San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

NOV 20 2019

Greg Hooker
Diamond H Dairy
9730 Avenue 18½
Chowchilla, CA 93610

Re: Notice of Preliminary Decision - Authority to Construct
Facility Number: C-5289
Project Number: C-1191298

Dear Mr. Hooker:

Enclosed for your review and comment is the District's analysis of Diamond H Dairy's application for an Authority to Construct for the modification of the existing dairy operation to install robotic milking centers, construct additional housing units and an anaerobic digester, and increase the herd size from 5,650 mature cows and 6,260 total support stock to 8,282 mature cows and 8,544 total support stock, at 9564 Avenue 18½, Chowchilla.

The notice of preliminary decision for this project has been posted on the District's website (www.valleyair.org). 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. Jonah Aiyabei of Permit Services at (559) 230-5910.

Sincerely,

for Arnaud Marjollet
Director of Permit Services

AM:jka

Enclosures

cc: Courtney Graham, CARB (w/ enclosure) via email

Samir Sheikh
Executive Director/Air Pollution Control Officer

Northern Region
4800 Enterprise Way
Modesto, CA 95356-8718
Tel: (209) 557-6400 FAX: (209) 557-6475

Central Region (Main Office)
1990 E. Gettysburg Avenue
Fresno, CA 93726-0244
Tel: (559) 230-6000 FAX: (559) 230-6061

Southern Region
34946 Flyover Court
Bakersfield, CA 93308-9725
Tel: 661-392-5500 FAX: 661-392-5585

www.valleyair.org www.healthyairliving.com

San Joaquin Valley Air Pollution Control District

Authority to Construct Application Review

Dairy Consolidation/Expansion and Robotic Milking Centers

Facility Name:	Diamond H Dairy	Date:	November 20, 2019
Mailing Address:	9730 Avenue 18½ Chowchilla, CA 93610	Engineer:	Jonah Aiyabei
		Lead Engineer:	Jerry Sandhu
Contact Person:	Greg Hooker		
Telephone:	(209) 595-4548		
E-Mail:	ghooker@aol.com		
Application #s:	C-5289-1-5, 2-6, 3-6, 4-5, and 13-4		
Project #:	C-1191298		
Deemed Complete:	May 8, 2019		

I. Proposal

Diamond H Dairy has applied for Authority to Construct (ATC) permits to make the following changes to a recently permitted project (#C-1180202, finalized on December 11, 2018):

Milking operation (C-5289-1)

- Install 10 robotic milking centers in Freestall Barns FS-3, FS-5, FS-10, and FS-14 instead of the previously proposed 72-stall carousel milking parlor.

Cow housing (C-5289-2)

- Freestall Barn FS-1 will be used as a special needs/hospital barn to meet the increased special needs capacity requirements associated with the use of robotic milking systems.
- Freestall Barn FS-10 will be reduced in capacity from 700 to 400 to make room for the robotic milking system's milk house.
- Freestall Barns FS-3, FS-4, FS-5, FS-7, FS-11, and FS-14 will be increased in design capacity from 700 to 800.
- The proposed location of Freestall Barn FS-14 will change from the east to the west side of the existing milk barn.

The current application does not include any changes to the previously issued ATC permits for liquid manure handling (C-5289-3-5), solid manure handling (C-5289-4-4), or feed storage and handling (C-5289-13-3). However, since the ATC conditions required all the ATCs to be implemented concurrently, and the project was public-noticed with the concurrent-implementation requirement, these ATCs will also be re-issued via the current project. The previously issued ATCs will be cancelled and replaced by the ATCs from the current project. The modifications proposed in the previous project will be re-evaluated in the current project.

The following items from the previously permitted project (#C-1180202) will remain unchanged (ATC permit number modified):

Facility-wide

The applicant, being the owner of Diamond H Dairy (facility C-5289) and Defense Ranch (facility C-5701)[1] proposes to modify both facilities by transferring all the cows from Defense Ranch to Diamond H Dairy and shutting down Defense Ranch. As a result, the following condition will be placed on each of the resulting ATC permits:

- Upon implementation of the modification(s) authorized by this Authority to Construct (ATC), the following permits shall be surrendered to the District: C-5701-1-0, 2-0, 3-0, 4-0, and 5-0. [District Rule 2201]

Milking Parlor (C-5289-1)

- Increase the milk cow herd size from 4,900 milk cows to 7,278 milk cows.

Cow Housing (C-5289-2)

- Transfer all 1,210 support stock (heifers, calves, and bulls) from Defense Ranch to Diamond H Dairy. The applicant has also proposed to bring additional animals from offsite; the proposed herd profile will be increased from 4,900 milk cows not to exceed a total of 5,650 mature cows and 6,260 total support stock to 7,278 milk cows not to exceed a total of 8,282 mature cows and 8,544 total support stock.
- Construct 5 freestall barns and 1 loafing barn over existing exercise pens.
- Construct two new loafing barns and 10 new open corrals.
- Subdivide 5 existing corrals into 7 smaller corrals.
- Increase the maximum number of calf hutches from 500 to 750.
- Plant downwind windbreaks around existing corrals and upwind and downwind windbreaks around new corrals

Liquid Manure Handling (C-5289-3)

- Allow increase in liquid manure as a result of the increase in herd size.
- Convert one existing storage pond into one covered anaerobic treatment digester lagoon. The covered anaerobic treatment digester lagoon will be operated by a third party, Madera DP2, LLC, and a separate ATC (C-9220-1-0) was issued under project C-1172116.

Solid Manure Handling (C-5289-4)

- Allow increase in solid manure as a result of the increase in herd size.

Feed Storage and Handling (C-5289-13)

- Allow increase in feed and TMR as a result of the increase in herd size.

[1] Even though they are permitted as separate dairies, these facilities are considered the same stationary source pursuant to District Rule 2201 Section 3.29.

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 (8/15/19)
Rule 2410	Prevention of Significant Deterioration (6/16/11)
Rule 2520	Federally Mandated Operating Permits (8/15/19)
Rule 4101	Visible Emissions (2/17/05)
Rule 4102	Nuisance (12/17/92)
Rule 4550	Conservation Management Practices (CMP) (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)
Public Resources Code 21000-21177: California Environmental Quality Act (CEQA)
California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000-15387: CEQA Guidelines

III. Project Location

The facility is located at 9564 Avenue 18½ in Chowchilla. The District has verified that the dairy 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 this facility 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. Therefore, a dairy operation may have several types of animal groups present, including calves, heifers, mature cows (lactating and dry cows), and bulls.

The milk cows at a dairy usually generate anywhere from 130 to 150 pounds of manure per day. Manure accumulates in confinement areas such as barns, open corrals, and the milking center. Manure is primarily deposited in areas where the herd is fed and given water. How the manure is collected, stored, and treated depends directly on the manure management techniques used at a particular dairy.

Dairy manure is collected and managed as a liquid, a semi-solid or slurry, and a solid. Manure with a total solids or dry matter content of 20% or higher usually can be handled as a solid while manure with a total solids content of 10% or less can be handled as a liquid.

Milking Parlors

The milking parlor is a separate building, apart from the lactating cow confinement. The milking parlor is designed to facilitate changing the groups of cows milked and to allow workers access to the cows during milking. A holding area confines the cows that are ready for milking. The

holding area is covered with open sides and is part of the milking parlor, which in turn, is located in the immediate vicinity of the cow housing.

Diamond H Dairy is currently permitted for one double 34 herringbone (64 stall) milking parlor and one double 45 parallel (90 stall) milking parlor. The proposed project will result in the addition of ten robotic milking parlors (centers) to the milking operation. As shown on the project site plan in Appendix J, the robotic milking centers will be installed at several different locations in Freestall Barns 3, 5, 10, and 14.

A robotic milking center consists of a one-cow booth in which all the milking functions are completely automated. Once the cow enters the booth, the intake gate closes to keep it in place. Feed is also dispensed for the cow to eat during the milking session. The milking robot uses sensors to locate and clean the teats. All the required equipment and accessories are manipulated using a robotic arm. An assembly with roller brushes (and/or cleaning cups) and water jets is used for cleaning. The milking suction cups, which are located on a separate assembly, are then attached to each teat. Once the suction cups are attached, milking commences and proceeds as usual. Each suction cup detaches once no more milk flow is sensed from the teat. Once all the cups have detached, the robot retracts the milking cup assembly and uses the cleaning assembly to administer the required post-milking disinfection treatment to the teats. This completes the milking session. The exit gate opens to release the cow. Once the exit gate closes, the intake gate opens to admit the next cow.

Due to food safety regulations, high standards of hygiene must be observed in all milking parlors/centers. The milking parlor/center floors are constructed of concrete or similar solid material, and are properly sloped to ensure effective drainage. Any manure that is deposited on the milking parlor/center floors during milking is promptly sprayed down with clean water and flushed into the drainage system, from where it is carried through pipes into the manure lagoons.

Cow Housing

In the freestall barn, cows are grouped in large pens with free access to feed bunks, waterers, and stalls for resting. A standard free-stall barn design has a feed alley in the center of the barn separating two feed bunks on each side. A variety of types of bedding materials are used for animal comfort and to prevent animal injury.

Loafing barns are similar in design to freestall barns, except that the loafing barn floors are not paved and are not divided into stalls. This type of housing structure provides coverage for a very large surface area providing protection from the heat and creating a cooler environment.

An open corral is a large open area where cows are confined, also with unlimited access to feed bunks, water, and possibly an open structure to provide shade. Detailed pre-project and post project housing arrangements are shown in Appendix F.

Liquid Manure Handling

The liquid manure handling system consists of settling basin(s), mechanical separator(s), and 3 storage ponds.

Solids Separation/Mechanical Separator(s)

Flush water from the milk barn and housing areas is collected into a processing pit near the mechanical separator(s). The flush water is periodically agitated and pumped over the mechanical separator screens. The liquid passes through the screens and flows into the liquid manure lagoons. The solids fall off the bottom of the screen onto a stacking pad, from where they are later removed by a front end loader and spread out to dry on the drying pads.

Settling Basin(s)

The liquid manure from the flushed lanes will flow to the settling basin(s) for solids separation prior to entering the lagoon. Settling basins are structures designed to separate solids from liquid manure by sedimentation. The inflow of manure is restricted to allow some of the solids to settle out. A settling basin may achieve a solids removal rate of 40-70%. The liquids from the settling basins will gradually drain to the treatment lagoons. Solids remaining in settling basins are left to dry and then are removed. The separated solids will either be incorporated into cropland or stored for use as fertilizer.

