Table A.15
Emissions of N_2O from Agricultural Soil

Crop Type	2019 Cultivated Acres	Nitrogen Requirement per Crop (lb/acre/yr)	No. of Crops per Year[(1)]	N_f Nitrogen in Fertilizer (ton/yr)	CF Conversion Factor N2O-N to N2O[(2)]	N2O Emission Factor (kg N2O-N/kg N)			F_{leach} Fraction of N Lost through Leaching & Runoff[(4)]	F_{gasm} Fraction of N Volatilization as NH3 and NOx[(4)]	2019 Annual GHG Emissions (metric ton/yr)[(5)]	
						EF_1 Direct from Soils[(3)]	EF_5 Indirect from Runoff[(4)]	EF_4 Indirect from Volatilization[(4)]			N_2O	CO_2e
Corn Silage (double)	153,479	250	2	38,370	1.57	0.005	0.011	0.005	0.24	0.21	475	141,652
Alfalfa	153,479	480	1	36,835	1.57	0.005	0.011	0.005	0.24	0.21	456	135,986
Total	--	--	--	**75,205**	--	--	--	--	--	--	**932**	**277,638**

Notes:

1. Assume the support crop acreage has 2 summer crops of corn and 1 winter crop of alfalfa (alfalfa was conservatively selected over wheat because it has a higher nitrogen requirement).
2. Source: IPCC, 2019. *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* . Volume 4, Chapter 11. May 12, 2019. Available: https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html. Accessed 7/1/2020.
3. Source: IPCC, 2019. Table 11.1. Dry climate.
4. Source: IPCC, 2019. Table 11.3. Dry climate.
5. The N_2O emission rate is calculated based on Equations 11.1 (direct), 11.9 (volatilization), and 11.10 (runoff) in IPCC, 2019. The combined equation is:
   $Emission\ Rate = N_f \times CF \times [EF_1 + (EF_5 \times F_{leach}) + (EF_4 \times F_{gasm})] \times 0.9072$

Table A.16
GHG Emissions Associated with Support Crop Irrigation

2019 Cultivated Acres	Usage Factor for Electric Irrigation Pumps (MWh/acre/yr)[1]	2019 Electricity Usage (MWh/yr)[2]	2019 Emission Factors (lb/MWh)[3]			Annual Emissions (metric ton/yr)			
			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2e
153,479	1.59	244,032	453.2	0.033	0.004	50,166	3.7	0.4	50,389

Notes:

1. Source: Tulare County RMA. *Draft EIR for the ACFP and Dairy CAP* . January 2016. Appendix E.2.
2. Calculations assume all ACF support crop irrigation pumps are electric.
3. Source: U.S. EPA. Emissions & Generation Resources Integrated Database (eGRID). eGRID Summary Tables 2019. CAMX Subregion. Available: https://www.epa.gov/sites/production/files/2021-02/documents/egrid2019_summary_tables.pdf. Accessed April 2021.

Table A.17
Emission Factors for Diesel Dairy Equipment

Emission Source	Emission Factor (kg/gal)		
	CO_2 [1]	CH_4 [2]	N_2O [2]
Agricultural Tractor 51-120 hp	10.21	4.14E-04	8.28E-05
Rubber Tired Loader 121-175 hp	10.21	4.14E-04	8.28E-05
Off-Highway Truck 251-500 hp	10.21	4.14E-04	8.28E-05
Generator Set 251-500 hp	10.21	4.14E-04	8.28E-05

Notes:

1. The CO2 emission factor is from The Climate Registry, 2020 Emission Factors, Table 1.1.

2. CH_4 and N_2O emission factors were scaled from the CO_2 emission factor in proportion to the emission factors from The Climate Registry, 2020 Emission Factors. Table 1.9 for CH_4 and N_2O.

Table A.18
2019 Emissions Associated with Dairy Equipment

Emission Source	2013 Equipment Annual Work Done (hp-hr/yr)	2019 Equipment Annual Work Done (hp-hr/yr)[2]	2019 Fuel Use (gal/yr)[1]	2019 Annual Emissions (metric ton/yr)			
				CO_2	CH_4	N_2O	CO_2e
Dairy Tractor 51-120 hp	80,652,507	76,961,962	3,973,194	40,566	1.6	0.3	40,706
Loader 121-175 hp	54,730,496	52,226,105	2,696,195	27,528	1.1	0.2	27,623
Feed Mixer Truck 251-500 hp	87,599,377	83,590,952	4,315,419	44,060	1.8	0.4	44,212
Standby Generator 251-500 hp	33,600	28,611	1,477	15	0.0	0.0	15
Total	**223,015,980**	**212,807,630**	**10,986,285**	**112,170**	**4.5**	**0.9**	**112,555**

Notes:

1. Fuel use (gal/yr) = Annual Work (hp-hr/yr) x BSFC (lb/hp-hr) / Fuel Conversion (lb/gallon)
Brake specific fuel consumption (BSFC) (lb/hp-hr): *0.367*
Diesel Fuel conversion (lb/gallon) *7.1089*
CARB, MSEI Documentation Off-Road Diesel Equipment, 2017 Off-road Diesel Emission Factors. *ordas_ef_fcf_2017_v7.xlsx.*
Available: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road. Accessed July 2020.

2. Annual work done in 2019 was scaled from 2013 in proportion to the No. of facilities for standby generators and the No. of animal units for all other source categories.

Table A.19
On-Road Vehicle Emissions

Vehicle Description	Vehicle Type[1]	2013 Round Trips (trips/yr)	2019 Round Trips (trips/yr)[2]	One-Way Trip Length (mi/trip)	2019 Annual VMT (mi/yr)	2019 Annual Emissions (metric ton/yr)[3]			
						CO_2	CH_4	N_2O	CO_2e
Silage Truck 3-axle, 10-ton	T6 Instate Tractor Class 6-7	573,151	546,924	1	1,093,849	1,245	0.0	0.2	1,304
Silage Truck 5-axle, 20-ton	T7 Tractor Class 8	71,644	68,366	1	136,731	230	0.0	0.0	241
Hay Truck 3-axle, 10-ton	T6 Instate Tractor Class 6-7	12,882	12,293	2	49,170	56	0.0	0.0	59
Hay Truck 5-axle, 20-ton	T7 Tractor Class 8	57,972	55,319	20	2,212,771	3,724	0.1	0.6	3,901
Concentrated Feed Truck 5-axle, 20-ton	T7 Tractor Class 8	202,104	192,856	20	7,714,240	12,983	0.2	2.1	13,600
Calf Milk Replacer Truck 2-axle, 10-ton	T6 Instate Tractor Class 6-7	817	780	20	31,185	35	0.0	0.0	37
Cattle Truck - baby calves from dairies to calf ranches	T6 Instate Tractor Class 6-7	12,607	12,030	10	240,602	274	0.0	0.0	287
Cattle Truck - weaned heifer calves from calf ranches to dairies	T6 Instate Tractor Class 6-7	6,380	6,088	10	121,761	139	0.0	0.0	145
Cattle Truck - weaned bull calves from calf ranches to foothill pasture	T6 Instate Tractor Class 6-7	1,418	1,353	25	67,656	77	0.0	0.0	81
Cattle Truck - weaned bull calves from calf ranches to background feedlots	T7 Tractor Class 8	1,588	1,515	50	151,534	255	0.0	0.0	267
Cattle Truck - other cattle trips from calf ranches	T7 Tractor Class 8	1,418	1,353	20	54,125	91	0.0	0.0	95
Cattle Truck - beef cattle from foothill pasture to finishing feedlots	T6 Instate Tractor Class 6-7	4,721	4,505	75	675,746	769	0.0	0.1	805
Cattle Truck - dairies to beef processing facilities - gooseneck trailers	T6 Instate Tractor Class 6-7	17,008	16,230	20	649,190	739	0.0	0.1	774
Cattle Truck - dairies to beef processing facilities - semi tractor/trailers	T7 Tractor Class 8	1,278	1,220	50	121,952	205	0.0	0.0	215
Total - Trucks		**964,988**	**920,832**		**13,320,511**	**20,822**	**0.4**	**3.3**	**21,812**
Dairy Employee trips	LDT1-2	1,349,040	1,148,728	10	22,974,560	9,048	0.6	0.5	9,211
Dairy Visitor trips (vet, breeder, sales, delivery)	LDT1-2	161,616	137,618	20	5,504,739	2,168	0.2	0.1	2,207
Total - Automobiles		**1,510,656**	**1,286,346**		**28,479,299**	**11,216**	**0.8**	**0.6**	**11,418**

Notes:

1. All trucks are assumed to be Medium-Heavy Duty Diesel Trucks (T6 Class 6, 19,501-26,000 lbs GVWR; T6 class 7, 26,001-33,000 lbs GVWR) and Heavy-Heavy Duty Diesel Trucks (T7 Class 8; above 33,000 lbs GVWR). All employees and visitors are conservatively assumed to drive light-duty trucks (LDT1; 0-3,750 lbs and LDT2; 3,751-5,750 lbs equivalent test weight).
2. Trips in 2019 were scaled from 2013 in proportion to the number of animal units for trucks and the number of facilities for automobiles.
3. Emissions include running, idle, and starting exhaust and GHGs from electricity usage.

Table A.20
EMFAC 2021 Output
EMFAC2021 (v1.0.0) Emissions Inventory
Region Type: County
Region: TULARE
Calendar Year: 2019
Season: Annual
Vehicle Classification: EMFAC202x Categories
Units: miles/day for CVMT and EVMT, trips/day for Trips, kWh/day for Energy Consumption, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population	Total VMT	CVMT	EVMT	Trips	Energy Consumption
Tulare	2019	LDT1	Aggregate	Aggregate	Gasoline	19,343	571,223	571,223	0	81,447	0.0
Tulare	2019	LDT1	Aggregate	Aggregate	Diesel	17	288	288	0	53	0.0
Tulare	2019	LDT1	Aggregate	Aggregate	Electricity	6	151	0	151	28	58.5
Tulare	2019	LDT1	Aggregate	Aggregate	Plug-in Hybrid	0	4	2	2	0	0.5
Tulare	2019	LDT2	Aggregate	Aggregate	Gasoline	64,963	2,346,083	2,346,083	0	298,664	0.0
Tulare	2019	LDT2	Aggregate	Aggregate	Diesel	118	4,813	4,813	0	561	0.0
Tulare	2019	LDT2	Aggregate	Aggregate	Electricity	2	48	0	48	9	18.4
Tulare	2019	LDT2	Aggregate	Aggregate	Plug-in Hybrid	58	2,938	1,562	1,375	285	415.4
Tulare	2019	T6 Instate Tractor Class 6	Aggregate	Aggregate	Diesel	14	606	606	0	157	0.0
Tulare	2019	T6 Instate Tractor Class 7	Aggregate	Aggregate	Diesel	316	19,070	19,070	0	3,655	0.0
Tulare	2019	T6 Instate Tractor Class 7	Aggregate	Aggregate	Natural Gas	2	206	206	0	27	0.0
Tulare	2019	T7 Tractor Class 8	Aggregate	Aggregate	Diesel	1,309	119,886	119,886	0	19,021	0.0
Tulare	2019	T7 Tractor Class 8	Aggregate	Aggregate	Natural Gas	18	1,786	1,786	0	261	0.0

Legend: VMT = vehicle miles traveled; CVMT = conventional vehicle miles traveled; EVMT = electric vehicle miles traveled; CO2 = carbon dioxide; CH4 = methane; N2O = nitrous oxide; RUNEX = running exhaust emissions; IDLEX = idle exhaust emissions; STREX = start exhaust tailpipe emissions; TOTEX = total exhaust emissions; LDT1 = light-duty trucks (GVWR <6000 lbs and ETW <= 3750 lbs); LDT2 = light-duty trucks (GVWR <6000 lbs and ETW 3751-5750 lbs); T6 Instate Tractor Class 6 = Medium-Heavy Duty Tractor Truck (GVWR 19501-26000 lbs); T6 Instate Tractor Class 7 = Medium-Heavy Duty Tractor Truck (GVWR 26001-33000 lbs); T7 Tractor Class 8 = Heavy-Heavy Duty Tractor Truck (GVWR 33001 lbs and over); GVWR = gross vehicle weight rating; ETW = equivalent test weight.
Source: EMFAC2021 Web Database (v1.0.0). Available: https://arb.ca.gov/emfac/emissions-inventory/dfe5e89adcbd37ff4bace7e99f6cfaf99e90cff2. Accessed 4/2021.

