OCT 17 2013

Sean Cove
Trilogy Dairy, LP
15857 Bear Mountain Blvd
Bakersfield, CA 93311

Re: Notice of Preliminary Decision - Authority to Construct
Facility Number: S-4835
Project Number: S-1120174

Dear Mr. Cove:

Enclosed for your review and comment is the District's analysis of Trilogy Dairy, LP's application for an Authority to Construct for modifing its herd makeup to house all mature cows (4,570 milk cows, 1,356 dry cows, and 50 mature bulls), at 17661 Bear Mountain Blvd, Bakersfield.

The notice of preliminary decision for this project will be published approximately three days from the date of this letter. After addressing all comments made during the 30-day public notice period, the District intends to issue the Authority to Construct. Please submit your written comments on this project within the 30-day public comment period, as specified in the enclosed public notice.

Thank you for your cooperation in this matter. If you have any questions regarding this matter, please contact Mr. Kamaljit Sran of Permit Services at (559) 230- 5889.

Sincerely,

David Warner
Director of Permit Services

DW:KS

Enclosures

cc: Mike Tollstrup, CARB (w/ enclosure) via email

San Joaquin Valley Air Pollution Control District
Authority to Construct Application Review
Modify Herd Makeup to House All Mature Cows

Facility Name:	Trilogy Dairy, LP	Date:	October 14, 2013
Mailing Address:	15857 Bear Mountain Blvd Bakersfield, CA 93311	Engineer: Lead Engineer:	Kamaljit Sran Martin Keast
Contact Person:	Jason Pausma (Innovative Ag Services)		
Telephone:	(559) 587-2800		
Application #s:	S-4835-1-3, -2-4, & -3-3		
Project #:	S-1120174		
Deemed Complete:	August 8, 2013		

I. PROPOSAL:

Trilogy Dairy, LP. is applying for an Authority to Construct (ATC) permit to modify herd makeup to house all mature cows as following:

Existing Herd Numbers							
	Flushed Freestalls	Scraped Freestalls	Vacuumed Freestalls	Flushed Corral Feedlanes	Scraped Corral Feedlanes	Vacuumed Corral Feedlanes	Other:
Milk Cows	3,200						
Dry Cows	48						
Heifers (15 - 24 months)				1,472			
Heifers (7 - 14 months)				928			
Total Herd: 6,080	Breed of Cow: Holstein						

All changes will take place within existing footprint of the dairy.

Proposed Herd Numbers							
	Flushed Freestalls	Scraped Freestalls	Vacuumed Freestalls	Flushed Corral Feedlanes	Scraped Corral Feedlanes	Vacuumed Corral Feedlanes	Other:
Milk Cows	3,850			720			
Dry Cows				1,356			
Mature Bulls				50			
Total Herd: 5,976	Breed of Cow: Holstein						

II. APPLICABLE RULES:

Rule 1070 Inspections (12/17/92)
Rule 2010 Permits Required (12/17/92)
Rule 2201 New and Modified Stationary Source Review Rule (4/21/11)
Rule 2410 Prevention of Significant Deterioration (6/16/2011)
Rule 2520 Federally Mandated Operating Permits (6/21/01)
Rule 2550 Federally Mandated Preconstruction Review for Major Air Toxics Sources (6/18/98)
Rule 4101 Visible Emissions (2/17/05)
Rule 4102 Nuisance (12/17/92)
Rule 4550 Conservation Management Practices (8/19/04)
Rule 4570 Confined Animal Facilities (CAF) (10/21/10)
CH&SC 41700 Health Risk Assessment
CH&SC 42301.6 School Notice
California Environmental Quality Act (CEQA)
SB 700 Senate Bill 700

III. PROJECT LOCATION:

The facility is located at 17661 Bear Mountain Blvd in Bakersfield, CA. The equipment is not located within 1,000 feet of the outer boundary of a K-12 school. Therefore, the public notification requirement of California Health and Safety Code 42301.6 is not applicable to this project.

IV. PROCESS DESCRIPTION:

The primary function of Trilogy Dairy is the production of milk, which is used to make dairy products for human consumption. Production of milk requires a herd of mature dairy cows that are lactating. In order to produce milk, the cows must be bred and give birth. The gestation period for a cow is 9 months, and dairy cows are bred again 4 months after calving. Thus, a mature dairy cow produces a calf every 12 to 14 months.

Cow Housing

In freestall barns, cows are grouped in large pens with free access to feed bunks, water, and stalls for resting. A standard freestall barn design has a feed alley in the center of the barn separating two feed bunks on each side. An open corral is a large open area where cows are confined with unlimited access to feed and water.

Liquid Manure handling System

The liquid manure handling system at dairy includes the following:

- Two mechanical separator
- Two storage ponds

V. EQUIPMENT LISTING:

S-4835-1:

Pre-Project Equipment Description:

S-4835-1-2: 3,200 COW MILKING OPERATION WITH 100 STALL PARALELL MILKING PARLOR AND 12 STALL HOSPITAL MILKING PARLOR.

Proposed Changes:

Increase number of milking cows to 4,570.

Post-Project Equipment Description:

S-4835-1-3: 4,570 COW MILKING OPERATION WITH 100 STALL PARALELL MILKING PARLOR AND 12 STALL HOSPITAL MILKING PARLOR.

S-4835-2:

Pre-Project Equipment Description:

S-4835-2-4: COW HOUSING 3,200 MILK COWS NOT TO EXCEED 3,680 MATURE COWS (MILK AND DRY COWS): 2,400 TOTAL SUPPORT STOCK (HEIFERS, CALVES AND BULLS).

Proposed Changes:

Change herd numbers to 4570 milk cows 1356 dry cows and 50 mature bulls.

Post-Project Equipment Description:

S-4835-2-4: COW HOUSING 4,570 MILK COWS NOT TO EXCEED 5,926 MATURE COWS (MILK AND DRY COWS): 50 TOTAL SUPPORT STOCK (BULLS).

S-4713-3:

Pre-Project Equipment Description:

S-4835-3-2: LIQUID MANURE HANDLING SYSTEM CONSISTING OF TWO MECHANICAL SEPARATOR AND 2 STORAGE PONDS CONTROLLED BY AERATORS: MANURE IS LAND APPLIED THROUGH FLOOD IRRIGATION

Proposed Changes:

Allow an increase in manure from the modified herd numbers.

Post-Project Equipment Description:

S-4835-3-3: LIQUID MANURE HANDLING SYSTEM CONSISTING OF TWO MECHANICAL SEPARATOR, ONE (1135' x 150' x 18') ANAEROBIC LAGOON AND ONE (1135' x 150' x 18') STORAGE POND: MANURE IS LAND APPLIED THROUGH FLOOD IRRIGATION

VI. EMISSION CONTROL TECHNOLOGY EVALUATION:

PM_{10}, VOC, and NH_3 are the major pollutants of concern from dairy operations.

Particulate matter emissions from freestall barns are greatly reduced because the cows will be on a paved surface rather than on dry dirt. The feed lanes and walkways in the freestalls are flushed, generally 2 times or more per day. Manure, which is a source of emissions, will be removed from the freestall by flushing. Because of ammonia's high affinity for and solubility in water, flushing the feed lanes and walkways reduces volatilization of ammonia from the deposited manure. Additionally, flushing of the lanes creates a moist environment, which further decreases particulate matter emissions.

VII. GENERAL CALCULATIONS:

A. Assumptions:

- Potential to Emit for the dairy will be based on the maximum design capacity of the number and types of cows at the dairy.
- After completion of this project, 4,570 milk cows and 5,976 total herd will be housed in freestalls and open corrals.
- All PM_{10} emissions from the dairy will be allocated to the cow housing permit unit.
- For this dairy, only emissions from the lagoon/storage pond(s), internal combustion engine(s) will be used in determining if this facility will be a major source since the lagoon/storage pond(s), internal combustion engine(s) are considered to be the only non-fugitive emissions at a dairy.
- The PM_{10} emission factors for the dairy animals are based on a District document entitled "Dairy and Feedlot PM_{10} Emissions Factors", which compiled data from studies performed by Texas A&M ASAE and a USDA/UC Davis report quantifying dairy and feedlot emissions.
- The VOC and NH_3 emission factors for milk cows are based on an internal document entitled "*Breakdown of Dairy VOC Emission Factor into Permit Units.*" The VOC and NH_3 emission factors for the other cows were developed by taking the ratio of manure generated by the different types of cows to the milk cow and multiplying it by the milk cow emission factor.
- Because H_2S is produced as a result of the decomposition of sulfur compounds under anaerobic conditions and the lagoons and storage ponds will be the

primary source of H_2S emissions at a dairy, all H_2S emissions from the dairy will be allocated to the lagoon/storage of the liquid manure handling permit unit.

- An anaerobic treatment lagoon designed in accordance with the NRCS Guideline (359) has the potential of reducing significant amount of emissions, since the system is designed to promote the conversion of Volatile Solids (VS) into methane by methanogenic bacteria. Although VOC emission reductions are expected to be high, to be conservative, a control efficiency of 40% will be applied to this mitigation measure for both the lagoon(s) and land application until better data becomes available.
- Many of the mitigation measures required will also have a reduction in ammonia emissions, however, due to limited data, these reductions will not be quantified in this evaluation.

B. Emission Factors:

PM_{10}, VOC, and NH_3

The tables in Appendix B list the PM_{10}, VOC, and NH_3 emission factors for the animals at the dairy. These emission factors will be used to calculate the pre and post-project PM_{10}, VOC, and NH_3 emissions from the dairy.

Hydrogen Sulfide (H_2S)

Hydrogen Sulfide (H_2S) is produced as a result of the decomposition of sulfur compounds under anaerobic conditions. Therefore, the lagoons and storage ponds will be the primary source of H_2S emissions at a dairy. The H_2S emissions rate from lagoons and storage ponds is strongly influenced by the amount of exposed surface area and environmental conditions (e.g. wind, temperature, pH). For this evaluation, average annual H_2S emissions will be conservatively estimated as 10% of the average annual NH_3 emissions from the storage pond. This is because both organic nitrogen and sulfur compounds excreted by cattle are primarily ingested as components of amino acids and tend to occur in set ratios. Studies have also indicated that the average ammonia emissions from lagoons and ponds treating or storing liquid manure are generally more than ten times greater than the H_2S emissions.[1] However, because studies have indicated substantial variation in daily H_2S emission rates, the maximum daily H_2S rate will be conservatively estimated at five times the average daily H_2S in this evaluation.

C. Calculations:

[1] For examples see: l.) L. Y. Zhao, M. Darr, X. Wang, R. Manuzon, M. Brugger, E. !merman, G. Arnold, H. Keener, A. J. Heber, Temporal variations in gas and odor emissions from a dairy manure storage pond, Proceedings of the 6th International Dairy Housing Conference2007St. Joseph, MIASABEASABE Paper No. 70lP0507e. 2.) Ron E. Sheffield and Bruce Louks, Diurnal Variations of Ammonia and Hydrogen Sulfide Flux from a Dairy Manure Storage Pond in Idaho. 3) Blunden, J., and V. P. Aneja, 2008, "Characterizing ammonia and hydrogen sulfide emissions from a swine waste treatment lagoon in North Carolina", *Atmospheric Environment*, vol. 42, No. 14, pp. 3277-3290]

1. Pre-Project Potential to Emit (PE_1)

Pre-Project Potential to Emit (PE_1) for the dairy will be calculated below based on the maximum design capacity for each type of cow at the dairy and the controls required and proposed by the dairy.

All emission calculations for this project are included in Appendix B. The summary of the Pre-Project emissions are shown in the table below:

Pre-Project Potential to Emit (PE1)							
		PM_{10}		VOC		NH_3	
		lbs/day	lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr
S-4835-1-2 Milk Parlor		--	--	3.5	1,267	1.7	608
S-4835-2-3 Cow Housing		77.4	28,260	118.3	43,208	584.7	213,408
S-4835 -3-2 Liquid Manure Handling	*Lagoon/Storage*			*13.9*	*5,078*	*90.1*	*32,886*
	Land Application			*15.0*	*5,469*	*97.5*	*35,604*
	Total			28.9	10,547	187.6	68,490

2. Post-Project Potential to Emit (PE_2)

Post-Project Potential to Emit (PE_2) for the dairy will be calculated below based on the maximum design capacity for each type of cow at the dairy and the controls required and proposed by the dairy.

All emission calculations for this project are included in Appendix B. The summary of the Post-Project emissions are shown in the table below:

Post-Project Potential to Emit (PE2)							
		PM_{10}		VOC		NH_3	
		lbs/day	lbs/yr	lbs/day	lbs/yr	lbs/day	lbs/yr
S-4835-1-3 Milk Parlor		--	--	5.0	1,810	2.4	868
S-4835-2-4 Cow Housing		42.7	15,600	144.8	52,876	771.3	281,543
S-4835-3-3 Liquid Manure Handling	*Lagoon/Storage*			*17.1*	*6,247*	*118.8*	*43,379*
	Land Application			*18.4*	*6,718*	*128.8*	*47,000*
	Total			35.5	12,965	247.5	90,379

3. Pre-Project Stationary Source Potential to Emit (SSPE1)

Pursuant to Section 4.9 of District Rule 2201, the Pre-project Stationary Source Potential to Emit (SSPE1) is the Potential to Emit (PE) from all units with valid Authorities to Construct (ATC) or Permits to Operate (PTO) at the Stationary Source and the quantity of emission reduction credits (ERC) which have been banked since

September 19, 1991 for Actual Emissions Reductions that have occurred at the source, and which have not been used on-site.

Pre-Project Stationary Source Potential to Emit [SSPE1] (lb/year)								
	NO_X	SO_X	PM_{10}	CO	VOC	NH_3	H_2S	$CO_2(e)$
S-4835-1-2	0	0	0	0	1,267	608		
S-4835-2-3	0	0	28,260	0	43,208	213,408		
S-4835-3-2	0	0	0	0	10,547	68,490	3,289	40,706
S-4835-4-1	0	0	0	0	2,051	13,693		
S-4835-8-1	0	0	0	0	139,293	0		
S-4835-5-1*	4,055	23	145	6,559	95	--		417
S-4835-6-0*	661	63	33	201	75	--		18
S-4835-7-0*	2,205	209	110	670	251	--		59
S-4835-9-1*	4,055	23	145	6,559	95	--		417
SSPE1	10,976	318	28,693	13,989	196,882	296,199	3,289	41,617

*From project S-1090391

4. Post-Project Stationary Source Potential to Emit (SSPE2)

Pursuant to Section 4.10 of District Rule 2201, the Post Project Stationary Source Potential to Emit (SSPE2) is the Potential to Emit (PE) from all units with valid Authorities to Construct (ATC) or Permits to Operate (PTO) at the Stationary Source and the quantity of emission reduction credits (ERC) which have been banked since September 19, 1991 for Actual Emissions Reductions that have occurred at the source, and which have not been used on-site.

Post-Project Stationary Source Potential to Emit [SSPE2] (lb/year)								
	NO_X	SO_X	PM_{10}	CO	VOC	NH_3	H_2S	$CO_2(e)$
S-4835-1-2	0	0	0	0	1,810	868		
S-4835-2-3	0	0	15,600	0	52,876	281,543		
S-4835-3-2	0	0	0	0	12,965	90,379	4,338	55,333
S-4835-4-1	0	0	0	0	2,521	18,062		
S-4835-8-1	0	0	0	0	138,456	0		
S-4835-5-1*	4,055	23	145	6,559	95	--		417
S-4835-6-0*	661	63	33	201	75	--		18
S-4835-7-0*	2,205	209	110	670	251	--		59
S-4835-9-1*	4,055	23	145	6,559	95	--		417
SSPE2	10,976	318	16,033	13,989	209,144	390,852	4,338	56,244

*From project S-1090391

5. Major Source Determination

a. <u>Rule 2201 Major Source Determination:</u>

Pursuant to Section 3.25 of District Rule 2201, a major source is a stationary source with post-project emissions or a Post Project Stationary Source Potential to Emit (SSPE2), equal to or exceeding one or more of the threshold values.

In determining whether a facility is a major source, fugitive emissions are not counted unless the facility belongs to certain specified source categories. 40 CFR 71.2 (Definitions, Major Source (2)) states the following:

(2) A major stationary source of air pollutants or any group of stationary sources as defined in section 302 of the Act, that directly emits, or has the potential to emit, 100 tpy or more of any air pollutant (including any major source of fugitive emissions of any such pollutant, as determined by rule by the Administrator). The fugitive emissions of a stationary source shall not be considered in determining whether it is a major stationary source for the purposes of section 302(j) of the Act, unless the source belongs to one of the following categories of stationary source: (i) Coal cleaning plants (with thermal dryers); (ii) Kraft pulp mills; (iii) Portland cement plants; (iv) Primary zinc smelters; (v) Iron and steel mills; (vi) Primary aluminum ore reduction plants; (vii) Primary copper smelters; (viii) Municipal incinerators capable of charging more than 250 tons of refuse per day; (ix) Hydrofluoric, sulfuric, or nitric acid plants; (x) Petroleum refineries; (xi) Lime plants; (xii) Phosphate rock processing plants; (xiii) Coke oven batteries; (xiv) Sulfur recovery plants; (xv) Carbon black plants (furnace process); (xvi) Primary lead smelters; (xvii) Fuel conversion plants; (xviii) Sintering plants; (xix) Secondary metal production plants; (xx) Chemical process plants; (xxi) Fossil-fuel boilers (or combination thereof) totaling more than 250 million British thermal units per hour heat input; (xxii) Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels; (xxiii) Taconite ore processing plants; (xxiv) Glass fiber processing plants; (xxv) Charcoal production plants; (xxvi) Fossil-fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input; or (xxvii) Any other stationary source category which, as of August 7, 1980, is being regulated under section 111 or 112 of the Act.

Because agricultural operations do not fall under any of the specific source categories listed above, fugitive emissions are not counted when determining if an agricultural operation is a major source. 40 CFR 71.2 defines fugitive emissions as "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening."

Since emissions at the dairy are not actually collected, a determination of whether emissions could be reasonably collected must be made by the permitting authority. The California Air Pollution Control Association (CAPCOA) prepared guidance in 2005 for estimating potential to emit of Volatile Organic Compounds from dairy farms. The guidance states that *"VOC emissions from the milking centers, cow housing areas, corrals, common manure storage areas, and land application of manure are not physically contained and could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening. No collection technologies* *currently exist for VOC emissions from these emissions units. Therefore, the VOC emissions from these sources are considered fugitive."* The guidance also concludes that, because VOC collection technologies do exist for liquid waste systems at dairies, *"...the VOC emissions from waste lagoons and storage ponds are considered non-fugitive."* The District has researched this issue and concurs with the CAPCOA assessment, as discussed in more detail below.

Milking Center

The mechanical system for the milking parlors can be utilized to capture the gases emitted from the milking parlors, however in order to capture all of the gases, and to keep an appropriate negative pressure throughout the system, the holding area would also need to be entirely enclosed. No facility currently encloses the holding area since cows are continuously going in and out of the barn throughout the day. The capital required to enclose this large area would also be significant. Since the holding area is primarily kept open, the District cannot reasonably demonstrate that emissions can pass through a stack, chimney, vent, or other functionally equivalent opening.

Cow Housing

Although there are smaller dairy farms that have enclosed freestall barns, these barns are not fully enclosed and none of the barns have been found to vent the exhaust through a collection device. The airflow requirements through dairy barns are extremely high, primarily for herd health purposes. The airflow requirements will be even higher in the San Joaquin valley, where temperatures reach in excess of 110 degrees in the dry summer. Collection and control of the exhaust including the large amounts of airflow have not yet been achieved by any facility. Due to this difficultly, the District cannot reasonably demonstrate that emissions can pass through a stack, chimney, vent, or other functionally equivalent opening.

Manure storage Areas

Many dairies have been found to cover dry manure piles. Covering dry manure piles is also a mitigation measure included in District Rule 4570. However, the District was not able to find any facility, which currently captures the emissions from the storage or handling of manure piles. Although many of these piles are covered, the emissions cannot easily be captured. Therefore, the District cannot reasonably demonstrate that these emissions can pass through a stack, chimney, vent, or other functionally equivalent opening. In addition, emissions from manure piles have been shown to be insignificant from recent studies.

Land Application

Emissions generated from the application of manure on land cannot reasonably be captured due to the extremely large areas, in some cases thousands of acres, of cropland at dairies. Therefore, the District cannot reasonably demonstrate that these emissions can pass through a stack, chimney, vent, or other functionally equivalent opening.

Feed Handling and Storage

The majority of dairies store the silage piles underneath a tarp or in an agbag. The entire pile is covered except for the face of the pile. The face of the pile is kept open due to the continual need to extract the silage for feed purposes. The silage pile is disturbed 2-3 times per day. Because of the ongoing disturbance to these piles, it makes it extremely difficult to design a system to capture the emissions from these piles. In fact, as far as the District is aware, no system has been designed to successfully extract the gases from the face of the pile to capture them, and, as important, no study has assessed the potential impacts on silage quality of a continuous air flow across the silage pile, as would be required by such a collection system. Therefore, the District cannot demonstrate that these emissions can be reasonably expected to pass through a stack, chimney, vent, or other functionally equivalent opening.

Therefore, the VOC emissions from these sources are considered fugitive. The District has determined that control technology to capture emissions from lagoons (biogas collection systems, for instance) is in use and these emissions can be reasonably collected and are not fugitive. Therefore, only emissions from the lagoons, storage ponds, IC engines, and gasoline tanks will be used to determine if this facility is a major source. The emissions from the lagoon/storage pond(s) are presented in the calculation section.

The following table shows the non-fugitive Post-Project Stationary Source Potential to Emit for the dairy.

Non-Fugitive Post-Project Stationary Source Potential to Emit [SSPE2] (lb/year)					
	NO_X	SO_X	PM_{10}	CO	VOC
S-4835-3-3	0	0	0	0	6,247
S-4835-5-1*	4,055	23	145	6,559	95
S-4835-6-0*	661	63	33	201	75
S-4835-7-0*	2,205	209	110	670	251
S-4835-9-1*	4,055	23	145	6,559	95
Non Fugitive SSPE2	**10,976**	**318**	**433**	**13,989**	**6,763**
Major Source Threshold	20,000	140,000	140,000	200,000	20,000
Major Source?	No	No	No	No	No

*From project S-1090391

As seen in the table above, the facility is not a Major Source.

b. Rule 2410 Major Source Determination:

The facility or the equipment evaluated under this project is not listed as one of the categories specified in 40 CFR 52.21 (b)(1)(i). Therefore the following PSD Major Source thresholds are applicable.

PSD Major Source Determination (tons/year)							
	NO_2	VOC	SO_2	CO	PM	PM_{10}	CO_2(e)
Estimated Facility PE before Project Increase	5.5	2.8	0.2	7.0	0.2	0.2	911
PSD Major Source Thresholds	250	250	250	250	250	250	100,000
Existing PSD Major Source ?	N	N	N	N	N	N	N

As shown above, the facility is not an major source for PSD for any pollutant. Therefore the facility is not an existing major source for PSD.

6. Baseline Emissions (BE)

The BE calculation (in lb/year) is performed on a pollutant-by-pollutant basis to determine the amount of offsets required, where necessary, when the SSPE1 is greater than the offset threshold. This project is exempt from offsets pursuant to Rule 2201, Section 4.6.9. Therefore, BE calculations are not required.

7. Major Modification

Major Modification is defined in 40 CFR Part 51.165 as "*any physical change in or change in the method of operation of a major stationary source that would result in a significant net emissions increase of any pollutant subject to regulation under the Act.*"

As discussed in Section VII.C.5 previously, the facility is not a Major Source for any criteria pollutant; therefore, the project does not constitute a Major Modification.

8. Federal Major Modification

As shown above, this project does not constitute a Major Modification. Therefore, in accordance with District Rule 2201, Section 3.17, this project does not constitute a Federal Major Modification and no further discussion is required.

9. Rule 2410 – Prevention of Significant Deterioration (PSD) Applicability Determination

Rule 2410 applies to pollutants for which the District is in attainment or for unclasssified, pollutants. The pollutants addressed in the PSD applicability determination are listed as follows:

- NO_2 (as a primary pollutant)
- SO_2 (as a primary pollutant)
- CO
- PM
- PM_{10}
- Greenhouse gases (GHG): CO_2, N_2O, CH_4, HFCs, PFCs, and SF6

The first step of this PSD evaluation consists of determining whether the facility is an existing PSD Major Source or not (See Section VII.C.5 of this document).

In the case the facility is NOT an existing PSD Major Source but is an existing source, the second step of the PSD evaluation is to determine if the project, by itself, would be a PSD major source.

In the case the facility is new source, the second step of the PSD evaluation is to determine if this new facility will become a new PSD major Source as a result of the project and if so, to determine which pollutant will result in a PSD significant increase.

The facility or the equipment evaluated under this project is not listed as one of the categories specified in 40 CFR 52.21 (b)(1)(i). Therefore the following PSD Major Source thresholds are applicable.