Storage Ponds

The storage ponds are designed to have sufficient volume to hold all of the following: all manure and wastewater accumulated at the dairy for a period of 120 days; normal precipitation and any drainage to the lagoon system minus evaporation from the surface of lagoons; and precipitation during a 25 year, 24 hour storm event. The liquid manure from the storage pond will be used to irrigate crops.

Land Application

Liquid manure from the storage ponds and lagoon will be applied to cropland as fertilizer/irrigation water. The application is done through flood and furrow irrigation, at agronomic rates in conformance with a nutrient management plan that has been approved by the Regional Water Quality Control Board.

Anaerobic Digester System

An anaerobic digester is a sealed basin or tank that is designed to accelerate and control the decomposition of organic matter by microorganisms in the absence of oxygen. Anaerobic decomposition results in the conversion of organic compounds in the substrate into methane (CH_4), carbon dioxide (CO_2), and water rather than intermediate Volatile Organic Compounds (VOC). The gas generated by this process is known as biogas, waste gas, or digester gas. In addition to methane and carbon dioxide, biogas may also contain small amounts of Nitrogen (N_2), Oxygen (O_2), Hydrogen Sulfide (H_2S), and Ammonia (NH_3). Biogas may also include trace amounts of various VOC that remain from incomplete digestion of the volatile solids in the incoming substrate. 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.

For information purposes, the covered anaerobic digester system, permitted as C-9220-1-0, will process the manure slurry (mixed manure solids and liquids) from the reception pits. The manure will be flushed from the milking parlor and the cow housing areas at the dairy and

the manure will be routed via the existing underground piping system to reception pits where the waste stream will be adjusted to the proper solids content (9-15% solids) and then pumped into the digester. The effluent from the digester will be pumped to a solid separation area where the fiber solids will be separated from the liquid digester effluent. After the fiber solids have been separated, the liquid digester effluent will be pumped back to the separated liquid pit to be used in the flush system. Excess liquid will flow to the remaining settling basins and storage ponds to be used to fertilize adjacent cropland.

Solid Manure Handling

The solid manure stockpiled at this dairy will include the separated solids from the mechanical separator. The separated solids will be immediately incorporated into cropland, be dried and used as fertilizer or as bedding in the freestall barns, or hauled offsite. The applicant proposes to cover the dry separated solids piles and animal waste piles with weatherproof coverings from October through May, so that the solids will remain dry until they are ready to be used.

Feed Storage and Handling

Silage Piles and Commodity Barns

The feed consists primarily of silage, which is made from corn and alfalfa, or a variety of other feed crops. The silage is made by placing the harvested crops, chopped to desired pieces if necessary, into piles, which are then compacted with heavy equipment to remove air. The piles are then tightly covered to avoid reintroduction of air. This allows anaerobic microbes present in the crops to multiply, resulting in fermentation of the organic material in the feed. When the silage is ready, one end of the pile can be opened and the required amount of silage can be removed from that end on a daily basis.

In order to provide the right nutritional balance, silage is usually blended with other feed additives, such as oils, whey, seeds and grains, nut hulls, and various salts and minerals before it is fed to the cattle. These additives are usually stored in commodity barns to avoid exposure to weather.

Total Mixed Rations (TMR)

TMR refers to a blended mixture of silage and additives that is ready to be fed to the cattle. Most cattle facilities prepare their TMRs in small batches using a feed wagon equipped with a mixer. The silage and additives are placed in the feed wagon in the proportions prescribed by the dietary requirements of the group of cows to be fed. These ingredients are then thoroughly mixed in the wagon and delivered to the feed bunks.

V. Equipment Listing

Facility C-5289 (Diamond H Dairy)

C-5289-1-2: 4,900 COW MILKING OPERATION WITH ONE DOUBLE 34 HERRINGBONE (68 STALLS) MILKING PARLOR AND ONE DOUBLE 45 PARALLEL (90 STALLS) MILKING PARLOR

C-5289-2-3: COW HOUSING - 4,900 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 5,650 MATURE COWS (MILK AND DRY); 6,260 TOTAL SUPPORT STOCK (HEIFERS, CALVES AND BULLS); AND EIGHT FREESTALLS WITH FLUSH/SCRAPE

C-5289-3-4: LIQUID MANURE HANDLING SYSTEM CONSISTING OF SETTLING BASIN(S); DOUBLE MECHANICAL SEPARATOR(S); AND THREE STORAGE PONDS; MANURE LAND APPLIED THROUGH FLOOD IRRIGATION

C-5289-4-2: SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND

C-5289-13-1: FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARNS AND SILAGE PILES

Facility C-5701 (Defense Ranch)

C-5701-1-0: DORMANT COW MILKING OPERATION WITH ONE 20 STALL FLAT MILKING PARLOR

C-5701-2-0: COW HOUSING - NO MATURE COWS (MILK AND DRY COWS) PRESENT AT THIS TIME; TOTAL SUPPORT STOCK NOT TO EXCEED 1,210 HEIFERS, CALVES, AND BULLS

C-5701-3-0: LIQUID MANURE HANDLING SYSTEM CONSISTING OF ONE STORAGE POND; MANURE LAND APPLIED THROUGH FLOOD IRRIGATION AND FURROW IRRIGATION

C-5701-4-0: SOLID MANURE HANDLING CONSISTING OF OPEN MANURE STOCK PILES; COMPOSTING; SOLID MANURE APPLICATION TO LAND AND HAULED OFFSITE

C-5701-5-0: FEED STORAGE AND HANDLING CONSISTING OF COVERED FEED STORAGE OR COMMODITY BARN AND SILAGE PILES

Proposed Modifications

C-5289-1-5: MODIFICATION OF 4,900 COW MILKING OPERATION WITH ONE DOUBLE 34 HERRINGBONE (68 STALLS) MILKING PARLOR AND ONE DOUBLE 45 PARALLEL (90 STALLS) MILKING PARLOR: INCREASE MAXIMUM NUMBER OF MILK COWS FROM 4,900 TO 7,278 AND CONSTRUCT 10 ROBOTIC MILKING CENTERS IN FREESTALL BARNS FS-3, FS-5, FS-10, AND FS-14

For permit unit C-5289-2, an administrative correction to the equipment description will be made to include 500 existing on-ground hutches, which were inadvertently omitted in the most recent two permitting actions.

C-5289-2-6: MODIFICATION OF COW HOUSING - 4,900 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 5,650 MATURE COWS (MILK AND DRY); 6,260 TOTAL SUPPORT STOCK (HEIFERS, CALVES, AND BULLS); AND 8 FREESTALL BARNS AND 1 LOAFING BARN WITH FLUSH/SCRAPE SYSTEM: INCREASE MILK COWS TO 7,278, MATURE COWS TO 8,282, SUPPORT STOCK TO 8,544; INCREASE NUMBER OF CALF HUTCHES (ONGROUND) FROM 500 TO 750; CONSTRUCT 5 FREESTALL BARNS AND 1 LOAFING BARN WITH FLUSH SYSTEMS OVER EXISTING EXERCISE PENS; CONSTRUCT 2 NEW LOAFING BARNS AND 10 NEW OPEN CORRALS WITH FLUSH SYSTEMS; AND SUBDIVIDE 5 EXISTING OPEN CORRALS INTO 7 SMALLER CORRALS

C-5289-3-6: MODIFICATION OF LIQUID MANURE HANDLING SYSTEM CONSISTING OF SETTLING BASIN(S); DOUBLE MECHANICAL SEPARATOR(S); AND THREE STORAGE PONDS; MANURE LAND APPLIED THROUGH FLOOD IRRIGATION: INCREASE IN LIQUID MANURE DUE TO INCREASE IN HERD SIZE AND CONVERSION OF 2 SETTLING BASINS INTO A COVERED ANAEROBIC TREATMENT DIGESTER LAGOON AS AUTHORIZED BY ATC C-9220-1-0

C-5289-4-5: MODIFICATION OF SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND: INCREASE IN SOLID MANURE DUE TO INCREASE IN HERD SIZE

For permit unit C-5289-13, an administrative correction to the equipment description will be made to include "TOTAL MIXED RATION FEEDING", which appears to have been inadvertently omitted in all the previous permitting actions.

C-5289-13-4: MODIFICATION OF FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARN(S), SILAGE PILE(S), AND TOTAL MIXED RATION FEEDING: INCREASE IN THROUGHPUT DUE TO INCREASE IN HERD SIZE

Post Project Equipment Description

C-5289-1-5: 7,278 COW MILKING OPERATION WITH ONE DOUBLE 34 HERRINGBONE (68 STALLS) MILKING PARLOR, ONE DOUBLE 45 PARALLEL (90 STALLS) MILKING PARLOR, AND 10 ROBOTIC MILKING CENTERS IN FREESTALL BARNS FS-3, FS-5, FS-10, AND FS-14

C-5289-2-6: COW HOUSING – 7,278 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 8,282 MATURE COWS (MILK AND DRY); 8,544 TOTAL SUPPORT STOCK (HEIFERS, CALVES, AND BULLS); 750 ONGROUND CALF HUTCHES; AND 13 FREESTALL BARNS AND 4 LOAFING (CALVING) BARNS WITH FLUSH/SCRAPE SYSTEM

C-5289-3-6: LIQUID MANURE HANDLING SYSTEM CONSISTING OF SETTLING BASIN(S); MECHANICAL SEPARATOR(S); 3 STORAGE PONDS; LIQUID MANURE IS SENT TO A COVERED ANAEROBIC TREATMENT DIGESTER LAGOON OPERATED BY FACILITY C-9220; MANURE LAND APPLIED THROUGH FLOOD IRRIGATION

C-5289-4-5: SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES AND SOLID MANURE APPLICATION TO LAND

C-5289-13-4: FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARN(S), SILAGE PILE(S), AND TOTAL MIXED RATION FEEDING

VI. Emission Control Technology Evaluation

Particulate matter (PM_{10}), volatile organic compounds (VOC), ammonia (NH_3), and hydrogen sulfide (H_2S) are the major pollutants of concern from dairy operations.