Table A.20 (Continued)
EMFAC 2021 Output
EMFAC2021 (v1.0.0) Emissions Inventory
Region Type: County
Region: TULARE
Calendar Year: 2019
Season: Annual
Vehicle Classification: EMFAC202x Categories
Units: miles/day for CVMT and EVMT, trips/day for Trips, kWh/day for Energy Consumption, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	CO2_RUNEX	CO2_IDLEX	CO2_STREX	CO2_TOTEX	CH4_RUNEX	CH4_IDLEX	CH4_STREX	CH4_TOTEX
Tulare	2019	LDT1	Aggregate	Aggregate	Gasoline	2.29E+02	0.00E+00	9.52E+00	2.38E+02	1.22E-02	0.00E+00	1.87E-02	3.09E-02
Tulare	2019	LDT1	Aggregate	Aggregate	Diesel	1.27E-01	0.00E+00	0.00E+00	1.27E-01	4.41E-06	0.00E+00	0.00E+00	4.41E-06
Tulare	2019	LDT1	Aggregate	Aggregate	Electricity	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tulare	2019	LDT1	Aggregate	Aggregate	Plug-in Hybrid	6.36E-04	0.00E+00	3.88E-05	6.74E-04	1.53E-09	0.00E+00	6.83E-08	6.99E-08
Tulare	2019	LDT2	Aggregate	Aggregate	Gasoline	9.96E+02	0.00E+00	3.37E+01	1.03E+03	1.71E-02	0.00E+00	4.18E-02	5.89E-02
Tulare	2019	LDT2	Aggregate	Aggregate	Diesel	1.76E+00	0.00E+00	0.00E+00	1.76E+00	6.22E-06	0.00E+00	0.00E+00	6.22E-06
Tulare	2019	LDT2	Aggregate	Aggregate	Electricity	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tulare	2019	LDT2	Aggregate	Aggregate	Plug-in Hybrid	4.62E-01	0.00E+00	2.84E-02	4.91E-01	1.12E-06	0.00E+00	4.81E-05	4.92E-05
Tulare	2019	T6 Instate Tractor Class 6	Aggregate	Aggregate	Diesel	7.70E-01	3.72E-02	0.00E+00	8.07E-01	8.67E-06	4.46E-07	0.00E+00	9.11E-06
Tulare	2019	T6 Instate Tractor Class 7	Aggregate	Aggregate	Diesel	2.31E+01	8.44E-01	0.00E+00	2.39E+01	1.98E-04	1.09E-05	0.00E+00	2.09E-04
Tulare	2019	T6 Instate Tractor Class 7	Aggregate	Aggregate	Natural Gas	2.20E-01	1.30E-02	0.00E+00	2.32E-01	1.57E-04	3.18E-05	0.00E+00	1.89E-04
Tulare	2019	T7 Tractor Class 8	Aggregate	Aggregate	Diesel	2.11E+02	1.15E+01	0.00E+00	2.23E+02	8.57E-04	2.13E-04	0.00E+00	1.07E-03
Tulare	2019	T7 Tractor Class 8	Aggregate	Aggregate	Natural Gas	2.56E+00	3.35E-01	0.00E+00	2.89E+00	1.97E-03	1.29E-03	0.00E+00	3.26E-03

Legend: VMT = vehicle miles traveled; CVMT = conventional vehicle miles traveled; EVMT = electric vehicle miles traveled; CO2 = carbon dioxide; CH4 = methane; N2O = nitrous oxide; RUNEX = running exhaust emissions; IDLEX = idle exhaust emissions; STREX = start exhaust tailpipe emissions; TOTEX = total exhaust emissions; LDT1 = light-duty trucks (GVWR <6000 lbs and ETW <= 3750 lbs); LDT2 = light-duty trucks (GVWR <6000 lbs and ETW 3751-5750 lbs); T6 Instate Tractor Class 6 = Medium-Heavy Duty Tractor Truck (GVWR 19501-26000 lbs); T6 Instate Tractor Class 7 = Medium-Heavy Duty Tractor Truck (GVWR 26001-33000 lbs); T7 Tractor Class 8 = Heavy-Heavy Duty Tractor Truck (GVWR 33001 lbs and over); GVWR = gross vehicle weight rating; ETW = equivalent test weight.
Source: EMFAC2021 Web Database (v1.0.0). Available: https://arb.ca.gov/emfac/emissions-inventory/dfe5e89adcbd37ff4bace7e99f6cfaf99e90cff2. Accessed 4/2021.

Table A.20 (Continued)
EMFAC 2021 Output
EMFAC2021 (v1.0.0) Emissions Inventory
Region Type: County
Region: TULARE
Calendar Year: 2019
Season: Annual
Vehicle Classification: EMFAC202x Categories
Units: miles/day for CVMT and EVMT, trips/day for Trips, kWh/day for Energy Consumption, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	N2O_RUNEX	N2O_IDLEX	N2O_STREX	N2O_TOTEX	Fuel Consumption
Tulare	2019	LDT1	Aggregate	Aggregate	Gasoline	1.59E-02	0.00E+00	4.82E-03	2.07E-02	25.13
Tulare	2019	LDT1	Aggregate	Aggregate	Diesel	1.99E-05	0.00E+00	0.00E+00	1.99E-05	0.01
Tulare	2019	LDT1	Aggregate	Aggregate	Electricity	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00
Tulare	2019	LDT1	Aggregate	Aggregate	Plug-in Hybrid	1.79E-09	0.00E+00	2.58E-08	2.76E-08	0.00
Tulare	2019	LDT2	Aggregate	Aggregate	Gasoline	3.18E-02	0.00E+00	1.65E-02	4.83E-02	108.66
Tulare	2019	LDT2	Aggregate	Aggregate	Diesel	2.78E-04	0.00E+00	0.00E+00	2.78E-04	0.16
Tulare	2019	LDT2	Aggregate	Aggregate	Electricity	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00
Tulare	2019	LDT2	Aggregate	Aggregate	Plug-in Hybrid	1.31E-06	0.00E+00	1.83E-05	1.96E-05	0.05
Tulare	2019	T6 Instate Tractor Class 6	Aggregate	Aggregate	Diesel	1.21E-04	5.85E-06	0.00E+00	1.27E-04	0.07
Tulare	2019	T6 Instate Tractor Class 7	Aggregate	Aggregate	Diesel	3.63E-03	1.33E-04	0.00E+00	3.76E-03	2.13
Tulare	2019	T6 Instate Tractor Class 7	Aggregate	Aggregate	Natural Gas	4.47E-05	2.64E-06	0.00E+00	4.74E-05	0.03
Tulare	2019	T7 Tractor Class 8	Aggregate	Aggregate	Diesel	3.33E-02	1.81E-03	0.00E+00	3.51E-02	19.89
Tulare	2019	T7 Tractor Class 8	Aggregate	Aggregate	Natural Gas	5.21E-04	6.83E-05	0.00E+00	5.89E-04	0.33

Legend: VMT = vehicle miles traveled; CVMT = conventional vehicle miles traveled; EVMT = electric vehicle miles traveled; CO2 = carbon dioxide; CH4 = methane; N2O = nitrous oxide; RUNEX = running exhaust emissions; IDLEX = idle exhaust emissions; STREX = start exhaust tailpipe emissions; TOTEX = total exhaust emissions; LDT1 = light-duty trucks (GVWR <6000 lbs and ETW <= 3750 lbs); LDT2 = light-duty trucks (GVWR <6000 lbs and ETW 3751-5750 lbs); T6 Instate Tractor Class 6 = Medium-Heavy Duty Tractor Truck (GVWR 19501-26000 lbs); T6 Instate Tractor Class 7 = Medium-Heavy Duty Tractor Truck (GVWR 26001-33000 lbs); T7 Tractor Class 8 = Heavy-Heavy Duty Tractor Truck (GVWR 33001 lbs and over); GVWR = gross vehicle weight rating; ETW = equivalent test weight.
Source: EMFAC2021 Web Database (v1.0.0). Available: https://arb.ca.gov/emfac/emissions-inventory/dfe5e89adcbd37ff4bace7e99f6cfaf99e90cff2. Accessed 4/2021.

Table A.21
Vehicle Exhaust GHG Emission Factors

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Regional Totals[1] VMT (mi/day)	Regional Totals[1] CO_2 Emissions (ton/day)	Regional Totals[1] CH_4 Emissions (ton/day)	Regional Totals[1] N_2O Emissions (ton/day)	GHG Emission Factors CO_2 (g/mi)	GHG Emission Factors CH_4 (g/mi)	GHG Emission Factors N_2O (g/mi)
TULARE	2019	LDT1-2	Aggregate	Aggregate	Aggregate	2,925,548	1,269.9	0.0899	0.0694	393.8	0.028	0.022
TULARE	2019	T6 Instate Tractor Class 6-7	Aggregate	Aggregate	Aggregate	19,882	24.9	0.0004	0.0039	1,138.0	0.019	0.180
TULARE	2019	T7 Tractor Class 8	Aggregate	Aggregate	Aggregate	121,671	225.7	0.0043	0.0357	1,683.0	0.032	0.266

Notes:

Legend: LDT1-2 = light-duty trucks (GVWR <6000 lbs and ETW <= 5750 lbs); T6 Instate Tractor Class 6-7 = Medium-Heavy Duty Tractor Truck (GVWR 19501-33000 lbs); T7 Tractor Class 8 = Heavy-Heavy Duty Tractor Truck (GVWR 33001 lbs and over); GVWR = gross vehicle weight rating; ETW = equivalent test weight; VMT = vehicle miles traveled.

1. Source: EMFAC2021 Web Database (v1.0.0). Tulare County. Emission factors include running, idle, and starting exhaust.

Table A.22
Vehicle Electricity Usage GHG Emission Factors

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Regional Totals[1] VMT (mi/day)	Regional Totals[1] Electricity Usage (kWh/day)	2019 Electricity Usage Emission Factors[2] CO_2 (lb/MWh)	2019 Electricity Usage Emission Factors[2] CH_4 (lb/MWh)	2019 Electricity Usage Emission Factors[2] N_2O (lb/MWh)	GHG Emission Factors CO_2 (g/mi)	GHG Emission Factors CH_4 (g/mi)	GHG Emission Factors N_2O (g/mi)
TULARE	2019	LDT1-2	Aggregate	Aggregate	Aggregate	2,925,548	493	453.2	0.033	0.004	0.035	2.52E-06	3.06E-07
TULARE	2019	T6 Instate Tractor Class 6-7	Aggregate	Aggregate	Aggregate	19,882	0	453.2	0.033	0.004	0	0	0
TULARE	2019	T7 Tractor Class 8	Aggregate	Aggregate	Aggregate	121,671	0	453.2	0.033	0.004	0	0	0

Notes:

Legend: LDT1-2 = light-duty trucks (GVWR <6000 lbs and ETW <= 5750 lbs); T6 Instate Tractor Class 6-7 = Medium-Heavy Duty Tractor Truck (GVWR 19501-33000 lbs); T7 Tractor Class 8 = Heavy-Heavy Duty Tractor Truck (GVWR 33001 lbs and over); GVWR = gross vehicle weight rating; ETW = equivalent test weight; VMT = vehicle miles traveled; kWh = kilowatt hours; MWh = megawatt hours.