PSD Major Source Determination (tons/year)							
	NO_2	VOC	SO_2	CO	PM	PM_{10}	CO_2(e)
Total PE from New and Modified Units	5.5	3.3	0.2	7.0	0.2	0.2	911
PSD Major Source Thresholds	250	250	250	250	250	250	100,000
New PSD Major Source ?	N	N	N	N	N	N	N

10. Quarterly Net Emissions Change (QNEC)

The QNEC is calculated solely to establish emissions that are used to complete the District's PAS emissions profile screen. Detailed QNEC calculations are included in Appendix B.

VIII. <u>COMPLIANCE:</u>

Rule 1070 Inspections

This rule allows the District to perform inspections for the purpose of obtaining information necessary to determine whether air pollution sources are in compliance with applicable rules and regulations. The rule also allows the District to require record keeping, to make inspections and to conduct tests of air pollution sources. The following conditions will be listed on the permit to ensure compliance:

- {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]

- {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]

Rule 2010 Permits Required

The provisions of this rule apply to any person who plans to or does operate, construct, alter, or replace any source operation, which may emit air contaminants or may reduce the emission of air contaminants.

Pursuant to section 4.0, a written permit shall be obtained from the APCO. No Permit to Operate shall be granted either by the APCO or the Hearing Board for any source operation described in section 3.0 constructed or installed without authorization as required by section 3.0 until the information required is presented to the APCO and such source operation is altered, if necessary, and made to conform to the standards set forth in Rule 2070 (Standards for Granting Applications) and elsewhere in these rules and regulations.

The facility has obtained all required Air District permits and is in compliance with the requirements of this rule.

Rule 2201 New and Modified Stationary Source Review Rule

A. Best Available Control Technology BACT

1. BACT Applicability:

BACT requirements are triggered on a pollutant-by-pollutant basis and on an emissions unit-by-emissions unit basis. BACT is required for the following actions*:

(1) Any new emissions unit with a potential to emit exceeding two pounds in any one day,
(2) The relocation of an existing emissions unit from one stationary source to another with a potential to emit exceeding two pounds in any one day,
(3) Modifications to an existing emissions unit with a valid Permit to Operate resulting in an AIPE exceeding two pounds in any one day, and
(4) Any new or modified emissions unit, in a stationary source project, which results in a Title I Modification.

*Except for CO emissions from a new or modified emissions unit at a Stationary Source with an SSPE2 of less than 200,000 pounds per year of CO.

a. New emissions units – PE > 2 lb/day

There are no new emissions units associated with this project; therefore BACT for new units with PE > 2 lb/day purposes is not triggered.

b. Relocation of emissions units – PE > 2 lb/day

There are no emissions units being relocated from one stationary source to another; therefore BACT is not triggered.

c. Modification of emissions units – AIPE > 2 lb/day

Adjusted Increase in Permitted Emissions (AIPE)

AIPE = PE2 – HAPE,

Where,
AIPE = Adjusted Increase in Permitted Emissions, (lb/day)
PE2 = Post-Project Potential to Emit, (lb/day)
HAPE = Historically Adjusted Potential to Emit, (lb/day)

HAPE = PE1 x (EF2/EF1)

Where,

PE1 = The emissions unit's Potential to Emit prior to modification or relocation, (lb/day)
EF2 = The emissions unit's permitted emission factor for the pollutant after modification or relocation. If EF2 is greater than EF1 then EF2/EF1 shall be set to 1.
EF1 = The emissions unit's permitted emission factor for the pollutant before the modification or relocation

AIPE = PE2 – (PE1 x (EF2/EF1))

Since this dairy was grandfathered into permitting pursuant to Senate Bill (SB) 700 and has never been evaluated under an NSR rule, therefore emissions unit's permitted emission factor before and after modification is same and HAPE is equal to PE1.

Milking Parlor (S-4835-1-3):

	PE_2 (lb/day)	-	PE_1 (lb/day)	=	AIPE (lb/day)
VOC	5.0	-	3.5	=	1.5
NH_3	2.4	-	1.7	=	0.7

As demonstrated above, the AIPE is not greater than 2.0 lb/day for VOC, and NH_3 from the milking parlor; therefore BACT is not triggered for any pollutant from the milking parlor.

Cow Housing (S-4835-2-4):

	PE_2 (lb/day)	-	PE_1 (lb/day)	=	AIPE (lb/day)
PM_{10}	48.1	-	77.4	=	(29.3)

VOC	144.8	-	118.8	=	26.0
NH_3	771.3	-	584.7	=	186.6

As demonstrated above, the AIPE for the project for the cow housing permit does not exceed 2.0 lb/day for PM_{10} but exceeds 2.0 lb/day for VOC and NH_3; therefore BACT is not triggered for PM_{10} from the cow housing permit unit but BACT is triggered for VOC and NH_3 from the cow housing permit unit.

Liquid Manure Handling System (S-4835-3-3):

Lagoon/Storage Pond

	PE_2 (lb/day)	-	PE_1 (lb/day)	=	AIPE (lb/day)
VOC	17.1	-	13.9	=	3.2
H_2S	11.9		9.0		2.9
NH_3	118.9	-	90.1	=	28.8

As demonstrated above, the AIPE is greater than 2.0 lb/day for VOC, H_2S, and NH_3 from the lagoon/storage pond; therefore BACT is triggered for VOC, H_2S, and NH_3 from the lagoon/storage pond.

Land Application

	PE_2 (lb/day)	-	PE_1 (lb/day)	=	AIPE (lb/day)
VOC	18.4	-	14.9	=	3.5
NH_3	128.7	-	97.5	=	31.2

As demonstrated above, the AIPE is greater than 2.0 lb/day for VOC and NH_3 from land application; therefore BACT is triggered for VOC and NH_3 from land application.

Solid Manure Handling System (S-4835-4-2):

Solid Manure Storage

	PE_2 (lb/day)	-	PE_1 (lb/day)	=	AIPE (lb/day)
VOC	1.8	-	1.2	=	0.6
NH_3	13.7	-	10.4	=	3.3

As demonstrated above, the AIPE for the project for the solid manure storage does not exceed 2.0 lb/day for VOC but exceeds 2.0 lb/day for NH_3; therefore BACT is not triggered for VOC from the solid manure handling system but BACT is triggered for NH_3 from the solid manure storage.

Separated Solid Piles

	PE_2 (lb/day)	-	PE_1 (lb/day)	=	AIPE (lb/day)
VOC	0.8	-	0.6	=	0.2
NH_3	5.5	-	4.1	=	1.4

As demonstrated above, the AIPE is greater than 2.0 lb/day for VOC and NH_3 from separated solid piles; therefore BACT is not triggered for VOC and NH_3 from separated solid piles.

Land Application

	PE_2 (lb/day)	-	PE_1 (lb/day)	=	AIPE (lb/day)
VOC	4.3	-	3.5	=	0.8
NH_3	30.3	-	22.9	=	7.4

As demonstrated above, the AIPE for the project does not exceed 2.0 lb/day for VOC but exceeds 2.0 lb/day for NH_3; from land application; therefore BACT is not triggered for VOC but BACT is triggered for NH_3 from land application.

Feed Storage and Handling (S-4835-5-0):

VOC	PE_2 (lb/day)	-	PE_1 (lb/day)	=	AIPE (lb/day)
Silage	247.6	-	247.6	=	0.0
TMR	131.7	-	134.0	=	(2.3)

d. SB 288/Federal Major Modification

As discussed in Section VII.C.7 above, this project does not constitute an SB 288 or a Federal Major Modification; therefore BACT is not triggered for an SB 288 Major Modification or Federal Major Modification.

2. Top-Down BACT Analysis

Per Permit Services Policies and Procedures for BACT, a Top-Down BACT analysis shall be performed as a part of the application review for each application subject to the BACT requirements pursuant to the District's NSR Rule.

Pursuant to the attached Top-Down BACT Analysis (see Appendix C), BACT for the project has been satisfied with the following:

Cow Housing (S-4835-2-4)

VOC: 1) Concrete feed lanes and walkways
2) Feed lanes and walkways for mature cows (milk and dry cows) flushed four times per day.

3) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

NH_3: 1) Concrete feed lanes and walkways
2) Feed lanes and walkways for mature cows (milk and dry cows) flushed four times per day.
3) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

Liquid Manure Handling System (S-4835-3-3)

Lagoons/Storage Ponds

VOC: 1) Two-stage Anaerobic Treatment Lagoon designed according to NRCS Guidelines.
2) Installation of an anaerobic digester contingent upon the final Dairy BACT guideline.
3) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

NH_3: All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

H_2S: 1) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.
2) Separation of solids from liquid manure stream prior to treatment in the lagoons.

Liquid Manure Land Application

NH_3: All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

Solid Manure Handling System (C-4835-4-3)

NH_3: All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes that have been found by the APCO to be cost effective and technologically feasible for such class or category of source. The District has found that the basic mitigation measures required by District Rule 4570 are cost effective and technologically feasible for confined animal facilities. Therefore, in addition to the BACT requirements evaluated in the Top-Down BACT Analysis and listed above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for VOC and NH_3 emissions from the dairy.

B. Offsets:

Pursuant to Section 4.6.9 of District Rule 2201, agricultural sources that are not major sources are exempt from offsets if emissions reductions from that source would not meet the criteria for real, permanent, quantifiable, and enforceable emission reductions. Over time, EPA policies and court determinations have established fairly rigorous definitions and tests for each of these terms.

For agricultural operations and other nontraditional sources of emissions, it is difficult to demonstrate that emission reductions are real, permanent, quantifiable, enforceable, and surplus – *as those terms are defined by EPA and case law.* Under SB 700, the air districts are prohibited from requiring offsets for sources for which the above demonstration cannot be made. These sources may include, for example, crop farm fugitive dust, agricultural burning, and non-equipment operations at CAFs. When it becomes possible to demonstrate that emissions (increases and reductions) are real, permanent, quantifiable, enforceable, and surplus, Emission Reduction Credits (ERCs) may be granted and offsets required. A program to allow this would have to include a regulation that is approved by EPA and incorporated into the State Implementation Plan (SIP). Such regulations specify appropriate quantification methodologies, and other provisions that ensure the reduction meet all the applicable tests, and the regulatory process allows for public review and comment.

To date, EPA has not approved the issuance of ERCs by California air districts for agricultural activities. This has been the case even for reductions from on-the-farm equipment that is similar to traditional stationary sources. Therefore, ERCs will not be granted, nor will offsets be required for agricultural sources until the District has adopted the needed regulations, and EPA has approved those regulations and incorporated them into the SIP. Therefore, offsets are not required for this project.

C. Public Notification:

1. Applicability

Public noticing is required for:

a. Any new facility which is also a Major Source,

b. Major Modifications,
c. Any project which results in the offset thresholds being reached or surpassed,
d. Any new emissions unit with a Potential to Emit greater than 100 pounds during any one day for any one pollutant, and/or
e. Any project with an SSIPE of greater than 20,000 lb/year for any pollutant.

a. New Major Source

Based upon the determination in Section VII.C.6 above, this facility is not a new major source. Therefore, public notification is not required for new major source purposes.

b. Major Modification

As demonstrated in VII.C.7, this project does not constitute a Major Modification; therefore, public noticing for Major Modification purposes is not required.

c. Offset Threshold

Public notification is required if the Pre-Project Stationary Source Potential to Emit (SSPE1) is increased from a level below the offset threshold to a level exceeding the emissions offset threshold, for any pollutant.

The following table compares the SSPE1 with the SSPE2 in order to determine if any offset thresholds have been surpassed with this project.

Offset Threshold				
Pollutant	SSPE1 (lb/year)	SSPE2 (lb/year)	Offset Threshold	Public Notice Required?
NO_X	10,976	10,976	20,000 lb/year	No
SO_X	318	318	54,750 lb/year	No
PM_{10}	28,693	16,033	29,200 lb/year	No
CO	13,898	13,898	200,000 lb/year	No
VOC	196,882	209,144	20,000 lb/year	No

As detailed above, there were no thresholds surpassed with this project; therefore public noticing is not required for offset purposes.

d. PE > 100 lb/day

Applications which include a new emissions unit with a Potential to Emit greater than 100 pounds during any one day for any pollutant will trigger public noticing requirements. There are no new emissions units associated with this project; therefore public noticing is not required for this project for Potential to Emit Purposes.

e. SSIPE > 20,000 lb/year

Public notification is required for any permitting action that results in a Stationary Source Increase in Permitted Emissions (SSIPE) of more than 20,000 lb/year of any affected pollutant. According to District policy, the SSIPE is calculated as the Post Project Stationary Source Potential to Emit (SSPE2) minus the Pre-Project Stationary Source Potential to Emit (SSPE1), i.e. SSIPE = SSPE2 – SSPE1. The values for SSPE2 and SSPE1 are calculated according to Rule 2201, Sections 4.9 and 4.10, respectively. The SSIPE is compared to the SSIPE Public Notice thresholds in the following table:

Stationary Source Increase in Permitted Emissions [SSIPE]					
Pollutant	SSPE2 (lb/year)	SSPE1 (lb/year)	SSIPE (lb/year)	SSIPE Public Notice Threshold	Public Notice Required?
NO_x	10,976	10,976	0	20,000 lb/year	No
SO_x	318	318	0	20,000 lb/year	No
PM_{10}	16,033	28,693	-12,660	20,000 lb/year	No
CO	13,989	13,989	0	20,000 lb/year	No
VOC	209,144	196,882	12,262	20,000 lb/year	No
NH_3	390,352	296,199	94,153	20,000 lb/year	Yes

As shown above, the SSIPE for NH_3 is greater than 20,000 lb/year; therefore public noticing for SSIPE purposes is required.

2. Public Notice Action

As discussed above, public noticing is required for this project because the SSIPE for NH_3 was greater than 20,000 lb/year. Therefore, public notice documents will be submitted to the California Air Resources Board (CARB) and a public notice will be published in a local newspaper of general circulation in the county of the project prior to the issuance of the ATCs for the dairy.

D. Daily Emission Limits

Daily emissions limitations (DELs) and other enforceable conditions are required by Section 3.17 to restrict a unit's maximum daily emissions, to a level at or below the emissions associated with the maximum design capacity. Per Sections 3.17.1 and 3.17.2, the DEL must be contained in the latest ATC and contained in or enforced by the latest PTO and enforceable, in a practicable manner, on a daily basis.

For dairies, the DEL is satisfied based on the number and types of cows at the dairy and the required controls and mitigation measures. The number and types of cows are listed in the permit equipment description for the Cow Housing

Cow Housing (S-4835-2-4)

The following condition will be added to limit the total number of cows housed at the dairy:

The total number of Cattle housed at this dairy at any one time shall not exceed any of the following: 4,570 milk cows; 1,356 dry cows; and 50 mature bulls. [District Rule 2201]

Liquid Manure Handling System (S-4835-3-3)

Since emissions from the liquid manure handling system depend on the amount of manure handled, the following condition will be placed on the permit:

The liquid manure handling system shall handle flush manure from no more than 4,570 milk cows; 1,356 dry cows; and 50 mature bulls. [District Rule 2201]

E. Compliance Assurance

The following measures shall be taken to ensure continued compliance with District Rules:

1. Source Testing

No source testing is currently required for dairy operations.

2. Monitoring

No monitoring is required for this project.

3. Record Keeping

Cow Housing (S-4835-2-4)

- Permittee shall maintain daily records of the number of milk cows, dry cows, and mature bulls at this dairy. [District Rule 2201 and 4570]
- All records shall be maintained and retained on-site for a period of at least 5 years and shall be made available for District inspection upon request. [District Rule 1070]

Rule 2520 Federally Mandated Operating Permits

Pursuant to their current operating permit, this facility is an existing major source; however, the facility has not received their Title V permit. An application to comply with

Rule 2520–*Federally Mandated Operating Permits* will be submitted to the District; therefore, no action is required at this time.

Rule 2550 Federally Mandated Preconstruction Review for Major Sources of Air Toxics

The provisions of this rule only apply to applications to construct or reconstruct a major air toxics source with Authority to Construct issued on or after June 28, 1998.

Under Rule 2550, newly constructed facilities or reconstructed units or sources[2] at existing facilities would be subject to preconstruction review requirements if they have the potential to emit hazardous air pollutants (air toxics) in "major" amounts (10 tons or more of an individual pollutant or 25 tons or more of a combination of pollutants) and the new units are not already subject to a standard promulgated under Section 112(d), 112(j), or 112(h) of the Clean Air Act." Facilities or sources subject to Rule 2550 would be subject to stringent air pollution control requirements, referred to Maximum Achievable Control Technology.

The federal Clean Air Act lists 189 substances as potential HAPs (Clean Air Act Section 112(b)(1)). Based on the current emission factor for dairies, the following table outlines the HAPs expected to be emitted at dairies. Since this dairy is complying with Best Available Control Technology (BACT) emissions control requirements, many of the pollutants listed below are expected to be reduced significantly; however, no control is being applied in the emissions estimates in order to calculate worst-case emissions. Please note that a conclusion that MACT requirements are triggered would necessarily involve consideration of controlled emissions levels. The following is a list of HAPs generated at dairies including the associated emission factor.

Hazardous Air Pollutant Emissions		
HAP	lbs-milk cow-yr	Source
Methanol	1.35	UC Davis - *VOC Emission from Dairy Cows and their Excreta*, 2005
Carbon Disulfide	0.027	Dr. Schmidt - *Dairy Emissions using Flux Chambers (Phase I & II)*, 2005
Eythylbenzene	0.003	
o-Xylene	0.005	
1,2-Dibromo-3chloropropane	0.011	
1,2,4-Trichlorobenzene	0.025	
Napthalene	0.012	
Hexachlorobutadiene	0.012	
Formaldehyde	0.005	
Acetaldehyde	0.029	
Chloroform	0.017	California State University Fresno (CSUF) - *Monitoring and Modeling of ROG at California Dairies*, 2005
Styrene	0.01	
Vinyl Acetate[3]	0.08	Dr. Schmidt - *Dairy Emissions using*

[2] Reconstruction" is defined as a change that costs 50 percent of the cost of constructing a new unit or source like the one being rebuilt.
[3] 0.01 + 0.07 = 0.08 lbs/hd-yr

Toluene[4]	0.162	*Flux Chambers (Phase I & II)* & California State University Fresno (CSUF) - *Monitoring and Modeling of ROG at California Dairies*, 2005
Cadmium	0.009	Air Resources Board's Profile No. 423, Livestock Operations Dust
Hexavalent Chromium	0.004	
Nickel	0.026	
Arsenic	0.005	
Cobalt	0.003	
Lead	0.033	
Total	**1.828**	

Although some of the pollutants listed above may have been misidentified as HAPs due to similarities of many compounds consisting of very similar spikes (as measured through the gas Chromatograph Mass Spectroscopy–GCMS), all of these pollutants will be used in calculating the worst-case HAP emissions. Since this dairy is complying with all of the Best Available Control Technology (BACT) requirements and Rule 4570 mitigation measures, many of the pollutants listed above are expected to be mitigated, however, no control is being applied to these factors at this time in order to calculate the worst-case emissions. The emission calculations are shown below:

HAP Emissions						
Type of Cow	**Number of cows**		**Emission Factor lbs/hd-yr[5]**		**lbs/yr**	**tons/yr**
Milking Cow	4,570	x	1.828	=	8,354	4.2
Dry Cow	1,356	x	1.123	=	1,528	0.8
Bulls	50	x	1.123	=	56	0.0
Total				=	**9,938**	**5.0**

As shown above, each individual HAP is expected to be below 10 tons per year and total HAP emissions are expected to be below 25 tons per year. The largest individual HAP would be methanol, at 3.7 tons per year (5.0 tons/yr x (1.35 lbs-methanol/1.828 lbs-HAPs)). Therefore, this facility will not be a major air toxics source and the provisions of Rule 2550 do not apply.

There are several recently completed and ongoing research studies that that will be considered in future revisions of the current emission factors for dairies, including the recent study conducted by Dr. Mitloehner in a study entitled "*Dairy Cow Measurements of Volatile Fatty Acids, Amine, Phenol, and Alcohol Emissions Using an Environmental Chamber*" completed in 2006. These studies have not been fully vetted or reviewed in the context of establishing standardized emission factors. For instance, although Dr. Mitloehner indicates a high methanol emissions rate from fresh manure in the cited study,

[4] 0.012 + 0.15 = 0.162 lbs/hd-yr

[5] The emission factor has been adjusted for each type of cow based on the ratio of amount of manure generated for each cow.

in the same report he also indicates that the flushing of manure may significantly reduce alcohol emissions, including methanol.

Future review of these studies may indeed result in a change in the current emission factors and/or control efficiencies for various practices and controls, but until that scientific review process is complete and the District has had opportunity to consider public comment on any proposed changes, the premature, and therefore potentially flawed, use of such emissions data would be inconsistent with good governance and good science.

Rule 4101 Visible Emissions

Pursuant to section 4.12, emissions subject to or specifically exempt from Regulation VIII (Fugitive PM10 Prohibitions) are exempt from Rule 4101.

Pursuant to District Rule 8011, section 4.12, on-field agricultural sources are exempt from the requirements of Regulation VIII.

On-field agricultural sources are defined in Rule 8011, section 3.35 as the following:

- Activities conducted solely for the purpose of preparing land for the growing of crops or ***the raising of fowl or animals***, such as brush or timber clearing, grubbing, scraping, ground excavation, land leveling, grading, turning under stalks, disking, or tilling;

Therefore, activities conducted solely for the purpose of raising fowl or animals are exempt from the requirements of Regulation VIII and Rule 4101.

Rule 4102 Nuisance

Rule 4102 states that no air contaminant shall be released into the atmosphere which causes a public nuisance. This dairy is expected to comply with requirements of this rule.

California Health and Safety Code 41700 (Health Risk Assessment)

District Policy APR 1905 – Risk Management Policy for Permitting New and Modified Sources specifies that for an increase in emissions associated with a proposed new source or modification, the District perform an analysis to determine the possible impact to the nearest resident or worksite.

An HRA is not required for a project with a total facility prioritization score of less than one. According to the Technical Services Memo for this project (Appendix D), the total facility prioritization score including this project was greater than one. Therefore, a health risk assessment was required to determine the short-term acute and long-term chronic exposure from this project.

RMR Summary				
Categories	**Pre-Project (Units 1-2 & 2-3)**	**Post-Project (Units 1-3 & 2-4)**	**Project Totals**	**Facility Totals**
Prioritization Score	>1[1]	>1[1]	>1[1]	>1
Acute Hazard Index	0.36[2]	0.63[3]	0.27[4]	N/A
Chronic Hazard Index	0.17[2]	0.16[3]	0.0[5]	N/A
Maximum Individual Cancer Risk	**2.66E-06[2]**	**1.22E-06[3]**	0.0[5]	N/A
T-BACT Required?	**No**	**No**		
Special Permit Conditions?	No	No		

1 Prioritizations for these units were not conducted; due to extensive pre- and post-project modeling it has been determined that this facility's prioritization score would result in a score greater than 1.0.
2 This score reflects the facility's grandfathered score. This score was generated to determine the overall impact of the new proposed project.
3 This score reflects the post-project score. This score will act as the baseline score for any new proposed projects.
4 This score is the difference between the pre-project and post -project scores and will be used for the facility RMR scores for any future projects.
5 Facility score will be 0 if results are a negative score.

Discussion of T-BACT

BACT for toxic emission control (T-BACT) is required if the cancer risk exceeds one in one million. As demonstrated above, T-BACT is not required for this project because the HRA indicates that the risk is not above the District's thresholds for triggering T-BACT requirements; therefore, compliance with the District's Risk Management Policy is expected.

District policy APR 1905 also specifies that the increase in emissions associated with a proposed new source or modification not have acute or chronic indices, or a cancer risk greater than the District's significance levels (i.e. acute and/or chronic indices greater than 1 and a cancer risk greater than 10 in a million). As outlined in the table above and by the HRA Summary in Appendix D of this report, the cancer post project risk is 1.22E-6 but will not result in requiring T-BACT since the post project is a reduction from the pre project cancer score.

Rule 4550 Conservation Management Practices

This rule applies to agricultural operations located within the San Joaquin Valley Air Basin. The purpose of this rule is to limit fugitive dust emissions from agricultural operations.

Pursuant to Section 5.1, effective on and after July 1, 2004, an owner/operator shall implement the applicable CMPs selected pursuant to Section 6.2 for each agricultural operation site.

Pursuant to Section 5.2, an owner/operator shall prepare and submit a CMP application for each agricultural operation site to the APCO for approval.

The facility received District approval for its CMP plan on January 31, 2012. Continued compliance with the requirements of District Rule 4550 is expected.

Rule 4570 Confined Animal Facilities (CAF)

This rule applies to Confined Animal Facilities (CAF) located within the San Joaquin Valley Air Basin. The purpose of this rule is to limit emissions of Volatile Organic Compounds (VOC) from Confined Animal Facilities (CAF).

The applicant has implemented mitigation measures selected to comply with requirements of District Rule 4570 and these mitigation measures have been incorporated into the permits for this dairy. The proposed herd changes in this project does not warrant any changes in mitigation measures practiced at this dairy.