Gaseous pollutant emissions at a dairy result from the ruminant digestive processes (enteric emissions), from the decomposition and fermentation of feed, and also from decomposition of organic material in dairy manure. Volatile Organic Compounds (VOCs) are formed as intermediate metabolites when organic matter in manure degrades. Ammonia volatilization is the result of the microbial decomposition of nitrogenous compounds in manure. The quantity of enteric emissions depends directly on the number and types of cows. The quantity of emissions from manure decomposition depends on the amount of manure generated, which also depends on the number and types of cows. Therefore, the total herd size and composition is the critical factor in quantifying emissions from a dairy. Various management practices are used to control emissions at this dairy. Examples of some of these practices are discussed below:

Milking Parlors

This dairy uses a flush/spray system to wash out the manure from the milking parlors after each group of cows are milked. Since the milking parlors are constantly flushed, there will be no particulate matter emissions from the milking parlor. Manure, which is a source of VOC emissions, is removed from the milking parlor many times a day by flushing after each milking. Because of ammonia's high affinity for and solubility in water, volatilization of ammonia from the milking parlors will also be reduced by flushing after each milking.

Cow Housing

The cows at the facility will be housed in a combination of freestall barns, loafing barns, and open corrals. Some of the practices that will be utilized to reduce emissions are described below:

Freestall Barns (With Exercise Pens)

Particulate matter emissions from freestall barns are greatly reduced because the cows will be on a paved surface rather than on dry dirt. Additionally, flushing of the freestall lanes creates a moist environment, which further decreases particulate matter emissions.

Loafing Barns

Loafing barns are similar in design to freestall barns, except that the loafing barn floors are not paved and are not divided into stalls. This type of housing structure provides coverage for a very large surface area providing protection from the heat and creating a cooler environment. Emissions are reduced in two ways; the soil will contain more moisture (due to cooler temperature and moisture from manure) and less soil disturbance under the barn.

Shade Structures

Some of the support stock will be housed in an open corral with concrete lanes and a shade structure. Providing shade for the animals reduces movement and unnecessary activity during hot weather, which reduces PM_{10} emissions.

Frequent Flushing

Frequent flushing is also used for the removal of manure from the lanes and walkways in the housing barns. Frequent flushing creates a moist environment that greatly reduces or eliminates PM_{10} emissions. In addition, flush water dissolves NH_3 as well as various water-soluble VOC in the manure, thereby stopping or decelerating the emission of these pollutants directly into the atmosphere. Both manure and dissolved pollutants are subsequently carried by the flush water into the liquid manure handling system for further treatment.

Liquid Manure Handling

Settling Basin Separation

The purpose of settling basin separation is to remove the fibrous materials prior to the liquid manure entering the lagoon. By removing the most fibrous material from the liquid stream prior to entering the pond, it is anticipated that the amount of intermediate metabolites released during digestion in the pond may be reduced. Removal of the fibrous material allows for more complete digestion in the pond and lower emissions. Solids remaining in the settling basin are left to dry and then are removed. The separated solids can be immediately incorporated into cropland or spread in thin layers, harrowed, and dried.

Solids Separation (Mechanical Separator)

The purpose of solids separation is to remove fibrous materials prior to the liquid manure entering the lagoon. By removing the most fibrous material from the liquid stream prior to entering the lagoon, it is anticipated that the amount of intermediate metabolites released during digestion in the lagoon may be reduced. Removal of the fibrous material allows for more complete digestion in the lagoon and lower emissions. Solids remaining are left to dry and then are removed. The separated solids can be immediately incorporated into cropland or spread in thin layers, harrowed, and dried.

Liquid Manure Land Application

Liquid manure will be applied to cropland at agronomic rates, in compliance with the dairy's comprehensive nutrient management plan and the requirements of the Regional Water Quality Control Board. These practices are expected to reduce odors and result in faster uptake of nutrients by crops. When applied nutrients are optimally matched with the nutrient

needs of developing crops, the excess nutrients that are associated with increased emissions and/or groundwater pollution are minimized.

Solid Manure Handling

Based on the information currently available, emissions from solid manure applied to cropland are expected to be low. However, to ensure that any possible emissions are minimized, the manure will be promptly incorporated into the soil after application. This will reduce any volatilization of gaseous pollutants, as the soil provides cover from wind and other weather elements that enhance volatilization. In addition, incorporation reduces emissions by biofilter effect, whereby the adsorption of NH_3, VOC, and other compounds onto soil particles provides an opportunity for oxidation by the action of various microorganisms the soil.[2]

Feed Storage and Handling

All cows will be fed in accordance with National Research Council (NRC) guidelines using routine nutritional analysis for rations. NRC guidelines are intended to optimize nutrient uptake by the cow, which not only increases feed efficiency but also minimizes the excretion of undigested protein and other nutrients in the manure. Since excess manure nutrients are the feedstock for the processes that result in NH_3, H_2S, and VOC emissions as manure decomposes, the reduction of nutrients in the manure is expected to reduce the emission of these pollutants.

In addition, any refused feed will be removed from the feed lanes on a regular basis to minimize gaseous emissions from decomposition. Silage piles will be covered with plastic tarps to minimize volatilization of pollutants from the pile surfaces.

Rule 4570 Mitigation Measures

The facility currently complies with all applicable Phase II mitigation measure requirements of District Rule 4570, as previously processed under District project C-1110877 for Diamond H Dairy and project C-1103643 for Defense Ranch. This project does not involve any change to the mitigation measures practiced at the facility.

All mitigation measures are expected to result in VOC emissions reductions for each permit unit at the dairy; reductions in ammonia emissions are also expected. A complete list of the mitigation measures practiced at the facility, and the expected control efficiency for each, is included with the emissions calculations shown in Appendix F.

VII. General Calculations

A. Assumptions

- Potential to Emit for the dairies will be based on the maximum design capacity for the number and category of cows.
- Diamond H Dairy (C-5289) and Defense Ranch (C-5701) constitute the same stationary source.

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

- For worst case potential to emit calculations, all support stock are assumed to be heifers. However, for health risk and ambient air quality impact analyses, the potential to emit for calves (0 – 3 months) will be used for the calf hutch area(s).
- 100% of the milk cows can be milked in any of the proposed new robotic milking parlors on any given day.
- The mitigation measures practiced at Diamond H Dairy as well as the number, type, and size of silage piles are taken from the Rule 4570 Phase II application, processed under District project C-1110877.
- The post-project Rule 4570 mitigation measures practiced at this dairy will be the same as the pre-project mitigation measures.
- For dairies, only emissions from the lagoon/storage ponds, internal combustion engines, and gasoline dispensing operations are used in determining if a facility will be a major source since the lagoon/storage ponds, internal combustion engines, and gasoline dispensing operations are considered to be the only non-fugitive emissions at dairy facilities.
- There will be no new lagoons/storage ponds or any change to the surface area of the existing lagoons/storage ponds.
- All H_2S emissions will be allocated to the liquid manure permit units.
- The NH_3 emission factors for milk cows are based on an internal document entitled "*Breakdown of Dairy VOC Emission Factor into Permit Units*." The 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.
- The VOC emission factors for the dairy animals are based on the District document entitled "Air Pollution Control Officer's Revision of the Dairy VOC Emissions Factor".
- 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.
- All PM_{10} emissions from the cows will be allocated to the cow housing permit unit.
- Current District practice to streamline calculations for $PM_{2.5}$ emissions is to assume $PM_{2.5}$ emissions to be equal to PM_{10} emissions. However, the District has been made aware of a number of scientific studies[3] that have established more representative $PM_{2.5}$-to-PM_{10} fractions from dairy operations. Data from a preliminary analysis of these studies indicate a range of percentages (from 8.6% to 26.7%) for the $PM_{2.5}$-to-PM_{10} fraction, but a final $PM_{2.5}$ fraction has not been determined. Since this additional evaluation is in progress and has not been finalized; for this specific project, the District will include an additional 7.5% margin of safety to the highest published value of 26.7%[4] and use a conservative $PM_{2.5}$ fraction of 28.7% $PM_{2.5}$-to-PM_{10}. Additional work must be completed to more closely analyze the results of these studies and determine a final $PM_{2.5}$-to-PM_{10} fraction for district-wide usage.

[3] Including: (1) California Air Resources Board - Speciation Profiles Used in ARB Modeling (PMSIZE spreadsheet); (2) Winkel, A. et al (2015). Emissions of particulate matter from animal houses in the Netherlands. Atmospheric Environment, 111, pp.202-212.; (3) Joo, H.S., et al (2013). Particulate matter dynamics in naturally ventilated freestall dairy barns. Atmospheric Environment, 69, pp.182-190.; and (4) Marchant, C. C.; et al, (2011) "Estimation of Dairy Particulate Matter Emission Rates by LIDAR and Inverse Modeling". *Space Dynamics Lab Publications.* Paper 85.

[4] The 26.7% fraction was derived from the Joo, H.S., et. al. (2013) study and the study was conducted in the State of Washington in the Pacific Northwest region of the U.S. While utilizing the highest published fraction may seem conservative, the study also states, "a comparison of PM emissions across different geographical and climate regions is, however, complicated because of the differences in environmental conditions, animal feed, feed and manure management, bedding material, amongst others."

B. Emission Factors

The emissions calculations shown in Appendix F include the PM_{10}, VOC, NH_3, and H_2S emission factors from the animals and silage at this dairy. These emission factors will be used to calculate the pre-project and post-project PM_{10}, VOC, NH_3, and H_2S emissions from the entire dairy.

C. Calculations

Detailed potential to emit calculations for this project are included in Appendix C.