1. Source: EMFAC2021 Web Database (v1.0.0).

2. Source: U.S. EPA. Emissions & Generation Resources Integrated Database (eGRID). eGRID Summary Tables 2019. CAMX Subregion. Available: https://www.epa.gov/sites/production/files/2021-02/documents/egrid2019_summary_tables.pdf. Accessed April 2021.

Table A.23
Vehicle Combined Exhaust and Electricity Usage GHG Emission Factors

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Combined GHG Emission Factors CO_2 (g/mi)	Combined GHG Emission Factors CH_4 (g/mi)	Combined GHG Emission Factors N_2O (g/mi)
TULARE	2019	LDT1-2	Aggregate	Aggregate	Aggregate	393.8	0.028	0.022
TULARE	2019	T6 Instate Tractor Class 6-7	Aggregate	Aggregate	Aggregate	1,138.0	0.019	0.180
TULARE	2019	T7 Tractor Class 8	Aggregate	Aggregate	Aggregate	1,683.0	0.032	0.266

Legend: LDT1-2 = light-duty trucks (GVWR <6000 lbs and ETW <= 5750 lbs); T6 Instate Tractor Class 6-7 = Medium-Heavy Duty Tractor Truck (GVWR 19501-33000 lbs); T7 Tractor Class 8 = Heavy-Heavy Duty Tractor Truck (GVWR 33001 lbs and over); GVWR = gross vehicle weight rating; ETW = equivalent test weight; VMT = vehicle miles traveled.

Table A.24
Emissions Associated with Dairy Electricity Use

2019 Population (Dairy Cows and Heifers)	Dairy Electricity Usage per Cow (MWh/cow/yr)[1]	2019 Electricity Usage (MWh/yr)	2019 Emission Factors (lb/MWh)[2]			2019 Annual Emissions (metric ton/yr)			
			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2e
836,706	0.49	409,986	453.2	0.033	0.004	84,281	6.137	0.744	84,657

Notes:

1. Source: Tulare County RMA. *Draft EIR for the ACFP, and Dairy CAP* . January 2016. Appendix E.2.
2. Source: U.S. EPA. Emissions & Generation Resources Integrated Database (eGRID). eGRID Summary Tables 2019. CAMX Subregion. Available: https://www.epa.gov/sites/production/files/2021-02/documents/egrid2019_summary_tables.pdf. Accessed April 2021.

Table A.25
GHG Emissions Associated with Dairy Refrigeration Equipment

2013 Total Refrigerant Charge (lb)	2019 Total Refrigerant Charge (lb)[1]	Refrigerant Type[2]	Global Warming Potential[3]	Annual Refrigerant Loss Rate[4]	2019 Annual Emissions (metric ton/yr)	
					HFCs	CO_2e
48,072	43,114	HFC-23	14,800	25%	4.89	72,358

Notes:

1. The 2019 refrigerant charge was scaled from 2013 in proportion to the number of dairy cows.
2. HFC-23 was conservatively selected as a worst case refrigerant for industrial refrigeration in terms of its global warming potential.
3. GWP is from the IPCC fourth assessment report (AR4). GWP is consistent with the CARB California Greenhouse Gas Emission Inventory Program.
4. Source: The Climate Registry. *2020 Default Emission Factor Document* . April 2020. Table 4.1. Industrial Refrigeration.

Table A.26
California Herd Distribution Fractions by Manure Management System

Manure Management System	Herd Fraction[1][2]	
	Dairy Cows	Dairy Heifers
Anaerobic Digester	1.19E-02	0.00E+00
Anaerobic Lagoon	5.82E-01	0.00E+00
Daily Spread	1.06E-01	1.08E-01
Deep Pit	1.04E-03	0.00E+00
Dry Lot	0.00E+00	8.74E-01
Liquid/Slurry	2.02E-01	8.74E-03
Pasture	6.71E-03	9.25E-03
Solid Storage	9.10E-02	0.00E+00
Total	**1.00E+00**	**1.00E+00**

[1] Source: CARB, Annex 3B - Manure Management (IPCC 3A2). Available: http://www.arb.ca.gov/cc/inventory/doc/methods_00-12/annex_3b_manure_management.pdf; which is found in the 2014 Edition Archive of California's 2000-2012 Greenhouse Gas Emissions Inventory Technical Support Document: https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2012/ghg_inventory_00-12_technical_support_document.pdf; which is found on CARB's website: https://ww2.arb.ca.gov/ghg-inventory-archive.

[2] The herd distribution fractions reflect 2013 assumptions to preserve business-as-usual manure management practices for the 2019 BAU emission calculations. Nevertheless, the distribution fractions have not changed in the CARB GHG Emission Inventories through the most recent available year (2018).

Table A.27
Tulare County 2019 Dairy Cattle Herd Counts

Dairy Cows	Dairy Heifers
487,382	411,195

Note: Year 2019 cattle populations were provided by Tulare County. Dairy Cows category includes milk cows and dry cows. Dairy Heifers category includes all heifers and calves.

Table A.28
CH_4 2019 Business-As-Usual Emissions from Manure Management - Dairy Cows

Manure Management System	Tulare County Current Inventory Year (2019)[a] $CH_{4,man}$ (MT/yr)[b]	V_{ex} (MT/yr)[c]	$WMS*N_{animals}$ (animals)[d]	VS (kg VS/animal/yr)[e]	B_o (m^3 CH_4/kg VS)[f]	MCF (%)[g]	c_1 (kg/m^3)[h]
Anaerobic Digester	477.4	16,601	5,811	2,857	0.24	0.181	0.662
Anaerobic Lagoon	94,098.8	810,210	283,588	2,857	0.24	0.731	0.662
Daily Spread	116.7	146,937	51,431	2,857	0.24	0.005	0.662
Deep Pit	74.0	1,442	505	2,857	0.24	0.323	0.662
Dry Lot	0.0	0	0	2,857	0.24	0.015	0.662
Liquid/Slurry	14,429.9	281,184	98,419	2,857	0.24	0.323	0.662
Pasture	22.3	9,347	3,271	2,857	0.24	0.015	0.662
Solid Storage	805.4	126,730	44,358	2,857	0.24	0.04	0.662
Total	**110,024.5**	--	**487,382**	--	--	--	--

Table A.29
CH_4 2019 Business-As-Usual Emissions from Manure Management - Dairy Heifers

Manure Management System	Tulare County Current Inventory Year (2019)[a] $CH_{4,man}$ (MT/yr)[b]	V_{ex} (MT/yr)[c]	$WMS*N_{animals}$ (animals)[d]	VS (kg VS/animal/yr)[e]	B_o (m^3 CH_4/kg VS)[f]	MCF (%)[g]	c_1 (kg/m^3)[h]
Anaerobic Digester	0.0	0	0	1,252	0.17	0.181	0.662
Anaerobic Lagoon	0.0	0	0	1,252	0.17	0.731	0.662
Daily Spread	31.3	55,610	44,417	1,252	0.17	0.005	0.662
Deep Pit	0.0	0	0	1,252	0.17	0.323	0.662
Dry Lot	759.5	449,943	359,379	1,252	0.17	0.015	0.662
Liquid/Slurry	163.6	4,500	3,594	1,252	0.17	0.323	0.662
Pasture	8.0	4,763	3,805	1,252	0.17	0.015	0.662
Solid Storage	0.0	0	0	1,252	0.17	0.04	0.662
Total	**962.4**	--	**411,195**	--	--	--	--

Notes:

[a] 2019 BAU emission calculations used the 2019 herd population and calculation methodology consistent with the California GHG 2000-2018 Inventory.

[b] $CH_{4,man}$: Methane emissions estimated using Equation 1 (see below).

Equation 1 $CH_{4,man} = V_{ex} \times B_o \times MCF \times c_1$

[c] V_{ex}: Volatile solids excreted estimated using Equation 2 (see below).

Equation 2 $V_{ex} = VS \times (WMS*N_{animals}) \times (kg\ to\ MT)$

[d] $WMS*N_{animals}$: Number of animals per waste (manure) management system. Apportionment factors are from Table A.26.

[e] VS: Volatile solids excreted per animal.

[f] B_o: Maximum methane producing capacity.

[g] MCF: Methane conversion factor.

[h] c_1: Conversion factor representing density of methane at 25C.

Other abbreviations: kg = kilogram; m^3 = cubic meter; MT = metric ton; yr = year.

Table A.30
N_2O 2019 Business-As-Usual Emissions from Manure Management - Dairy Cows

Manure Management System	Tulare County Current Inventory Year (2019)[a]							
	N_2O_{man}[b] (MT/yr)	$WMS*N_{animals}$[c] (animals)	N_{ex}[d] (g/yr)	Direct N as N_2O[e] (g N_2O-N/g)	Volatilization fraction[f] (fraction)	Indirect N as N_2O, volatilized[g] (g N_2O-N/g)	Runoff fraction[h] (fraction)	Indirect N as N_2O, runoff[i] (g N_2O-N/g)
Anaerobic Digester	6.3	5,811	158,656	0	0.43	0.01	0.008	0.0075
Anaerobic Lagoon	308.2	283,588	158,656	0	0.43	0.01	0.008	0.0075
Daily Spread	12.8	51,431	158,656	0	0.10	0.01	0	0.0075
Deep Pit	0.6	505	158,656	0.002	0.24	0.01	0	0.0075
Dry Lot	0.0	0	158,656	0.02	0.15	0.01	0.02	0.0075
Liquid/Slurry	187.9	98,419	158,656	0.005	0.26	0.01	0.008	0.0075
Pasture	0.0	3,271	158,656	0	0.00	0.01	0	0.0075
Solid Storage	85.1	44,358	158,656	0.005	0.27	0.01	0	0.0075
Total	**600.9**	**487,382**	--	--	--	--	--	--

Table A.31
N_2O 2019 Business-As-Usual Emissions from Manure Management - Dairy Heifers

Manure Management System	Tulare County Current Inventory Year (2019)[a]							
	N_2O_{man}[b] (MT/yr)	$WMS*N_{animals}$[c] (animals)	N_{ex}[d] (g/yr)	Direct N as N_2O[e] (g N_2O-N/g)	Volatilization fraction[f] (fraction)	Indirect N as N_2O, volatilized[g] (g N_2O-N/g)	Runoff fraction[h] (fraction)	Indirect N as N_2O, runoff[i] (g N_2O-N/g)
Anaerobic Digester	0.0	0	68,911	0	0.43	0.01	0.008	0.0075
Anaerobic Lagoon	0.0	0	68,911	0	0.43	0.01	0.008	0.0075
Daily Spread	4.8	44,417	68,911	0	0.10	0.01	0	0.0075
Deep Pit	0.0	0	68,911	0.002	0.24	0.01	0	0.0075
Dry Lot	842.4	359,379	68,911	0.02	0.15	0.01	0.02	0.0075
Liquid/Slurry	3.0	3,594	68,911	0.005	0.26	0.01	0.008	0.0075
Pasture	0.0	3,805	68,911	0	0.00	0.01	0	0.0075
Solid Storage	0.0	0	68,911	0.005	0.27	0.01	0	0.0075
Total	**850.2**	**411,195**	--	--	--	--	--	--

Notes:

[a] 2019 BAU emission calculations used the 2019 herd population and calculation methodology consistent with the California GHG 2000-2018 Inventory.