To ensure ongoing compliance, the mitigation measures that the applicant has previously to comply with the rule will be incorporated into the ATCs issued under this project.

California Health & Safety Code Section 42301.6 (School Notice)

California Health & Safety Code Section 42301.6 requires that the District prepare a school notice prior to approving an application for a permit to construct or modify a source that emits toxic air emissions which is located within 1,000 feet from the outer boundary of a K-12 school site. This facility is not located within 1,000 feet of any K-12 school and therefore a school notice is not required.

California Environmental Quality ACT (CEQA)

The California Environmental Quality Act (CEQA) requires each public agency to adopt objectives, criteria, and specific procedures consistent with CEQA Statutes and the CEQA Guidelines for administering its responsibilities under CEQA, including the orderly evaluation of projects and preparation of environmental documents. The San Joaquin Valley Unified Air Pollution Control District (District) adopted its *Environmental Review Guidelines* (ERG) in 2001. The basic purposes of CEQA are to:

- Inform governmental decision-makers and the public about the potential, significant environmental effects of proposed activities.
- Identify the ways that environmental damage can be avoided or significantly reduced.
- Prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible.
- Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved.

The County of Kern (County) is the public agency having principal responsibility for approving the project. As such, the County served as the Lead Agency (CCR §15367). In approving the project, the Lead Agency prepared and adopted a Negative

Declaration. The Lead agency filed a Notice of Determination, stating that the environmental document was adopted pursuant to the provisions of CEQA and concluding that the project would not have a significant effect on the environment.

The District is a Responsible Agency for the project because of its discretionary approval power over the project via its Permits Rule (Rule 2010) and New Source Review Rule (Rule 2201), (CCR §15381). As a Responsible Agency the District complies with CEQA by considering the environmental document prepared by the Lead Agency, and by reaching its own conclusion on whether and how to approve the project (CCR §15096).

The District has considered the Lead Agency's environmental document. Furthermore, the District has conducted an engineering evaluation of the project, this document, which demonstrates that Stationary Source emissions from the project would be below the District's thresholds of significance for criteria pollutants. Thus, the District finds that through a combination of project design elements, compliance with applicable District rules and regulations, and compliance with District air permit conditions, project specific stationary source emissions will have a less than significant impact on air quality. The District does not have authority over any of the other project impacts and has, therefore, determined that no additional findings are required (CEQA Guidelines §15096(h)).

Senate Bill 700

This dairy facility has already been issued initial farm permits as required by the provisions of SB700. No other SB700 provisions are applicable to the current project.

IX. Recommendation

Issue Authorities to Construct permits #S-4835-1-3, -2-4, & -3-3 subject to conditions listed on the attached draft.

X. Billing Information

Permit Number	Fee Schedule	Fee Description
S-4835-1-3	3020-06	Milking Operation
S-4835-2-4	3020-06	Cow Housing
S-4835-3-3	3020-06	Liquid Manure Handling

XI. Appendices

A: Current Permits to Operate (S-4835-1-2, -2-3, & -3-2)
B: Emission Calculations and Anaerobic Lagoon Design Check
C: Top-Down BACT Analysis
D: Summary of Health Risk Assessment (HRA)
E: Draft Authority to Construct Permit (S-4835-1-3, -2-4, & -3-3)

Appendix A

Current Permits to Operate

S-4835-1-2, -2-3 and -3-2

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: S-4835-1-2 **EXPIRATION DATE:** 12/31/2014

EQUIPMENT DESCRIPTION:
3,200 COW MILKING OPERATION WITH 100 STALL PARALLEL MILKING PARLOR AND 12 STALL HOSPITAL MILKING PARLOR

PERMIT UNIT REQUIREMENTS

1. Permittee shall implement and maintain all the Mitigation Measures contained in this permit on and after February 4, 2013. [District Rule 4570]
2. If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
3. Permittee shall flush or hose milk parlor immediately prior to, immediately after, or during each milking. [District Rule 4570]
4. Permittee shall provide verification that milk parlors are flushed or hosed prior to, immediately after, or during each milking. [District Rule 4570]
5. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: S-4835-2-3 **EXPIRATION DATE:** 12/31/2014

EQUIPMENT DESCRIPTION:
COW HOUSING 3,200 MILK COWS NOT TO EXCEED 3,680 MATURE COWS (MILK AND DRY COWS): 2,400 TOTAL SUPPORT STOCK (HEIFERS, CALVES AND BULLS)

PERMIT UNIT REQUIREMENTS

1. Permittee shall implement and maintain all the Mitigation Measures contained in this permit on and after February 4, 2013. [District Rule 4570]
2. If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
3. Permittee shall pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers. [District Rule 4570]
4. Permittee shall flush, scrape or vacuum freestall lanes immediately prior to, immediately after or during each milking. [District Rule 4570]
5. Permittee shall maintain records sufficient to demonstrate that freestall lanes are flushed, scraped or vacuumed immediately prior to, immediately after or during each milking. [District Rule 4570]
6. Permittee shall remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rule 4570]
7. Permittee shall record the date that manure that is not dry is removed from individual cow freestall beds or raked, harrowed, scraped, or freestall bedding is graded at least once every seven (7) days. [District Rule 4570]
8. Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [District Rule 4570]
9. Permittee shall maintain records demonstrating that water pipes and troughs are inspected and leaks are repaired at least once every seven (7) days. [District Rule 4570]
10. Permittee shall clean manure from corrals at least four (4) times per year with at least sixty (60) days between each cleaning, or permittee shall clean corrals at least once between April and July and at least once between September and December. [District Rule 4570]
11. Permittee shall demonstrate that manure from corrals are cleaned at least four (4) times per year with at least sixty (60) days between each cleaning or demonstrate that corrals are cleaned at least once between April and July and at least once between September and December. [District Rule 4570]
12. Permittee shall implement at least one of the following corral mitigation measures: 1) slope the surface of the corrals at least 3% where the available space for each animal is 400 square feet or less and shall slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 square feet per animal; 2) maintain corrals to ensure proper drainage preventing water from standing more than forty-eight hours; or 3) harrow, rake, or scrape pens sufficiently to maintain a dry surface except during periods of rainy weather. [District Rule 4570]

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

13. Permittee shall either 1) maintain sufficient records to demonstrate that corrals are maintained to ensure proper drainage preventing water from standing for more than forty-eight hours or 2) maintain records of dates pens are groomed (i.e., harrowed, raked, or scraped, etc.). [District Rule 4570]
14. Permittee shall scrape, vacuum or flush concrete lanes in corrals at least once every day for mature cows and every seven (7) days for support stock. [District Rule 4570]
15. Permittee shall maintain records demonstrating that concrete lanes in corrals are scraped, vacuumed, or flushed at least once every day for mature cows and at least once every seven (7) days for support stock. [District Rule 4570]
16. Shade structures shall be installed in any of the following ways: 1) constructed with a light permeable roofing material; 2) uphill of any slope in the corral; 3) installed so that the structure has a North/South orientation. OR Permittee shall clean manure from under corral shades at least once every fourteen (14) days, when weather permits access into the corral. [District Rule 4570]
17. Permittee shall manage corrals such that the manure depth in the corral does not exceed twelve (12) inches at any time or point, except for in-corral mounding. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. However, permittee must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. [District Rule 4570]
18. Permittee shall measure and document the depth of manure in the corrals at least once every ninety (90) days. [District Rule 4570]
19. Permittee shall maintain a record of the number of animals of each species and production group at the facility and shall maintain quarterly records of any changes to this information. [District Rule 4570]
20. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: S-4835-3-2 **EXPIRATION DATE:** 12/31/2014

EQUIPMENT DESCRIPTION:
LIQUID MANURE HANDLING SYSTEM CONSISTING OF TWO MECHANICAL SEPARATOR AND 2 STORAGE PONDS CONTROLLED BY AERATORS: MANURE IS LAND APPLIED THROUGH FLOOD IRRIGATION

PERMIT UNIT REQUIREMENTS

1. Permittee shall implement and maintain all the Mitigation Measures contained in this permit on and after February 4, 2013. [District Rule 4570]
2. If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
3. Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rule 4570]
4. Permittee shall not allow liquid manure to stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570]
5. Permittee shall maintain records to demonstrate liquid manure did not stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570]
6. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]

Appendix B

Emission Calculations

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Anaerobic Lagoon Design Check

Spreadsheets

Instructions: Provide the information required in the yellow-shaded cells below. Then go to the "Mitigation Measures" tabsheet and select the Rule 4570 mitigation measures practiced/proposed by the facility.

Pre-Project Dairy Information

Are all cows at this facility Jersey cows? no

Most dairies house Holstein cows unless explicitly stated on the PTO or application.

Does the facility have an anaerobic treatment lagoon? yes

Total support stock (heifers, calves, and bulls) should be entered as large heifers. However, if entering the entire support stock as large heifers will result in NSR implications, it may be appropriate to enter each herd size individually (talk to Supervisor) Enter bulls as large heifers.

If unsure whether herd is housed in freestalls or open corrals, assume open corrals to be conservative.

Pre-Project Herd Size				
Herd	Size	Total	Shades?	Shade CE
Milk Cows in Freestalls	3,200	3,200	N/A	0.0%
Milk Cows in Open Corrals				0.0%
Dry Cows in Freestalls	480	480	N/A	0.0%
Dry Cows in Open Corrals				0.0%
Large Heifers in Freestalls		1,472	N/A	0.0%
Large Heifers in Open Corrals	1,472		x	8.3%
Medium Heifers in Freestalls		928	N/A	0.0%
Medium Heifers in Open Corrals	928		x	8.3%
Small Heifers in Freestalls		0	N/A	0.0%
Small Heifers in Open Corrals				0.0%
Calves in Open Corrals		0		0.0%
Calves in On-Ground Hutches				0.0%
Calves in Above-Ground Flushed Hutches				0.0%
Calves in Above-Ground Scraped Hutches				0 0%
Total Milk Cows		3,200		
Total Mature Cows		3,680		
Total Support Stock		2,400		
Total Dairy Head		6,080		

If there are shades, enter "x". Otherwise leave blank.

Silage info may be found in the Rule 4570 Phase II application or EE.

Silage Information			
Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn	3	40	170
Alfalfa	3	40	170
Wheat	3	40	170

Post-Project Dairy Information

Are all cows at this facility Jersey cows? no

Most dairies house Holstein cows unless explicitly stated on the PTO or application.

Does the facility have an anaerobic treatment lagoon? yes

Total support stock (heifers, calves, and bulls) should be entered as large heifers. However, if entering the entire support stock as large heifers will result in NSR implications, it may be appropriate to enter each herd size individually (talk to Supervisor). Enter bulls as large heifers

If unsure whether herd is housed in freestalls or open corrals, assume open corrals to be conservative.

Post-Project Herd Size				
Herd	Size	Total	Shades?	Shade CE
Milk Cows in Freestalls	3,850	4,570	N/A	0.0%
Milk Cows in Open Corrals	720			0.0%
Dry Cows in Freestalls		1,406	N/A	0.0%
Dry Cows in Open Corrals	1,406		x	16.7%
Large Heifers in Freestalls		0	N/A	0.0%
Large Heifers in Open Corrals				0.0%
Medium Heifers in Freestalls		0	N/A	0.0%
Medium Heifers in Open Corrals				0.0%
Small Heifers in Freestalls		0	N/A	0.0%
Small Heifers in Open Corrals				0.0%
Calves in Open Corrals		0		0.0%
Calves in On-Ground Hutches				0.0%
Calves in Above-Ground Flushed Hutches				0.0%
Calves in Above-Ground Scraped Hutches				0.0%
Total Milk Cows		4,570		
Total Mature Cows		5,976		
Total Support Stock		0		
Total Dairy Head		5,976		

If there are shades, enter "x". Otherwise leave blank

Silage info may be found in the Rule 4570 Phase II application or EE

Silage Information			
Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn	3	40	170
Alfalfa	3	40	170
Wheat	3	40	170

For each mitigation measure, enter "x" if the facility practices or is proposing the corresponding measure. Leave blank if not. This info may be found in the Rule 4570 Phase II application or EE.

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

Cow Housing				
Measure Proposed?		Mitigation Measure(s) per Emissions Point	Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Enteric Emissions Mitigations		
x	x	Feed according to NRC guidelines	10%	10%
		Total Control Efficiency	10%	10%
		Corrals/Pens Mitigations		
x	x	Feed according to NRC guidelines	10%	10%
x	x	Inspect water pipes and troughs and repair leaks at least once every seven days. Note: If selected for dairies > 999 milk cows, CE is already included in EF.	0%	0%
x	x	Clean manure from corrals at least four times per year with at least 60 days between cleaning, or clean corrals at least once between April and July and at least once between September and December. Note: If selected for dairies > 999 milk cows, CE is already included in EF.	0%	0%
x	x	Scrape, vacuum, or flush concrere lanes in corrals at least once every day for mature cows and every seven days for support stock, or clean concrete lanes such that the depth of manure does not exceed 12 inches at any point or time.	10%	10%
x	x	Implement one of the following: 1) slope the surface of the corrals at least 3% where the available space for each animal is 400 sq ft or less and slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 sq ft; 2) maintain corrals to ensure proper drainage preventing water from standing more than 48 hrs; 3) harrow, rake, or scrape pens sufficiently to maintain a dry surface. Note: If selected for dairies > 999 milk cows, CE already included in EF.	0%	0%
		Install shade structures such that they are constructed with a light permeable roofing material. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.	0%	0%
x	x	Install all shade structures uphill of any slope in the corral. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.	5%	5%
		Clean manure from under corral shades at least once every 14 days, when weather permits access into corral. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used incldues a partial control for this measure.	0%	0%

		Install shade structure so that the structure has a North/South orientation. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used incldues a partial control for this measure.	0%	0%
x	x	Manage corrals such that the manure depth in the corral does not exceed 12 inches at any time or point, except for in-corral mounding. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. The manure facility must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF.	0%	0%
		Knockdown fence line manure build-up prior to it exceeding a height of 12 inches at any time or point. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. The facility must resume management of the manrue depth of 12 inches or lower immediately upon the corral becoming accessible.	0%	0%
		Use lime or a similar absorbent material in the corral according to the manufacturer's recommendation to minimize moisture in the corrals.	0%	0%
		Apply thymol to the corral soil in accordance with the manufacturer's recommendation.	0%	0%
		Total Control Efficiency	23.05%	23.05%
		Bedding Mitigations		
x	x	Feed according to NRC guidelines	10%	10%
		Use non-manure-based bedding and non-separated solids based bedding for at least 90% of the bedding material, by weight, for freestalls (e.g. rubber mats, almond shells, sand, or waterbeds).	0%	0%
x	x	For a large dairy only (1,000 milk cows or larger) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 7 days.	10%	10%
		For a medium dairy only (500 to 999 milk cows) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 14 days.	0%	0%
		Total Control Efficiency	19.00%	19.00%
		Lanes Mitigations		
x	x	Feed according to NRC guidelines	10%	10%
x	x	Pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers. Note: No control efficiency at this time.	0%	0%
x	x	Flush, scrape, or vacuum freestall flush lanes immediately prior to or after, or during each milking; or flush or scrape freestall flush lanes at least 3 times per day.	10%	10%
		Have no animals in exercise pens or corrals at any time.	0%	0%
		Total Control Efficiency	19.00%	19.00%

Liquid Manure Handling				
Measure Proposed?		**Mitigation Measure(s) per Emissions Point**	**Control Efficiency (%)**	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Lagoons/Storage Ponds Mitigations		
x	x	Feed according to NRC guidelines	10%	10%
		Use phototropic lagoon	0%	0%
		Use an anaerobic treatment lagoon designed according to NRCS Guideline No. 359	0%	0%
x	x	Remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF.	0%	0%

		Maintain lagoon pH between 6.5 and 7.5	0%	0%
		Total Control Efficiency	10.00%	10.00%
		Liquid Manure Land Application Mitigations		
x	x	Feed according to NRC guidelines	10%	10%
		Only apply liquid manure that has been treated with an anaerobic or aerobic treatment lagoon, aerobic lagoon, or digester system	0%	0%
x	x	Allow liquid manure to stand in the fields for no more than 24 hours after irrigation. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF.	0%	0%
		Apply liquid/slurry manure via injection with drag hose or similar apparatus	0%	0%
		Total Control Efficiency	10.00%	10.00%

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

Silage and TMR				
Measure Proposed?		**Mitigation Measure(s) per Emissions Point**	**Control Efficiency (%)**	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Corn/Alfalfa/Wheat Silage Mitigations		
		1. Utilize a sealed feed storage system (e.g. Ag-Bag) for bagged silage, or 2. Cover the surface of silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least 5 mils thick (0.005 inches), multiple plastic tarps with a cumulative thickness of at least 5 mils (0.005 inches), or an oxygen barrier film covered with a UV resistant material within 72 hours of last delivery of material to the pile, and implement one of the following:		

x	x	a) build silage piles such that the average bulk density is at least 44 lb/cu-ft for corn silage and 40 lb/cu-ft for other silage types, as measured in accordance with Section 7.10 of Rule 4570, b) when creating a silage pile, adjust filling parameters to assure a calculated average bulk density of at least 44 lb/cu-ft for corn silage and at least 40 lb/cu-ft for other silage types, using a spreadsheet approved by the District, c) harvest silage crop at > or = 65% moisture for corn; and >= 60% moisture for alfalfa/grass and other silage crops; manage silage material delivery such that no more than 6 inches of materials are uncompacted on top of the pile; and incorporate the applicable Theoretical Length of Chop (TLC) and roller opening for the crop being harvested. Implement two of the following: Manage Exposed Silage. a) manage silage piles such that only one silage pile has an uncovered face and the uncovered face has a total exposed surface area of less than 2,150 sq. ft., or b) manage multiple uncovered silage piles such that the total exposed surface area of all silage piles is less than 4,300 sq ft. Maintain Silage Working Face. a) use a shaver/facer to remove silage from the silage pile, or b) maintain a smooth vertical surface on the working face of the silage pile Silage Additive: a) inoculate silage with homolactic acid bacteria in accordancew with manufacturer recommendations to achieve a concentration of at least 100,000 colony forming units per gram of wet forage or apply proprionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at a rate specified by the manufacturer to reduce yeast counts when forming silage pile; or b) apply other additives at specified rates that have been demonstrated to reduce alcohol concentrations in silage and/or VOC emissions from silage and have been approved by the District and EPA.	39%	39%
		Total Control Efficiency*	39.00%	39.00%

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

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

lb/hd-yr Dairy Emissions Factors

			Milk Cows				Dry Cows				Large Heifers (15 to 24 months)			
			Uncontrolled		EF1	EF2	Uncontrolled		EF1	EF2	Uncontrolled		EF1	EF2
			<1000 milk cows	≥1000 milk cows			<1000 milk cows	≥1000 milk cows			<1000 milk cows	≥1000 milk cows		
Milking Parlor	VOC	Enteric Emissions in Milking Parlors	0.43	0.41	0.37	0.37	-	-	-	-	-	-	-	-
		Milking Parlor Floor	0.04	0.03	0.03	0.03	-	-	-	-	-	-	-	-
		Total	**0.47**	**0.44**	**0.40**	**0.40**	-	-	-	-	-	-	-	-
	NH3	**Total**	**0.19**	**0.19**	**0.19**	**0.19**	-	-	-	-	-	-	-	-
Cow Housing	VOC	Enteric Emissions in Cow Housing	3.89	3.69	3.32	3.32	2.33	2.23	2.01	2.01	1.81	1.71	1.54	1.54
		Corrals/Pens	10.00	6.60	5.08	5.08	5.40	3.59	2.76	2.76	4.20	2.76	2.12	2.12
		Bedding	1.05	1.00	0.81	0.81	0.57	0.54	0.44	0.44	0.44	0.42	0.34	0.34
		Lanes	0.64	0.80	0.65	0.65	0.45	0.44	0.35	0.35	0.35	0.33	0.27	0.27
		Total	**15.78**	**12.09**	**9.86**	**9.86**	**8.75**	**6.80**	**5.57**	**5.57**	**6.81**	**5.22**	**4.27**	**4.27**
	NH3	**Total**	**53.30**	**53.30**	**53.30**	**53.30**	**27.00**	**27.00**	**27.00**	**27.00**	**14.00**	**14.00**	**14.00**	**14.00**
Liquid Manure Handling	VOC	Lagoons/Storage Ponds	1.52	1.30	1.17	1.17	0.82	0.71	0.64	0.64	0.64	0.54	0.49	0.49
		Liquid Manure Land Application	1.64	1.40	1.26	1.26	0.89	0.76	0.69	0.69	0.69	0.58	0.53	0.53
		Total	**3.16**	**2.70**	**2.43**	**2.43**	**1.71**	**1.47**	**1.32**	**1.32**	**1.33**	**1.13**	**1.02**	**1.02**
	NH3	Lagoons/Storage Ponds	8.20	8.20	8.20	8.20	4.20	4.20	4.20	4.20	2.20	2.20	2.20	2.20
		Liquid Manure Land Application	8.90	8.90	8.90	8.90	4.50	4.50	4.50	4.50	2.30	2.30	2.30	2.30
		Total	**17.10**	**17.10**	**17.10**	**17.10**	**8.70**	**8.70**	**8.70**	**8.70**	**4.50**	**4.50**	**4.50**	**4.50**
Solid Manure Handling	VOC	Solid Manure Storage	0.16	0.15	0.12	0.12	0.09	0.08	0.07	0.07	0.07	0.06	0.05	0.05
		Separated Solids Piles	0.08	0.08	0.05	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02
		Solid Manure Land Application	0.39	0.33	0.30	0.30	0.21	0.18	0.16	0.16	0.16	0.14	0.12	0.12
		Total	**0.61**	**0.54**	**0.47**	**0.47**	**0.33**	**0.29**	**0.26**	**0.26**	**0.26**	**0.23**	**0.20**	**0.20**
	NH3	Solid Manure Storage	0.95	0.95	0.95	0.95	0.48	0.48	0.48	0.48	0.25	0.25	0.25	0.25
		Separated Solids Piles	0.38	0.38	0.38	0.38	0.19	0.19	0.19	0.19	0.10	0.10	0.10	0.10
		Solid Manure Land Application	2.09	2.09	2.09	2.09	1.08	1.08	1.08	1.08	0.55	0.55	0.55	0.55
		Total	**3.42**	**3.42**	**3.42**	**3.42**	**1.73**	**1.73**	**1.73**	**1.73**	**0.90**	**0.90**	**0.90**	**0.90**

			Medium Heifers (7 to 14 months)				Small Heifers (3 to 6 months)				Calves (0 - 3 months)			
			Uncontrolled		EF1	EF2	Uncontrolled		EF1	EF2	Uncontrolled		EF1	EF2
			<1000 milk cows	≥1000 milk cows			<1000 milk cows	≥1000 milk cows			<1000 milk cows	≥1000 milk cows		
Milking Parlor	VOC	Enteric Emissions in Milking Parlors	-	-	-	-		-	-	-		-	-	-
		Milking Parlor Floor	-	-	-	-		-	-	-		-	-	-
		Total	-	-	-	-		-	-	-		-	-	-
	NH3	**Total**	-	-	-	-		-	-	-		-	-	-
Cow Housing	VOC	Enteric Emissions in Cow Housing	1.23	1.17	1.05	1.05	0.69	0.65	0.58	0.58	0.32	0.31	0.28	0.28
		Corrals/Pens	2.85	1.88	1.45	1.45	1.60	1.04	0.80	0.80	0.75	0.50	0.39	0.39
		Bedding	0.30	0.26	0.23	0.23	0.17	0.16	0.13	0.13	0.08	0.08	0.08	0.08
		Lanes	0.24	0.23	0.18	0.18	0.13	0.13	0.10	0.10	0.08	0.08	0.05	0.05
		Total	**4.62**	**3.56**	**2.91**	**2.91**	**2.59**	**1.98**	**1.62**	**1.62**	**1.22**	**0.95**	**0.78**	**0.78**
	NH3	**Total**	**10.00**	**10.00**	**10.00**	**10.00**	**7.60**	**7.80**	**7.80**	**7.80**	**2.20**	**2.20**	**2.20**	**2.20**
Liquid Manure Handling	VOC	Lagoons/Storage Ponds	0.43	0.37	0.33	0.33	0.24	0.21	0.19	0.19	0.11	0.10	0.09	0.09
		Liquid Manure Land Application	0.47	0.40	0.36	0.36	0.26	0.22	0.20	0.20	0.12	0.11	0.10	0.10
		Total	**0.90**	**0.77**	**0.69**	**0.69**	**0.51**	**0.43**	**0.38**	**0.38**	**0.24**	**0.21**	**0.18**	**0.18**
	NH3	Lagoons/Storage Ponds	1.50	1.50	1.50	1.50	1.20	1.20	1.20	1.20	0.35	0.35	0.35	0.35
		Liquid Manure Land Application	1.70	1.70	1.70	1.70	1.30	1.30	1.30	1.30	0.37	0.37	0.37	0.37
		Total	**3.20**	**3.20**	**3.20**	**3.20**	**2.50**	**2.50**	**2.50**	**2.50**	**0.72**	**0.72**	**0.72**	**0.72**
Solid Manure Handling	VOC	Solid Manure Storage	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01
		Separated Solids Piles	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
		Solid Manure Land Application	0.11	0.09	0.08	0.08	0.06	0.05	0.05	0.05	0.03	0.03	0.02	0.02
		Total	**0.17**	**0.15**	**0.13**	**0.13**	**0.10**	**0.09**	**0.07**	**0.07**	**0.05**	**0.04**	**0.04**	**0.04**
	NH3	Solid Manure Storage	0.18	0.18	0.18	0.18	0.13	0.13	0.13	0.13	0.04	0.04	0.04	0.04
		Separated Solids Piles	0.07	0.07	0.07	0.07	0.05	0.05	0.05	0.05	0.02	0.02	0.02	0.02
		Solid Manure Land Application	0.39	0.39	0.39	0.39	0.30	0.30	0.30	0.30	0.09	0.09	0.09	0.09
		Total	**0.64**	**0.64**	**0.64**	**0.64**	**0.48**	**0.48**	**0.48**	**0.48**	**0.15**	**0.15**	**0.15**	**0.15**