1. Pre-Project Potential to Emit (PE1)

A summary of the pre-project emissions from the modified units are shown in the following tables:

Daily PE1 (lb/day) – C-5289 (Diamond H Dairy)							
Permit #	**NOx**	**SOx**	**PM_{10}**	**CO**	**VOC**	**NH_3**	**H_2S**
C-5289-1-2 (milking parlor)	0.0	0.0	0.0	0.0	5.4	1.8	0.0
C-5289-2-3 (cow housing)	0.0	0.0	223.5	0.0	205.7	400.7	0.0
C-5289-3-4 (liquid manure handling)	0.0	0.0	0.0	0.0	52.8	143.6	3.3
C-5289-4-2 (solid manure handling)	0.0	0.0	0.0	0.0	10.2	53.8	0.0
C-5289-13-1 (feed storage and handling)	0.0	0.0	0.0	0.0	297.8	0.0	0.0

Daily PE1 (lb/day) – C-5701 (Defense Ranch)							
Permit #	**NOx**	**SOx**	**PM_{10}**	**CO**	**VOC**	**NH_3**	**H_2S**
C-5701-1-0 (milking parlor)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C-5701-2-0 (cow housing)	0.0	0.0	32.1	0.0	19.7	46.4	0.0
C-5701-3-0 (liquid manure handling)	0.0	0.0	0.0	0.0	4.4	14.9	0.7
C-5701-4-0 (solid manure handling)	0.0	0.0	0.0	0.0	0.9	3.0	0.0
C-5701-5-0 (feed storage and handling)	0.0	0.0	0.0	0.0	51.5	0.0	0.0

Annual PE1 (lb/year) – C-5289 (Diamond H Dairy)							
Permit #	**NOx**	**SOx**	**PM_{10}**	**CO**	**VOC**	**NH_3**	**H_2S**
C-5289-1-2 (milking parlor)	0	0	0	0	1,960	670	0
C-5289-2-3 (cow housing)	0	0	81,521	0	75,204	146,219	0
C-5289-3-4 (liquid manure handling)	0	0	0	0	19,290	52,403	1,191
C-5289-4-2 (solid manure handling)	0	0	0	0	3,750	19,635	0
C-5289-13-1 (feed storage and handling)	0	0	0	0	108,708	0	0

Annual PE1 (lb/year) – C-5701 (Defense Ranch)							
Permit #	**NOx**	**SOx**	**PM_{10}**	**CO**	**VOC**	**NH_3**	**H_2S**
C-5701-1-0 (milking parlor)	0	0	0	0	0	0	0
C-5701-2-0 (cow housing)	0	0	11,706	0	7,175	16,940	0
C-5701-3-0 (liquid manure handling)	0	0	0	0	1,609	5,445	266
C-5701-4-0 (solid manure handling)	0	0	0	0	315	1,089	0
C-5701-5-0 (feed storage and handling)	0	0	0	0	18,793	0	0

2. Post Project Potential to Emit (PE2)

A summary of the post-project emissions from the modified units are shown in the following tables:

Daily PE2 (lb/day) – C-5289 (Diamond H Dairy)							
Permit #	**NOx**	**SOx**	**PM_{10}**	**CO**	**VOC**	**NH_3**	**H_2S**
C-5289-1-5 (milking parlor)	0.0	0.0	0.0	0.0	8.0	2.7	0.0
C-5289-2-6 (cow housing)	0.0	0.0	216.1	0.0	296.0	580.5	0.0
C-5289-3-6 (liquid manure handling)	0.0	0.0	0.0	0.0	45.6	134.5	3.3
C-5289-4-5 (solid manure handling)	0.0	0.0	0.0	0.0	14.8	77.9	0.0
C-5289-13-4 (feed storage and handling)	0.0	0.0	0.0	0.0	406.1	0.0	0.0

Annual PE2 (lb/year) – C-5289 (Diamond H Dairy)							
Permit #	**NOx**	**SOx**	**PM_{10}**	**CO**	**VOC**	**NH_3**	**H_2S**
C-5289-1-5 (milking parlor)	0	0	0	0	2,911	996	0
C-5289-2-6 (cow housing)	0	0	78,756	0	108,050	211,824	0
C-5289-3-6 (liquid manure handling)	0	0	0	0	16,631	49,088	1,191
C-5289-4-5 (solid manure handling)	0	0	0	0	5,391	28,440	0
C-5289-13-4 (feed storage and handling)	0	0	0	0	148,264	0	0

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

Pursuant to District Rule 2201, the 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 (AER) that have occurred at the source, and which have not been used on-site. The emissions for permit units C-5289-1 through C-5289-4 and C-5289-13 and C-5701-1 through C-5701-5 are calculated in Appendix C. The emissions for permit units C-5289-9 and C-5289-10 are calculated in Appendix H. The SSPE1 is summarized in the following table:

Pre-Project Stationary Source Potential to Emit [SSPE1] (lb/year)							
Permit #	**NOx**	**SOx**	**PM_{10}**	**CO**	**VOC**	**NH_3**	**H_2S**
C-5289-1-2	0	0	0	0	1,960	670	0
C-5289-2-3	0	0	81,521	0	75,204	146,216	0
C-5289-3-4	0	0	0	0	19,290	52,403	1,191
C-5289-4-2	0	0	0	0	3,750	19,635	0
C-5289-9-0	1,664	1	79	506	190	0	0
C-5289-10-0	0	0	0	0	47	0	0
C-5289-13-1	0	0	0	0	108,708	0	0
C-5701-1-0	0	0	0	0	0	0	0
C-5701-2-0	0	0	11,706	0	7,175	16,940	0
C-5701-3-0	0	0	0	0	1,609	5,445	266
C-5701-4-0	0	0	0	0	315	1,089	0
C-5701-5-0	0	0	0	0	18,793	0	0
SSPE1	**1,664**	**1**	**93,306**	**506**	**237,041**	**242,398**	**1,457**

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

Pursuant to District Rule 2201, the SSPE2 is the PE from all units with valid ATCs or PTOs at the Stationary Source and the quantity of ERCs which have been banked since September 19, 1991 for AER that have occurred at the source, and which have not been used on-site. The emissions for permit units C-5289-1 through C-5289-4 and C-5289-13 are calculated in Appendix C. The emissions for permit units C-5289-9 and C-5289-10 are calculated in Appendix H. The SSPE2 is summarized in the following table:

Post-Project Stationary Source Potential to Emit [SSPE2] (lb/year)							
Permit #	**NO_X**	**SO_X**	**PM_{10}**	**CO**	**VOC**	**NH_3**	**H_2S**
C-5289-1-5	0	0	0	0	2,911	996	0
C-5289-2-6	0	0	78,756	0	108,050	211,824	0
C-5289-3-6	0	0	0	0	16,631	49,088	1,191
C-5289-4-5	0	0	0	0	5,391	28,440	0
C-5289-9-0	1,664	1	79	506	190	0	0
C-5289-10-0	0	0	0	0	47	0	0
C-5289-13-4	0	0	0	0	148,264	0	0
SSPE2	**1,664**	**1**	**78,835**	**506**	**281,484**	**290,348**	**1,191**

5. Major Source Determination

Rule 2201 Major Source Determination

Pursuant to District Rule 2201, a major source is a stationary source with an SSPE2 equal to or exceeding one or more of the major source thresholds shown in Table 3-3. For the purposes of determining major source status the following shall not be included:

- Any ERCs associated with the stationary source
- Emissions from non-road engines (i.e. engines at a particular site at the facility for less than 12 months)
- Fugitive emissions, except for the source categories specified in 40 CFR 51.165

Agricultural operations do not belong to any of the source categories specified in 40 CFR 51.165. Since this facility is an agricultural operation, fugitive emissions shall not be included in determining whether it is a major stationary 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." In 2005, the California Air Pollution Control Officers Association (CAPCOA) issued guidance for estimating VOC emissions from dairy farms. This guidance determined that VOC emissions from the milking centers, cow housing areas, corrals, common manure storage areas, and land application of manure are considered fugitive since they are not physically contained and could not reasonably pass through a stack, chimney, vent, or other functionally-equivalentopening. The guidance also determined that VOC emissions from liquid manure lagoons and storage ponds are not considered fugitive because emission

collection technologies for liquid manure systems exist. The District has researched this issue and concurs with the CAPCOA determinations, as discussed in more detail below:

Milking Parlor

The mechanical ventilation system could arguably be utilized to capture emissions from the milking parlor. In order achieve and maintain the negative pressure required for this purpose, the adjoining holding area would also need to be completely enclosed. However, enclosing the holding area is not practical due to the continuous movement of cows in and out of the barn throughout the day. In addition, the capital outlay required to enclose this large area would be prohibitive. The District therefore determines that emissions from the milking parlor cannot reasonably be captured, and are to be considered fugitive.

Cow Housing

Although there are smaller dairy farms that have enclosed housing barns, such barns are usually not fully enclosed and do not include any systems for the collection of emissions. In addition, the airflow requirements for dairy cows are extremely high, primarily for herd health reasons. Airflow requirements are expected to be even higher in places such as the San Joaquin Valley, where daytime temperatures can exceed 110 degrees for prolonged periods during the summer months. Given the high air flow rates that will be involved, collection and control of the exhaust from housing barns is not only impractical but also cost prohibitive. The District therefore determines that emissions from housing barns cannot reasonably be captured, and are to be considered fugitive.

Manure Storage Areas

Solid manure is typically stored in the housing areas, as mounds or piles in individual corrals or pens. Some manure may also be stored in piles outside the housing areas while awaiting land application, shipment offsite, or other uses. Thus, manure storage areas are widely distributed over the dairy site, making it impractical to capture emissions from any significant proportion of the solid manure. The District therefore determines that emissions from manure storage areas cannot reasonably be captured, and are to be considered fugitive.

Land Application

Since manure has to be applied over large expanses of cropland (hundreds or even thousands of acres), there is no practical method that can be used to capture the associated emissions. The District therefore determines that emissions from land application of manure cannot reasonably be captured, and are to be considered fugitive.

Feed Handling and Storage

Silage and total mixed rations (TMR) are the primary sources of emissions from feed storage and handling. Silage is stored in several tarped/covered piles and/or plastic

bags. One end/face of the pile/bag that is actively being used to prepare feed rations must remain open to allow extraction of the silage. A front-end loader is used to extract silage from the open face of the pile throughout the day as the feed rations for the various groups or categories of cows are prepared. A significant proportion of silage pile emissions are associated with this open face, which is exposed to the atmosphere and frequently disturbed during silage extraction. Due to the need to access the pile's open face throughout the day, it is not practical to enclose it or equip it with any kind of device or system that could be used to capture of emissions.

TMR is prepared by mixing silage with various additives such as seeds, grains, and molasses. Because the quality of silage degrades fairly rapidly upon exposure to air, TMR is prepared only when needed and promptly distributed to the feed lanes for consumption. Most of the TMR emissions are thus emitted from the feed lanes, which are located inside the housing barns, where the TMR will remain exposed to the air for at least several hours as the cows feed. As previously discussed, collection and control of emissions from housing barns is not only impractical but also cost prohibitive.

The District therefore determines that emissions from feed handling and storage cannot reasonably be captured, and are to be considered fugitive.