[b] N_2O_{man}: Nitrous oxide emissions estimated using Equation 1 (see below).

Equation 1 $N_2O = WMS*N_{animals} \times N_{ex} \times [D_{EF} + (V_{frac} \times V_{EF}) + (R_{frac} \times R_{EF})] \times 1.5711 \times (g \text{ to } MT)$

[c] $WMS*N_{animals}$: Number of animals per waste (manure) management system. Apportionment factors are from Table A.26.

[d] N_{ex}: Nitrogen excreted per animal.

[e] Direct N a N_2O: Emission factor representing direct nitrogen as N_2O-N for the particular waste management system.

[f] Volatilization fraction of N for the animal group.

[g] Emission factor representing indirect nitrogen as N_2O-N for redeposited volatilized N.

[h] Runoff fraction of N for the animal group.

[i] Emission factor representing indirect nitrogen as N_2O-N for runoff N.

Other abbreviations: kg = kilogram; g = gram; MT = metric ton; yr = year.

Table A.32
Dairy Cattle Herd Counts for Enteric Fermentation Calculation

Category	Dairy Cows	Dairy Heifers 0-12 mo	Dairy Heifers 12-24 mo	Dairy Calves
California (2018)[1]	1,741,577	218,090	513,097	891,443
Tulare County (2019)[2]	487,382	165,914	183,410	61,871

Notes:

1. California populations are from the CARB 2000-2018 GHG Inventory Query Tool, 13th Edition. Most recent year available (2018). Available at: https://www.arb.ca.gov/app/ghg/2000_2018/ghg_sector.php. Accessed April 2021.
2. 2019 year cattle populations were provided by Tulare County. Dairy cows include cows in milk and dry cows.

Table A.33
Emissions from Enteric Fermentation - Dairies

	CH_4 (MT/yr)				
Source	Dairy Cows	Dairy Heifers 0-12 mo	Dairy Heifers 12-24 mo	Dairy Calves	Total
California (2018)[1]	251,841	9,493	33,715	10,370	**305,419**
Tulare County (2019)[2]	70,478	7,222	12,052	720	**90,471**

Notes:

1. California populations are from the CARB 2000-2018 GHG Inventory Query Tool, 13th Edition. Most recent year available (2018). Available at: https://www.arb.ca.gov/app/ghg/2000_2018/ghg_sector.php. Accessed April 2021.

2. CARB and EPA use the same methodology to estimate emissions from enteric fermentation. As such, this table assumes that Tulare emissions are proportional to the California emissions based on animal population.

Abbreviations:

CARB - California Air Resources Board
CH_4 - methane
CO_2e - carbon dioxide equivalents
kg - kilogram
mo - months old
MT - metric tonne
yr - year

Table A.34
CARB GHG Inventory - Enteric Fermentation
GHG Emission Inventory Summary [2000 - 2018]
Main Sector: Agriculture & Forestry
Sub Sector Level 1: Enteric Fermentation
Sub Sector Level 2: Cattle
Inventory Accounting: Included
Measurement: CO2Eq
GWP: AR4
Unit: tonnes

Inventory Accounting	Main Sector	Sub Sector Level 1	Sub Sector Level 2	Sub Sector Level 3	Main Activity	Activity Subset	GHG	2018 Emission (MT/yr)
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Beef calves	CH4	71,102
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Beef cows	CH4	1,598,707
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Beef replacements 0-12 months	CH4	40,698
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Beef replacements 12-24 months	CH4	108,800
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Bulls	CH4	172,709
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Dairy calves	CH4	259,257
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Dairy cows	CH4	6,296,023
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Dairy replacements 0-12 months	CH4	237,319
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Dairy replacements 12-24 months	CH4	842,871
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Heifer feedlot	CH4	178,405
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Heifer stockers	CH4	173,617
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Steer feedlot	CH4	286,775
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Steer stockers	CH4	382,424

	California 2018 Enteric Fermentation Emissions				
Dairy	**Total**	**Dairy Cows**	**Dairy Heifers 0-12 mo**	**Dairy Heifers 12-24 mo**	**Dairy Calves**
Total CH4 (tonnes):	305,419	251,841	9,493	33,715	10,370
Total CO2e (tonnes):	7,635,469	6,296,023	237,319	842,871	259,257

Feedlot:

Total CH4 (tonnes):	120,529
Total CO2e (tonnes):	3,013,235

CH4 GWP: 25

Source: CARB 2000-2018 GHG Inventory Query Tool, 13th Edition. Most recent year available (2018). Available at: https://www.arb.ca.gov/app/ghg/2000_2018/ghg_sector.php. Accessed April 2021.

Table A.35
Feedlot Cattle Herd Counts for Enteric Fermentation and Manure Management Calculations

Category	Feedlot Cattle[1]
California (2018)[2]	1,928,552
Tulare County (2019)[3]	179,261

Notes:

1. California inventory: Reflects all cattle other than dairy cows, replacement dairy heifers (0-24 months), and dairy calves. Tulare inventory: Reflects all animals in feedlot facilities and mature bulls identified in dairies.
2. California populations are from the CARB 2000-2018 GHG Inventory Query Tool, 13th Edition. Most recent year available (2018). Available at: https://www.arb.ca.gov/app/ghg/2000_2018/ghg_sector.php. Accessed April 2021.
3. 2019 year cattle populations were provided by Tulare County.

Table A.36
Emissions from Enteric Digestion and Manure Management - Feedlots

Source	Enteric Digestion	Manure Management	
	CH_4 (MT/yr)	CH_4 (MT/yr)	N_2O (MT/yr)
California (2018)[1]	120,529	5,191	994
Tulare County (2019)[2]	11,203	482	92

Notes:

1. California CH4 and N2O emissions are from are from the CARB 2000-2018 GHG Inventory Query Tool, 13th Edition. Most recent year available (2018). Available at: https://www.arb.ca.gov/app/ghg/2000_2018/ghg_sector.php. Accessed April 2021.

2. CARB and EPA use the same methodology to estimate emissions from enteric fermentation and manure management. As such, this table assumes that Tulare emissions are proportional to the California emissions based on animal population.

Table A.37
CARB GHG Inventory - Manure Management
GHG Emission Inventory Summary [2000 - 2018]
Main Sector: Agriculture & Forestry
Sub Sector Level 1: Manure Management
Sub Sector Level 2: Cattle
Inventory Accounting: Included
Measurement: CO2Eq
GWP: AR4
Unit: million tonnes

Inventory Accounting	Main Sector	Sub Sector Level 1	Sub Sector Level 2	Sub Sector Level 3	Main Activity	Activity Subset	GHG	2018 Emission (million MT/yr)
Included	Agriculture & Forestry	Manure Management	Cattle	Anaerobic digester	Livestock population	Dairy cows	CH4	0.0427
Included	Agriculture & Forestry	Manure Management	Cattle	Anaerobic digester	Livestock population	Dairy cows	N2O	0.0067
Included	Agriculture & Forestry	Manure Management	Cattle	Anaerobic lagoon	Livestock population	Dairy cows	CH4	8.4104
Included	Agriculture & Forestry	Manure Management	Cattle	Anaerobic lagoon	Livestock population	Dairy cows	N2O	0.3282
Included	Agriculture & Forestry	Manure Management	Cattle	Daily spread	Livestock population	Dairy cows	CH4	0.0104
Included	Agriculture & Forestry	Manure Management	Cattle	Daily spread	Livestock population	Dairy cows	N2O	0.0137
Included	Agriculture & Forestry	Manure Management	Cattle	Daily spread	Livestock population	Dairy heifers	CH4	0.0014
Included	Agriculture & Forestry	Manure Management	Cattle	Daily spread	Livestock population	Dairy heifers	N2O	0.0025
Included	Agriculture & Forestry	Manure Management	Cattle	Deep pit	Livestock population	Dairy cows	CH4	0.0066
Included	Agriculture & Forestry	Manure Management	Cattle	Deep pit	Livestock population	Dairy cows	N2O	0.0006
Included	Agriculture & Forestry	Manure Management	Cattle	Dry lot	Livestock population	Dairy heifers	CH4	0.0338
Included	Agriculture & Forestry	Manure Management	Cattle	Dry lot	Livestock population	Dairy heifers	N2O	0.4464
Included	Agriculture & Forestry	Manure Management	Cattle	Dry lot	Livestock population	Feedlot - heifers 500+ lbs	CH4	0.0096
Included	Agriculture & Forestry	Manure Management	Cattle	Dry lot	Livestock population	Feedlot - heifers 500+ lbs	N2O	0.0994
Included	Agriculture & Forestry	Manure Management	Cattle	Dry lot	Livestock population	Feedlot - steers 500+ lbs	CH4	0.0179
Included	Agriculture & Forestry	Manure Management	Cattle	Dry lot	Livestock population	Feedlot - steers 500+ lbs	N2O	0.1959
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Dairy cows	CH4	1.2906
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Dairy cows	N2O	0.2001
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Dairy heifers	CH4	0.0073
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Dairy heifers	N2O	0.0016
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Feedlot - heifers 500+ lbs	CH4	0.0034
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Feedlot - heifers 500+ lbs	N2O	0.0004
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Feedlot - steers 500+ lbs	CH4	0.0034
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Feedlot - steers 500+ lbs	N2O	0.0004
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Dairy cows	CH4	0.0020
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Dairy heifers	CH4	0.0004
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Not on feed - beef cows	CH4	0.0479
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Not on feed - bulls 500+ lbs	CH4	0.0058
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Not on feed - calves <500 lbs	CH4	0.0171
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Not on feed - heifers 500+ lbs	CH4	0.0103
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Not on feed - steers 500+ lbs	CH4	0.0143
Included	Agriculture & Forestry	Manure Management	Cattle	Solid storage	Livestock population	Dairy cows	CH4	0.0719
Included	Agriculture & Forestry	Manure Management	Cattle	Solid storage	Livestock population	Dairy cows	N2O	0.0907

GWP:	
CH4	25
N2O	298

California 2018 Manure Management Emissions - Feedlot

Total CO2e from CH4:	129,772	MT/yr
Total CO2e from N2O:	296,235	MT/yr
Total CH4:	5,191	MT/yr
Total N2O:	994	MT/yr

Source: CARB 2000-2018 GHG Inventory Query Tool, 13th Edition. Most recent year available (2018). Available at: https://www.arb.ca.gov/app/ghg/2000_2018/ghg_sector.php. Accessed April 2021.

Table A.38
Global Warming Potentials

CO_2	CH_4	N_2O	HFC-23
1	25	298	14,800

Note: Values are 100-yr GWPs from the IPCC fourth assessment report (AR4). GWPs are consistent with the CARB California Greenhouse Gas Emission Inventory Program. Available: https://ww2.arb.ca.gov/our-work/programs/ghg-inventory-program. Accessed June 30, 2020.