Silage and TMR (Total Mixed Ration) Emissions (μg/m^2-min)

		Silage Type	Uncontrolled	EF1	EF2
Feed Storage and Handling	VOC	Corn Silage	34,881	21,155	21,155
		Alfalfa Silage	17,458	10,649	10,649
		Wheat Silage	43,844	26,745	26,745
		TMR	13,056	10,575	10,575

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

PM_{10} Emission Factors (lb/hd-yr)

Type of Cow	Dairy EF	Source
Cows in Freestalls	1.37	Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy
Milk/Dry in Corrals	5.46	Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy
Heifers/Bulls in Open Corrals	10.55	Based on a USDA/UC Davis report quantifying dairy and feedlot emissions in Tulare & Kern Counties (April '01)
Calf (under 3 mo) open corrals	1.37	SJVAPCD
Calf on-ground hutches	0.343	SJVAPCD (75% control efficiency)
Calf above-ground flushed	0.069	SJVAPCD (95% control efficiency)
Calf above-ground scraped	0.206	SJVAPCD (85% control efficiency)

Pre-Project Potential to Emit (PE1)

Pre-Project Herd Size				
Herd	Size	Total	Shades?	Shade CE
Milk Cows in Freestalls	3,200	3,200	N/A	0.0%
Milk Cows in Open Corrals	0			0.0%
Dry Cows in Freestalls	480	480	N/A	0.0%
Dry Cows in Open Corrals	0			0.0%
Large Heifers in Freestalls	0	1,472	N/A	0.0%
Large Heifers in Open Corrals	1,472		x	8.3%
Medium Heifers in Freestalls	0	928	N/A	0.0%
Medium Heifers in Open Corrals	928		x	8.3%
Small Heifers in Freestalls	0	0	N/A	0.0%
Small Heifers in Open Corrals	0			0.0%
Calves in Open Corrals	0	0		0.0%
Calves in On-Ground Hutches	0			0.0%
Calves in Above-Ground Flushed Hutches	0			0.0%
Calves in Above-Ground Scraped Hutches	0			0.0%
Total Milk Cows		3,200		
Total Mature Cows		3,680		
Total Support Stock		2,400		
Total Dairy Head		**6,888**		

Silage Information				
Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)	Open Face Area (ft^2)
Corn	3	40	170	15,806
Alfalfe	3	40	170	15,806
Wheat	3	40	170	15,806

Open Face Area = [#open face piles] x [height] x (([width] + ([width]/(0.1667 x [width]/[height]) + 1.111)))/2)

Feed Handling and Storage		
	Daily PE (lb/day)	Annual PE (lb/yr)
Corn Emissions	98.4	35,920
Alfalfa Emissions	24.8	9,041
Wheat Emissions	124 4	45,410
TMR*	134.0	48,922
Total	**381.6**	**139,293**

*Total support stock, including any calves, will be included in TMR calculation.

Calculations for annual silage emissions:

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

Calculations for annaul TMR emissions:

Annual PE = (# cows) x (EF1) x (0.658 m²) x (525,600 min/yr) x (2.20E-9 lb/μg)

Calculations for daily emissions:

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

Milking Parlor				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	3.5	1,267	1 7	608

Cow Housing						
Cow	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	86.4	31,545	467 3	170,560	12 0	4,384
Dry Cows	7.3	2,672	35.5	12,960	1.8	658
Large Heifers	17 2	6,288	56 5	20,608	39.0	14,241
Medium Heifers	7 4	2,703	25 4	9,280	24.6	8,978
Small Heifers	0.0	0	0 0	0	0 0	0
Calves	0 0	0	0.0	0	0.0	0
Total	**118.3**	**43,208**	**584.7**	**213,408**	**77.4**	**28,268**

Liquid Manure Handling				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	21.3	7,776	149.9	54,720
Dry Cows	1.7	635	11.4	4,176
Large Heifers	4.1	1,494	18.1	6,624
Medium Heifers	1.8	642	8.1	2,970
Small Heifers	0.0	0	0.0	0
Calves	0.0	0	0.0	0
Total	**28.9**	**10,547**	**187.5**	**68,490**

Calculations for milking parlor:

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

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

Solid Manure Handling				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	4 1	1,512	30 0	10,944
Dry Cows	0.3	123	2 3	830
Large Heifers	0 8	291	3 6	1,325
Medium Heifers	0 3	125	1 6	594
Small Heifers	0.0	0	0.0	0
Calves	0.0	0	0.0	0
Total	**5.5**	**2,051**	**37.5**	**13,693**

Calculations for all other permits:

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

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

Total Daily Pre-Project Potential to Emit (lb/day)						
Permit	NOx	SOx	PM10	CO	VOC	NH3
Milking Parlor	0 0	0 0	0.0	0.0	3.5	1 7
Cow Housing	0.0	0.0	77.4	0.0	118.3	584.7
Liquid Manure	0.0	0.0	0 0	0.0	28.9	187.5
Solid Manure	0 0	0 0	0 0	0.0	5.5	37.5
Feed Handling	0.0	0.0	0 0	0.0	381.6	0.0
Total	**0.8**	**0.8**	**77.4**	**0.0**	**537.8**	**811.4**

Total Annual Pre-Project Potential to Emit (lb/yr)						
Permit	NOx	SOx	PM10	CO	VOC	NH3
Milking Parlor	0	0	0	0	1,267	608
Cow Housing	0	0	28,260	0	43,208	213,408
Liquid Manure	0	0	0	0	10,547	68,490
Solid Manure	0	0	0	0	2,051	13,693
Feed Handling	0	0	0	0	139,293	0
Total	**0**	**0**	**28,260**	**0**	**196,356**	**296,199**

Post-Project Potential to Emit (PE2)

Post-Project Herd Size				
Herd	Size	Total	Shades?	Shade CE
Milk Cows in Freestalls	3,850	4,570	N/A	0.0%
Milk Cows in Open Corrals	720			0.0%
Dry Cows in Freestalls	0	1,406	N/A	0.0%
Dry Cows in Open Corrals	1,406		x	18.7%
Large Heifers in Freestalls	0	0	N/A	0.0%
Large Heifers in Open Corrals	0			0.0%
Medium Heifers in Freestalls	0	0	N/A	0.0%
Medium Heifers in Open Corrals	0			0.0%
Small Heifers in Freestalls	0	0	N/A	0.0%
Small Heifers in Open Corrals	0			0.0%
Calves in Open Corrals	0	0		0.0%
Calves in On-Ground Hutches	0			0.0%
Calves in Above-Ground Flushed Hutches	0			0.0%
Calves in Above-Ground Scraped Hutches	0			0.0%
Total Milk Cows		4,570		
Total Mature Cows		5,976		
Total Support Stock		0		
Total Dairy Head		**5,976**		

Silage Information				
Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)	Open Face Area (ft^2)
Corn	3	40	170	15,806
Alfalfa	3	40	170	15,806
Wheat	3	40	170	15,806

Open Face Area = [#open face piles] x [height] x (([width] + ([width]/(0.1667 x [width]/[height]) + 1.111))/2)

Feed Handling and Storage		
	Daily PE (lb/day)	Annual PE (lb/yr)
Corn Emissions	98.4	35,920
Alfalfa Emissions	24.8	9,041
Wheat Emissions	124.4	45,410
TMR*	131.7	48,085
Total	**379.3**	**138,456**

*Total support stock, including any calves, will be included in TMR calculation.

Calculations for annual silage emissions:

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

Calculations for annaul TMR emissions:

Annual PE = [# cows) x (EF1) x (0.658 m²) x (525,600 min/yr) x (2.20E-9 lb/µg)

Calculations for daily emissions:

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

Milking Parlor				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	5.0	1,810	2.4	868

Cow Housing						
Cow	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	123.4	45,050	667.3	243,581	25.2	9,206
Dry Cows	21.4	7,826	104.0	37,962	17.5	6,395
Large Heifers	0.0	0	0.0	0	0.0	0
Medium Heifers	0.0	0	0.0	0	0.0	0
Small Heifers	0.0	0	0.0	0	0.0	0
Calves	0.0	0	0.0	0	0.0	0
Total	**144.8**	**52,876**	**771.3**	**281,543**	**42.7**	**15,600**

Liquid Manure Handling				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	30.4	11,105	214.1	78,147
Dry Cows	5.1	1,860	33.5	12,232
Large Heifers	0.0	0	0.0	0
Medium Heifers	0.0	0	0.0	0
Small Heifers	0.0	0	0.0	0
Calves	0.0	0	0.0	0
Total	**35.5**	**12,965**	**247.6**	**90,379**

Calculations for milking parlor:

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

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

Calculations for all other permits:

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

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

Solid Manure Handling				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	5.9	2,159	42.8	15,629
Dry Cows	1.0	362	6.7	2,432
Large Heifers	0.0	0	0.0	0
Medium Heifers	0.0	0	0.0	0
Small Heifers	0.0	0	0.0	0
Calves	0.0	0	0.0	0
Total	**6.9**	**2,521**	**49.5**	**18,062**

Total Daily Post-Project Potential to Emit (lb/day)						
Permit	NOx	SOx	PM10	CO	VOC	NH3
Milking Parlor	0.0	0.0	0.0	0.0	5.0	2.4
Cow Housing	0.0	0.0	42.7	0.0	144.8	771.3
Liquid Manure	0.0	0.0	0.0	0.0	35.5	247.6
Solid Manure	0.0	0.0	0.0	0.0	6.9	49.5
Feed Handling	0.0	0.0	0.0	0.0	379.3	0.0
Total	**0.0**	**0.0**	**42.7**	**0.0**	**571.5**	**1,070.8**

Total Annual Post-Project Potential to Emit (lb/yr)						
Permit	NOx	SOx	PM10	CO	VOC	NH3
Milking Parlor	0	0	0	0	1,810	868
Cow Housing	0	0	15,600	0	52,876	281,543
Liquid Manure	0	0	0	0	12,965	90,379
Solid Manure	0	0	0	0	2,521	18,062
Feed Handling	0	0	0	0	138,456	0
Total	**0**	**0**	**15,600**	**0**	**208,628**	**390,852**

Quarterly Net Emissions Change (QNEC)

The Quarterly Net Emissions Change is used to complete the emission profile screen for the District's PAS database. The QNEC shall be calculated as follows:

QNEC = PE2 - PE1, where:

QNEC = Quarterly Net Emissions Change for each emissions unit, lb/qtr.
PE2 = Post Project Potential to Emit for each emissions unit, lb/qtr.
PE1 = Pre-Project Potential to Emit for each emissions unit, lb/qtr.

Using the values in Sections VII.C.1 and VII.C.2 in the evaluation above, quarterly PE1 and quarterly PE2 can be calculated as follows:

(Delete tables as necessary for units not part of project.)

Milking Parlor					
	PE2 (lb/yr)	PE2 (lb/qtr)	PE1 (lb/yr)	PE1 (lb/qtr)	QNEC (lb/qtr)
NOx	0	0	0	0	0
SOx	0	0	0	0	0
PM10	0	0	0	0	0
CO	0	0	0	0	0
VOC	1,810	452	1,267	317	136
NH3	868	217	608	152	65

Cow Housing					
	PE2 (lb/yr)	PE2 (lb/qtr)	PE1 (lb/yr)	PE1 (lb/qtr)	QNEC (lb/qtr)
NOx	0	0	0	0	0
SOx	0	0	0	0	0
PM10	15,600	3,900	28,260	7,065	-3,165
CO	0	0	0	0	0
VOC	52,876	13,219	43,208	10,802	2,417
NH3	281,543	70,386	213,408	53,352	17,034

Liquid Manure					
	PE2 (lb/yr)	PE2 (lb/qtr)	PE1 (lb/yr)	PE1 (lb/qtr)	QNEC (lb/qtr)
NOx	0	0	0	0	0
SOx	0	0	0	0	0
PM10	0	0	0	0	0
CO	0	0	0	0	0
VOC	12,965	3,241	10,547	2,637	604
NH3	90,379	22,595	68,490	17,122	5,472

Solid Manure					
	PE2 (lb/yr)	PE2 (lb/qtr)	PE1 (lb/yr)	PE1 (lb/qtr)	QNEC (lb/qtr)
NOx	0	0	0	0	0
SOx	0	0	0	0	0
PM10	0	0	0	0	0
CO	0	0	0	0	0
VOC	2,521	630	2,051	513	118
NH3	18,062	4,515	13,693	3,423	1,092

Feed Storage and Handling					
	PE2 (lb/yr)	PE2 (lb/qtr)	PE1 (lb/yr)	PE1 (lb/qtr)	QNEC (lb/qtr)
NOx	0	0	0	0	0
SOx	0	0	0	0	0
PM10	0	0	0	0	0
CO	0	0	0	0	0
VOC	138,456	34,614	139,293	34,823	-209
NH3	0	0	0	0	0

Adjusted Increase in Permitted Emissions

Milking Parlor

VOC Emissions

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	5.0	3.5	0.40	0.40	1.5
				Total	1.5

NH3 Emissions

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	2.4	1.7	0.19	0.19	0.7
				Total	0.7

Cow Housing

VOC Emissions

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	123.4	86.4	9.86	9.86	37.0
Dry Cows	21.4	7.3	5.57	5.57	14.1
Large Heifers	0.0	17.2	4.27	4.27	-17.2
Medium Heifers	0.0	7.4	2.91	2.91	-7.4
Small Heifers	0.0	0.0	1.62	1.62	0.0
Calves	0.0	0.0	0.78	0.78	0.0
				Total	26.5

NH3 Emissions

NH3	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	667.3	467.3	53.30	53.30	200.0
Dry Cows	104.0	35.5	27.00	27.00	68.5
Large Heifers	0.0	56.5	14.00	14.00	-56.5
Medium Heifers	0.0	25.4	10.00	10.00	-25.4
Small Heifers	0.0	0.0	7.60	7.60	0.0
Calves	0.0	0.0	2.20	2.20	0.0
				Total	186.6

PM10 Emissions

PM10	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows (Freestalls)	14.5	12.0	1.37	1.37	2.4
Milk Cows (Corrals)	10.8	0.0	5.46	5.46	10.8
Dry Cows (Freestalls)	0.0	1.8	1.37	1.37	-1.8
Dry Cows (Corrals)	17.5	0.0	4.55	5.46	17.5
Large Heifers (Freestalls)	0.0	0.0	1.37	1.37	0.0
Large Heifers (Corrals)	0.0	39.0	10.55	9.67	-42.5
Medium Heifers (Freestalls)	0.0	0.0	1.37	1.37	0.0
Medium Heifers (Corrals)	0.0	24.6	10.55	9.67	-28.8
Small Heifers (Freestalls)	0.0	0.0	1.37	1.37	0.0
Small Heifers (Corrals)	0.0	0.0	10.55	10.55	0.0
Calves (Corrals)	0.0	0.0	1.37	1.37	0.0
Calves (O-G Hutches)	0.0	0.0	0.343	0.343	0.0
Calves (A-G Flushed)	0.0	0.0	0.069	0.069	0.0
Calves (A-G Scraped)	0.0	0.0	0.206	0.206	0.0
				Total	-40.4

Liquid Manure Handling

VOC Emissions - Lagoon/Storage Pond(s)

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	14.6	10.3	1.17	1.17	4.3
Dry Cows	2.5	0.8	0.64	0.64	1.7
Large Heifers	0.0	2.0	0.49	0.49	-2.0
Medium Heifers	0.0	0.8	0.33	0.33	-0.8
Small Heifers	0.0	0.0	0.19	0.19	0.0
Calves	0.0	0.0	0.09	0.09	0.0
				Total	3.2

VOC Emissions - Land Application

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	15.8	11.0	1.28	1.28	4.8
Dry Cows	2.6	0.9	0.69	0.69	1.7
Large Heifers	0.0	2.1	0.53	0.53	-2.1
Medium Heifers	0.0	0.9	0.36	0.36	-0.9
Small Heifers	0.0	0.0	0.20	0.20	0.0
Calves	0.0	0.0	0.10	0.10	0.0
				Total	3.5

NH3 Emissions - Lagoon/Storage Pond(s)

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	102.7	71.9	8.20	8.20	30.8
Dry Cows	16.2	5.5	4.20	4.20	10.7
Large Heifers	0.0	8.9	2.20	2.20	-8.9
Medium Heifers	0.0	3.8	1.50	1.50	-3.8
Small Heifers	0.0	0.0	1.20	1.20	0.0
Calves	0.0	0.0	0.35	0.35	0.0
				Total	28.8

NH3 Emissions - Land Application

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	111.4	78.0	8.90	8.90	33.4
Dry Cows	17.3	5.9	4.50	4.50	11.4
Large Heifers	0.0	9.3	2.30	2.30	-9.3
Medium Heifers	0.0	4.3	1.70	1.70	-4.3
Small Heifers	0.0	0.0	1.30	1.30	0.0
Calves	0.0	0.0	0.37	0.37	0.0
				Total	31.2

Solid Manure Handling

VOC Emissions - Solid Manure Storage

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	1.5	1.1	0.12	0.12	0.4
Dry Cows	0.3	0.1	0.07	0.07	0.2
Large Heifers	0.0	0.2	0.05	0.05	-0.2
Medium Heifers	0.0	0.1	0.03	0.03	-0.1
Small Heifers	0.0	0.0	0.02	0.02	0.0
Calves	0.0	0.0	0.01	0.01	0.0
				Total	0.3

VOC Emissions - Separated Solids Piles

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	0.7	0.5	0.05	0.05	0.2
Dry Cows	0.1	0.0	0.03	0.03	0.1
Large Heifers	0.0	0.1	0.02	0.02	-0.1
Medium Heifers	0.0	0.0	0.02	0.02	0.0
Small Heifers	0.0	0.0	0.01	0.01	0.0
Calves	0.0	0.0	0.00	0.00	0.0
				Total	0.2

VOC Emissions - Land Application

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	3.7	2.6	0.30	0.30	1.10
Dry Cows	0.6	0.2	0.16	0.16	0.40
Large Heifers	0.0	0.5	0.12	0.12	-0.50
Medium Heifers	0.0	0.2	0.08	0.08	-0.20
Small Heifers	0.0	0.0	0.05	0.05	0.00
Calves	0.0	0.0	0.02	0.02	0.00
				Total	0.8

NH3 Emissions - Solid Manure Storage

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	11.9	8.3	1.0	1.0	3.6
Dry Cows	1.8	0.6	0.5	0.5	1.2
Large Heifers	0.0	1.0	0.3	0.3	-1.0
Medium Heifers	0.0	0.5	0.2	0.2	-0.5
Small Heifers	0.0	0.0	0.1	0.1	0.0
Calves	0.0	0.0	0.0	0.0	0.0
				Total	3.3

NH3 Emissions - Separated Solids Piles

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	4.8	3.3	0.4	0.4	1.5
Dry Cows	0.7	0.2	0.2	0.2	0.5
Large Heifers	0.0	0.4	0.1	0.1	-0.4
Medium Heifers	0.0	0.2	0.1	0.1	-0.2
Small Heifers	0.0	0.0	0.1	0.1	0.0
Calves	0.0	0.0	0.0	0.0	0.0
				Total	1.4

NH3 Emissions - Land Application

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	26.2	18.3	2.1	2.1	7.9
Dry Cows	4.1	1.4	1.1	1.1	2.7
Large Heifers	0.0	2.2	0.6	0.6	-2.2
Medium Heifers	0.0	1.0	0.4	0.4	-1.0
Small Heifers	0.0	0.0	0.3	0.3	0.0
Calves	0.0	0.0	0.1	0.1	0.0
				Total	7.4

Feed Storage and Handling

VOC Emissions - Silage

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Corn Silage	98.4	98.4	21,155	21,155	0.0
Alfalfa Silage	24.8	24.8	10,649	10,649	0.0
Wheat Silage	124.4	124.4	26,745	26,745	0.0
				Total	0.0

VOC Emissions - TMR

	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
TMR	131.7	134.0	10,575	10,575	-2.3
				Total	-2.3

Total Change in Emissions

Total Daily Change in Emissions (lb/day)

	NOx	SOx	PM10	CO	VOC	NH3
Milking Parlor	0.0	0.0	0.0	0.0	1.5	0.7
Cow Housing	0.0	0.0	-34.7	0.0	26.5	186.8
Liquid Manure	0.0	0.0	0.0	0.0	6.6	60.1
Solid Manure	0.0	0.0	0.0	0.0	1.4	12.0
Feed Handling	0.0	0.0	0.0	0.0	-2.3	0.0
Total	0.0	0.0	-34.7	0.0	33.7	259.4

Total Annual Change in Emissions (lb/yr)

	NOx	SOx	PM10	CO	VOC	NH3
Milking Parlor	0	0	0	0	543	260
Cow Housing	0	0	-12,660	0	9,668	68,135
Liquid Manure	0	0	0	0	2,418	21,889
Solid Manure	0	0	0	0	470	4,369
Feed Handling	0	0	0	0	-837	0
Total	0	0	-12,660	0	12,262	94,653

Greenhouse Gas Emissions

Uncontrolled GHG Emission Factors (lbs-hd/yr)						
Animal Type	CH4 (Anaerobic Treatment Lagoon)	CH4 (Lagoon)	CH4 (manure spreading)	CH4 (solid manure storage)	CH4 (enteric)	CO2 equivalent multiplier for CH4
Milk Cows	513	307.8	3.5	27.7	271 5	21
Dry Cows	513	307.8	3.5	27.7	271.5	21
Large Heifers	110.4	110.4	1.6	–	151.6	21
Medium Heifers	110.4	110.4	1.6	–	100.5	21
Small Heifers	110.4	110.4	1.6	–	100.5	21
Calves	–	–	–	–	–	–

Uncontrolled GHG Emission Factors (lbs-hd/yr)					
Animal Type	N2O (Anaerobic Treatment Lagoon	N2O (manure spreading)	N2O (solid manure storage)	N2O (enteric)	N2O equivalent multiplier for N2O
Milk Cows	1.5	0	2.6	0	310
Dry Cows	1.5	0	2.6	0	310
Large Heifers	1.4	0	–	0	310
Medium Heifers	1.4	0	–	0	310
Small Heifers	1.4	0	–	0	310
Calves	–	0	–	0	–

CO2e from CH4 = [CH4 (anaerobic treatment) lagoon + CH4 manure spreading + CH4 solid manure storage + CH4 enteric] x 21 x 0.9072 metric tons/short tons ÷ 2000 lb/ton

CO2e from N2O= [N20 anearobic treatment lagoon + N20 manure spreading + N20 solid manure storage + N2O enteric] x 310 x 0.9072 metric tons/short tons ÷ 2000 lb/ton

Pre-Project: Does the facility have an anaerobic treatment lagoon? yes
Post-Project: Does the facility have an anaerobic treatment lagoon? yes

Pre-Project CO2 Equivalent Emission Factors from Animal Type (metric tons-hd/yr)			
Animal Type	CO2e for CH4	CO2e for N2O	CO2e Total
Milk Cows	7.8	0.6	8.4
Dry Cows	7.8	0.6	8.4
Large Heifers	2.5	0.2	2 7
Medium Heifers	2.0	0.2	2.2
Small Heifers	2.0	0.2	2.2
Calves	0.0	0 0	0.0

Post-Project CO2 Equivalent Emission Factors from Animal Type (metric tons-hd/yr)			
Animal Type	CO2e for CH4	CO2e for N2O	CO2e Total
Milk Cows	7.8	0.6	8.4
Dry Cows	7.8	0.6	8.4
Large Heifers	2 5	0.2	2.7
Medium Heifers	2 0	0 2	2.2
Small Heifers	2 0	0.2	2.2
Calves	0.0	0.0	0.0

Pre-Project Total GHG Emissions			
Animal Type	Herd Size (hd)	CO2e (metric tons-hd/yr)	CO2e Total (metric tons/yr)
Milk Cows	3,200	8 4	26,880
Dry Cows	480	8.4	4,032
Large Heifers	1,472	2 7	3,974
Medium Heifers	928	2.2	2,042
Small Heifers	0	2.2	0
Calves	0	0.0	0
		Total	36,928

Post-Project Total GHG Emissions			
Animal Type	Herd Size (hd)	CO2e (metric tons-hd/yr)	CO2e Total (metric tons/yr)
Milk Cows	4,570	8.4	38,388
Dry Cows	1,406	8.4	11,810
Large Heifers	0	2.7	0
Medium Heifers	0	2.2	0
Small Heifers	0	2.2	0
Calves	0	0.0	0
		Total	50,198

Change in Project GHG Emissions			
Animal Type	Pre-Project CO2e (metric tons/yr)	Post-Project CO2e (metric tons/yr)	Change (metric tons/yr)
Milk Cows	26880	38388	11,508
Dry Cows	4032	11810	7,778
Large Heifers	3974	0	-3,974
Medium Heifers	2042	0	-2,042
Small Heifers	0	0	0
Calves	0	0	0
		Total	13,270

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Lagoon Design Check in Accordance with NRCS Guideline #359

Proposed Lagoon Volume

Volume of treatment lagoon = $(L \times W \times D) - (S \times D^2) \times (W + L) + (4 \times S^2 \times D^3 \div 3)$

Primary Treatment Lagoon Dimensions

Length	1135	ft
Width	150	ft
Depth	18	ft
Slope	1	ft

Primary Lagoon Volume	**2,655,936 ft3**

INSTRUCTIONS
* only input yellow fields

Step 1 Enter primary lagoon dimensions on this sheet
Step 2 Go to "Net Volatile Solids Loading" sheet and enter number of animals flushing manure to lagoon
Step 3 Adjust % in flush and separation as necessary (see notes on sheet)
Step 4 Go to "Minimum Treatment Volume"
Step 5 Minimum treatment volume should be<< lagoon volume to be considered anaerobic treatment lagoon
Step 6 Go to "Hydraulic Retention Time"
Step 7 Adjust fresh water as applicable
Step 8 Hydraulic retention time should be greater than 34 days to be considered anaerobic treatment lagoon.