As previously stated, emissions from liquid manure lagoons and storage ponds have already been determined to be non-fugitive. The facility's non-fugitive stationary source potential emissions are summarized in the following tables:

Non-Fugitive SSPE1 (lb/year)						
Category	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**VOC**
C-5289-3-4 - Lagoons only	0	0	0	0	0	9,280
C-5289-9-0 - Engine	1,664	1	79	79	506	190
C-5289-10-0 - GDO	0	0	0	0	0	47
C-5701-3-1 – Lagoons only	0	0	0	0	0	772
Non-Fugitive SSPE1	**1,664**	**1**	**79**	**79**	**506**	**10,289**

Non-Fugitive SSPE2 (lb/year)						
Category	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**VOC**
C-5289-3-6 - Lagoons only	0	0	0	0	0	7,954
C-5289-9-0 - Engine	1,664	1	79	79	506	190
C-5289-10-0- GDO	0	0	0	0	0	47
Non-Fugitive SSPE2	**1,664**	**1**	**79**	**79**	**506**	**8,191**

The Rule 2201 major source determination is summarized in the following table:

Rule 2201 Major Source Determination (lb/year)						
	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO	VOC
SSPE1	1,664	1	79	79	506	10,289
SSPE2	1,664	1	79	79	506	8,191
Major Source Threshold	20,000	140,000	140,000	140,000	200,000	20,000
Major Source?	No	No	No	No	No	No

Note: $PM_{2.5}$ assumed to be equal to PM_{10}

As seen in the table above, the facility is not an existing Major Source and is not becoming a Major Source as a result of this project.

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)(iii). Therefore the PSD Major Source threshold is 250 tpy for any regulated NSR pollutant.

PSD Major Source Determination (tons/year)						
	NO_2	VOC	SO_2	CO	PM	PM_{10}
Estimated Facility PE before Project Increase	0.8	5.1	0.0	0.3	0.0	0.0
PSD Major Source Thresholds	250	250	250	250	250	250
PSD Major Source ? (Y/N)	N	N	N	N	N	N

As shown above, the facility is not an existing PSD major source for any regulated NSR pollutant expected to be emitted at this facility.

6. Baseline Emissions (BE)

The BE calculation (in lb/year) is performed pollutant-by-pollutant for each unit within the project to calculate the QNEC, and if applicable, to determine the amount of offsets required.

Pursuant to District Rule 2201, BE = PE1 for:

- Any unit located at a non-Major Source,
- Any Highly-Utilized Emissions Unit, located at a Major Source,
- Any Fully-Offset Emissions Unit, located at a Major Source, or
- Any Clean Emissions Unit, located at a Major Source.

Otherwise,

BE = Historic Actual Emissions (HAE), calculated pursuant to District Rule 2201.

As shown in Section VII.C.5 above, the facility is not a Major Source for any pollutant.

Therefore BE = PE1.

As calculated in Section VII.C.1 above, BE is summarized in the following table:

BE (lb/year)						
Permit Unit	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**VOC**
C-5289-1-5	0	0	0	0	0	1,960
C-5289-2-6	0	0	81,521	27,228	0	75,204
C-5289-3-6	0	0	0	0	0	19,290
C-5289-4-5	0	0	0	0	0	3,750
C-5289-13-4	0	0	0	0	0	108,708

7. SB 288 Major Modification

SB 288 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."

Since this facility is not a major source for any of the pollutants addressed in this project, this project does not constitute an SB 288 major modification.

8. Federal Major Modification

District Rule 2201 states that a Federal Major Modification is the same as a "Major Modification" as defined in 40 CFR 51.165 and part D of Title I of the CAA.

Since this source is not included in the 28 specific source categories specified in 40 CFR 51.165, the increases in fugitive emissions are not included in the Federal Major Modification determination.

Since this facility is not a Major Source for any pollutants, this project does not constitute a Federal Major Modification.

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

Rule 2410 applies to any pollutant regulated under the Clean Air Act, except those for which the District has been classified nonattainment. The pollutants which must be addressed in the PSD applicability determination for sources located in the SJV and which are emitted in this project are: (See 52.21 (b) (23) definition of significant)

- PM
- PM_{10}

Project Emissions Increase - New Major Source Determination

The post-project potentials to emit from all new and modified units are compared to the PSD major source thresholds to determine if the project constitutes a new major source subject to PSD requirements.

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). The PSD Major Source threshold is 250 tpy for any regulated NSR pollutant.

PSD Major Source Determination: Potential to Emit (tons/year)						
	NO_2	VOC	SO_2	CO	PM	PM_{10}
Total PE from New and Modified Units	0.0	4.0	0.0	0.0	0.0	0.0
PSD Major Source threshold	250	250	250	250	250	250
New PSD Major Source?	N	N	N	N	N	N

As shown in the table above, the potential to emit for the project, by itself, does not exceed any PSD major source threshold. Therefore Rule 2410 is not applicable and no further analysis is required.

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 J.

VIII. Compliance Determination

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 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. Unless specifically exempted by Rule 2201, BACT shall be required for the following actions*:

a. Any new emissions unit with a potential to emit exceeding two pounds per day,
b. The relocation from one Stationary Source to another of an existing emissions unit with a potential to emit exceeding two pounds per day,
c. Modifications to an existing emissions unit with a valid Permit to Operate resulting in an Adjusted Increase in Permitted Emissions (AIPE) exceeding two pounds per day, and/or
d. Any new or modified emissions unit, in a stationary source project, which results in an SB 288 Major Modification or a Federal Major Modification, as defined by the rule.
*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

Milking Operation

The facility has proposed to construct 10 robotic milking centers. The District will conservatively assume that 100% of the milk cows can be milked in any of the proposed milking centers on any given day. Thus, as shown in the calculations in Appendix C, the PE2 for each milking center is 8.0 lb-VOC/day and 2.7 lb-NH_3/day. BACT is therefore triggered for VOC and NH_3 emissions from each robotic milking center.

Cow Housing

The facility has proposed to construct 10 new open corrals (OC 22 through OC 26) and two new loafing barns (OC 27 A & B). As shown in the calculations in Appendix D, BACT is triggered for PM_{10}, VOC, and NH_3 emissions from all the new open corrals and VOC and NH_3 emissions from the new loafing barns.

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

As discussed in Section I above, 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

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 PE 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))

C-5289-1

As shown in the calculations in Appendix D, BACT is triggered for VOC emissions from the existing milking parlor.

C-5289-2

The facility is proposing to increase the total herd size, increase the number of calf hutches, and convert existing exercise pens into freestall barns and a loafing barn. As shown in the calculations in Appendix D, the AIPE from the proposed modifications does not exceed 2.0 lb/day for any pollutants from any of the housing units. BACT is therefore not triggered any of the existing housing units.

C-5289-3

The liquid manure handling emissions are estimated for the entire dairy. As shown in the calculations in the calculations in Appendix D, BACT is triggered for VOC and NH_3 emissions from the lagoons/storage ponds and liquid manure land application.

C-5289-4

The solid manure handling emissions are estimated for the entire dairy. As shown in the calculations in the calculations in Appendix D, BACT is triggered for NH_3 emissions for the solid manure storage/separated solids piles; BACT is also triggered for VOC and NH_3 emissions for the solid manure land application.

C-5289-13

The feed handling and storage emissions are estimated using type of feed commodity, number of stockpiles, size of stockpiles, and number of piles that stays open. As shown in the calculations in Appendix D, BACT is triggered for VOC emissions from TMR.

d. SB 288/Federal Major Modification

As discussed in Sections VII.C.7 and VII.C.8 above, this project does not constitute an SB 288 and/or Federal Major Modification for any pollutant. Therefore BACT is not triggered for any pollutant.

2. BACT Guidelines

BACT Guideline 5.8.1, applies to the milking parlor operation. [Milking Parlor] (See Appendix E).

BACT Guideline 5.8.3, applies to the open corrals in the cow housing operation. [Cow Housing – Open Corrals] (See Appendix E).

BACT Guideline 5.8.4, applies to the loafing barns in the cow housing operation. [Cow Housing – Loafing Barns] (See Appendix E).

BACT Guideline 5.8.6, applies to the lagoon/storage ponds in the liquid manure handling system. [Liquid Manure Handling – Lagoon/Storage Pond] (See Appendix E).

BACT Guideline 5.8.7, applies to the liquid/slurry land application in the liquid manure handling system. [Liquid Manure Handling – Lagoon/Storage Pond] (See Appendix E).

BACT Guideline 5.8.8, applies to storage/separated solids piles in the solid manure handling system. [Solid Manure Handling – Storage/Separated Solids Piles] (See Appendix E).

BACT Guideline 5.8.9, applies to the land application in the solid manure handling system. [Solid Manure Handling – Land Application] (See Appendix E).

BACT Guideline 5.8.11, applies to the feed/TMR in the feed storage and handling operation. [Feed Storage and Handling – Feed/TMR] (See Appendix E).

3. 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 F), BACT has been satisfied with the following:

Milking Parlor/Centers

VOC: Flush/spray before, after, or during milking each group of cows.

Cow Housing - Loafing Barns

VOC:
1) Concrete feed lanes and walkways;
2) Flushing the feed lanes and walkways for mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day);
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface;

5) Scraping pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and
6) VOC mitigation measures required by District Rule 4570.

NH_3:
1) Concrete feed lanes and walkways;
2) Flushing the feed lanes and walkways for mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day);
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface;
5) Scraping pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and

Cow Housing - Open Corrals

VOC:
1) Concrete feed lanes and walkways;
2) Flushing the feed lanes and walkways for mature cows four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day);
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping open corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing open corrals to maintain a dry surface;
5) Scraping open corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and
6) VOC mitigation measures required by District Rule 4570.

NH_3:
1) Concrete feed lanes and walkways;
2) Flushing the feed lanes and walkways for mature cows four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day);
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping open corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where

the available space for each animal is more than 400 square feet per animal) or managing open corrals to maintain a dry surface; and

5) Scraping open corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions.

PM_{10}:

1) Concrete feedlanes and walkways;
2) Scraping of open corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions
3) Shade structures in open corrals;
4) Feeding heifers in corrals near dusk (within 1 hour of dusk);
5) Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities) or an alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%)

Liquid Manure - Lagoon/Storage Pond

VOC: Covered lagoon digester vented to a control device with minimum 95% control.

NH_3: All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines.

Liquid Manure - Land Application

VOC: Irrigation of crops using liquid manure from a holding/storage pond after being treated in a covered lagoon/digester.

NH_3: All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines.

Solid Manure – Storage Piles

NH_3: All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines.

Solid Manure - Land Application

VOC: Rapid incorporation of solid manure into the soil after land application.

NH_3: Rapid incorporation of solid manure into the soil after land application, and all animals fed in accordance with NRCS or other District-approved guidelines.

Feed Storage and Handling - TMR

VOC: Implement District Rule 4570 management practices for feed.