Appendix B – 2019 Emission Reduction Calculations

Appendix B - GHG Emission Reductions

Table B.1
GHG Emission Reductions from a Hypothetical 1,000 kW Solar Panel Project in Tulare County

Description	DC System Size (kW)	System Output (kWh/year)[1]	GHG Reduction Over 30-Year Lifetime ($MT CO_2e$)[2]	GHG Reduction Over 5 Years ($MT CO_2e$)[3]	GHG Reduction Over 1 Year ($MT CO_2e$)[3]
Standard module, fixed array (open rack), 20 deg tilt, 180 deg azim	1,000	1,604,034	10,621	1,770	354

Notes:

1. Source: National Renewable Energy Laboratory (NREL) PVWatts Calculator, version 6.1.4. Available at: https://pvwatts.nrel.gov. Accessed: 4/2021.
2. Source: CARB, Low-Income Weatherization Program: Single-Family Energy Efficiency and Solar Photovoltaics Multi-Family Energy Efficiency and Renewables. January 1, 2019. Website: https://ww2.arb.ca.gov/resources/documents/cci-quantification-benefits-and-reporting-materials. Acessed: April, 2021.
3. GHG reductions over 5 and 1 years were scaled from the 30-year reductions.

Table B.2
GHG Emission Reductions from Solar Panel Projects at Tulare County Dairies

Facility Name[1]	Permit #	Permit Issue Date	Finaled Date	Size (kW)	5-Year GHG Reduction ($MT CO_2e$)[2]	Annual GHG Reduction ($MT CO_2e$)[2]	CY 2019 GHG Reduction ($MT CO_2e$)[3]
Fern Oak Farms	A1301506	7/2/2013	11/6/2014	922	1,632	326	326
DG Farms	A1403104	12/9/2014	3/11/2015	1,109	1,963	393	393
Moonlight Dairy	A1500022	2/10/2015	4/22/2015	1,109	1,963	393	393
Rancho Teresita Dairy	A1402852	11/19/2014	4/29/2015	1,122	1,986	397	397
Four Star Fruit	A1403112	12/3/2014	6/11/2015	1,269	2,246	449	449
Terra Linda Dairy	A1500299	3/9/2015	8/14/2015	830	1,469	294	294
Legacy Ranch #2 Dairy	A1500954	4/21/2015	9/8/2015	840	1,487	297	297
Pete Vander Poel Dairy	A1500778	4/2/2015	9/23/2015	1,098	1,944	389	389
Bar VP Dairy	A1500799	4/16/2015	9/23/2015	1,098	1,944	389	389
Ron Verhoeven Family Dairy	A1403278	1/26/2015	10/19/2015	820	1,452	290	290
Lemstra Dairy	A1501662	6/11/2015	11/10/2015	840	1,487	297	297
Robert Vander Eyk & Sons Dairy	A1503907	12/1/2015	3/11/2016	1,107	1,960	392	392
5 Star Dairy	A1503908	12/1/2015	4/20/2016	1,110	1,965	393	393
Dystra Dairy	A1504116	12/1/2015	4/29/2016	1,046	1,852	370	370
Parreira Gaspar Dairy	A1600266	3/9/2016	5/27/2016	539	953	191	191
Riverbend Farms Dairy	A1600733	3/16/2016	7/21/2016	1,107	1,960	392	392
Manuel C Leal Diary	A1601333	5/10/2016	8/11/2016	520	920	184	184
SBS AG	A1601142	5/10/2016	8/25/2016	762	1,348	270	270
Friesian Farms[c]	A1601590	6/15/2016	9/16/2016	1,107	1,960	392	392
F&L Barcellos Dairy	A1601056	4/13/2016	9/20/2016	573	1,015	203	203
T-Bar Dairy	A1601861	7/8/2016	9/27/2016	682	1,208	242	242
Felicita Dairy	A1601593	6/15/2016	10/21/2016	1,109	1,963	393	393
JR Dairy[c]	A1601592	6/15/2016	11/23/2016	1,107	1,960	392	392
Oakview Dairy	A1601996	8/3/2016	12/12/2016	1,107	1,960	392	392
KG Farms	A1602619	8/31/2016	12/12/2016	254	450	90	90
Four J Farms and Jerseys	A1602867	10/3/2016	12/12/2016	962	1,703	341	341
Vanderham West Dairy	A1600476	3/15/2016	12/13/2016	1,105	1,956	391	391
Arthur Leyendekker Dairy	A1600755	3/31/2016	12/15/2016	544	963	193	193
Horizon Dairy Tipton (Horizon Jersies)	A1602130	7/20/2016	4/19/2017	840	1,488	298	298
Rob Van Grouw Dairy	A1603967	1/18/2017	4/20/2017	1,107	1,960	392	392
Aukeman Farms	A1603968	2/2/2017	4/21/2017	1,107	1,960	392	392
Airoso Dairy	A1700087	2/2/2017	5/1/2017	1,111	1,967	393	393
R&M Cattle	A1604445	2/2/2017	5/11/2017	1,107	1,960	392	392
Mario Simoes Family Dairy	A1603927	12/29/2016	5/23/2017	1,111	1,967	393	393
Decade Dairy LLC	A1700354	2/22/2017	5/24/2017	928	1,643	329	329
Jer-Z Boyz Ranch	A1700741	4/10/2017	5/31/2017	1,107	1,960	392	392
Vander Tuig Dairy	A1700780	4/5/2017	6/2/2017	670	1,186	237	237
Skyline Dairy	A1700088	2/2/2017	6/8/2017	803	1,421	284	284
Heritage Dairy	A1700739	4/5/2017	6/13/2017	737	1,305	261	261
Willem De Boer Dairy	A1700783	4/5/2017	6/13/2017	1,101	1,949	390	390
Schott Dairy	A1604446	2/2/2017	6/15/2017	1,107	1,960	392	392
Sierra Cattle Company	A1700593	3/7/2017	6/15/2017	1,101	1,949	390	390
John Mendonca & Son Dairy	A1700782	4/5/2017	6/15/2017	365	646	129	129
Scheenstra Dairy	A1700857	4/5/2017	6/15/2017	928	1,643	329	329

Table B.2
GHG Emission Reductions from Solar Panel Projects at Tulare County Dairies

Facility Name[1]	Permit #	Permit Issue Date	Finaled Date	Size (kW)	5-Year GHG Reduction ($MT CO_2e$)[2]	Annual GHG Reduction ($MT CO_2e$)[2]	CY 2019 GHG Reduction ($MT CO_2e$)[3]
Tom Dejong Dairy	A1700859	4/5/2017	6/15/2017	1,111	1,967	393	393
John Scheenstra Dairy	A1701020	4/5/2017	6/15/2017	180	318	64	64
Boertje & Sons Dairy	A1700740	4/10/2017	6/16/2017	556	984	197	197
Riverbend Dairy	A1701277	5/10/2017	6/22/2017	678	1,200	240	240
S&S Dairy	A1600425	4/25/2016	8/9/2017	1,100	1,947	389	389
Cornerstone Dairy	A1603456	11/8/2016	12/7/2017	1,116	1,975	395	395
Richard Westra Dairy	A1702954	10/24/2017	12/14/2017	1,107	1,959	392	392
Rijlaarsdam Dairy	A1701786	7/3/2017	12/19/2017	653	1,156	231	231
Joe Simoes Family Dairy	A1700781	4/5/2017	4/15/2018	522	924	185	185
Vander Eyk Dairy	A1800879	4/12/2018	10/22/2018	1,107	1,960	392	392
Jongsma Dairy	A1802264	8/20/2018	11/5/2018	582	1,030	206	206
Will De Groot	A1801463	5/09/2018	11/7/2018	376	666	133	133
Will De Groot	A1801464	7/25/2018	11/7/2018	376	666	133	133
Nunes & Sons Dairy	A1801196	6/14/2018	11/20/2018	790	1,398	280	280
SBS Ag Dairy	A1402386	9/25/2014	n/a	962	1,703	341	0
Curtimade Dairy	A1501019	5/17/2016	n/a	412	729	146	0
Avenue 128 Dairy	A1601191	5/24/2016	n/a	600	1,062	212	0
GTA Dairy	A1602329	8/2/2016	n/a	696	1,232	246	0
Mendonca Dairy	A1603966	12/29/2016	n/a	480	849	170	0
Junio Dairy	A1604447	2/2/2017	n/a	306	541	108	0
Edwin Brasil Dairy	A1702384	Ready To Issue	n/a	679	1,202	240	0
Rijlaarsdam Dairy	A1701785	7/3/2017	n/a	1,330	2,354	471	0
Bosman Dairy	A1801627	7/10/2018	n/a	662	1,171	234	0
Milk Maid Dairy	A2000293	4/30/2020	11/24/2020	1,084	1,919	384	0
D & V Dairy	A2000454	4/1/2020	11/9/2020	1,085	1,921	384	0
Visser	A2000718	4/20/2020	6/15/2020	771.4	1,365	273	0
Dick Vanderham & Sons Dairy	A2001506	7/14/2020	n/a	1080.0	1,912	382	0
Holstein Farms	A2001542	7/14/2020	12/23/2020	1086.4	1,923	385	0
Van Beek Brothers Dairy	A2002832	12/1/2020	n/a	1080.0	1,912	382	0
Solar Projects Operating in 2019	**58**	--	--	**51,281**	**90,773**	**18,155**	**18,155**
Solar Projects Projected in 2020+	**6**	--	--	**6,187**	**10,951**	**2,190**	--

Notes:

1. Source for project list: Tulare County Resource Management Agency. Dairy Solar List Updated 3-23-2020.xlsx. Email from Jason Garcia-LoBue, MPA, Chief Planner. March 24, 2021.
2. GHG reductions were estimated using CARB's Benefits Calculator Tool for the Low-Income Weatherization Program: Single-Family Energy Efficiency and Solar Photovoltaics Multi-Family Energy Efficiency and Renewables.
3. The calendar year 2019 emission reductions for Projects with permits issued in 2019 and prior were prorated by the number of days remaining in 2019.

Table B.3
GHG Emission Reductions from Solar Thermal Hot Water Systems at Tulare County Dairies

Facility Name[(1)]	Permit #	Size (MBtu)	5-Year GHG Reduction (MT CO_2e)	Annual GHG Reduction (MT CO_2e)[(2)]	CY 2019 GHG Reduction (MT CO_2e)[(3)]
Nunes and Sons Dairy	A1702065	1,005	3.4	0.68	0.68
Souza Dairy	A1702083	1,005	3.4	0.68	0.68
Aveline Partners Dairy	A1702084	1,005	3.4	0.68	0.68
Total 2019 Operational Projects	**3**	**3,015**	**10.2**	**2.0**	**2.0**

Notes:

1. Source for project list: Tulare County Resource Management Agency. Dairy Solar List Updated 3-23-2020.xlsx. Email from Jason Garcia-LoBue, MPA, Chief Planner. March 24, 2021.
2. An average annual GHG reduction rate of 0.68 MT CO_2e/year per residential system was obtained from California Solar Initiative (CSI)-Thermal Program Data. CSI-Thermal Program Data.xlsx.
   Website: http://www.csithermalstats.org/download.html. Accessed June 8, 2020.
3. All systems were installed prior to 2018 and therefore produced full year reductions in 2018 and 2019.