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Lagoon Design Check in Accordance with NRCS Guideline #359

Net Volatile Solids loading Calculation

Net Volatile Solids (VS) Loading of Treatment Lagoons									
Breed: Jersey Type of Cow	Number of Animals	x	VS Excreted[1] (lb/day)	x	% Manure in Flush[2]	x	(1 - % VS Removed in Separation[3])	=	Net VS Loading (lb/day)
Milk Cows (Free Stall)	3,850	x	17	x	71%	x	(1 – 50%)	=	**23,235**
Milk Cows (Open corrall)	720		17		48%		(1 – 50%)	=	**2,938**
Dry Cow (Open Corrals)	1,356	x	9.2	x	48%	x	(1 – 50%)	=	**2,994**
Heifer (15 to 24 months)	0	x	7.1	x	48%	x	(1 – 50%)	=	**0**
Heifer (7 to 14 months)	0	x	4.9	x	48%	x	(1 – 50%)	=	**0**
Heifer (3 to 6 months)	0	x	2.7	x	48%	x	(1 – 50%)	=	**0**
Calf (under 3 months)	0	x	1.0	x	100%	x	(1 – 50%)	=	**0**
Bulls	20	x	9.2	x	48%	x	(1 – 50%)	=	**44**
Total for Dairy									**29,211**

[1]The Volatile Solids (VS) excretion rates for Holstein cattle are based on Table 1.b - Section 3 of ASAE D384.2 (March 2005). VS excretion rates for milk cows, dry cows, & heifers 15-24 months were taken from directly from the table. The VS excretion rate for heifers 3-6 months was estimated based on total solids excretion. The VS excretion rate for heifers 7-14 months was estimated as the average of heifers 15-24 months and heifers 3-6 months. The table did not give values for total solids or volatile solids excreted by baby calves. The VS excretion rate for baby calves was estimated based on an estimated dry matter intake (DMI) of 1.7% of body weight and the ratio of DMI to VS excretion for 150 kg calves. The VS excretion rate for mature bulls was assumed to be similar to dry cows.

[2] The % manure was taken from Table 3-1 of the California Regional Water Quality Control Board Document "Managing Dairy Manure in the Central Valley of California", UC Davis, June 2005. This document estimated that 21-48% of the manure in open corral dairies is handled as a liquid. Therefore, as a worst case assumption, 48% will be used for all cows housed in open corrals with flush lanes. The document also estimates a range of 42-100% manure handled as a liquid in the freestalls. For freestalls without exercise pens, 100% of manure as a liquid in the flush will be used; for freestalls with exercise pens, the average of the range ((100+42)/2 = 71%) will be used. (http://groundwater.ucdavis.edu/Publications/uc-committee-of-experts-final-report%202006.pdf) Saudi style/loafing barns are hybrids between freestalls and open corrals, the percentage of manure collected on the concrete feed lanes will be averaged between the values from the cows housed in freestall barns and open corrals. Therefore the % of manure deposited on the concrete lanes is equal to 60% [(71+48)/2].

[3] Chastain, J.P., Vanotti, M. B., and Wingfield, M. M., Effectiveness of Liquid-Solid Separation For Treatment of Flushed Dairy Manure: A Case Study, Applied Engineering in Agriculture, Vol 17(3): 343-354 - This document outlines a VS removal rate of 50.1% to 70% depending on the type of separation system used, however to be conservative, a 50% VS removal will be used for all systems.

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Lagoon Design Check in Accordance with NRCS Guideline #359

Minimum Treatment Volume Calculation

MTV = TVS/VSLR

Where:

MTV = Minimum Treatment Volume (ft^3)

TVS = daily Total Volatile solids Loading (lb/day) = 0.011 lb/ft3-day

VSLR = Volatile Solids Loading Rate (lb/1000 ft3-day)

Minimum Treatment Volume in Primary Lagoon					
Breed: Jersey **Type of Cow**	**Net VS Loading (lb/day)**		**VSLR** (lb/ft3-day)[1]		**MTV (ft^3)**
Milk Cows (Free Stalls)	23,235	÷	0.011	=	**2,112,250**
Milk Cows (Open Corrals)	2,938	÷	0.011	=	**267,055**
Dry Cow (Open Corrals)	2,994	÷	0.011	=	**272,186**
Heifer (15 to 24 months)	0	÷	0.011	=	**0**
Heifer (7 to 14 months)	0	÷	0.011	=	**0**
Heifer (3 to 6 months)	0	÷	0.011	=	**0**
Calf (under 3 months)	0	÷	0.011	=	**0**
Bulls	44	÷	0.011	=	**4,015**
Total for Dairy					**2,655,505**

[1] VSLR for an anaerobic treatment lagoon in San Joaquin Valley would be 6.5 lb VS/1000 ft3-day to 11 lb VS/1000 ft3-day according to the NRCS and USDA AWTFH. Based on phone conversation with Matt Summers (USDA) on July 14, 2006, he suggested that the 11 lb VS VS/1000 ft3-day

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Sludge Accumulation Volume

The sludge accumulation volume accounts for the solids contained in the manure that cannot be fully digested by bacteria and that gradually settle to the bottom of the lagoon as sludge. The sludge accumulation volume for lagoon systems without solids separation can be calculated from the USDA Field Handbook. However, there are no accepted guidelines for calculating the sludge accumulation volume for lagoon systems with solids separation, but many designers of digester expect it to be minimal.

This facility has an efficient solids separation system consisting prior to the anaerobic treatment lagoon system. The separation system will remove a large portion of the fibers, lignin, cellulose, and other fibrous materials from the manure. These are the materials that would otherwise cause sludge accumulation from the lack of digestion in a lagoon or digester. Because fibrous materials and other solids will not enter the lagoon system, the sludge accumulation volume required will be minimized and can be considered negligible.

Nevertheless, the primary lagoon will have sufficient space remaining for sludge accumulation, as shown by the following calculation:

SAV = VPL - MTV

Where:

SAV = Sludge Accumulation Volume (ft^3)
VPL = total Volume of Primary Lagoon (ft^3)
MTV = Minimum Treatment Volume (ft^3)

SAV =	VPL	- MTV		
SAV =	**2,655,936**	**2,655,505 =**		**431 (ft3)**

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Lagoon Design Check in Accordance with NRCS Guideline #359

Hydraulic Retention Time (HRT) Calculation

The anaerobic treatment lagoon and covered lagoon anaerobic digester must be designed to provide sufficient Hydraulic Retention Time (HRT) to adequately treat the waste entering the lagoon and to allow environmentally safe utilization of this waste. The NRCS Technical Guide Code 365 – Anaerobic Digester – Ambient Temperature specifies a minimum HRT 38 days in the San Joaquin Valley.

The Hydraulic Retention Time (HRT) is calculated as follows:

HRT = MTV/HFR

where:

HFR = Hydraulic flow rate (1000ft^3/day)
HRT = Hydraulic Retention Time (day)

The Hydraulic Flow Rate is Calculated below

Type	# of cows		Amount of Manure*			HFR	
Milk Cows (Free Stalls)	3,850	x	1.80	ft^3	=	6,930	ft^3/day
Milk Cows (Open Corrals)	720	x	1.80	ft^3	=	1,296	ft^3/day
Dry Cows (Open Corrals)	1,356	x	0.98	ft^3	=	1,329	ft^3/day
Heifers (15-24 mo)	0	x	0.59	ft^3	=	-	ft^3/day
Heifers (7-14 mo)	0	x	0.59	ft^3	=	-	ft^3/day
Heifers (3-6 mo)	0	x	0.23	ft^3	=	-	ft^3/day
Calves	0	x	0.11	ft^3	=	-	ft^3/day
Bulls	20	x	0.98	ft^3	=	20	ft^3/day
Total	5,946					**9,574**	**ft^3/day**
Fresh water per milk cow used in flush at milk parlor			**50**	gal/day			

* The volumes of total daily manure production for Holstein milk cows, dry cows, and large heifers were taken from Table 1.b – Section 3 of ASAE D384.2 (March 2005). These values were reduced by 25% to account for the difference in size between Holstein and Jersey cows (1,350 –1500 lb for a mature Holstein cow & 900 – 1000 lb for a mature Jersey cow).

Formula:

$$\frac{\text{Gallon}}{\text{Milk Cow*Day}} \times \text{\# Milk Cows} \times \frac{ft^3}{\text{gallon}} + \frac{ft^3}{\text{day}}$$

Total HFR:

$$\Rightarrow \frac{50 \text{ gal}}{\text{milk cow * day}} \times 4570 \text{ milk cows} \times \frac{ft^3}{7.48 \text{ gal}} + 9{,}574 \frac{ft^3}{day}$$

= **40,122.6** **ft^3/day**

Formula:

$$\text{MTV } (ft^3) \times \frac{(day)}{\text{HFR } (ft^3)} =$$

HRT:

$$\Rightarrow 2{,}655{,}505 \; ft^3 \times \frac{day}{40{,}122.6 \; ft^3} =$$ **66.18476172 days**

Appendix C

Top-Down BACT Analysis

TRILOGY DAIRY (S-4835, PROJECT # S-1120174)

TOP-DOWN BACT ANALYSIS

Pursuant to Section 5.2 of the Settlement Agreement between the District and the Western United Dairyman and the Alliance of Western Milk Producers Inc, signed September 20, 2004, "*... the District will not make any Achieved in Practice BACT determinations for individual dairy permits or for the dairy BACT guidance until the final BACT guidance has been adopted by the APCO....*".[6] Therefore, a cost effectiveness analysis will be performed for all the technologies, which have not been proposed by the applicant.

The U.S. Environmental Protection Agency (USEPA) RACT/BACT/LAER Clearinghouse, the California Air Pollution Control Officers Association (CAPCOA) BACT Clearinghouse, the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) BACT Clearinghouse, the Bay Area Air Quality Management District (BAAQMD), and the South Coast Air Quality Management District (SCAQMD) BACT Guidelines were reviewed to determine potential control technologies for this class and category of operation. No BACT guidelines were found for this class and category of source.

I. Pollutants Emitted from Dairies

1. PM_{10} Emissions from Dairies

The National Ambient Air Quality Standards currently regulate concentrations of particulate matter with an aerodynamic diameter of 10 micrometers or less (PM_{10}) and particulate matter with an aerodynamic diameter of 2.5 micrometers or less ($PM_{2.5}$). Studies have shown that particles in the smaller size fractions contribute most to human health effects. The $PM_{2.5}$ standard was published in 1997, but is only recently beginning to be implemented because of the time that was required to resolve litigation regarding the standard. On April 5, 2005, EPA finalized classification of areas for the $PM_{2.5}$ standard. On April 21, 2011 District Rule 2201 – New and Modified Stationary Source Review Rule was amended to incorporate $PM_{2.5}$ new and modified source review requirements.

All animal confinement facilities are sources of particulate matter emissions. However, the composition of these emissions will vary. Dust emissions from unpaved surfaces, dry manure storage sites, and land application sites are potential particulate matter emission sources. Sources of particulate matter emissions at a dairy include feed, bedding materials, dry manure, animal dander, and unpaved soil surfaces such as corrals.

The mass of particulate matter emitted from totally or partially enclosed confinement facilities, as well as the particle size distribution, depend on type of ventilation and ventilation rate. Particulate matter emissions from naturally ventilated buildings will be lower than those from mechanically ventilated buildings.

[6] Settlement Agreement. Western United Dairymen, Alliance of Western Milk Producers v. San Joaquin Valley Air Pollution Control District, settled in the Fresno Superior Court September 2004 (http://www.valleyair.org/busind/pto/dpag/settlement.pdf

2. VOC Formation and Emissions from Manure:

Volatile Organic Compounds (VOCs) result from ruminant digestive processes and are formed as intermediate metabolites when organic matter manure decomposes. Under aerobic conditions, any VOCs formed in the manure are rapidly oxidized to carbon dioxide and water. Under anaerobic conditions, complex organic compounds are microbially decomposed to volatile organic acids and other volatile organic compounds, which in turn are mostly converted to methane and carbon dioxide by methanogenic bacteria. When the activity of the methanogenic bacteria is not inhibited, virtually all of the VOCs are metabolized to simpler compounds, and the potential for VOC emissions is minimized. However, the inhibition of methane formation results in a buildup of VOCs in the manure and ultimately to volatilization to the air. Inhibition of methane formation typically is caused by low temperatures or excessive loading rates, which both create an imbalance between the populations of microorganisms responsible for the formation of VOC and methane. VOC emissions will vary with temperature because the rate of VOC formation, reduction to methane, and volatilization and the solubility of individual compounds vary with temperature.[7] VOC emissions from manure and the associated field application site can be minimized by a properly designed and operated stabilization process (such as an anaerobic treatment lagoon). In contrast, VOC emissions will be higher from storage tanks, ponds, overloaded anaerobic lagoons, and the land application sites associated with these systems.

3. Emissions from Silage and Total Mixed ration (TMR):

Volatile Organic Compounds (VOCs) are created during the process that is used to create silage, which is preserved, fermented plant matter that is fed to cattle. The purpose of silage production is to move the ensiled plant material from an aerobic phase to an anaerobic phase as quickly as possible and achieve a rapid drop in pH that will hinder further microbial decomposition in order to preserve the nutritive value of the forage. The rapid drop in pH is primarily caused by conversion of soluble carbohydrates to nonvolatile lactic acid. In addition to lactic acid, alcohols (primarily ethanol), volatile fatty acids (primarily acetic acid), and other VOC compounds (primarily oxygenated VOCs) are also formed during the process. These VOCs largely remain trapped in the silage piles until the silage is exposed to the surrounding atmosphere at the open face of the silage pile from where silage is removed, during mixing, or when placed in feed lanes for the cattle to consume as a Total Mixed Ration (TMR). Once exposed to the surrounding air much of the VOCs contained in the silage and TMR will begin to be rapidly emitted to the atmosphere and the concentration of the VOCs in the silage and TMR will decrease. Loss of VOCs from the silage and TMR can be reduced by minimizing the area exposed to the atmosphere and good silage management practices that will reduce the formation of these VOCs in the silage reduce aerobic deterioration, which leads to heating of the open faces of silage piles and of the TMR placed in the feed lanes.

[7] EPA Document "Emissions from Animal Feeding Operations" (Draft, August 15, 2001), pg. 2-10

4. Ammonia Emissions from Dairies

When sulfur dioxide and nitrogen oxides are present, ammonia is a precursor for the secondary formation of $PM_{2.5}$ in the atmosphere. Ammonia reacts with sulfuric and nitric acids, which are produced from sulfur dioxide and nitrogen oxides in the ambient air, to form ammonium sulfate, ammonium nitrate, and other fine particulates.[8] Exposure to high levels of ammonia can cause irritation to the skin, throat, lungs, and eyes.

Ammonia volatilization is the result of the microbial decomposition of nitrogenous compounds in manure. The primary nitrogenous compound in dairy manure is urea, but nitrogenous compounds also occur in the form of undigested organic nitrogen in animal feces. Whenever urea comes in contact with the enzyme urease, which is excreted in animal feces, the urea will hydrolyze rapidly to form ammonia and this ammonia will be emitted soon after. The formation of ammonia will continue more slowly (over a period of months or years) with the microbial breakdown of organic nitrogen in the manure. Because ammonia is highly soluble in water, ammonia will accumulate in manure handled as liquids and semi-solids or slurries, but will volatize rapidly with drying from manure handled as solids.

The potential for ammonia volatilization exists wherever manure is present, and ammonia will be emitted from confinement buildings, open lots, stockpiles, anaerobic lagoons, and land application from both wet and dry handling systems. The rate of ammonia volatilization is influenced by a number of factors including the concentrations of nitrogenous compounds in the manure, temperature, air velocity, surface area, moisture, and pH. Because of its high solubility in water, the loss of ammonia to the atmosphere will be more rapid when drying of manure occurs. However, there the difference in total ammonia emissions between solid and liquid manure handling systems may not be great if liquid manure is stored over extended periods of time prior to land application.[9]

5. Hydrogen Sulfide Emissions from Dairies

Hydrogen Sulfide (H_2S) is produced from the anaerobic decomposition of organic sulfur compounds. In the absence of oxygen, sulfur reducing bacteria in the lagoons and storage ponds reduce sulfate ions in the manure into sulfide. Aqueous sulfide exists in three different forms: molecular (un-dissociated) hydrogen sulfide (H_2S) and the bisulfide (HS^-) and sulfide (S^{2-}) ions. In aqueous solutions molecular H_2S exists in equilibrium with the bisulfide (HS-) and sulfide (S^{2-}) ions but only molecular H_2S, not the ionized forms, can be transferred across the gas-liquid interface and emitted to the atmosphere. The fractional amount of the form of sulfide present in a solution is a function of temperature and pH. Under acidic conditions ($pH < 7$) greater amounts of sulfide will be in the form of molecular H_2S and the potential for H_2S emissions will increase. As the pH increases, a greater proportion of sulfide will be in the ionic form and the potential for H_2S emissions will decrease.

[8] Workshop Review Draft for EPA Regional Priority AFO Science Question Synthesis Document - Air Emission Characterization and Management, pg. 2
[9] Emissions From Animal Feeding Operations – Draft, US EPA – Emissions Standards Division, August 15, 2001, pgs. 2-6 and 2-7

In a dairy, the conditions for the production of hydrogen sulfide exist in small amounts such as wet indentions in corrals, manure piles, and separated solids piles. However, the most significant sources are the liquid manure lagoons and storage ponds.

II. Top Down BACT Analysis for the Cow Housing Permit Unit (S-4835-2)

1. BACT Analysis for VOC Emissions from the Cow Housing Permit Unit:

a. Step 1 - Identify all control technologies

Since specific VOC emissions control efficiencies have not been identified in the literature for dairy cow housing areas, the control efficiencies will be estimated based on the control efficiencies of similar processes and engineering judgment.

The following options were identified as possible controls for VOC emissions from the freestall barns (cow housing permit unit):

1) Enclosed freestalls vented to a control device (e.g. incinerator, biofilter, e.g) - Entire herd (≈64-72%; 80% Capture and 80-90% Control of cow housing emissions)
2) Feed and Manure Management Practices
   - Concrete feed lanes and walkways for all cows
   - Feed lanes and walkways for milk cows and dry cows flushed four times per day
   - All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines
   - VOC mitigation measures required by District Rule 4570

<u>Description of Control Technologies</u>

1) Enclosed Freestall Barns vented to a Control Device

In a freestall barn, cows are grouped in large pens with free access to feed bunks, water, and stalls for resting. In the mild climate of the San Joaquin Valley, the typical freestall barn is an open structure (roof but no sides). The primary freestall design consists of a roof that provides shade with all sides open to allow air to flow through, which keeps the cows cool. The open freestall barns take advantage of natural summer winds in the San Joaquin Valley that are generally greater than four mph. The natural winds result in an excellent summer ventilation rate that is equivalent to 1,000 cfm per cow more, which is why open dairy barns are generally recommended in the San Joaquin Valley. In colder climates enclosed or partially enclosed barns may be utilized to protect cows from winter extremes. However, no completely enclosed freestall barns that were installed at a California dairy were identified.

Although the potential to enclose cows in a barn may exist, the feasibility of reasonably collecting the gas through a stack, chimney, or vent remains in question considering the extremely large amounts of airflow going through the barns needed to keep the cows cool. The airflow requirements would be even higher in the San Joaquin valley, where temperatures can exceed 110° F in the hot summer. If the barn exhaust can be properly captured it may be possible to vent it to a VOC control device. If the gases can be properly captured, then those gases may be and sent to a control device. It is estimated that up to 80% of the gases emitted from enclosed freestall barns can be captured by the mechanical ventilation system and sent to a control device, such as an incinerator or biofilter.

Thermal incineration is a well-established VOC control technique. During combustion, gaseous hydrocarbons are oxidized to form CO_2 and water. In addition to the difficulty of capturing all of the gases in a freestall barn, a disadvantage of thermal incineration is that when concentrations of combustible VOCs in the gas stream are very low very large amounts of supplemental fuel must be used to sufficiently increase the temperature of all of the ventilation air in order to incinerate these VOCs. This generally renders incineration cost prohibitive for large flows of dilute VOCs, such as in the ventilation air from a freestall barn. Because of this biofilters have generally been found to be more cost-effective for handling dilute streams of biodegradable VOCs. A biofilter is a device for removing contaminants from a gas in which the gas is passed through a media that supports microbial activity by which pollutants are degraded by biological oxidation. During biofiltration microorganisms oxidize the gaseous organic contaminants, ammonia, and sulfur compounds in the exhaust air resulting in carbon dioxide, nitrogen, water, salt, and biomass. Additional information on biofiltration is given below in the analysis for enclosed freestall barns vented to a control device.

Although many questions remain about the reasonability of requiring animals to be confined in buildings and venting the exhaust to a control device, it will be considered for purposes of this analysis.

2) Feed and Manure Management Practices

Concrete Feed Lanes and Walkways

Dairy animals spend a large amount of time on the feed lanes and walkways. Constructing these areas of concrete will reduce particulate matter emissions by having the animals spend more time on a paved surface rather than dry dirt. The concrete lanes and walkways create an avenue for the flush system. The flush system will further reduce particulate matter emissions and will also reduce VOC and ammonia emissions (see below). Although concrete feed lanes and walkways are necessary for an effective flush system, they do not individually reduce emissions of gaseous pollutants; therefore, no VOC control efficiency will be assigned for this practice.

Increased Flushing for Feed Lanes and Walkways

Many dairy operations use a flush system to remove manure from the corral and freestall feed lanes and walkways. The flush system introduces a large volume of water at the head of the paved area of the corrals or freestalls, and the cascading water removes the manure. The required volume of flush water varies with the size and slope of the area to be flushed. The freestall and corral lanes are for milk and dry cows are typically flushed twice per day, but the flushing frequency can vary between one to four times per day. The lanes for support stock are usually flushed once per day or less frequently.

In addition to cleaning the corral and freestall feed lanes and walkways, the flush system also serves as an emission control for reducing PM_{10}, VOC, and ammonia emissions. The manure deposited in the lanes, which is a source of VOC emissions, is removed from the cow housing area by the flush system. Many of the VOCs emitted from fresh cow manure, such as alcohols (ethanol and methanol) and many Volatile Fatty Acids (VFAs), are highly soluble in water. Therefore, a large percentage of these compounds will dissolve in the flush water and will not be emitted from the cow housing permit unit. The flush water can then carry the manure and the dissolved volatile compounds to an anaerobic treatment lagoon or other manure stabilization process for treatment.

It must be noted that the flush system will only control the VOCs emitted from the manure it will have little or no effect on enteric emissions produced from the cows' digestive processes. As stated above, the feed lanes and walkways in the cow housing areas are typically flushed twice per day. Flushing the lanes four times per day will increase the frequency that manure is removed from the cow housing permit unit and should result in a higher percentage of soluble volatile compounds being dissolved in the flush. Although the control efficiency for VOCs may actually be much higher, flushing the freestall lanes four times per day will be conservatively assumed to have a control efficiency of 10% for VOCs emitted from manure until better data becomes available.