B. Offsets

1. Offset Applicability

Pursuant to District Rule 2201, Section 4.5, offset requirements shall be triggered on a pollutant by pollutant basis and shall be required if the SSPE2 equals or exceeds the offset threshold levels in Table 4-1 of Rule 2201.

The SSPE2 is compared to the offset thresholds in the following table:

Offset Determination (lb/year)					
	NO_X	SO_X	PM_{10}	CO	VOC
SSPE2	1,664	1	78,835	506	281,484
Offset Thresholds	20,000	54,750	29,200	200,000	20,000
Offsets triggered?	No	No	Yes	No	Yes

2. Quantity of Offsets Required

The SSPE values for PM_{10} and VOC emissions exceed the offset threshold level. However, per Section 4.6.9 of Rule 2201, offsets are not required for agricultural sources unless they are a major source. As determined in Section VII.C.5 of this evaluation, this facility is not a major source for any pollutant. Offsets are therefore not required.

C. Public Notification

1. Applicability

Public noticing is required for:
a. New Major Sources, Federal Major Modifications, and SB 288 Major Modifications,
b. Any new emissions unit with a Potential to Emit greater than 100 pounds during any one day for any one pollutant,
c. Any project which results in the offset thresholds being surpassed,
d. Any project with an SSIPE of greater than 20,000 lb/year for any pollutant, and/or
e. Any project which results in a Title V significant permit modification

a. New Major Sources, Federal Major Modifications, and SB 288 Major Modifications

New Major Sources are new facilities, which are also Major Sources. Since this is not a new facility, public noticing is not required for this project for New Major Source purposes.

As demonstrated in Sections VII.C.7 and VII.C.8, this project does not constitute an SB 288 or Federal Major Modification; therefore, public noticing for SB 288 or Federal Major Modification purposes is not required.

b. PE > 100 lb/day

Applications which include a new emissions unit with a PE 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 PE > 100 lb/day.

c. Offset Threshold

The SSPE1 and SSPE2 are compared to the offset thresholds in the following table:

Offset Thresholds				
Pollutant	**SSPE1 (lb/year)**	**SSPE2 (lb/year)**	**Offset Threshold**	**Public Notice Required?**
NO_X	1,664	1,664	20,000 lb/year	No
SO_X	1	1	54,750 lb/year	No
PM_{10}	93,306	78,835	29,200 lb/year	No
CO	506	506	200,000 lb/year	No
VOC	237,041	281,484	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. SSIPE > 20,000 lb/year

Public notification is required for any permitting action that results in a SSIPE of more than 20,000 lb/year of any affected pollutant. According to District policy, the SSIPE = SSPE2 – SSPE1. The SSIPE is compared to the SSIPE Public Notice thresholds in the following table:

SSIPE Public Notice Thresholds					
Pollutant	**SSPE2 (lb/year)**	**SSPE1 (lb/year)**	**SSIPE (lb/year)**	**SSIPE Public Notice Threshold**	**Public Notice Required?**
NO_X	1,664	1,664	0	20,000 lb/year	No
SO_X	1	1	0	20,000 lb/year	No
PM_{10}	78,835	93,306	-14,471	20,000 lb/year	No
CO	506	506	0	20,000 lb/year	No
VOC	281,484	237,041	44,443	20,000 lb/year	Yes
NH_3	290,348	242,398	47,950	20,000 lb/year	Yes
H_2S	1,191	1,457	-266	20,000 lb/year	No

As demonstrated above, the SSIPEs for VOC and NH_3 were greater than 20,000 lb/year; therefore public noticing for SSIPE purposes is required.

e. Title V Significant Permit Modification

Since this facility does not have a Title V operating permit, this change is not a Title V significant Modification, and therefore public noticing is not required.

2. Public Notice Action

As discussed above, public noticing is required for this project for VOC and NH_3 emissions increasing over 20,000 lb/year. Therefore, public notice documents will be submitted to the California Air Resources Board (CARB) and a public notice will be electronically published on the District's website prior to the issuance of the ATC for this equipment.

D. Daily Emission Limits (DELs)

DELs and other enforceable conditions are required by Rule 2201 to restrict a unit's maximum daily emissions, to a level at or below the emissions associated with the maximum design capacity. 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. DELs are also required to enforce the applicability of BACT.

For dairies, the DEL is satisfied based on the number and types of cows at the dairy, and any proposed mitigation measures. The number and types of cows are listed in the permit equipment description for the milking parlor and cow housing permits.

The following District Rule 2201 rule references will be added to the ATCs to ensure compliance with applicable BACT requirements and/or control efficiencies attributed to mitigation measures implemented at the facility. Some of the following conditions may reference District Rule 4570, as these are mitigation measures the facility has selected to comply with that rule.

C-5289-1-5 (Cow Milking)

- Permittee shall flush or hose down milking parlors and centers immediately prior to, immediately after, or during each milking. [District Rules 2201 and 4570]

C-5289-2-6 (Cow Housing)

- 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 Rules 2201 and 4570]
- Permittee shall flush or scrape freestall flush lanes at least three (3) times per day. [District Rules 2201 and 4570]
- Permittee shall remove manure that is not dry from individual cow freestall beds or shall rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rules 2201 and 4570]
- Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [District Rules 2201 and 4570]
- 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 Rules 2201 and 4570]

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rule 2201]

- 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 Rules 2201 and 4570]

- 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 Rules 2201 and 4570]

- For open corrals OC 22 through OC 26 and loafing barns OC 27 (A & B), permittee shall flush or scrape the feed lanes and walkways at least four times per day for mature cows and at least once per day for support stock. [District Rule 2201]

- For open corrals OC 22 through OC 26 and loafing barn OC 27 (A & B), permittee shall scrape corral surfaces at least once every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions. [District Rule 2201]

- Open corrals LB 10, OC 11, OC 12, and OC 22 through OC 26 shall each be equipped with at least one shade structure. [District Rule 2201]

- 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 Rules 2201 and 4570]

- Permittee shall knockdown fence line manure build-up prior to it exceeding a height of twelve (12) inches at any time or point. 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 Rules 2201 and 4570]

- At least one of the feedings of the heifers housed in open corrals OC 22 through OC 26 shall be near (within one hour of) dusk. [District Rule 2201]

- The applicant shall establish windbreaks adjacent to and along the entire west side (824 ft) and south side (2,288 ft) of Corrals 16, 17, 19, 20, and 21, and along the entire east side (480 ft) and south side (1,888 ft) of Corrals 22 through 27. The windbreaks shall consist of evergreen trees, planted 10 to 15 feet apart. [District Rule 2201]

- Trees/shrubs that are initially planted as part of the windbreak shall have a minimum container size of five gallons. [District Rule 2201]

- Windbreaks shall be irrigated and maintained for survivability and rapid growth. Dead trees and shrubs shall be replaced as necessary to maintain a windbreak density of 65%. [District Rule 2201]

C-5289-3-6 (Liquid Manure Handling)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rule 2201]
- Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rule 2201]
- Permittee shall not allow liquid manure to stand in the fields for more than twenty-four (24) hours after irrigation. [District Rules 2201 and 4570]
- All liquid manure shall be treated in the covered anaerobic digester lagoon. [District Rule 2201]
- The covered anaerobic digester lagoon shall be configured and operated in accordance with National Resource Conservation Service (NRCS) California Field Office Technical Guide Code 366: Anaerobic Digester or other standards approved by the District. [District Rule 2201]
- Permittee shall only apply liquid manure that has been treated in the covered anaerobic digester lagoon. [District Rule 2201]

C-5289-4-5 (Solid Manure Handling)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- Within seventy two (72) hours of removal of solid manure from housing, permittee shall either 1) remove dry manure from the facility, or 2) 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 twenty-four (24) hours per event. [District Rules 2201 and 4570]
- Solid manure applied to fields shall be incorporated into the soil within two hours after application. [District Rules 2201 and 4570]

C-5289-13-3 (Feed Storage and Handling)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- Permittee shall push feed so that it is within three feet of feedlane fence within two hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the animals. [District Rules 2201 and 4570]

- Permittee shall begin feeding total mixed rations within two hours of grinding and mixing rations. [District Rules 2201 and 4570]

- Permittee shall store grain in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rules 2201 and 4570]

- Permittee shall feed steam-flaked, dry rolled, cracked or ground corn or other steam-flaked, dry rolled, cracked or ground cereal grains. [District Rules 2201 and 4570]

- For bagged silage/feedstuff, permittee shall utilize a sealed feed storage system (e.g., ag bag). [District Rules 2201 and 4570]

- Permittee shall cover all silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least five (5) mils (0.005 inches) thick, 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. Silage piles shall be covered within seventy-two (72) hours of last delivery of material to the pile. Sheets of material used to cover silage shall overlap so that silage is not exposed where the sheets meet. [District Rules 2201 and 4570]

- For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall harvest corn used for the pile at an average moisture content of at least 65% and harvest other silage crops for the pile at an average moisture content of at least 60%. [District Rules 2201 and 4570]

- For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall adjust setting of equipment used to harvest crops for the pile to incorporate the following parameters for Theoretical Length of Chop (TLC) and roller opening, as applicable: 1) Corn with no processing: TLC not exceeding 1/2 inch, 2) Processed Corn: TLC not exceeding 3/4 inch and roller opening of 1-4 mm, 3) Alfalfa/Grass: TLC not exceeding 1.0 inch, 4) Other silage crops: TLC not exceeding 1/2 inch. [District Rules 2201 and 4570]

- For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rules 2201 and 4570]

E. Compliance Assurance

1. Source Testing

Pursuant to District Policy APR 1705, source testing is not required to demonstrate compliance with Rule 2201.

2. Monitoring

No monitoring is required to demonstrate compliance with Rule 2201.