Table B.4
GHG Emission Reductions from Digester Projects at Tulare County Dairies

Facility Name[1]	Facility ID Number	Project Title	Location	Start of Full Operation	10-Year GHG Reduction ($MT CO_2e$)[3]	5-Year GHG Reduction ($MT CO_2e$)[4]	Annual GHG Reduction ($MT CO_2e$)[4]	CY 2019 GHG Reduction ($MT CO_2e$)[5]
2017 Operation								
GJ TeVelde Ranch[2]	246	GJ Te Velde Tipton Dairy Digester	Tipton	6/5/2017	189,080	94,540	18,908	18,908
2018 Operation								
Circle A Dairy	358	Circle A Dairy Digester Fuel Pipeline Project	Pixley	8/30/2018	138,745	69,373	13,875	13,875
R Vander Eyk Dairy	265A	R Vander Eyk Dairy Digester Fuel Pipeline Project	Pixley	12/17/2018	132,586	66,293	13,259	13,259
Legacy Dairy	241	Legacy Dairy Digester Fuel Pipeline	Pixley	12/3/2018	207,209	103,605	20,721	20,721
2019 New Projects								
Van Beek[2]	256	Van Beek Brothers Dairy Digester	Tipton	1/7/2019	106,240	53,120	10,624	10,449
Cornerstone Dairy	313	Cornerstone Dairy Digester Pipeline Project	Tipton	4/17/2019	185,238	92,619	18,524	13,144
Sousa & Sousa Dairy	236	Sousa & Sousa Dairy Digester Pipeline Project	Tipton	7/17/2019	68,700	34,350	6,870	3,162
Vander Poel Dairy	330	Vander Poel Dairy Digester Pipeline Project	Pixley	8/6/2019	290,060	145,030	29,006	11,761
Hilarides[2]	346	Hilarides Dairy Digester Renovation	Lindsay	8/30/2019	564,000	282,000	56,400	19,161
K&M Visser Dairy	326	K&M Visser Dairy Digester Fuel Pipeline Project	Pixley	9/3/2019	205,553	102,777	20,555	6,758
Riverview Dairy	328	Riverview Dairy Digester Pipeline Project	Pixley	10/3/2019	90,093	45,047	9,009	2,221
Little Rock Dairy; Blue Moon Dairy	40	Little Rock Centralized Dairy Digester Pipeline Project	Tipton	12/13/2019	146,839	73,420	14,684	764
2020+ Projected New Projects								
S&S Dairy Biogas	226	S&S Dairy Biogas	Visalia	TBD	167,417	83,709	16,742	0
Pixley Dairy		Pixley Dairy Digester Fuel Pipeline Project	Pixley	TBD	215,321	107,661	21,532	0
Moonlight Dairy Biogas	298	Moonlight Dairy Biogas	Visalia	TBD	154,834	77,417	15,483	0
Bos Farms Dairy Biogas	33	Bos Farms Dairy Biogas	Tulare	TBD	168,398	84,199	16,840	0
Hamstra Dairy Biogas	118	Hamstra Dairy Biogas	Tulare	TBD	205,115	102,558	20,512	0
Rancho Teresita Dairy Biogas	139	Rancho Teresita Dairy Biogas	Tulare	TBD	236,251	118,126	23,625	0
4K Dairy	218	4K Dairy Digester Pipeline Project	Pixley	TBD	192,143	96,072	19,214	0
Aukeman Farms Dairy Biogas	61	Aukeman Dairy Biogas	Tulare	TBD	207,701	103,851	20,770	0
Decade Energy LLC	359	Decade Centralized Dairy Digester Pipeline Project	Tulare	TBD	192,558	96,279	19,256	0
Double J Dairy Biogas	245	Double J Dairy Biogas	Visalia	TBD	285,496	142,748	28,550	0
Dykstra Dairy Biogas	323	Dykstra Dairy Biogas	Tulare	TBD	265,936	132,968	26,594	0
The El Monte Dairy Biogas	255	El Monte Dairy Biogas	Tipton	TBD	118,903	59,452	11,890	0
FM Jersey Biogas LLC	185	FM Jerseys Dairy Digester Virtual Pipeline Project	Tipton	TBD	161,960	80,980	16,196	0
Horizon Jersey Dairy Biogas	336	Horizon Jersey Dairy Biogas	Tipton	TBD	335,398	167,699	33,540	0
Jacobus De Groot #2 Dairy	63	Jacobus De Groot #2 Dairy Biogas	Visalia	TBD	61,616	30,808	6,162	0
Mellema Dairy Biogas	177	Mellema Dairy Biogas	Visalia	TBD	152,057	76,029	15,206	0
Milky Way Dairy Biogas	67	Milky Way Dairy Biogas	Visalia	cancelled				
Mineral King Dairy Biogas	364	Mineral King Dairy Biogas	Visalia	TBD	194,751	97,376	19,475	0
Rancho Sierra Vista Dairy Biogas	108	Rancho Sierra Vista Dairy Biogas	Visalia	TBD	172,958	86,479	17,296	0
Riverbend Dairy Biogas	189	Riverbend Dairy Biogas	Tulare	TBD	245,930	122,965	24,593	0
Rob Van Grouw Dairy Biogas	261	Rob Van Grouw Dairy Biogas	Visalia	TBD	140,442	70,221	14,044	0
Udder Dairy Biogas	19	Udder Dairy Biogas	Visalia	TBD	135,706	67,853	13,571	0
Scheenstra Dairy	300	Scheenstra Dairy Biogas	Tulare	TBD	220,360	110,180	22,036	0

Table B.4
GHG Emission Reductions from Digester Projects at Tulare County Dairies

Facility Name[1]	Facility ID Number	Project Title	Location	Start of Full Operation	10-Year GHG Reduction ($MT CO_2e$)[3]	5-Year GHG Reduction ($MT CO_2e$)[4]	Annual GHG Reduction ($MT CO_2e$)[4]	CY 2019 GHG Reduction ($MT CO_2e$)[5]
Clearlake Dairy[2]	151	Clearlake Dairy Digester Pipeline Project	Tulare	TBD	95,510	47,755	9,551	0
JR Dairy	TBD	JR Dairy Digester Pipeline	Tulare	TBD	191,049	95,525	19,105	0
Fern Oaks Dairy	346	Fern Oaks Dairy Digester Pipeline Project	Tulare	TBD	169,370	84,685	16,937	0
Mario Simoes Family Dairy; Joe M Simoes Family Dairy	TBD	Simoes Centralized Digester Pipeline Project	Tipton	TBD	161,275	80,638	16,128	0
Schott Dairy	342	Schott Dairy Digester Pipeline Project	Tulare	TBD	129,082	64,541	12,908	0
Hettinga Dairy Farm; Avenue 128 Dairy	122	Hettinga Centralized Dairy Digester Pipeline Project	Tulare	TBD	167,339	83,670	16,734	0
Northstar Dairy	299	Northstar Dairy Digester Pipeline Project	Tulare	TBD	170,658	85,329	17,066	0
Gerben Leyendekker Dairy	11	Gerben Leyendekker Dairy Biogas	Visalia	TBD	85,419	42,710	8,542	0
Friesian Farms Dairy	101	Friesian Farms Dairy Biogas	Tulare	TBD	63,145	31,573	6,315	0
Ribeiro Dairy	215	Ribeiro Dairy Biogas	Tulare	TBD	132,348	66,174	13,235	0
GP Dairy		GP Dairy Biogas	Tulare	TBD	50,722	25,361	5,072	0
Rio Blanco Dairy	289	Rio Blanco Dairy Biogas	Tulare	TBD	100,886	50,443	10,089	0
Curtimade Dairy	56	Curtimade Dairy Biogas	Tulare	TBD	174,734	87,367	17,473	0
Elk Creek Dairy	50	Elk Creek Dairy Biogas	Tulare	TBD	59,555	29,778	5,956	0
Rib-Arrow Dairy	213	Rib-Arrow Dairy Biogas	Tulare	TBD	76,343	38,172	7,634	0
Art Leyendekker Dairy	76	Art Leyendekker Dairy Biogas	Tulare	TBD	77,697	38,849	7,770	0
Elkhorn Dairy	324	Elkhorn Dairy Biogas	Tulare	TBD	211,940	105,970	21,194	0
Dairyland Farms Dairy	352	Dairyland Farms Dairy Biogas	Tulare	TBD	177,475	88,738	17,748	0
De Boer Dairy	60	De Boer Dairy Digester Pipeline Project	Tulare	TBD	191,647	95,824	19,165	0
Digester Projects Operating in 2019	**12**	--	--	--	**2,324,343**	**1,162,172**	**232,434**	**134,183**
Digester Projects Projected in 2020+	**41**	--	--	--	**6,717,445**	**3,358,723**	**671,745**	--

Notes:

1. Source for project lists: California Department of Food and Agriculture. Dairy Digester Research and Development Program. Projects Selected for Award of Funds. Online: https://www.cdfa.ca.gov/oefi/ddrdp/. Accessed: April 8, 2020.
2. Projects not included on the CDFA project list but identified by Tulare County RMA as part of the Dairy Digester Research and Development Program.
3. The 10-year GHG reductions were estimated by the recipient.
4. 5-Year and annual GHG reductions were scaled from the 10-year reductions by the number of years.
5. The calendar year 2018 emission reductions for Projects that started full operation in 2018 were prorated by the number of days remaining in 2018.

Table B.5
GHG Emission Reductions from Alternative Manure Management Projects at Tulare County Dairies

Facility ID	Facility Name[1]	Project Title	Start of Full Operation	5-Year GHG Reduction ($MT CO_2e$)[2]	Annual GHG Reduction ($MT CO_2e$)[3]	CY 2019 GHG Reduction ($MT CO_2e$)[4]
64	Sierra View Dairy	Sierra View Dairy AMMP Grant (pasture based management; conversion from flush to scrape; solar drying)	1/1/2018	35,050	7,010	7,010
25	Milk River	Milk River GHG Reduction Project (conversion from flush to scrape; solar drying)	4/1/2019	16,012	3,202	2,413
58	SBS AG	Solid Separation (conversion from settling ponds to processing pit and separating system)	5/1/2019	7,887	1,577	1,059
104	Henry A. Garcia Dairy	Flush to scrape	2020	25,720	5,144	0
	Creekside Dairy	Solid separation	2020	9,150	1,830	0
194	Rainimaid	Compost bedded pack barn	2020	8,930	1,786	0
20	Jesse & James Jongsma Dairy	Solid separation	2020	7,193	1,439	0
144	Westwood Farms	Compost bedded pack barn	2020	20,422	4,084	0
133	James Jongsma Dairy	Solid separation	2020	2,719	544	0
28	A&L Dairy	Solid separation	10/1/2020	2,620	524	0
210	Backroad Ranch	Compost bedded pack barn	2020	13,639	2,728	0
190	Brian James Jongsma Dairy	Solid separation	2020	4,988	998	0
350	South Creek Dairy	Solid separation	2020	16,197	3,239	0
AMMP Projects Operating in 2019		**3**	--	**58,949**	**11,790**	**10,482**
AMMP Projects Projected in 2020+		**10**	**--**	**111,578**	**22,316**	**--**

Notes:

1. Source for project lists: California Department of Food and Agriculture. *1.B. - AMMP FOR TULARE COUNTY 2020.xlsx* provided by Tulare County.
2. The 5-year GHG reductions were estimated by the recipient.
3. Annual GHG reductions were assumed to be 1/5 of the 5-year reductions.
4. The calendar year emission reductions for Projects were prorated by the number of days remaining in that calendar year.