Animals fed in accordance with (NRC) or other District-approved Guidelines

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for VOC emissions can be reduced by reducing the quantity of undigested nutrients in the manure. Many of the VOCs emitted from Confined Animal Facilities, including dairies, originate from the decomposition of undigested protein in animal waste.[10] This undigested protein also produces ammonia and hydrogen sulfide emissions. The level of microbial action in the manure corresponds to the level of organic nitrogen content in the manure; the lower the level of nitrogen the lower the level of microbial action and the lower the production of VOCs, ammonia, and hydrogen sulfide.

A diet that is formulated to feed proper amounts of ruminantly degradable protein will result in improved nitrogen utilization by the animal and corresponding

[10] "Emissions of Volatile Organic Compounds Originating from UK Livestock Agriculture", Hobbs, P.J. 2004 – Journal of the Science of Food and Agriculture

reduction in urea and organic nitrogen content of the manure, which will reduce the production of VOCs and ammonia. The latest National Research Council (NRC) guidelines for the selection of an optimal bovine diet should be followed to the maximum extent possible. The diet recommendations made in this publication seek to achieve the maximum uptake of protein by the animal and the minimum carryover of nitrogen into the manure.

Based on very limited data (Klaunser, 1998, *J Prod Agric),* diet manipulation decreased nitrogen excretion by 34% while improving milk production. Up to 70% of excess nitrogen is lost off of the farm through volatilization, denitrification and leaching. Because of limited research, feeding dairy animals in accordance with National Research Council (NRC) or other District-approved guidelines will be assumed to have a conservative control efficiency of only 10% for both enteric VOC emissions from dairy animals and VOC emissions from manure.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1.

c. Step 3 - Rank remaining options by control effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

1) Enclosed freestalls vented to a control device (e.g. incinerator, biofilter, e.g) (≈68-72% ; 80% Capture and 85-90% Control of cow housing emissions)
2) Feed and Manure Management Practices
   - Concrete feed lanes and walkways for all cows
   - Feed lanes and walkways for milk cows and dry cows flushed four times per day
   - All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines
   - VOC mitigation measures required by District Rule 4570

d. Step 4 - Cost Effectiveness Analysis

<u>Enclosed Freestall Barns Vented to a Control Device (Biofilter)</u>

The analysis below is based on the Analysis for Confining Livestock in Enclosed Buildings and Venting Emissions to a Control Device contained in the District document Final Staff Report – Revised Proposed Amendments to Rule 4570 (Confined Animal Facilities), Appendix E – Analysis of Class Two Mitigation Measures for Revised Proposed Amendments to Rule 4570 (Confined Animal Facilities) dated October 21, 2010. Additional details regarding the cost analysis can be found in the referenced report for the amendments to District Rule 4570.

This analysis does not quantify all of the costs or examine all of the potential issues that make requiring this option infeasible but it is intended to more accurately reflect the actual costs to implement this measure. The use of a biofilter as a control device for VOCs is expected to result in much lower costs than other control options, such as incineration. The U.S. Environmental Protection Agency (US EPA), Clean Air Technology Center (CATC) document "Using Bioreactors to Control Air Pollution" states, "*The capital cost of a bioreaction installation is usually just a fraction of the cost of a traditional control device installation. Operating costs are usually considerably less than the costs of traditional technology, too.*"[11] Therefore, this analysis will evaluate the use of a biofilter to determine the minimum cost of the emission reductions that would be achieved by venting enclosed animal housing to a control device.

<u>Description of Control Technology</u>

A biofilter is a device for removing contaminants from a gas in which the gas is passed through a media that supports microbial activity by which pollutants are degraded by biological oxidation. During biofiltration, exhaust air containing pollutants passes through a media that contains an established, diverse population of aerobic microorganisms. These microorganisms oxidize the gaseous organic contaminants, ammonia, and sulfur compounds in the exhaust air resulting in carbon dioxide, nitrogen, water, salt, and biomass. The bacterial cultures (microorganisms that typically consist of several species coexisting in a colony) that use oxygen to biodegrade organics are called aerobic cultures. These aerobic cultures are usually supported by organic material contained in the biofilter, such as compost, wood chips, soil, peat, etc. Biofilters must maintain sufficient porosity to allow the contaminated air stream to pass through for treatment and to minimize anaerobic conditions. The moisture content of biofilter beds must also be regulated to ensure that there is sufficient moisture to maintain the microorganisms needed for treatment while avoiding excess moisture that can cause anaerobic conditions. A filtration system may be required upstream of a biofilter to remove particular matter which will clog the biofilter over time. Biofilters must be maintained free of rodents and weeds to avoid channeling of gases through the filter media and a loss of performance. The filter media of natural biofilters needs to be replaced periodically because of deterioration and loss of porosity.

Since biofilters rely on living organisms to function, a biofilter's performance will be affected by several factors, including: ambient temperature; temperature of the air stream being treated; the pollutant concentrations in the air stream; moisture content of the filter and air stream, and pH of the filter media. These parameters should be monitored to ensure optimum operating conditions for the biofilter.

<u>Advantages and Disadvantages of Using a Biofilter to Control Emissions</u>

Some of the general advantages related to the use of biofilters include: low installation costs for traditional biofilter designs; generally low operating costs in comparison to other control technologies; high control efficiencies for some

[11] U.S. Environmental Protection Agency, The Clean Air Technology Center (CATC), "Using Bioreactors to Control Air Pollution" EPA-456/R-03-003, (E143-03), September 2003, http://www.epa.gov/ttn/catc/dirl/fbiorect.pdf

compounds such as aldehydes, organic acids, hydrogen sulfide, and certain water-soluble organic compounds.

Some of the general disadvantages of the use of biofilters include: large land requirements for traditional biofilter designs; difficulty in determining the control efficiency for traditional open biofilter designs; for biofilters that use inexpensive natural bed media, the filter bed media must be replaced every 2 to 5 years; biofilters usually require some time to reach optimum control efficiency after initial startup and after periods of nonuse because of the need to establish or re-establish the microbial population; and biofilters can also be a source of nitrous oxide emissions due to denitrification.

Additional disadvantages specifically related to the use of biofilters to control emissions from livestock include: facilities that currently use natural ventilation would incur additional costs because of the need to convert to mechanical ventilation; facilities that currently use mechanical ventilation systems may need to upgrade these systems to overcome the increased pressure drop across the biofiltration system; greater energy usage for all facilities to push air through the biofilter; few reported cases where a biofilter has been shown to be economically viable when applied to animal feeding operations[12]; a very large biofilter system must be used to handle these huge flow rates while maintaining adequate contact time for treatment of emissions. Finally, because of the extremely large airflow rates needed to provide adequate ventilation for livestock it is not practical to treat all of the ventilation air from large confined animal housing units.

Biofilter VOC Control Efficiency

It is assumed that 80% of the gasses emitted from the enclosed animal housing will be captured by the mechanical ventilation system and that a properly functioning biofilter will eliminate 85% of the captured VOC emissions[13]; therefore, the total control for VOCs from the enclosed animal housing = 0.80 x 0.85 = 68%.

Cost Estimates for Enclosed Freestall Barns for this Analysis

Based on the information contained in the District Staff Report for the Revised Proposed Amendments to Rule 4570 (Confined Animal Facilities) dated October 21, 2010, the following cost estimates for enclosed freestall barns will be used in this analysis.

Capital Cost for Enclosed Freestall Barn (2010): $1,700-2,700/cow

[12] U.S. Environmental Protection Agency, "Emissions from Animal Feeding Operations" (Draft), EPA Contract No. 68-D6-0011, August 15, 2001, pg. 9-20, http://www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf

[13] The SCAQMD Rule 1133.2 staff report (page 18) indicates control efficiencies of 80-90% for VOC for existing biofilter composting applications and that a well-designed, well-operated, and well-maintained biofilter is capable of achieving 80 percent control efficiency for VOC, http://www.aqmd.gov/rules/doc/r1133/r1133_staffreport.pdf

Estimated Adjusted Capital Cost: **$1,275-2,025/cow** (capital cost estimate reduced by 25% because it may be possible to use the existing concrete work and some of the existing freestall infrastructure with the new building shell)

Increased Operating Costs[14]: **$74- 98/cow more**

Capital Cost for Freestall Barn Enclosure for 4,570 Milk Cows and 1,356 Dry Cows

Low capital cost estimate: $1,275/cow x 5,926 cows = $7,555,650
High capital cost estimate: $2,025/cow x 5,926 cows = $12,000,150

Increased Operating Costs for Enclosed Freestall Barns for 4,570 Milk Cows and 1,356 Dry Cows

Low operating cost estimate: $74/cow-yr x 5,926 cows = $438,524/yr
High operating cost estimate: $98/cow-yr x 5,926 cows = $580,748/yr

Cost Estimate for Biofilters

Several reference documents were consulted to determine the expected capital and operating costs of using a biofilter to control VOC emissions from enclosed animal housing for evaluation of the Class Two Mitigation Measures contained in the District Staff Report for the Revised Proposed Amendments to Rule 4570 (Confined Animal Facilities) dated October 21, 2010. Several companies that specialize in building and supplying biofilters and bio-scrubbers for the control of VOC emissions were also contacted to request capital cost estimates for biofilter systems specifically for the treatment of VOC emissions from dairy cows housed in enclosed barns. The resulting cost estimates from the District staff report are summarized below. Based on the information reviewed, it was also determined that there would not be any additional cost reduction benefit related to economy of scale for biofilters handling the large flow rates from freestall barns. For purposes of this analysis, the following biofilter cost estimates will be used.

Capital Cost (2010): **$3-35/cfm**
Operating Costs (2010): **$2.12-20/cfm**

The cost is largely dependent on the airflow rate that the biofilter must handle. Biofilters used to treat exhaust air should be sized to treat the maximum ventilation rate, which is typically the warm weather rate. The higher cost estimate is representative of a biotrickling filter, which may be necessary to handle the high air flow rates from the barns.

[14] Increased operating costs were based on information from following document, adjusted to 2010 dollars assuming 3% annual inflation: Dhuyvetter, Kevin C., Harner, Joe P., Smith, John F., & Bradford, Barry J., Kansas State University Department of Agricultural Economics, "Economic Considerations of Low-Profile Cross-Ventilated Freestall Barns", Presented at Dairy Housing of the Future, Sioux Falls, South Dakota, September 10-11, 2008, http://www.agmanager.info/Faculty/dhuyvetter/presentations/2008/LPCV%20Conference(Sep2008).pdf

Required Airflow Rate of the Freestall Barns

In order to calculate the costs of this control option, the airflow rate required for the freestall barns must be determined. The University of Minnesota's publication "Improving Mechanical Ventilation in Dairy Barns"[15], gives minimum ventilation rates for dairy cattle, which are listed in the table below.

Minimum Ventilation Rates for Dairy Cows (cfm/cow)			
Age	Winter	Mild Weather	Summer
Baby Calf	15	50	100
Heifer (2-12 months)	20	60	130
Heifer (12-24 months)	30	80	180
Mature Cow	50	170	500 – 1,000

The minimum summer ventilation rate listed for mature cows is 500 cfm per cow. However, according to the University of Minnesota publication and Cornell University's publication "Natural or Tunnel Ventilation of Freestall Structures: What is Right for Your Dairy Facility?"[16], the minimum required airflow rate in the summer increases to 1,000 cfm per cow if tunnel ventilation is used to provide additional cooling.

The climate in the San Joaquin Valley is characterized by mild winters and hot summers. Because of the warmer climate, it is expected that tunnel ventilation or a similar system would need to be employed in an enclosed freestall barn to prevent excessive heat stress. Additionally, tunnel ventilation systems are more representative of the types of systems that would be required to capture and control emissions.

Minimum Summer Air Requirements for freestall barns vented to a biofilter for 4,570 Milk Cows and 1,356 Dry Cows:

The minimum required summer airflow rate for housing 4,570 milk cows and 1,356 dry cows in enclosed freestalls is calculated as below:

Low Summer Ventilation Rate: 5,926 cows x 500 cfm/cow = 2,963,000 cfm
High Summer Ventilation Rate: 5,926 cows x 1,000 cfm/cow = 5,926,000 cfm

Capital Cost of a Biofilter for 4,570 Milk Cows and 1,356 Dry Cows

The lower cost estimate does not include installation of the required ductwork. As stated above, the estimated capital costs for a biofilter range of between $3.00 per cfm and $35.00 per cfm. The capital cost estimates of a biofilter for enclosed freestall bams housing 4,570 milk cows and 1,356 dry cows are calculated as follows:

[15] "Improving Mechanical Ventilation in Dairy Barns", J.P. Chastain, http://www.milkproduction.com/Library/Articles/Improving_mechanical_ventilation.htm
[16] Natural or Tunnel Ventilation of Freestall Structures: What is Right for Your Dairy Facility?, C.A. Gooch, http://www.ansci.cornell.edu/pdfs/nattunnel.pdf

Low capital cost estimate: \$3.00/cfm x 2,963,000 cfm = \$8,889,000
High capital cost estimate: \$35.00/cfm x 5,926,000 cfm = \$207,410,000

Operating Costs for a Biofilter for 4,570 Milk Cows and 1,356 Dry Cows

Low operating cost estimate: \$2.12/cfm-yr x 2,963,000 cfm = \$6,281,560/yr
High operating cost estimate: \$20.00/cfm-yr x 5,926,000 cfm = \$118,520,000/yr

Annualized Capital Costs for Biofilter for 4,570 Milk Cows and 1,356 Dry Cows

Pursuant to District Policy APR 1305, Section X (11/09/99), the cost for the purchase of the biofilter will be spread over the expected life of the system using the capital recovery equation. The expected life of the entire system (fans, media, plenum, etc) will be estimated at 10 years. A 10% interest rate is assumed in the equation and the assumption will be made that the equipment has no salvage value at the end of the ten-year cycle.

$A = [P \times I(I+1)^n]/[(I+1)^n-1]$

Where: A = Annual Cost
P = Present Value (freestall enclosure and biofilter)
I = Interest Rate (10%)
N = Equipment Life (10 years)

Low Annualized Capital Cost Estimate =
$[(\$7,555,650 + \$8,889,000) \times 0.1(1.1)^{10}]/[(1.1)^{10}-1] = \$2,676,416$/year

High Annualized Capital Cost Estimate =
$[(\$12,000,150 + \$207,410,000) \times 0.1(1.1)^{10}]/[(1.1)^{10}-1] = \$35,709,660$/year

Total Annual Cost Estimates

The total annualized capital costs and operating costs for a freestall enclosure vented to a biofilter are given below. For the least expensive biofilters, the biofilter media (e.g., soil, compost, wood chips) must be replaced after 3-5 years in order to remain effective. This may be an additional cost because it may not have been included in the least expensive operating cost estimates provided above.

Total annual cost estimate = (total annualized capital cost) + (increased operating cost for an enclosed freestall barn) + (biofilter operating cost)

Low total annual cost estimate = (\$2,676,416/yr) + (\$438,524/yr) + (\$6,281,560/yr) = \$9,396,500/year

High total annual cost estimate = (\$35,709,660/yr) + (\$580,748/yr) + (\$118,520,000/yr) = \$154,810,408/year

Potential Income from Increased Milk Production

Cooling milk cows in enclosed freestall barns may reduce heat stress and result in increased milk production. Because dairy cows in California already have some of the highest milk production rates in the nation, it is questionable regarding whether enclosing the milk cows will result in any significant increases in milk production. This is because heat stress is related to both temperature and humidity and it is likely that the increased temperatures in California relative to other states are mitigated by the much lower humidity. Although questions remain about the potential to increase milk production in the San Joaquin Valley by reducing heat stress, this potential benefit will be quantified for this analysis.

Potential Increased Daily Milk Production: 4-6 lb/cow-day (District 4570 Staff Report, June 2006)

Potential Increased Annual Milk Production: 1,460-2,190 lb/cow-yr
Class 4b Price of milk[17] for March 2012: $13.67/cwt
Income from increased milk production: $199.58-299.37/cow-yr

Max Income from increased milk production for 4,570 milk cows:
4,570 milk cows x $299.37/cow-yr = $1,368,121/yr

Low total annual cost estimate – income from increased milk production =
($9,369,500/yr) - ($1,368,121/yr) = $8,001,379/year

VOC Emission Reductions for 4,570 Milk Cows and 1,356 Dry Cows

The annual VOC Emission reductions for enclosed freestall barns for 4,570 Milk Cows and 1,356 Dry Cows vented to a biofilter are calculated as follows:

VOC Emissions from Cows (Enteric) and Manure:
[Number of cows] x [Uncontrolled Cow Housing VOC EF (lb/cow-year)] x [Jersey adjustment Factor] x [Capture Efficiency] x [Biofilter Control Efficiency]

VOC Reductions from Cows Housed in Enclosed Freestall Barns Vented to a Biofilter (Cows, Stalls, & Lanes)										
Type of Cow	**# of cows**	**x**	**Housing EF* (lb/cow-yr)**	**x**	**Capture (%)**	**x**	**Control (%)**	**=**	**lb-VOC/yr**
Milk Cow	4,570	x	5.93	x	80%	x	85%	=	18,428
Dry Cow	1,356	x	3.21	x	80%	x	85%	=	2,960
Bulls	50	x	3.21	x	80%	x	85%	=	109
Total (lb-VOC/yr)									**21,497**

*For milk cows, emissions in the milk parlor(s) are included in the cow housing emission factor

[17] http://www.cdfa.ca.gov/dairy/pdf/Prices Grid.pdf: The Class 4b milk price was because dairy industry representatives state that increased production is purchased at the lowest price. Additionally, sufficient increased production will cause the price to fall

VOC Emissions from TMR:
[Number of cows] x [Area of TMR (ft^2/cow)] x [Uncontrolled TMR Flux Rate (lb-VOC/ft^2-day)] x [365/day/year)]x [Capture Efficiency] x [Biofilter Control Efficiency]

VOC Reductions from TMR (Feed) for Cows Housed in Enclosed Freestall Barns Vented to a Biofilter														
Type of Cow	# of cows	x	TMR Area* (ft^2/cow)	x	TMR Flux (lb/ft^2-day)	x	days/ yr	x	Capture (%)	x	Control (%)	=	lb-VOC/yr
Milk Cow	4,570	x	7.08	x	3.85E-03	x	365	x	80%	x	85%	=	30,918
Dry Cow	1,356	x	7.08	x	3.85E-03	x	365	x	80%	x	85%	=	9,174
Bulls	50	x	7.08	x	3.85E-03	x	365	x	80%	x	85%	=	338
											Total (lb-VOC/yr)		40,430

*For more conservative calculations the TMR Area has not been reduced to account for the reduced size and feed consumption of Jersey cows when compared to Holsteins

Total VOC Emission Reductions from Milk Parlor, Cow Housing, and TMR
=21,497 lb-VOC/yr + 40,430 lb-VOC/yr = 61,927 lb-VOC/yr

Cost of VOC Emission Reductions

Low Estimate[18] = ($9,396,500/year)/[(61,927 lb-VOC/year)(1 ton/2000 lb)]
= **$303,505/ton of VOC reduced**

High Estimate = ($154,810,408/year)/[(61927,870 lb-VOC/year)(1 ton/2000 lb)]
= **$5,000,336/ton of VOC reduced**

As shown above, the costs for a freestall enclosure and biofilter would cause the cost of the VOC reductions to be at least $303,505/ton. There are additional costs related to increased electricity use, and regulatory compliance and testing that have not been quantified in this analysis. Even without these costs, it is clear that the cost of the VOC emission reductions achieved would be far greater than the $17,500/ton-VOC cost effectiveness threshold of the District BACT policy. The equipment is therefore not cost effective and is being removed from consideration at this time.

Feed and Manure Management Practices:

- Concrete feed lanes and walkways for all cows
- Feed lanes and walkways for milk cows and dry cows flushed four times per day
- All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines
- VOC mitigation measures required by District Rule 4570

e. Step 5 - Select BACT

[18] Includes reduction in overall annual costs because of potential additional revenue from maximum supposed increase in milk production.

The facility is proposing concrete feed lanes and walkways; to flush the freestall flush lanes immediately prior to or after, or; during each milking and to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations, which satisfies the BACT requirements.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes that have been found by the APCO to be cost effective and technologically feasible for such class or category of sources or for a specific source. The District has found that the basic mitigation measures required by District Rule 4570 are cost effective and technologically feasible for confined animal facilities and the applicant has proposed these options. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for VOC emissions from the cow housing permit.

3. BACT Analysis for NH_3 Emissions from the Cow Housing Permit Unit:

a. Step 1 - Identify all control technologies

A cost effectiveness threshold has not been established for ammonia. Therefore, only options that meet the District's definition of Achieved-in-Practice controls will be evaluated in this project. However, for purposes of the Dairy BACT Guideline, the District will not deem any control options Achieved-in-Practice until after the final Dairy BACT Guideline has been established

The following management practices have been identified as possible control options for the NH_3 emissions from the cow housing permit unit and have been proposed by the applicant:

1) Feed and Manure Management Practices
   - Concrete feed lanes and walkways for all cows
   - Feed lanes and walkways for milk cows and dry cows flushed four times per day
   - All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines

Description of Control Technologies

1) Feed and Manure Management Practices

Concrete Feed Lanes and Walkways
Dairy animals spend a large amount of time on the feed lanes and walkways. Constructing these areas of concrete will reduce particulate matter emissions by having the animals spend more time on a paved surface rather than dry dirt. The concrete lanes and walkways create an avenue for the flush system. The flush

system will further reduce particulate matter emissions and will also reduce VOC and ammonia emissions (see below).

Increased Flushing for feed lanes and walkways
Many dairy operations use a flush system to remove manure from the corral and freestall feed lanes and walkways. The flush system introduces a large volume of water at the head of the paved area of the corrals or freestalls, and the cascading water removes the manure. The required volume of flush water varies with the size and slope of the area to be flushed. The freestall and corral lanes for milk and dry cows are typically flushed twice per day, but the flushing frequency can vary between one to four times per day. The lanes for support stock are usually flushed once per day or less frequently.

In addition to cleaning the corral and freestall feed lanes and walkways, the flush system also serves as an emission control for reducing PM_{10}, VOC, and ammonia emissions. The manure deposited in the lanes, which is also a source of NH_3 emissions, is removed from the cow housing area by the flush system. Ammonia has a high affinity for water and is highly soluble in water. Therefore, a large portion of ammonia will be flushed away with the flush water and will not be emitted from the cow housing permit unit.

Animals fed in accordance with (NRC) or other District-approved Guidelines
Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for ammonia emissions can be reduced by reducing the amount of undigested nitrogen compounds in the manure. The level of microbial action in the manure corresponds to the level of organic nitrogen content in the manure; the lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia and VOCs.

A diet that is formulated to feed proper amounts of ruminantly degradable protein will result in improved nitrogen utilization by the animal and corresponding reduction in urea and organic nitrogen content of the manure, which will reduce the production of VOCs and ammonia. The latest National Research Council (NRC) guidelines for the selection of an optimal bovine diet should be followed to the maximum extent possible. The diet recommendations made in this publication seek to achieve the maximum uptake of protein by the animal and the minimum carryover of nitrogen into the manure.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1.

c. Step 3 - Rank remaining options by control effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

1) Feed and Manure Management Practices

- Concrete feed lanes and feed walkways for all cows
- Feed lanes and walkways for milk cows and dry cows flushed four times per day and feed lanes
- All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines

d. Step 4 - Cost Effectiveness Analysis

The applicant has proposed the only option listed; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The facility is proposing concrete feed lanes and walkways; to flush the feed lanes and walkways for the milk and dry cows four times per day and to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes that have been found by the APCO to be cost effective and technologically feasible for such class or category of sources or for a specific source. The District has found that the basic mitigation measures required by District Rule 4570 are technologically feasible for confined animal facilities and the applicant has proposed these options. Although District Rule 4570 is only intended to reduce VOC emissions, many of these measures also reduce ammonia emissions. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for NH_3 emissions from the cow housing permit.

III. Top Down BACT Analysis for the Liquid Manure Handling System –Lagoon/Storage Pond (S-4835-3)

1. BACT Analysis for VOC Emissions from the Lagoon & Storage Pond:

a. Step 1 - Identify all control technologies

Since, specific control efficiencies have not been identified in the literature for VOC emissions from dairy lagoons and storage ponds, the control efficiencies listed are based on the control efficiencies of similar processes and engineering judgment.

The following options were identified as possible controls for VOC emissions from the Lagoon and Storage Pond:

1) Aerobic Treatment Lagoon – mechanical aeration to achieve a dissolved oxygen concentration of 2.0 mg/L (≈95%; based information provided by Dr. Ruihong Zhang of UC Davis)

2) Covered Lagoon Anaerobic Digester with biogas collected and vented to a destruction device such as an internal combustion engine or flare, and treated waste discharged into a secondary lagoon or storage pond. (≈75%) (Note: not required unless required by the final Dairy BACT Guideline)

3) Anaerobic Treatment Lagoon designed to meet Natural Resources Conservation Service (NRCS) standards (≈40%)

Description of Control Technologies

1) Aerobic Treatment Lagoon – mechanical aeration to achieve a dissolved oxygen concentration of 2.0 mg/L

An aerobic treatment lagoon is a waste treatment lagoon that is designed to facilitate the decomposition of wastewater by microbes in the presence of oxygen (O_2). The process of aerobic decomposition results in the conversion of organic compounds in the wastewater into carbon dioxide (CO_2), and (H_2O), nitrates, sulphates, and inert biomass (sludge). The process of aerobic digestion is sometimes referred to as nitrification (especially when discussing NH_3 transformation). Complete aerobic digestion (100% aeration) removes nearly all malodors and also virtually eliminates VOCs, H_2S, and NH_3 emissions from liquid waste.