3. Recordkeeping

C-5289-1-5 (Cow Milking)

- Permittee shall provide verification that milking parlors and centers are flushed or hosed down prior to, immediately after, or during each milking. [District Rules 2201 and 4570]

- 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 Rules 2201 and 4570]

C-5289-2-6 (Cow Housing)

- Permittee shall keep records or maintain an operating plan that requires freestall flush lanes to be flushed or scraped at least three times per day. [District Rules 2201 and 4570]

- For open corrals OC 22 through OC 26 and loafing barns OC 27 (A & B), permittee shall keep records or maintain an operating plan that requires the feed lanes and walkways for mature cows to be flushed or scraped at least four times per day and the feed lanes and walkways for support stock to be flushed at least once per day. [District Rules 2201 and 4570]

- Permittee shall record either of the following: 1) the dates when manure that is not dry is removed from individual cow freestall beds or 2) the dates when the freestall bedding is raked, harrowed, scraped, or graded. [District Rules 2201 and 4570]

- Permittee shall maintain records demonstrating that water pipes and troughs are inspected and leaks are repaired at least once every seven (7) days. [District Rules 2201 and 4570]

- 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 Rules 2201 and 4570]

- 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]

- 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 Rules 2201 and 4570]

- 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 Rules 2201 and 4570]

- For open corrals OC 22 through OC 26 and loafing barns OC 27 (A & B), permittee shall maintain sufficient records to demonstrate that the feed lanes and walkways are flushed or scraped at least four times per day for mature cows and at least once per day for support stock. [District Rule 2201]

- For open corrals OC 22 through OC 26 and loafing barn OC 27 (A & B), permittee shall maintain sufficient records to demonstrate that corral surfaces are scraped at least once every two weeks, except when prevented by wet conditions. [District Rule 2201]

- If permittee has selected to comply using shades constructed with a light permeable roofing material, then permittee shall maintain records, such as design specifications, demonstrating that the shade structures are equipped with such roofing material or if Permittee has selected to comply by cleaning the manure from under corral shades, then Permittee shall maintain records demonstrating that manure is cleaned from under the shades at least once every fourteen (14) days, as long as weather permits access to corrals. [District Rules 2201 and 4570]

- Permittee shall measure and document the depth of manure at the fence line at least once every ninety (90) days. [District Rules 2201 and 4570]

- For open corrals OC 22 through OC 26, permittee shall maintain a schedule listing the times when heifers are fed at or near dusk. [District Rule 2201]

- 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 Rules 2201 and 4570]

- 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 Rules 2201 and 4570]

C-5289-3-6 (Liquid Manure Handling)

- 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]

- Permittee shall maintain records to demonstrate liquid manure did not stand in the fields for more than twenty-four (24) hours after irrigation. [District Rules 2201 and 4570]

- Permittee shall maintain records to demonstrate that only liquid manure that has been treated in the covered anaerobic digester lagoon is applied to fields. [District Rule 2201]

- 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 Rules 2201 and 4570]

C-5289-4-5 (Solid Manure Handling)

- 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 Rules 2201 and 4570]

- Permittee shall keep records of dates when manure is removed from the facility or permittee shall maintain records to demonstrate that dry manure piles outside the pens are covered with a weatherproof covering from October through May. [District Rules 2201 and 4570]

- If weatherproof coverings are used, permittee shall maintain records, such as manufacturer warranties or other documentation, demonstrating that the weatherproof covering over dry manure are installed, used, and maintained in accordance with manufacturer recommendations and applicable standards listed in NRCS Field Office Technical Guide Code 313 or 367, or any other applicable standard approved by the APCO, ARB, and EPA. [District Rules 2201 and 4570]

- Permittee shall maintain records to demonstrate that all solid manure has been incorporated within two hours of land application. [District Rules 2201 and 4570]

- 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 Rules 2201 and 4570]

C-5289-13-4 (Feed Storage and Handling)

- 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 Rules 2201 and 4570]

- Permittee shall maintain an operating plan or record that requires feed to be pushed within three feet of feedlane fence within two hours of putting out the feed, or use of a feed trough or other structure designed to maintain feed within reach of the animals. [District Rules 2201 and 4570]

- Permittee shall maintain an operating plan or record of when feeding of total mixed rations began within two hours of grinding and mixing rations. [District Rules 2201 and 4570]

- Permittee shall maintain records demonstrating grain is/was stored in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rules 2201 and 4570]

- Permittee shall maintain records to demonstrate animals are fed steam-flaked, dry rolled, cracked or ground corn or other steam-flaked, dry rolled, cracked or ground cereal grains. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]

- Permittee shall maintain records of the thickness and type of cover used to cover each silage pile. Permittee shall also maintain records of the date of the last delivery of material to each silage pile and the date each pile is covered. [District Rules 2201 and 4570]

- Permittee shall select and implement one of the following mitigation measures for building each silage pile at the facility: Option 1) build the silage pile 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 7.11 of District Rule 4570; Option 2) Adjust filling parameters when creating the silage pile to achieve an average bulk density of at least 44 lb/cu ft for corn silage and at least 40 lb/cu ft for other silage types as determined using a District-approved spreadsheet; or Option 3) build silage piles using crops harvested with the applicable minimum moisture content, maximum Theoretical Length of Chop (TLC), and roller opening identified in District Rule 4570, Table 4.1, 1.d and manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. Records of the option chosen as a mitigation measure for building each silage pile shall be maintained. [District Rules 2201 and 4570]

- For each silage pile that Option 1 (Measured Bulk Density) is chosen as a mitigation measure for building the pile, records of the measured bulk density shall be maintained. [District Rules 2201 and 4570]

- For each silage pile that Option 2 (Bulk Density Determined by Spreadsheet) is chosen as a mitigation measure for building the pile, records of the filling parameters entered into the District-approved spreadsheet to determine the bulk density shall be maintained. [District Rules 2201 and 4570]

- {4475} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records of the average percent moisture of crops harvested for silage shall be maintained. [District Rules 2201 and 4570]

- {4477} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records that equipment used to harvest crops for the pile was set to the required TLC and roller opening for the type of crop harvested shall be maintained. [District Rules 2201 and 4570]

- {4479} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall maintain a plan that requires that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rules 2201 and 4570]

- {4481} If Option 1 (Limiting Exposed Area of Silage) is chosen as a mitigation measure for managing silage piles, the permittee shall calculate and record the maximum (largest part of pile) total exposed area of each silage pile. Records of the maximum calculated area shall be maintained. [District Rules 2201 and 4570]

- {4482} For each silage pile that Option 2 (Shaver/Facer or Smooth Face) is chosen as a mitigation measure for managing the pile, the permittee shall maintain records that a shaver/facer was used to remove silage from the pile or shall visually inspect the pile at least daily to verify that the working face was smooth and maintain records of the visual inspections. [District Rules 2201 and 4570]

- {4483} For each silage pile that Option 3 (Silage Additives) is chosen as a mitigation measure for managing the pile, records shall be maintained of the type additive (e.g. inoculants, preservative, other District & EPA-approved additive), the quantity of the additive applied to the pile, and a copy of the manufacturers instructions for application of the additive. [District Rules 2201 and 4570]

- {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 Rules 2201 and 4570]

4. Reporting

No reporting is required to demonstrate compliance with Rule 2201.

F. Ambient Air Quality Analysis (AAQA)

An AAQA shall be conducted for the purpose of determining whether a new or modified Stationary Source will cause or make worse a violation of an air quality standard. The District's Technical Services Division conducted the required analysis. Refer to Appendix G of this document for the AAQA summary sheet.

The proposed location is in an attainment area for NOx, CO, and SOx. As shown by the AAQA summary sheet the proposed equipment will not cause a violation of an air quality standard for NOx, CO, or SOx.

The proposed location is in a non-attainment area for the state's PM_{10} as well as federal and state $PM_{2.5}$ thresholds. As shown by the AAQA summary sheet the proposed equipment will not cause a violation of an air quality standard for PM_{10} and $PM_{2.5}$.

Rule 2410 Prevention of Significant Deterioration

As shown in Section VII.C.9 above, this project does not result in a new PSD major source or PSD major modification. No further discussion is required.

Rule 2520 Federally Mandated Operating Permits

Since this facility's potential emissions do not exceed any major source thresholds of Rule 2201, this facility is not a major source, and Rule 2520 does not apply.

Rule 4001 New Source Performance Standards (NSPS)

This rule incorporates NSPS from Part 60, Chapter 1, Title 40, Code of Federal Regulations (CFR); and applies to all new sources of air pollution and modifications of existing sources of air pollution listed in 40 CFR Part 60. However, no subparts of 40 CFR Part 60 apply to confined animal facilities.

Rule 4002 National Emission Standards for Hazardous Air Pollutants (NESHAPs)

This rule incorporates NESHAPs from Part 61, Chapter I, Subchapter C, Title 40, CFR and the NESHAPs from Part 63, Chapter I, Subchapter C, Title 40, CFR; and applies to all sources of hazardous air pollution listed in 40 CFR Part 61 or 40 CFR Part 63. However, no subparts of 40 CFR Part 61 or 40 CFR Part 63 apply to confined animal facilities operations.

Rule 4101 Visible Emissions

Rule 4101 states that no air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as, or darker than, Ringelmann 1 or 20% opacity.

Pursuant to section 4.12, emissions subject to or specifically exempt from Regulation VIII (Fugitive PM_{10} 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 prohibits discharge of air contaminants which could cause injury, detriment, nuisance or annoyance to the public. Public nuisance conditions are not expected as a result of these

operations, provided the equipment is well maintained. Therefore, compliance with this rule is expected.

California Health & 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 G), the total facility prioritization score including this project was greater than one. Therefore, an HRA was required to determine the short-term acute and long-term chronic exposure from this project.

The cancer risk for this project is shown below:

HRA Summary		
Unit	**Cancer Risk**	**T-BACT Required**
C-5289-1-5	1.82E-08	No
C-5289-2-6	8.71E-07	No
C-5289-3-6	N/A*	No
C-5289-4-5	N/A*	No
C-5289-13-4	N/A*	No

*No risk factors or insignificant risk.

T-BACT

BACT for toxic emission control (T-BACT) is required if the cancer risk exceeds one in one million. As shown above, T-BACT is not required for the milking parlor (C-5289-1-5), liquid manure (C-5289-3-6), solid manure (C-5289-4-5), or feed storage and handling (C-5289-13-4) because the HRA indicates that the risk is below the District's thresholds for triggering T-BACT requirements. T-BACT is not required for cow housing (C-5289-2-6) because the risk from each individual cow housing unit is below the District's thresholds for triggering T-BACT requirements. Compliance with the District's Risk Management Policy is therefore 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 20 in a million). As outlined by the HRA Summary in Appendix G of this report, the emissions increases for this project was determined to be less than significant.

Rule 4550 Conservation Management Practices (CMP)

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 4.2, dairies with at least 500 mature cows or cattle facilities with at least 190 cattle are subject to the provisions of this rule. Therefore, this facility is currently subject to the provisions of this rule as a dairy, and will continue to be subject to the provisions of this rule as a heifer ranch.

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.

Diamond H Dairy received District approval for its dairy CMP plan on February 15, 2007.

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).