ATTACHMENT NO 1:
EXHIBIT B

EXHIBIT "B"

ALTERNATIVE MANURE MANAGEMENT PROGRAM FOR TULARE COUNTY

Dairy Facility ID Number	Year Awarded Grant	Project Title	Project Description	Total Cost	CDFA Funding	Matching Funds	Construction Status	Location	GHG Reduction (5 years) (in $MTCO_2e$)
64	2017	Sierra View Dairy AMMP Grant	Remodel Existing Dairy, with both Open Lot corrals and Covered milk cow Feed Lanes flushed facility to a bed-pack compost barn (pasture based management) and collect manure from feed lanes through scraping with mobile equipment with scraper (conversion of flush to scrape). All scraped material will be dried utilizing open solar drying.	$ 1,627,520.00	$ 750,000.00	$ 877,520.00	Construction Complete	13376 Avenue 224, Tulare County	35,050
25	2017	Milk River GHG Reduction Project	Reducing greenhouse gas emissions by 72% by introducing a vacuum scraping system into our previously flushed lanes to collect lactating cow manure. This scraped product will be run through screw presses to reduce the moisture content. This manure will then be solar dried for future use as bedding or field nutrient/amendments. This process will prevent the manure from entering the anaerobic conditions present in the manure lagoons.	$ 395,358.00	$ 395,358.00	$ -	Began operating in April of 2019	34292 Road 124, Tulare County	16,012
104	2018	Henry A. Garcia Dairy	Converting flush lanes to a vacuum scrape system utilizing a Loewen Honey Vac. Collected manure will be deposited in a newly constructed concrete bunker, processed through a de-watering screw press and then receiving a second treatment through the existing sloped screen separator. Separated solids will then be spread on a concrete solar drying pad for final drying and stock piled and covered to prevent re-watering. By reducing the organic matter entering the lagoon system we will reduce our greenhouse gas emissions by 79% annually. The total estimated mtCO2e reduction over a 5 year period is 25,720 and reductions should continue to accumulate after.	$ 503,501.00	$ 503,501.00	$ -	Not Yet Applied to County	12521 Avenue 200, Tulare, Tulare County	25,720
58	2018	SBS AG	Change of Waste Water Handling and Solid Collection Management for the reduction of GHG produced. Converting from Settling Ponds to Processing pit and Separating System to capture volatile solids before the lagoons.	$ 786,308.00	$ 385,404.00	$ 400,904.00	Began operating in May of 2019	7123 Avenue 204, Tulare County	7,887
	2019	Creekside Dairy	Solid Separation	$ 611,642.00	$ 611,642.00	$ -		Tulare County	9,150
194	2019	Rainimaid	Compost Bedded Pack Barn	$ 1,188,883.00	$ 749,820.00	$ 439,063.00	Applications to County and Construction to begin Q3 2020	33640 Road 124, Tulare County	8,930
20	2019	Jesse & James Jongsma Dairy	Solid Separation	$ 816,117.00	$ 750,000.00	$ 66,117.00	Not Yet Applied to County	6780 Avenue 144, Tulare County	7,193

EXHIBIT "B"

144	2019	Westwood Farms	Compost Bedded Pack Barn	$ 1,058,201.00	$ 749,698.00	$ 308,503.00		Tulare County	20,422
133	2019	James Jongsma Dairy	Solid Separation	$ 727,508.00	$ 727,508.00	$ -	Not Yet Applied to County	9229 Road 164, Tulare County	2,719
28	2019	A&L Dairy	Solid Separation	$ 420,189.00	$ 420,189.00	$ -	Will began operating in Octoberl of 2020	23929 Road 48, Tulare County	2,620
210	2020	Backroad Ranch	Compost Bedded Pack Barn	$ 940,800.00	$ 750,000.00	$ 190,800.00	CDFA Grant Agreement Execution in Progress	22000 Road 28, Tulare	13,639
190?	2020	Brian James Jongsma Dairy	Solid Separation	$ 911,150.00	$ 750,000.00	$ 161,150.00	CDFA Grant Agreement Execution in Progress	16026 Road 132, Tulare	4,988
350	2020	South Creek Dairy	Solid Separation	$ 805,144.00	$ 750,000.00	$ 55,144.00	CDFA Grant Agreement Execution in Progress	11450 Avenue 64, Earlimart	16,197
				$ 10,792,321.00	$ 8,293,120.00	$ 2,499,201.00			170,527

ATTACHMENT NO 1:

EXHIBIT C

EXHIBIT "C"

Dairy No.	Operation Name	Project Title	Total Cost	CDFA Funding	Matching Funds	Construction Status	Location	GHG Reduction (10 years) (in $MTCO_2e$)	How Captured Methane is Used	Year of Application	Developer or Vendor for Project Implementation and/or Operation	Start of Full Operation	Reference
60	De Boer Dairy	De Boer Dairy Digester Pipeline Project	$ 3,650,523.00	$ 1,825,261.00	$ 1,825,262.00	0 Percent Complete	14799 and 14976 Avenue 168,Tulare County	191,647	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works	In constuction, not functional.	
352	Dairyland Farms Dairy	Dairyland Farms Dairy Biogas	$ 4,900,813.00	$ 1,760,347.00	$ 3,140,466.00	Under Construction, 2 Percent Completed	15920 Road 152, Tulare County	177,475	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy		
324	Elkhorn Dairy	Elkhorn Dairy Biogas	$ 6,645,917.00	$ 2,125,882.00	$ 4,520,035.00	Under Construction, 2 Percent Completed	10400 Avenue 368, Tulare County	211,940	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy		
76	Art Leyendekker Dairy	Art Leyendekker Dairy Biogas	$ 3,685,068.00	$ 769,784.00	$ 2,915,284.00	Under Construction, 3 Percent Complete	8651 Avenue 388, Dinuba, Tulare County	77,697	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy		
213	Rib-Arrow Dairy	Rib-Arrow Dairy Biogas	$ 4,175,150.00	$ 657,231.00	$ 3,517,919.00	Under Construction, 29 Percent Complete	18287 Road 136, Tulare County	76,343	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy		
50	Elk Creek Dairy	Elk Creek Dairy Biogas	$ 4,109,208.00	$ 512,706.00	$ 3,596,502.00	Under Construction, 36 Percent Completed	17993 Road 96, Tulare County	59,555	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy		
56	Curtimade Dairy	Curtimade Dairy Biogas	$ 4,773,194.00	$ 1,747,336.00	$ 3,025,858.00	Under Construction, 2 Percent Completed	18337 Road 24, Tulare County	174,734	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy		
289	Rio Blanco Dairy	Rio Blanco Dairy Biogas	$ 3,558,815.00	$ 1,002,797.00	$ 2,556,018.00	Under Construction, 2 Percent Completed	5041 Avenue 192, Tulare County	100,886	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy		

EXHIBIT "C"

	GP Dairy	GP Dairy Biogas	$ 3,418,177.00	$ 502,554.00	$ 2,915,623.00	Under Construction, 4 Percent Complete	Tulare County	50,722	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy		
215	Ribeiro Dairy	Ribeiro Dairy Biogas	$ 3,814,042.00	$ 1,124,962.00	$ 2,689,080.00	Under Construction	17983 Road 128, Tulare, Tulare County	132,348	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy		
101	Friesian Farms Dairy	Friesian Farms Dairy Biogas	$ 3,814,785.00	$ 639,602.00	$ 3,175,183.00	Under Construction, 3 Percent Complete	5593 Avenue 176, Tulare, Tulare County	63,145	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy		
11	Gerben Leyendekker Dairy	Gerben Leyendekker Dairy Biogas	$ 3,748,357.00	$ 845,589.00	$ 2,902,768.00	Under Construction, 3 Percent Complete	8517 Avenue 360, Visalia, Tulare County	85,419	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy		
299	Northstar Dairy	Northstar Dairy Digester Pipeline Project	$ 3,152,876.00	$ 1,576,438.00	$ 1,576,438.00	Under Construction, 23 Percent Complete	12718 Road 144, Tulare County	170,658	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works	In construction, not functional	
121 and/or 122	Hettinga Dairy Farm; Avenue 128 Dairy	Hettinga Centralized Dairy Digester Pipeline Project	$ 4,705,818.00	$ 2,352,909.00	$ 2,352,909.00	Under Construction, 38 Percent Complete	13002 Avenue 128 and/or 13400 Avenue 120, Tipton, Tulare County	167,339	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works	In construction, not functional	
342	Schott Dairy	Schott Dairy Digester Pipeline Project	$ 2,889,184.00	$ 1,444,592.00	$ 1,444,592.00	Under Construction, 3 Percent Complete	13602 Road 96, Tulare County	129,082	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works	In construction, not functional	
97, 231, 232, 233, and/or 234	Mario Simoes Family Dairy; Joe M Simoes Family Dairy	Simoes Centralized Digester Pipeline Project	$ 4,072,920.00	$ 2,036,460.00	$ 2,036,460.00	Under Construction, 2 Percent Completed	13185 Avenue 136, Tipton, and 13585 Road 136, Tipton, Tulare County	161,275	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works	In construction, not functional	

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~~346~~ 337	Fern Oaks Dairy	Fern Oaks Dairy Digester Pipeline Project	$ 3,377,788.00	$ 1,688,894.00	$ 1,688,894.00	Under Construction, 3 Percent Complete	~~24163 Road 188, Tulare County~~ 17001 Avenue 160, Porterville	169,370	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works	In construction, not functional	
207 and/or 249	JR Dairy	JR Dairy Digester Pipeline	$ 3,506,370.00	$ 1,753,185.00	$ 1,753,185.00	Approved by Tulare County in 2019	13806 Avenue 152 Tipton and/or 3800 Avenue 176 Tulare, Tulare County	168,134	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works	In construction, not functional	
151	Clearlake Dairy	Clearlake Dairy Digester Pipeline Project	$ 2,789,296.00	$ 1,394,648.00	$ 1,394,648.00	Not yet applied to Tulare County	24643 Road 36, Tulare County	95,510	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works	In development stages, not functional.	
330	Vander Poel Dairy	Vander Poel Dairy Digester Pipeline Project	$ 3,944,970.00	$ 1,972,485.00	$ 1,972,485.00	Operational, 11/18/2019	19493 Road 140, Pixley, Tulare County	290,060	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works	8/6/2019	Provided by Maas in 2020
19	Udder Dairy	Udder Dairy Biogas	$ 3,202,804.00	$ 1,153,459.00	$ 2,049,345.00	Under Construction, 90 Percent Complete	28723 Road 56, Visalia, Tulare County	135,701	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy		
236	Sousa & Sousa Dairy	Sousa & Sousa Dairy Digester Pipeline Project	$ 1,773,860.00	$ 886,934.00	$ 886,926.00	Operational, 11/18/2019	13510 Road 72, Tipton, Tulare County	68,700	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works	7/17/2019	Provided by Mass in 2020
300	Scheenstra Dairy	Scheenstra Dairy Biogas	$ 5,469,911.00	$ 1,873,064.00	$ 3,596,847.00	Under Construction, 90 Percent Complete	16900 Road 96, Tulare, Tulare County	220,360	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy		
261	Rob Van Grouw Dairy	Rob Van Grouw Dairy Biogas	$ 4,945,654.00	$ 1,193,757.00	$ 3,751,897.00	Under Construction, 90 Percent Complete	32843 Road 76, Visalia, Tulare County	140,442	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy		