Sufficient oxygen must be provided to sustain the aerobic microorganisms in completely aerated lagoons. Lagoons can be considered completely aerobic if sufficient oxygen is provided to achieve dissolved oxygen (DO) content of 2.0 mg/L or more. Oxygen is typically provided by mechanical aerators. These aerators may float on the lagoon surface or be submerged in the lagoon. Aeration can also be performed by injection of tiny air bubbles into the lagoon water, mixing of the lagoon water, or spraying of the water into the air. According to Dr. Ruihong Zhang, a researcher at the University of California, Davis, at least 95% VOC control can be achieved if the dissolved oxygen (DO) content of the liquid manure is 2.0 mg/L or more. A major disadvantage of completely aerated lagoons is the enormous cost of the energy required to run the aerators continuously. Because of this, it has been determined that completely aerated lagoons are not cost effective options for dairy facilities at the present time.

2) Covered Lagoon Anaerobic Digester

Pursuant to Section 5.3 of the Settlement Agreement (9/20/2004) between the District and the Western United Dairyman and the Alliance of Western Milk Producers Inc, installation of an anaerobic digester will only be required if this technology is proven effective in reducing emissions and is required by the final Dairy BACT Guideline.

Covered treatment lagoons are one type of anaerobic digester. An anaerobic digester is an enclosed basin or tank that is designed to facilitate the decomposition of wastewater by microbes in the absence of oxygen. The process of anaerobic decomposition results in the preferential conversion of organic compounds in the wastewater into methane (CH_4), carbon dioxide (CO_2), and water rather than intermediate metabolites (VOCs). The gas generated by this process is known as biogas, waste gas or digester gas. In addition to methane and carbon dioxide, biogas also contains small amounts of Nitrogen (N_2), Oxygen (O_2), Hydrogen Sulfide (H_2S), and Ammonia (NH_3). Biogas will also include trace amounts of various Volatile Organic Compounds (VOCs) that remain from incomplete digestion of the volatile solids in the incoming wastewater. The small amounts of undigested solids that remain after digestion are removed from the digester as sludge. Because biogas is mostly composed of methane, the main component of natural gas, the gas produced in the digester can be cleaned to remove H_2S and other impurities and used as fuel. The captured biogas can be combusted in a flare or may be sent to a boiler or internal combustion engine, where the gas can be used to generate useful heat or electrical energy.

As stated above, the gas generated in the covered lagoon can be captured and then sent to a suitable combustion device. Combustion (thermal incineration) is a generally accepted, well-established VOC control technique. During combustion, gaseous hydrocarbons are oxidized to form CO_2 and water. The VOCs emitted from the liquid manure in the covered lagoon can be reduced by 95% with the use of an appropriate combustion device. Therefore, installation of the digester will lower the total VOCs emitted from the liquid manure from the liquid manure handling system. Although the control efficiency of the gas captured from the primary lagoon is expected to be 95% or more, the overall control efficiency is expected to be less since VOCs will also be emitted from the storage pond and as fugitive emissions. The overall control efficiency is assumed to be 75% of the emissions that would have been emitted from the lagoon and storage pond.

3) Anaerobic Treatment Lagoon

An anaerobic treatment lagoon is a waste treatment lagoon that is designed to facilitate the decomposition of manure by microbes in the absence of oxygen. The process of anaerobic decomposition results in the preferential conversion of organic compounds in the wastewater into methane (CH_4), carbon dioxide (CO_2), and water rather than intermediate metabolites (VOCs). The National Resource Conservation Service (NRCS) California Field Office Technical Guide Code 359 - Waste Treatment Lagoon specifies criteria for the design of anaerobic treatment lagoons. A properly designed anaerobic treatment lagoon will reduce the Volatile Solids (VS) by at least 50% and will reduce the biological oxygen demand (BOD), which will result in greater efficiency in degrading compounds that contain carbon into methane and carbon dioxide rather than VOCs. Although, the VS reduction is expected to be at least 50%, a conservative control efficiency of 40% will be assumed for anaerobic treatment lagoons, until better data becomes available.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1.

c. Step 3 - Rank remaining options by control effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

1) Aerobic Treatment Lagoon – mechanical aeration to achieve a dissolved oxygen concentration of 2.0 mg/L (≈95%)

2) Covered Lagoon Anaerobic Digester with biogas collected and vented to a destruction device such as an internal combustion engine or flare, and treated waste discharged into a secondary lagoon or storage pond. (≈75%)

3) Anaerobic Treatment Lagoon designed to meet Natural Resources Conservation Service (NRCS) standards (≈40%)

d. Step 4 - Cost Effectiveness Analysis

<u>Aerobic Treatment Lagoon:</u>

The following cost analysis demonstrates that the energy costs alone, not including any capital costs, causes complete aeration to exceed the District VOC cost effective threshold.

<u>Energy Requirement for Complete Aeration</u>

In order to effectively calculate the costs of this control option, the energy requirement for complete aeration must be determined. According to Dr. Ruihong Zhang of the University of California, Davis, 2.4 lbs (1.1 kg) of oxygen (O_2) per cow must be provided each day for complete removal of Biological Oxygen Demand (BOD_5).[19] This does not include the additional oxygen that would be required for conversion of ammonia to nitrate (nitrification). The typical aeration efficiencies for mechanical aerators range from 1 to 2 kg of oxygen (O_2) provided per kW-hr of energy utilized.[19] For this analysis it will be assumed that twice the BOD is required for complete aeration and that mechanical aerators will provide 1.5 kg of oxygen per kW-hr. The yearly energy requirement per cow is calculated as follows:

$$2 \times [(1.1 \text{ kg/cow-day}) \div (1.5 \text{ kg/kW-hr})] \times (365 \text{ day/year}) = 535.3 \text{ kW/cow-year}$$

The total yearly energy requirement is calculated below. Based on animal units (AU), it is assumed that the BOD loading (and the energy requirement) for the dry

[19] An Assessment of Technologies for Management and Treatment of Dairy Manure in California's San Joaquin Valley, December 2005, page 35 (<u>http://www.arb.ca.gov/ag/caf/dairypnl/dmtfaprprt.pdf</u>)

cows will be 80% of that of the milk cows, and the BOD loading from the bull will be 100% of milk cows.[20]

As discussed in the evaluation, after completion of the project, the dairy will house 4,570 milk cows, 1356 dry cows, and 50 bulls. The amount of electricity required for complete aeration of the lagoon system is calculated as follows:

(4,570 milk cows x 535.3 kW/cow-year) + (1,356 dry cows x 0.8 x 535.3 kW/cow-year) + (50 bulls x 535.3 kW/cow-year) = 3,198,955 kW-hr/year

Cost of Electricity for Complete Aeration:

The cost for electricity is based upon on an average retail price of industrial electricity in California for the year 2011 taken from the Energy Information Administration (EIA) Website: http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html.

Average Cost for electricity = $0.1202/kW-hr

The electricity costs for complete aeration are calculated as follows:

3,198,955 kW-hr/year x $0.1202/kW-hr = **$384,514/year**

VOC Emission Reductions for Complete Aeration

In addition to controlling 95% of the emissions from the lagoon and storage pond, complete aeration will also control 95% of the emissions from liquid manure land application as well. Therefore, these emissions reductions will also be included in the analysis.

The annual VOC Emission Reductions for the lagoons, storage ponds, and liquid manure land application unit are calculated as follows:

{[Number of cows] x [Uncontrolled Lagoon/Storage Pond VOC EF (lb/cow-year)] x [Complete Aeration Control Efficiency for Lagoon/Storage Pond]} + {[Number of cows] x [Uncontrolled Land application VOC EF (lb/cow-year)] x [Complete Aeration Control Efficiency for Land Application]}

[(4,570 milk cows x 2.7 lb-VOC/milk cow-year) + (1,356 dry cows x 1.4 lb-VOC/milk cow-year) + (50 bulls x 1.6 lb-VOC/cow-year)] x 0.95 + [(4,570 milk cows x 5.0 lb-VOC/milk cow-year) + (1,356 dry cows x 2.3 lb-VOC/milk cow-year) + (50 bulls x 2.9 lb-VOC/cow-year)] x 0.95

= [14,317 lb-VOC/year x 0.95] + [26,114 lb-VOC/year x 0.95] = **38,410 lb-VOC/year**

[20] Animal Unit (AU) factors are taken from the California Regional Water Quality Control Board Central Valley Region Annual Report for Dairies Subject to Monitoring and Reporting (http://www.waterboards.ca.gov/centralvalley/available_documents/dairies/genorderwdrform.pdf)

Cost of VOC Emission Reductions

Cost of reductions = ($384,514/year)/((38,410 lb-VOC/year)(1 ton/2000 lb))
= **$20,027/ton of VOC reduced**

As shown above, the electricity cost alone for complete aeration would cause the cost of the VOC reductions to be greater than the $17,500/ton cost effectiveness threshold of the District BACT policy. The equipment is therefore not cost effective and is being removed from consideration at this time.

Covered Lagoon Anaerobic Digester:

Pursuant to Section 5.3 of the Settlement Agreement (9/20/2004) between the District and the Western United Dairyman and the Alliance of Western Milk Producers Inc, installation of an anaerobic digester will only be required if this technology is proven effective in reducing emissions and is required by the final Dairy BACT Guideline·

The applicant has proposed to install an anaerobic digester if this technology is proven effective in reducing emissions and is required by the final Dairy BACT Guideline. Since the applicant has proposed this option in accordance with the Settlement Agreement, a cost-effective analysis is not required. If an anaerobic digester is required in the final Dairy BACT Guideline, the applicant will be required to install the system in accordance with the timeframes and procedures established by the APCO in the final Dairy BACT Guideline.

Anaerobic Treatment Lagoon:

The applicant has proposed an anaerobic treatment lagoon, as described in full detail under section VI, Emission Control Technology Evaluation, of the main evaluation. The applicant's proposal therefore meets the BACT requirements under this category.

e. Step 5 - Select BACT

The facility is proposing an anaerobic treatment lagoon designed according to National Resource Conservation Service (NRCS) Guidelines. Additionally, the facility is proposing to install an anaerobic digester if determined to be an effective emissions control in the final Dairy BACT guideline. Therefore, the BACT requirements are satisfied.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes that have been found by the APCO to be cost effective and technologically feasible for such class or category of sources or for a specific source. The District has found that the mitigation measures required by District Rule 4570 are cost effective and technologically feasible for confined animal facilities and the applicant has proposed these options. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for VOC emissions from the lagoons/storage ponds.

2. BACT Analysis for NH_3 Emissions from the Lagoon/Storage Pond

a. Step 1 - Identify all control technologies

A cost effectiveness threshold has not been established for ammonia. Therefore, only options that meet the District's definition of Achieved-in-Practice controls will be considered for ammonia at this time. (Although these options must meet the District definition of Achieved-in-Practice, pursuant to the Settlement Agreement (9/20/2004) between the District and Western United Dairyman and Alliance of Western Milk Producers Inc, the District will not deem any control options Achieved-in-Practice until after the Dairy BACT Guideline has been established.)

The following practice has been identified as a possible control option for the NH_3 emissions from the lagoon/storage pond. No other control technologies that meet the definition of Achieved-in-Practice have been identified for the lagoon/storage pond.

1) Animals fed in accordance with National Research Council (NRC) or other District-approved guidelines

<u>Description of Control Technologies</u>

1) Animals fed in accordance with National Research Council (NRC) or other District-approved Guidelines

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for ammonia emissions can be reduced by reducing the amount of undigested nitrogen compounds in the manure. The level of microbial action in the manure corresponds to the level of organic nitrogen content in the manure; the lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia and VOCs.

A diet that is formulated to feed proper amounts of ruminantly degradable protein will result in improved nitrogen utilization by the animal and corresponding reduction in urea and organic nitrogen content of the manure, which will reduce the production of VOCs and ammonia. The latest National Research Council (NRC) guidelines for the selection of an optimal bovine diet should be followed to the maximum extent possible. The diet recommendations made in this publication seek to achieve the maximum uptake of protein by the animal and the minimum carryover of nitrogen into the manure, which will reduce ammonia emissions from the liquid manure in the lagoon/storage pond.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1.

c. Step 3 - Rank remaining options by control effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

1) Animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

d. Step 4 - Cost Effectiveness Analysis

The applicant has proposed the only option listed; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The facility is proposing to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations, which satisfies the BACT requirements.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes that have been found by the APCO to be cost effective and technologically feasible for such class or category of sources or for a specific source. The District has found that the basic mitigation measures required by District Rule 4570 are technologically feasible for confined animal facilities and the applicant has proposed these options. Although District Rule 4570 is only intended to reduce VOC emissions, many of these measures also reduce ammonia emissions. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for NH_3 emissions from the lagoon/storage pond.

3. BACT Analysis for H_2S Emissions from the Lagoon(s)/Storage Pond(s)

a. Step 1 - Identify all control technologies

A cost effectiveness threshold has not been established for hydrogen sulfide. Therefore, only options that meet the District's definition of Achieved-in-Practice controls will be considered for ammonia at this time.

The following practices have been identified as a possible control options for the H_2S emissions from the lagoon/storage pond. No other control technologies that meet the definition of Achieved-in-Practice have been identified for the lagoon/storage pond.

1) Animals fed in accordance with National Research Council (NRC) or other District-approved guidelines
2) Solids Separation
3) Increasing the pH of Lagoons/Ponds (> 7), with monitoring and recordkeeping, and adjustment with lime (or similar base) as needed
4) Reduce or Eliminate the Use of Copper Sulfate as a Footbath Disinfectant

Description of Control Technologies

1) Animals fed in accordance with National Research Council (NRC) or other District-approved Guidelines

H_2S is produced as a result of the decomposition of sulfur compounds in the manure under anaerobic conditions. The presence of these sulfur compounds in the manure is primarily due to excretion of excess sulfur from the digestive tract, as well as other inorganic sources.[21] The potential for hydrogen sulfide emissions can be reduced by reducing the amount of undigested sulfur compounds in the manure.

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. Because both organic Nitrogen and Sulfur compounds are primarily components of amino acids, they tend to occur in set ratios and strategies to reduce the excretion of undigested protein and Nitrogen will also reduce the amount of Sulfur in the manure. A diet that is formulated to feed proper amounts of ruminantly-degradable protein will result in improved protein utilization by the animal and corresponding reduction in sulfur content of the manure, which will reduce the potential for production of H_2S.

2) Solids Separation

Solids separation will reduce loading and the amount of organic Sulfur compounds that are stored under anaerobic conditions, thereby reducing the potential for production of H_2S.

Reducing the loading of lagoons also creates conditions that are more favorable to the growth of sulfur-reducing phototrophic bacteria. Phototrophic or red water treatment lagoons have a characteristic purple, pink, or rose color. Purple sulfur bacteria utilize hydrogen sulfide and volatile organic acids as an electron source for anoxygenic photosynthesis and utilize volatile organic acids and alcohols as a carbon source for growth. This reduces the concentration of these compounds at the surface of the lagoons and reduces the rate of volatilization of these compounds to the atmosphere.

In addition to mechanical separators, settling basins can also be used to remove solids; however, they must be frequently emptied (at least every six months) so

[21] http://www.epa.gov/ttnchiel/ap42/ch09/draft/draftanimalfeed.pdf

the removed solids do not remain anaerobic.

3) Increasing the pH of Lagoons/Ponds (pH > 7)

Aqueous sulfide exists in three different forms: molecular (un-dissociated) hydrogen sulfide (H_2S) and the bisulfide (HS^-) and sulfide (S^{2-}) ions and all three comprise total sulfide. In aqueous solutions molecular H_2S exists in equilibrium with the bisulfide (HS^-) and sulfide (S^{2-}) ions but only molecular H_2S, not the ionized forms, can be transferred across the gas-liquid interface and emitted to the atmosphere. The fractional amount of the form of sulfide present in a solution is a function of temperature and pH. Under acidic conditions (pH < 7) most of the sulfide will be in the form of molecular H_2S and the potential for H_2S emissions will increase. On the other hand, as the pH increases, a greater proportion of sulfide will be in the form of the bisulfide ion and the potential for H_2S emissions will decrease. Continued increases in pH will result in the formation sulfide ion but this amount of sulfide present in this form is negligible until the pH is above 12, well above the range of a typical dairy lagoon. If the pH is high enough, virtually all the sulfide will be in the ionic forms and there would be negligible H_2S emissions.

While increasing the pH high enough to completely eliminate H_2S emissions is probably not feasible in a large body of liquid such as a dairy manure lagoon, emissions may still be significantly reduced by increasing the pH of the lagoon and maintaining it in the basic range (> 7). Increases in pH can be achieved by the addition of lime (or similar base) to the lagoon. Monitoring and record keeping would be needed to ensure that the pH is maintained above the recommended value.

4) Reduce or Eliminate the Use of Copper Sulfate as a Footbath Disinfectant

Some researchers have recommended reducing or eliminating the use of Copper Sulfate as a means of reducing H_2S emissions from lagoons. This will reduce the amount of inorganic sulfur compounds that are stored under anaerobic conditions, thereby reducing the potential for production of H_2S. Copper Sulfate can also be detrimental to purple sulfur bacteria and other anaerobic microbes that reduce VOC and H_2S.[22]

Copper Sulfate is one of the main disinfectants used in dairy footbaths to prevent the occurrence and spread digital dermatitis (aka hairy foot warts) on the hooves of dairy cattle. Digital dermatitis is a health concern that can result in lameness in dairy cattle.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1, but the following control options should not be considered further:

[22] http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1148.pdf; http://courses.cals.uidaho.edu/bae/bae404/Dairy%20Odor%20Mgmt.pdf; and http://www.deq.idaho.gov/media/635665-58_0101_0502_scientific_basis_final.pdf

1) Increasing the pH of Lagoons/Ponds

This measure should not be considered because it would result in significant increases in Ammonia emissions. Under pH conditions close to neutral or acidic (pH ≤ 7) Ammonia exists primarily as the soluble Ammonium ion, which is retained in the lagoon[23]. When the pH increases, the Ammonium ion (NH_4^+) is increasingly converted into unionized Ammonia, which can be emitted into the atmosphere. Under normal circumstances properly operated lagoons will have a pH that is close to neutral or is slightly basic. In lagoons and ponds ammonical nitrogen is generally present in significantly greater quantities than sulfide. Therefore, increasing the pH will result in large increases in ammonia emissions with much smaller decreases in hydrogen sulfide emissions. Additionally, it is reasonable to assume that properly designed treatment lagoons will remain in a pH range that is effective in reducing VOC and odors and forcing large changes in the pH may negatively affect the equilibrium that has been established by the microbial populations in properly designed treatment lagoon systems. Because of these factors, increasing the pH of lagoons and ponds will not be required.

2) Reduce or Eliminate the Use of Copper Sulfate as a Footbath Disinfectant

Copper Sulfate is one of the main disinfectants used in dairy footbaths to prevent the occurrence and spread digital dermatitis (aka hairy foot warts) on the hooves of dairy cattle. Digital dermatitis is a health concern that can result in lameness in dairy cattle. Further research is needed to better quantify the effect that the use of copper sulfate has on H_2S emissions and to additional research is needed regarding the effectiveness and practicality of the use of alternative disinfectants for the prevention of digital dermatitis. Therefore, this practice will not be required at this time but may be revaluated later.

c. Step 3 - Rank remaining options by control effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

1) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines
2) Solids Separation

d. Step 4 - Cost Effectiveness Analysis

The remaining control options are achieved in practice and have been proposed by the applicant; therefore a cost analysis is not required.

e. Step 5 - Select BACT

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[23] http://pubs.ext.vt.edu/442/442-110/442-110.html

The facility is proposing to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations and to separate solids from the manure stream prior to treatment in the lagoon, which satisfies the BACT requirements.

IV. Top Down BACT Analysis for the Liquid Manure Handling System – Liquid Manure Land Application (S-4835-3)

1. BACT Analysis for VOC Emissions from Liquid Manure Land Application:

a. Step 1 - Identify all control technologies

Since, specific control efficiencies have not been identified in the literature for VOC emissions from dairy lagoons and storage ponds, the control efficiencies listed are based on the control efficiencies of similar processes and engineering judgment.

The following options were identified as possible controls for VOC emissions from the Lagoon and Storage Pond:

1) Aerobic Treatment Lagoon – mechanical aeration to achieve a dissolved oxygen concentration of 2.0 mg/L (≈95%)
2) Anaerobic Treatment Lagoon designed to meet Natural Resources Conservation Service (NRCS) standards (≈40%)
3) Injection of Liquid and Slurry Manure (≈50%)

Description of Control Technologies

1) Aerobic Treatment Lagoon – mechanical aeration to achieve a dissolved oxygen concentration of 2.0 mg/L

An aerobic treatment lagoon is a waste treatment lagoon that is designed to facilitate the decomposition of wastewater by microbes in the presence of oxygen (O_2). The process of aerobic decomposition results in the conversion of organic compounds in the wastewater into carbon dioxide (CO_2), and (H_2O), nitrates, sulphates and inert biomass (sludge). The process of aerobic digestion is sometimes referred to as nitrification (especially when discussing NH_3 transformation). Complete aerobic digestion (100% aeration) removes nearly all malodors and also virtually eliminates VOCs, H_2S, and NH_3 emissions from liquid waste. Because these compounds would be removed from the liquid manure, emissions from liquid manure land application would also be eliminated.

Sufficient oxygen must be provided to sustain the aerobic microorganisms in completely aerated lagoons. Lagoons can be considered completely aerobic if sufficient oxygen is provided to achieve a dissolved oxygen (DO) content of 2.0 mg/L or more. Oxygen is typically provided by mechanical aerators. These aerators may float on the lagoon surface or be submerged in the lagoon. Aeration can also be performed by injection of tiny air bubbles into the lagoon water, mixing of the lagoon water, or spraying of the water into the air. According to Dr. Ruihong Zhang, a researcher at the University of California, Davis, at least 95% VOC control can be achieved if the dissolved oxygen (DO) content of the liquid manure is 2.0 mg/L or more. A major disadvantage of completely aerated lagoons is the enormous cost of the energy required to run the aerators continuously. Because of this, it has been determined that completely aerated lagoons are not cost effective options for dairy facilities at the present time.

2) Anaerobic Treatment Lagoon

An anaerobic treatment lagoon is a waste treatment lagoon that is designed to facilitate the decomposition of manure by microbes in the absence of oxygen. The process of anaerobic decomposition results in the preferential conversion of organic compounds in the wastewater into methane (CH_4), carbon dioxide (CO_2), and water rather than intermediate metabolites (VOCs). The National Resource Conservation Service (NRCS) California Field Office Technical Guide Code 359 - Waste Treatment Lagoon specifies criteria for the design of anaerobic treatment lagoons. A properly designed anaerobic treatment lagoon will reduce the Volatile Solids (VS) by at least 50% and will reduce the biological oxygen demand (BOD), which will result in greater efficiency in degrading compounds that contain carbon into methane and carbon dioxide rather than VOCs. Since 50% of the Volatile Solids in the liquid manure will have been removed or digested in the lagoon, there will be less Volatile Solids remaining in the effluent to decompose into VOCs. Although, the Volatile Solids reduction will be at least 50%, to be conservative a 40% control will be applied to irrigation from a storage pond after an anaerobic treatment lagoon.

3) Injection of Liquid and Slurry Manure

Liquid and slurry manure is used to irrigate crops on land farmed by dairies. Manure can either be injected into the soil or left on the surface of the soil and allowed to soak in. Because the liquid and slurry manure is high in Nitrogen, Phosphorus, and Potassium (N-P-K), it supplies nutrients needed by crops. Dairies have nutrient management programs to regulate the amount of liquid and slurry manure applied to cropland. This program is used to balance the specific nutrients applied to the crops, such as nitrogen, with the amount of nutrients that the crops can utilize. Balancing the needs of the crop with what is supplied helps to minimize contamination of ground water. During the process of liquid and slurry manure application to the crops VOC and NH_3 are emitted. Injecting manure hinders volatilization and speeds the uptake of nutrients that would degrade into gaseous pollutants. It is estimated that injection of manure will reduce VOC emissions from land application of manure by 50%.

The manure can only be injected during the time when the crop is not fully mature. This is because a tractor must be used to pull a cultivator with the liquid and slurry manure shanks. Once the crop is planted and grown to a certain height, it is no longer feasible for the tractor to get into the field due to the potential of damaging the crop. Ron Prong of Till-Tech Systems [(519) 775-2575] states that his company's liquid and slurry manure injection system can be used up to four weeks after planting of the crops without causing damage. Therefore, injection of slurry manure can only be required until the crops become so tall that damage will occur.

b. Step 2 - Eliminate technologically infeasible options

Option 4 - Injection of Liquid and Slurry Manure

The Dairy Permitting Advisory Group (DPAG) found that injection of flushed manure was not be a feasible BACT option in their report of BACT options for dairies in the San Joaquin Valley.[24]

Injection is typically restricted to slurry manure that has been vacuumed from the cow housing or that has been removed from settling basins and/or weeping walls. Injection of flushed liquid manure from the lagoons is not considered feasible because the additional water from flushing increases the amount of liquid that must be transported by the trucks or honeywagons, which will generate more emissions. Because of the added time and expense, injection is not used for flushed liquid manure; therefore, this option will be removed from consideration at this time.

c. Step 3 - Rank remaining options by control effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

1) Aerobic Treatment Lagoon – mechanical aeration to achieve a dissolved oxygen concentration of 2.0 mg/L (≈95%)

2) Anaerobic Treatment Lagoon designed to meet Natural Resources Conservation Service (NRCS) standards (≈40%)

d. Step 4 - Cost Effectiveness Analysis

Aerobic Treatment Lagoon:

The preceding cost analysis performed for the BACT analysis for VOC emissions from the lagoon and storage pond demonstrated that the energy costs alone, not including any capital costs, caused complete aeration to exceed the District VOC cost effective threshold. This analysis included VOC reductions from liquid manure land application as well as the lagoon and storage pond since complete aeration reduces emissions from both emissions units. Therefore, no further cost analysis is required for complete aeration.

[24] Page 150 of the Final DPAG Report - "Recommendations to the San Joaquin Valley Air Pollution Control Officer Regarding Best Available Control Technology for Dairies in the San Joaquin Valley" January 31, 2006 (http://www.valleyair.org/busind/pto/dpag/dpag_idx.htm)

Anaerobic Treatment Lagoon:

The applicant has proposed a this control method; therefore a cost-effectiveness analysis is not required.

e. Step 5 - Select BACT

The facility is proposing an anaerobic treatment lagoon designed according to National Resource Conservation Service (NRCS) Guidelines. Additionally, the facility is proposing to install an anaerobic digester if determined to be an effective emissions control in the final Dairy BACT guideline. Therefore, the BACT requirements are satisfied.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes that have been found by the APCO to be cost effective and technologically feasible for such class or category of sources or for a specific source. The District has found that the mitigation measures required by District Rule 4570 are cost effective and technologically feasible for confined animal facilities and the applicant has proposed these options. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for VOC emissions from liquid manure land application.

2. BACT Analysis for NH_3 Emissions from the Liquid Manure Land Application

a. Step 1 - Identify all control technologies

A cost effectiveness threshold has not been established for ammonia. Therefore, only options that meet the District's definition of Achieved-in-Practice controls will be considered for ammonia at this time. (Although these options must meet the District definition of Achieved-in-Practice, pursuant to the Settlement Agreement (9/20/2004) between the District and Western United Dairyman and Alliance of Western Milk Producers Inc[Error! Bookmark not defined.], the District will not deem any control options Achieved-in-Practice until after the Dairy BACT Guideline has been established.)

The following practice has been identified as a possible control option for the NH_3 emissions from the liquid manure land application. No other control technologies that meet the definition of Achieved-in-Practice have been identified for liquid manure land application.

1) Animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

Description of Control Technologies

1) Animals fed in accordance with National Research Council (NRC) or other District-approved Guidelines

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for ammonia emissions can be reduced by reducing the amount of undigested nitrogen compounds in the manure. The level of microbial action in the manure corresponds to the level of organic nitrogen content in the manure; the lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia and VOCs.

A diet that is formulated to feed proper amounts of ruminantly degradable protein will result in improved nitrogen utilization by the animal and corresponding reduction in urea and organic nitrogen content of the manure, which will reduce the production of VOCs and ammonia. The latest National Research Council (NRC) guidelines for the selection of an optimal bovine diet should be followed to the maximum extent possible. The diet recommendations made in this publication seek to achieve the maximum uptake of protein by the animal and the minimum carryover of nitrogen into the manure, which will reduce ammonia emissions from liquid manure applied to cropland.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1.

c. Step 3 - Rank remaining options by control effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

1) Animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

d. Step 4 - Cost Effectiveness Analysis

The applicant has proposed the only option listed; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The facility is proposing to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations, which satisfies the BACT requirements.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes that have been found by the APCO to be cost effective and technologically feasible for such class or category of sources or for a specific source. The District has found that the basic mitigation measures required by District Rule 4570 are technologically feasible for confined animal facilities and the applicant has proposed these options. Although District Rule 4570 is only intended to reduce VOC emissions, many of these measures also reduce ammonia emissions. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for NH_3 emissions from liquid manure land application.

V. Top Down BACT Analysis for the Solid Manure Handling and Land Application (C-6831-4)

1. BACT Analysis for NH_3 Emissions

a. Step 1 - Identify all control technologies

A cost effectiveness threshold has not been established for ammonia. Therefore, only options that meet the District's definition of Achieved-in-Practice controls will be considered for ammonia at this time.

The following practices have been identified as possible control options for the NH_3 emissions from the liquid manure land application. No other control technologies that meet the definition of Achieved-in-Practice have been identified for liquid manure land application.

1) Animals fed in accordance with National Research Council (NRC) or other District-approved guidelines
2) Immediate incorporation of solid manure that has been applied to land into the soil

Description of Control Technologies

4) Animals fed in accordance with National Research Council (NRC) or other District-approved Guidelines

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for ammonia emissions can be reduced by reducing the amount of undigested nitrogen compounds in the manure. The level of microbial action in the manure corresponds to the level of organic nitrogen content in the manure; the lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia and VOCs.

A diet that is formulated to feed proper amounts of ruminantly degradable protein will result in improved nitrogen utilization by the animal and corresponding reduction in urea and organic nitrogen content of the manure, which will reduce the production of VOCs and ammonia. The latest National Research Council (NRC) guidelines for the selection of an optimal bovine diet should be followed to the maximum extent possible. The diet recommendations made in this publication seek to achieve the maximum uptake of protein by the animal and the minimum carryover of nitrogen into the manure, which will reduce ammonia emissions from liquid manure applied to cropland.

5) Immediate Incorporation of Solid Manure that has Been Applied to Land into the Soil

Immediate incorporation of the manure into the soil will reduce any volatilization of gaseous pollutants, including ammonia and VOC. Reduction in gaseous emissions is achieved by minimizing the amount of time that the manure is exposed to the atmosphere. Once manure has been incorporated into the soil, VOCs, ammonia, and any hydrogen sulfide are absorbed onto particles of soil providing the opportunity for these soil microbes to oxidize these compounds into carbon dioxide, water, nitrates, and sulfates.[25]

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1.

c. Step 3 - Rank remaining options by control effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

1) Immediate incorporation of solid manure that has been applied to land into the soil
2) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines

d. Step 4 - Cost Effectiveness Analysis

The remaining control options are achieved in practice and have been proposed by the applicant; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The facility is proposing to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations and to incorporate solid manure applied to cropland immediately (within two hours) after application, which satisfies the BACT requirements.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes that have been found by the APCO to be cost effective and technologically

[25] Page 9-38 of U.S. EPA's Draft Document Emissions From Animal Feeding Operations (http://www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf)

feasible for such class or category of sources or for a specific source. The District has found that the basic mitigation measures required by District Rule 4570 are technologically feasible for confined animal facilities and the applicant has proposed these options. Although District Rule 4570 is only intended to reduce VOC emissions, many of these measures also reduce ammonia emissions. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for NH_3 emissions from the solid manure handling system.

Appendix D

Summary of Health Risk Assessment (HRA)

San Joaquin Valley Air Pollution Control District
Risk Management Review
Updated 10-7-2013

To:	Kamaljit Sran – Permit Services
From:	Suzanne Medina – Technical Services
Date:	July 30, 2013
Facility Name:	Trilogy Dairy LP
Location:	17661 Bear Mountain Blvd, Bakersfield
Application #(s):	S-4835
Project #:	S-1120174

A. RMR SUMMARY

RMR Summary				
Categories	**Pre-Project (Units 1-2 & 2-3)**	**Post-Project (Units 1-3 & 2-4)**	**Project Totals Adjusted for Pre-project**	**Facility Totals**
Prioritization Score	>1[1]	>1[1]	>1[1]	>1
Acute Hazard Index	0.36[2]	0.63[3]	0.27[4]	N/A
Chronic Hazard Index	0.17[2]	0.16[3]	0.00[5]	N/A
Maximum Individual Cancer Risk	**2.66E-06[2]**	**1.22E-06[3]**	0.00[5]	N/A
T-BACT Required?	**No**	**No**		
Special Permit Conditions?	**No**	**No**		

[1]Prioritizations for these units were not conducted; due to extensive pre- and post-project modeling it has been determined that this facility's prioritization score would result in a score greater than 1.0.
[2]This score reflects the facility's preproject score. This score was generated to determine the overall impact of the new proposed project.
[3]This score reflects the post-project score.
[4]This score is the difference between the pre-project and post –project scores and will be used for the facility RMR scores for any future projects.
[5]Facility score will be 0 if results are a negative score.

B. RMR REPORT

I. Project Description

Technical Services received a request on July 22, 2013, to perform a Risk Management Review for modifications to an existing dairy to change the types of cows currently at the dairy from milk, dry, and heifers to milk, dry and bulls which will result in emission changes. The lagoons will not undergo any physical changes. VOC's and NH_3 are the only increase that will be modeled for the lagoon increases.

II. Analysis

Technical Services determined that the facility's prioritization score was greater than one; therefore, a refined health risk assessment was required and performed for pre-project unit emissions and post-project emissions increase. Emissions calculated using District-developed spreadsheets for dairies were input into the HEARTs database. A pre- and post-project AERMOD model was used, with area source parameters and meteorological data from Bakersfield to determine maximum dispersion factors at the nearest residential receptors. These dispersion factors were input into the HARP model to calculate the chronic and acute hazard indices and the carcinogenic risk for each unit. The pre-project scores were used as the baseline to determine if the modification scores resulted in an increase or decrease in overall risk.

The following parameters were used for the review:

Analysis Parameters S-4835, 1120174			
Total # of Cows Modeled (Pre)	**6080**	**Total # of Cows Modeled (Post)**	5976
Pre-Project PM10 (lb/hr)	2.71	**Post-Project PM10 (lb/hr)**	1.54
Pre-Project PM10 (lb/yr)	23687.87	**Post-Project PM10 (lb/hr)**	13520.16

Existing Cow Numbers							
	Flushed Freestalls	Scraped Freestalls	Vacuumed Freestalls	Flushed Corral Feedlanes	Scraped Corral Feedlanes	Vacuumed Corral Feedlanes	Other:
Milk Cows	3200						
Dry Cows	48						
Heifers (15 - 24 months)				1472			
Heifers (7 - 14 months)				928			
Total Herd:	6080	Breed of Cow:	Holstein				

Proposed Cow Numbers							
	Flushed Freestalls	Scraped Freestalls	Vacuumed Freestalls	Flushed Corral Feedlanes	Scraped Corral Feedlanes	Vacuumed Corral Feedlanes	Other:
Milk Cows	3850			720			
Dry Cows				1356			
Mature Bulls				50			
Total Herd:	5976	Breed of Cow: Holstein					

III. Conclusions

It has been determined that the risk scores from this project for cancer and chronic will result in a risk reduction for this facility. However, the acute score was an increase in risk score so the difference between the pre project acute score and the post project acute score will be 0.27 for the facility. The cancer post project risk is 1.22E-6 but will not result in requiring T-BACT since the post project is a reduction from the pre project cancer score.

IV. Attachments

A. RMR request from the project engineer
B. Additional information from the applicant/project engineer
C. Pre-Project Map w/ Dairy Spreadsheets
D. Post Project Map w/ Dairy Spreadsheets
E. Pre Project HARP Risk Report
F. Post Project HARP Risk Report
G. Facility Summary

Appendix E

Draft Authorities to Construct Permits

&

Emissions Profile

(S-4835-1-3, -2-4 & -3-3)

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

PERMIT NO: S-4835-1-3 **ISSUANCE DATE:** DRAFT

LEGAL OWNER OR OPERATOR: TRILOGY DAIRY LP
MAILING ADDRESS: 15857 BEAR MOUNTAIN BLVD
BAKERSFIELD, CA 93311

LOCATION: 17661 BEAR MOUNTAIN BLVD
BAKERSFIELD, CA 93311

EQUIPMENT DESCRIPTION:
MODIFICATION OF 3,200 COW MILKING OPERATION WITH 100 STALL PARALLEL MILKING PARLOR AND 12 STALL HOSPITAL MILKING PARLOR: INCREASE MILK COWS TO 4570.

CONDITIONS

1. {4452} If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
2. {4484} Permittee shall flush or hose milk parlor immediately prior to, immediately after, or during each milking. [District Rule 4570]
3. {4485} Permittee shall provide verification that milk parlors are flushed or hosed prior to, immediately after, or during each milking. [District Rule 4570]
4. {4453} Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]
5. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (661) 392-5500 WHEN CONSTRUCTION IS COMPLETED AND PRIOR TO OPERATING THE EQUIPMENT OR MODIFICATIONS AUTHORIZED BY THIS AUTHORITY TO CONSTRUCT. This is NOT a PERMIT TO OPERATE. Approval or denial of a PERMIT TO OPERATE will be made after an inspection to verify that the equipment has been constructed in accordance with the approved plans, specifications and conditions of this Authority to Construct, and to determine if the equipment can be operated in compliance with all Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District. Unless construction has commenced pursuant to Rule 2050, this Authority to Construct shall expire and application shall be cancelled two years from the date of issuance. The applicant is responsible for complying with all laws, ordinances and regulations of all other governmental agencies which may pertain to the above equipment.

Seyed Sadredin, Executive Director / APCO

DRAFT

DAVID WARNER, Director of Permit Services

S-4835-1-3 Oct 14 2013 8:57AM – SRANK Joint Inspection NOT Required

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: S-4835-2-4 **ISSUANCE DATE:** DRAFT

LEGAL OWNER OR OPERATOR: TRILOGY DAIRY LP
MAILING ADDRESS: 15857 BEAR MOUNTAIN BLVD
BAKERSFIELD, CA 93311

LOCATION: 17661 BEAR MOUNTAIN BLVD
BAKERSFIELD, CA 93311

EQUIPMENT DESCRIPTION:
MODIFICATION OF COW HOUSING 3,200 MILK COWS NOT TO EXCEED 3,680 MATURE COWS (MILK AND DRY COWS): 2,400 TOTAL SUPPORT STOCK (HEIFERS, CALVES AND BULLS): 4570 MILK COWS AND 1356 DRY COWS WITH NO SUPPORT STOCK.

CONDITIONS

1. {4452} If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
2. {4486} Permittee shall pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers. [District Rule 4570]
3. {4487} Permittee shall flush, scrape or vacuum freestall lanes immediately prior to, immediately after or during each milking. [District Rule 4570]
4. {4488} Permittee shall maintain records sufficient to demonstrate that freestall lanes are flushed, scraped or vacuumed immediately prior to, immediately after or during each milking. [District Rule 4570]
5. {4492} Permittee shall remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rule 4570]
6. {4493} Permittee shall record the date that manure that is not dry is removed from individual cow freestall beds or raked, harrowed, scraped, or freestall bedding is graded at least once every seven (7) days. [District Rule 4570]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (661) 392-5500 WHEN CONSTRUCTION IS COMPLETED AND PRIOR TO OPERATING THE EQUIPMENT OR MODIFICATIONS AUTHORIZED BY THIS AUTHORITY TO CONSTRUCT. This is NOT a PERMIT TO OPERATE. Approval or denial of a PERMIT TO OPERATE will be made after an inspection to verify that the equipment has been constructed in accordance with the approved plans, specifications and conditions of this Authority to Construct, and to determine if the equipment can be operated in compliance with all Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District. Unless construction has commenced pursuant to Rule 2050, this Authority to Construct shall expire and application shall be cancelled two years from the date of issuance. The applicant is responsible for complying with all laws, ordinances and regulations of all other governmental agencies which may pertain to the above equipment.

Seyed Sadredin, Executive Director / APCO

DRAFT

DAVID WARNER, Director of Permit Services

S-4835-2-4 Oct 14 2013 8:57AM – SRANK Joint Inspection NOT Required

7. {4499} Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [District Rule 4570]

8. {4500} Permittee shall maintain records demonstrating that water pipes and troughs are inspected and leaks are repaired at least once every seven (7) days. [District Rule 4570]

9. {4501} Permittee shall clean manure from corrals at least four (4) times per year with at least sixty (60) days between each cleaning, or permittee shall clean corrals at least once between April and July and at least once between September and December. [District Rule 4570]

10. {4502} Permittee shall demonstrate that manure from corrals are cleaned at least four (4) times per year with at least sixty (60) days between each cleaning or demonstrate that corrals are cleaned at least once between April and July and at least once between September and December. [District Rule 4570]

11. {4554} Permittee shall implement at least one of the following corral mitigation measures: 1) slope the surface of the corrals at least 3% where the available space for each animal is 400 square feet or less and shall slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 square feet per animal; 2) maintain corrals to ensure proper drainage preventing water from standing more than forty-eight hours; or 3) harrow, rake, or scrape pens sufficiently to maintain a dry surface except during periods of rainy weather. [District Rule 4570]

12. {4555} Permittee shall either 1) maintain sufficient records to demonstrate that corrals are maintained to ensure proper drainage preventing water from standing for more than forty-eight hours or 2) maintain records of dates pens are groomed (i.e., harrowed, raked, or scraped, etc.). [District Rule 4570]

13. {4508} Permittee shall scrape, vacuum or flush concrete lanes in corrals at least once every day for mature cows and every seven (7) days for support stock. [District Rule 4570]

14. {4556} Permittee shall maintain records demonstrating that concrete lanes in corrals are scraped, vacuumed, or flushed at least once every day for mature cows and at least once every seven (7) days for support stock. [District Rule 4570]

15. {4513} Shade structures shall be installed in any of the following ways: 1) constructed with a light permeable roofing material; 2) uphill of any slope in the corral; 3) installed so that the structure has a North/South orientation. OR Permittee shall clean manure from under corral shades at least once every fourteen (14) days, when weather permits access into the corral. [District Rule 4570]

16. {4518} Permittee shall manage corrals such that the manure depth in the corral does not exceed twelve (12) inches at any time or point, except for in-corral mounding. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. However, permittee must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. [District Rule 4570]

17. {4519} Permittee shall measure and document the depth of manure in the corrals at least once every ninety (90) days. [District Rule 4570]

18. The freestall lanes at this dairy shall be flushed at least four times per day. [District Rule 2201]

19. Permittee shall maintain an operating plan that requires the freestall lanes to be flushed at least four times per day. [District Rule 2201]

20. Permittee shall maintain records sufficient to demonstrate that freestall lanes are flushed at least four times per day. [District Rule 2201]

21. All animals at this dairy shall be fed in accordance with the National Research Council (NRC) guidelines utilizing routine dairy nutritionist analyses of rations. [District Rule 2201]

22. Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rule 2201]

23. The total number of Cattle housed at this dairy at any one time shall not exceed any of the following: 4,570 milk cows (3,850 in frestalls and 720 in flushed corrals); 1,356 dry cows in flushed corrals; and 50 mature bulls. [District Rule 2201]

DRAFT

CONDITIONS CONTINUE ON NEXT PAGE

24. Permittee shall maintain a record of the number of animals of each production group housed at this dairy and shall maintain quarterly records of any changes to this information. Such records may include DHIA monthly records, milk production invoices, ration sheets or periodic inventory records [District Rules 2201and 4570]

25. {4453} Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]

26. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: S-4835-3-4 **ISSUANCE DATE:** DRAFT

LEGAL OWNER OR OPERATOR: TRILOGY DAIRY LP
MAILING ADDRESS: 15857 BEAR MOUNTAIN BLVD
BAKERSFIELD, CA 93311

LOCATION: 17661 BEAR MOUNTAIN BLVD
BAKERSFIELD, CA 93311

EQUIPMENT DESCRIPTION:
MODIFICATION OF LIQUID MANURE HANDLING SYSTEM CONSISTING OF TWO MECHANICAL SEPARATOR AND 2 STORAGE PONDS CONTROLLED BY AERATORS: MANURE IS LAND APPLIED THROUGH FLOOD IRRIGATION: ALLOW AN INCREASE IN MANURE FROM THE MODIFIED HERD NUMBERS.

CONDITIONS

1. {4452} If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
2. Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rules 2201and 4570]
3. {4550} Permittee shall not allow liquid manure to stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570]
4. {4551} Permittee shall maintain records to demonstrate liquid manure did not stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570]
5. {4453} Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]
6. The liquid manure handling system shall handle flush manure from no more than 4,570 milk cows; 1,356 dry cows; and 50 mature bulls. [District Rule 2201]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (661) 392-5500 WHEN CONSTRUCTION IS COMPLETED AND PRIOR TO OPERATING THE EQUIPMENT OR MODIFICATIONS AUTHORIZED BY THIS AUTHORITY TO CONSTRUCT. This is NOT a PERMIT TO OPERATE. Approval or denial of a PERMIT TO OPERATE will be made after an inspection to verify that the equipment has been constructed in accordance with the approved plans, specifications and conditions of this Authority to Construct, and to determine if the equipment can be operated in compliance with all Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District. Unless construction has commenced pursuant to Rule 2050, this Authority to Construct shall expire and application shall be cancelled two years from the date of issuance. The applicant is responsible for complying with all laws, ordinances and regulations of all other governmental agencies which may pertain to the above equipment.

Seyed Sadredin, Executive Director / APCO

DRAFT

DAVID WARNER, Director of Permit Services

S-4835-3-4 Oct 14 2013 8:57AM – SRANK · Joint Inspection NOT Required

7. Liquid manure used for irrigation of cropland shall only be taken from the storage pond/secondary lagoon after treatment in the primary lagoon. [District Rule 2201]
8. One of the storage ponds shall be operated as "Anaerobic Treatment Lagoon" conforming to NRCS Guidline No. 359. The minimum treatment volume of this lagoon shall be maintained at 2,655,936 ft^3. [District Rule 2201]
9. Permittee shall maintain design specifications, calculations, including Minimum Treatment Volume (MTV), Hydraulic Retention Time (HRT) demonstrating that the anaerobic treatment lagoon meets the requirements listed in the NRCS Field Office Technical Guide Code 359. [District Rule 2201]
10. Installation of an anaerobic digester may be required for this operation contingent upon the final Dairy BACT Guideline. If the final Dairy BACT Guideline requires the installation of an an anaerobic digester for this operation, the permittee shall install the system in accordance with the timeframes and procedures established by the APCO. [District Rule 2201]
11. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]

DRAFT

Application Emissions

Permit #:	S-4835-1-3	Last Updated	
Facility:	TRILOGY DAIRY LP	10/01/2013	SRANK

Equipment Pre-Baselined: NO

	NOX	SOX	PM10	CO	VOC
Potential to Emit (lb/Yr):					1810.0
Daily Emis. Limit (lb/Day)					5.0
Quarterly Net Emissions Change (lb/Qtr)					
Q1:					135.0
Q2:					136.0
Q3:					136.0
Q4:					136.0
Check if offsets are triggered but exemption applies	N	N	N	N	N
Offset Ratio					
Quarterly Offset Amounts (lb/Qtr)					
Q1:					
Q2:					
Q3:					
Q4:					

SJVUAPCD
SOUTHERN

Application Emissions

10/14/13
8:57 am

Permit #: S-4835-2-4	**Last Updated**	
Facility: TRILOGY DAIRY LP	10/01/2013	SRANK

Equipment Pre-Baselined: NO

	NOX	**SOX**	**PM10**	**CO**	**VOC**
Potential to Emit (lb/Yr):			15600.0		52876.0
Daily Emis. Limit (lb/Day)			42.7		144.8
Quarterly Net Emissions Change (lb/Qtr)					
Q1:			-3165.0		2417.0
Q2:			-3165.0		2417.0
Q3:			-3165.0		2417.0
Q4:			-3165.0		2417.0
Check if offsets are triggered but exemption applies	N	N	N	N	N
Offset Ratio					
Quarterly Offset Amounts (lb/Qtr)					
Q1:					
Q2:					
Q3:					
Q4:					

Application Emissions

Permit #: S-4835-3-4	**Last Updated**	
Facility: TRILOGY DAIRY LP	10/01/2013	SRANK

Equipment Pre-Baselined: NO

	NOX	**SOX**	**PM10**	**CO**	**VOC**
Potential to Emit (lb/Yr):					12965.0
Daily Emis. Limit (lb/Day)					35.5
Quarterly Net Emissions Change (lb/Qtr)					
Q1:					605.0
Q2:					604.0
Q3:					604.0
Q4:					605.0
Check if offsets are triggered but exemption applies	N	N	N	N	N
Offset Ratio					
Quarterly Offset Amounts (lb/Qtr)					
Q1:					
Q2:					
Q3:					
Q4:					