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328	Riverview Dairy	Riverview Dairy Digester Pipeline Project	$ 2,664,140.00	$ 1,332,070.00	$ 1,332,070.00	Operational Completed 11/20/2019	9599 Avenue 88, Pixley, Tulare County	90,093	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works	10/3/2019	Provided by Mass in 2020
189	Riverbend Dairy	Riverbend Dairy Biogas	$ 4,822,385.00	$ 2,090,404.00	$ 2,731,981.00	Under Construction, 90 Percent Complete	20799 Road 132, Tulare, Tulare County	245,930	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy		
~~108~~ 36	Rancho Sierra Vista Dairy	Rancho Sierra Vista Dairy Biogas	$ 4,944,161.00	$ 1,470,143.00	$ 3,474,018.00	Under Construction, 90 Percent Complete	32866 Road 108, Visalia, Tulare County	172,958	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy	Permit finalized 3/12/2021	Digester Permit Information.xlsx
364	Mineral King Dairy	Mineral King Dairy Biogas	$ 5,071,416.00	$ 1,655,384.00	$ 3,416,032.00	Under Construction, 90 Percent Complete	33803 Road 108, Visalia, Tulare County	194,751	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy		
67	Milky Way Dairy	Milky Way Dairy Biogas	$ 7,198,161.00	$ 2,953,427.00	$ 4,244,734.00	Applications to County and Construction to begin Q3 2020	34800 Road 80, Visalia, Tulare County	347,462	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy		
177	Mellema Dairy	Mellema Dairy Biogas	$ 5,213,701.00	$ 1,292,485.00	$ 3,921,216.00	Under Construction, 90 Percent Complete	9420 Avenue 320, Visalia, Tulare County	152,057	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy		
40	Little Rock Dairy; Blue Moon Dairy	Little Rock Centralized Dairy Digester Pipeline Project	$ 4,193,156.00	$ 2,096,578.00	$ 2,096,578.00	Operational	13955 Road 80, Tipton, Tulare County	146,839	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works	12/13/2019	Provided by Mass in 2020
63	Jacobus De Groot #2 Dairy	Jacobus De Groot #2 Dairy Biogas	$ 3,381,424.00	$ 523,736.00	$ 2,857,688.00	Under Construction, 90 Percent Complete	8827 Avenue 312, Visalia, Tulare County	61,616	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy		

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336	Horizon Jerseys Dairy	Horizon Jerseys Dairy Biogas	$ 6,985,835.00	$ 2,850,886.00	$ 4,134,949.00	Under Construction, 75 Percent Complete	8798 Avenue 160, Tipton, Tulare County	335,398	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy		
185	FM Jerseys Dairy	FM Jerseys Dairy Digester Vitural Pipeline Project	$ 4,021,494.00	$ 2,010,747.00	$ 2,010,747.00	Under Construction, 51 Percent Complete	11595 Avenue 164, Tipton, Tulare County	161,960	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works	Functional 3/8/2021	
256 and/or 352	El Monte Dairy	El Monte Dairy Biogas	$ 4,132,977.00	$ 1,010,674.00	$ 3,122,303.00	Under Construction, 90 Percent Complete	10410 Avenue 160 and/or 15920 Road 152, Tipton, Tulare County	118,903	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy		
323	Dykstra Dairy	Dykstra Dairy Biogas	$ 5,696,457.00	$ 2,260,454.00	$ 3,436,003.00	Under Construction, 90 Percent Complete	6801 Avenue 176, Tulare, Tulare County	265,936	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy		
245	Double J Dairy	Double J Dairy Biogas	$ 6,716,522.00	$ 2,426,716.00	$ 4,289,806.00	Under Construction, 90 Percent Complete	6656 Avenue 328, Visalia, Tulare County	285,496	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy	1/27/2021	Digester Permit Information.xlsx
359	Decade Dairy; Richard Westra Dairy	Decade Centralized Dairy Digester Pipeline Project	$ 3,547,174.00	$ 1,773,587.00	$ 1,773,587.00	Completed 8/21/2019	3313 Avenue 256, Tulare, Tulare County	192,558	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works	In construction, not functional	
313	Cornerstone Dairy	Cornerstone Dairy Digester Pipeline Project	$ 2,532,107.00	$ 1,266,053.00	$ 1,266,054.00	Operational Completed 8/21/2019	8769 Avenue 128, Tipton, Tulare County	185,238	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works	4/17/2019	Provided by Mass in 2020
50 and/or 61	Aukeman Dairy	Aukeman Dairy Biogas	$ 4,998,508.00	$ 1,765,457.00	$ 3,233,051.00	Under Construction, 90 Percent Complete	17993 Road 96 and/or 17297 Road 96, Tulare, Tulare County	207,701	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy		

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218	4K Dairy	4K Dairy Digester Pipeline Project	$ 3,561,176.00	$ 1,780,588.00	$ 1,780,588.00	Operational Completed 1/24/2020	5147 Avenue 228, Pixley, Tulare County	192,143	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works	Functional as of 1/24/2020	
	Pixley Dairy	Pixley Dairy Digester Fuel Pipeline Project	$ 3,447,237.00	$ 1,600,000.00	$ 1,847,237.00	Under Construction, 90 Percent Complete	Pixley, Tulare County	212,622	RNG combustion in cogeneration turbines for bioethanol production	2017	Maas Energy Works	In construction, not functional	
226	S&S Dairy	S&S Dairy Biogas	$ 6,687,926.00	$ 1,600,000.00	$ 5,087,926.00	Completed 12/3/2020	5311 Avenue 272, Visalia, Tulare County	167,417	RNG generation and pipeline injection for vehicle fuel use	2016	California Bioenergy		
358	Circle A Dairy	Circle A Dairy Digester Fuel Pipeline Project	$ 2,351,228.00	$ 1,050,000.00	$ 1,301,228.00	Operational Completed 12/12/2018	11275 Road 96, Pixley, Tulare County	138,745	RNG combustion in cogeneration turbines for bioethanol production	2016	Maas Energy Works	8/30/2018	Provided by Mass in 2020
265A	R Vander Eyk Dairy	R Vander Eyk Dairy Digester Fuel Pipeline Project	$ 2,498,381.00	$ 1,000,000.00	$ 1,498,381.00	Operational Completed 2/28/2019	9993 Road 80, Pixley, Tulare County	132,586	RNG combustion in cogeneration turbines for bioethanol production	2016	Maas Energy Works	12/17/2018	Provided by Mass in 2020
298	Moonlight Dairy	Moonlight Dairy Biogas	$ 6,355,146.00	$ 1,500,000.00	$ 4,855,146.00	~~Under Construction~~ Completed 12/3/2020	5061 Avenue 280, Visalia, Tulare County	154,834	RNG generation and pipeline injection for vehicle fuel use	2016	California Bioenergy	9/30/2020	Digester Permit Information.xlsx
241	Legacy Dairy	Legacy Dairy Digester Fuel Pipeline	$ 3,281,327.00	$ 1,550,000.00	$ 1,731,327.00	Operational Completed 2/26/2019	8660 Ave 96, Pixley, CA 93256	207,209	RNG combustion in cogeneration turbines for bioethanol production	2016	Maas Energy Works	12/3/2018	Provided by Mass in 2020
33	Bos Farms Dairy	Bos Farms Dairy Biogas	$ 12,834,030.00	$ 1,500,000.00	$ 11,334,030.00	Under Construction, 90 Percent Complete	20397 Road 152, Tulare, Tulare County	168,398	RNG generation and pipeline injection for vehicle fuel use	2016	California Bioenergy		

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118	Hamstra Dairy	Hamstra Dairy Biogas	$ 6,580,840.00	$ 2,000,000.00	$ 4,580,840.00	Completed 12/3/2020	7590 Avenue 260, Tulare, Tulare County	205,115	RNG generation and pipeline injection for vehicle fuel use	2016	California Bioenergy	8/6/2020	Digester Permit Information.xlsx
139	Rancho Teresita Dairy	Rancho Teresita Dairy Biogas	$ 12,500,558.00	$ 2,100,000.00	$ 10,400,558.00	Under Construction, 90 Percent Complete	21744 Road 152, Tulare, Tulare County	236,251	RNG generation and pipeline injection for vehicle fuel use	2016	California Bioenergy		
326	K&M Visser Dairy	K&M Visser Dairy Digester Fuel Pipeline Project	$ 3,293,975.00	$ 1,500,000.00	$ 1,793,975.00	Operational Completed 11/18/2019	9279 Avenue 96, Pixley, Tulare County	203,416	RNG combustion in cogeneration turbines for bioethanol production	2016	Maas Energy Works	9/3/2019	Provided by Mass in 2020
246	GJ TeVelde Ranch	Te Velde Tipton Dairy Digester	$ 2, 500,000.00	N/A		Operational	5850 Avenue 160, Tipton, California 93,272	189,080	Electrical generation		Maas Energy Works	6/5/2017	Provided by Mass in 2020
256	Van Beek	Van Beek Brothers Dairy Digester	$ 2, 700,000.00	N/A		Operational	14808 Road 152, Tipton, California 93272	106,240	Electrical generation		Maas Energy Works	1/7/2019	Provided by Mass in 2020
346	Hilarides	Hilarides Dairy Digester Renovation	$ 1, 300,000.00	N/A		Operational	24163 Road 188, Lindsay, California 93247	564,000	Electrical generation		Maas Energy Works	8/30/2019	Provided by Mass in 2020
219	JR Dairy	JR Dairy Digester Project	$ 3,173,859.00	$ 1,300,000.00	$ 1,873,856.00	CDFA Grant Agreement Execution in Progress	13202a Road 104, Tipton, Tulare County	191,049	RCNC	2020	Maas Energy Works	In construction, not functional	
			$ 236,810,801.00	$ 80,100,265.00	$ 156,710,533.00			9,552,543					

ATTACHMENT NO 2:

Notice of Exemption

To: ☐ Office of Planning and Research
1400 Tenth Street, Room 121
Sacramento, CA 95814

☒ Tulare County Clerk
Room 105, Courthouse
221 South Mooney Boulevard
Visalia, CA 93291

Dated filed at Tulare County Clerk's Office

Lead Agency: Tulare County Resource Management Agency
5961 South Mooney Blvd.
Visalia, CA 93277
Attn: hguerra@tularecounty.ca.gov and jwillis@tularecounty.ca.gov

Applicant(s): Tulare County Resource Management Agency
5961 South Mooney Blvd.
Visalia, CA 93277 Ph: (559) 624-7000

Project Title: 2020 Annual Report of total Greenhouse Gas ("GHG") emissions from dairies and feedlots for 2019
Project Location - Specific: The project would apply to the unincorporated area of Tulare County that is zoned Agricultural
Project Location- Section, Township, Range: N/A
Project Location - City: N/A **Location - County:** Tulare

Description of Nature, Purpose, and Beneficiaries of Project:
2020 Annual Report of total GHG emissions from dairies and feedlots for 2019

Exempt Status: (*check one*)
- ☐ Ministerial (Sec. 21080(b)(1); 15268);
- ☐ Declared Emergency (Sec. 21080(b)(3); 15269(a));
- ☐ Emergency Project (Sec. 21080(b)(4); 15269(b)(c));
- ☒ Common Sense Exemption: CEQA Guidelines Section 15061 (b)(3)
- ☒ Categorical Exemption: CEQA Guidelines Class 6, Section 15306
- ☐ Statutory Exemptions:

Reasons why project is exempt:
This action is consistent with Section 15061(b)(3), which states that a project is exempt from CEQA if "The activity is covered by the common sense exemption that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA." The use of Section 15061(b)(3) is applicable and appropriate because preparing the 2020 Annual Report of total dairy GHG emissions from 2019 will not make any physical change to the environment since it only involves gathering information to prepare a written report concerning whether or not the County of Tulare is in compliance with the 2017 Animal Confinement Facilities Plan ("2017 ACFP") and the 2017 Dairy and Feedlot Climate Action Plan ("2017 Dairy CAP").

This action is consistent with Section 15306 Class 6, pertaining to basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. The use of Section 15306 is applicable and appropriate because preparing the 2020 Annual Report of total dairy GHG emissions from 2019 will not make any physical change to the environment because it only involves gathering information to prepare a written report concerning whether or not the County of Tulare is in compliance with the 2017 ACFP and the 2017 Dairy CAP.

Name of Public Agency Approving Project: County of Tulare, Board of Supervisors

Signature: _____ Date: _____ Title: Chief Environmental Planner
Hector Guerra

Signature: _____ Date: _____ Title: Environmental Assessment Officer
Reed Schenke, P.E. Director

☒ Signed by Lead Agency Date received for filing at OPR: N/A