PTOs incorporating Phase II mitigation measures of District Rule 4570, as evaluated under District project C-1110877 have already been issued to this dairy. Under this project, the applicant has not proposed to change any mitigation measures currently practiced.

California Health & Safety Code 42301.6 (School Notice)

The District has verified that this site is not located within 1,000 feet of a school. Therefore, pursuant to California Health and Safety Code 42301.6, a school notice is not required.

California Environmental Quality Act (CEQA)

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 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; and
- 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.

Greenhouse Gas (GHG) Significance Determination

District is a Responsible Agency

It is determined that another agency has prepared an environmental review document for the project. 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), (CEQA Guidelines §15381). As a Responsible Agency, the District is limited to mitigating or avoiding impacts for which it has statutory authority. The District does not have statutory authority for regulating greenhouse gas emissions. The District has determined that the applicant is responsible for implementing greenhouse gas mitigation measures, if any, imposed by the Lead Agency.

District CEQA Findings

The County of Madera (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 Mitigated 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 and finds that it adequately characterizes the project's potential impact on air quality. In addition, all feasible and cost-effective control measures to reduce potential impacts on air quality resulting from project related stationary source emissions have been applied to the project. Furthermore, the District has conducted an engineering evaluation of the project, this document, which demonstrates that Stationary Source emissions from the project would be reduced. 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 would be reduced to lessen the impacts 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))..

Indemnification Agreement/Letter of Credit Determination

According to District Policy APR 2010 (CEQA Implementation Policy), when the District is the Lead or Responsible Agency for CEQA purposes, an indemnification agreement and/or a letter of credit may be required. The decision to require an indemnity agreement and/or a letter of credit is based on a case-by-case analysis of a particular project's potential for litigation risk, which in turn may be based on a project's potential to generate

public concern, its potential for significant impacts, and the project proponent's ability to pay for the costs of litigation without a letter of credit, among other factors.

Although the project is located at a potential facility of concern (Dairy), the District has determined that through a combination of project design elements, compliance with applicable rules and regulations, and compliance with District air permit conditions, project specific stationary source emissions would be reduced to lessen the impacts on air quality. Therefore, an Indemnification Agreement and/or a Letter of Credit will not be required for this project in the absence of expressed public concern.

IX. Recommendation

Compliance with all applicable rules and regulations is expected. Pending a successful NSR Public Noticing period, issue ATCs C-5289-1-5, 2-6, 3-6, 4-5, and 13-4 subject to the permit conditions on the attached draft ATC in Appendix A.

X. Billing Information

Annual Permit Fees			
Permit Number	**Fee Schedule**	**Fee Description**	**Annual Fee**
C-5289-1-5	3020-06	Cow Milking Operation	$128
C-5289-2-6	3020-06	Cow Housing	$128
C-5289-3-6	3020-06	Liquid Manure Handling	$128
C-5289-4-5	3020-06	Solid Manure Handling	$128
C-5289-13-4	3020-06	Feed Storage and Handling	$128

Appendixes

A: Draft ATCs
B: Current PTOs
C: Emission Calculations
D: BACT Calculations
E: BACT Guidelines
F: BACT Analysis
G: HRA and AAQA Summary
H: PE Calculations for Permit Units C-5289-9-0 and 10-0
I: QNEC
J: Project Site Plans

APPENDIX A

Draft ATCs

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: C-5289-1-5

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: DIAMOND H DAIRY
MAILING ADDRESS: 9730 AVENUE 18-1/2
CHOWCHILLA, CA 93610

LOCATION: 9564 AVENUE 18-1/2
CHOWCHILLA, CA 93610

EQUIPMENT DESCRIPTION:
MODIFICATION OF 4,900 COW MILKING OPERATION WITH ONE DOUBLE 34 HERRINGBONE (68 STALLS) MILKING PARLOR AND ONE DOUBLE 45 PARALLEL (90 STALLS) MILKING PARLOR: INCREASE MAXIMUM NUMBER OF MILK COWS FROM 4,900 TO 7,278 AND CONSTRUCT 10 ROBOTIC MILKING CENTERS IN FREESTALL BARNS FS 3, FS 5, FS 10, AND FS 14

CONDITIONS

1. This Authority to Construct (ATC) cancels and replaces ATC C-5289-1-4. [District Rule 2201]
2. Upon implementation of the modification(s) authorized by this Authority to Construct (ATC), the following permits shall be surrendered to the District: C-5701-1-0, '-2-0, '-3-0, '-4-0, and '-5-0. [District Rule 2201]
3. {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]
4. {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]
5. {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]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (559) 230-5950 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.

Samir Sheikh, Executive Director / APCO

DRAFT

Arnaud Marjollet, Director of Permit Services

Central Regional Office • 1990 E. Gettysburg Ave. • Fresno, CA 93726 • (559) 230-5900 • Fax (559) 230-6061

6. Permittee shall flush or hose down milking parlors and centers immediately prior to, immediately after, or during each milking. [District Rules 2201 and 4570]
7. Permittee shall provide verification that milking parlors and centers are flushed or hosed down prior to, immediately after, or during each milking. [District Rules 2201 and 4570]
8. 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 Rules 2201 and 4570]
9. {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

PERMIT NO: C-5289-2-6

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: DIAMOND H DAIRY
MAILING ADDRESS: 9730 AVENUE 18-1/2
CHOWCHILLA, CA 93610

LOCATION: 9564 AVENUE 18-1/2
CHOWCHILLA, CA 93610

EQUIPMENT DESCRIPTION:
MODIFICATION OF COW HOUSING - 4,900 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 5,650 MATURE COWS (MILK AND DRY); 6,260 TOTAL SUPPORT STOCK (HEIFERS, CALVES, AND BULLS); AND 8 FREESTALL BARNS AND 1 LOAFING BARN WITH FLUSH/SCRAPE SYSTEM: INCREASE MILK COWS TO 7,278, MATURE COWS TO 8,282, SUPPORT STOCK TO 8,544; INCREASE NUMBER OF CALF HUTCHES (ONGROUND) FROM 500 TO 750; CONSTRUCT 5 FREESTALL BARNS AND 1 LOAFING BARN WITH FLUSH SYSTEMS OVER EXISTING EXERCISE PENS; CONSTRUCT 2 NEW LOAFING BARNS AND 10 NEW OPEN CORRALS WITH FLUSH SYSTEMS; AND SUBDIVIDE 5 EXISTING OPEN CORRALS INTO 7 SMALLER CORRALS

CONDITIONS

1. This Authority to Construct (ATC) cancels and replaces ATC C-5289-2-5. [District Rule 2201]
2. Upon implementation of the modification(s) authorized by this Authority to Construct (ATC), the following permits shall be surrendered to the District: C-5701-1-0, '-2-0, '-3-0, '-4-0, and '-5-0. [District Rule 2201]
3. {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]
4. {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]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (559) 230-5950 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.

Samir Sheikh, Executive Director / APCO

Arnaud Marjollet, Director of Permit Services

Central Regional Office • 1990 E. Gettysburg Ave. • Fresno, CA 93726 • (559) 230-5900 • Fax (559) 230-6061

5. {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]
6. 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 Rules 2201 and 4570]
7. Permittee shall flush or scrape freestall flush lanes at least three (3) times per day. [District Rules 2201 and 4570]
8. Permittee shall keep records or maintain an operating plan that requires freestall flush lanes to be flushed or scraped at least three times per day. [District Rules 2201 and 4570]
9. For open corrals OC 22 through OC 26 and loafing barns OC 27 (A & B), permittee shall keep records or maintain an operating plan that requires the feed lanes and walkways for mature cows to be flushed or scraped at least four times per day and the feed lanes and walkways for support stock to be flushed at least once per day. [District Rules 2201 and 4570]
10. Permittee shall remove manure that is not dry from individual cow freestall beds or shall rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rules 2201 and 4570]
11. Permittee shall record either of the following: 1) the dates when manure that is not dry is removed from individual cow freestall beds or 2) the dates when the freestall bedding is raked, harrowed, scraped, or graded. [District Rules 2201 and 4570]
12. Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [District Rules 2201 and 4570]
13. Permittee shall maintain records demonstrating that water pipes and troughs are inspected and leaks are repaired at least once every seven (7) days. [District Rules 2201 and 4570]
14. 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 Rules 2201 and 4570]
15. 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 Rules 2201 and 4570]
16. Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rule 2201]
17. 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]
18. 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 Rules 2201 and 4570]
19. 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 Rules 2201 and 4570]
20. 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 Rules 2201 and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

21. 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 Rules 2201 and 4570]
22. For open corrals OC 22 through OC 26 and loafing barns OC 27 (A & B), permittee shall flush or scrape the feed lanes and walkways at least four times per day for mature cows and at least once per day for support stock. [District Rules 2201 and 4570]
23. For open corrals OC 22 through OC 26 and loafing barns OC 27 (A & B), permittee shall maintain sufficient records to demonstrate that the feed lanes and walkways are flushed or scraped at least four times per day for mature cows and at least once per day for support stock. [District Rule 2201]
24. For open corrals OC 22 through OC 26 and loafing barns OC 27 (A & B), permittee shall scrape corral surfaces at least once every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions. [District Rule 2201]
25. For open corrals OC 22 through OC 26 and loafing barns OC 27 (A & B), permittee shall maintain sufficient records to demonstrate that corral surfaces are scraped at least once every two weeks, except when prevented by wet conditions. [District Rule 2201]
26. Open corrals LB 10, OC 11, OC 12, and OC 22 through OC 26 shall each be equipped with at least one shade structure. [District Rule 2201]
27. 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 Rules 2201 and 4570]
28. If permittee has selected to comply using shades constructed with a light permeable roofing material, then permittee shall maintain records, such as design specifications, demonstrating that the shade structures are equipped with such roofing material or if Permittee has selected to comply by cleaning the manure from under corral shades, then Permittee shall maintain records demonstrating that manure is cleaned from under the shades at least once every fourteen (14) days, as long as weather permits access to corrals. [District Rules 2201 and 4570]
29. Permittee shall knockdown fence line manure build-up prior to it exceeding a height of twelve (12) inches at any time or point. 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 Rules 2201 and 4570]
30. Permittee shall measure and document the depth of manure at the fence line at least once every ninety (90) days. [District Rules 2201 and 4570]
31. At least one of the feedings of the heifers housed in open corrals OC 22 through OC 26 shall be near (within one hour of) dusk. [District Rule 2201]
32. For open corrals OC 22 through OC 26, permittee shall maintain a schedule listing the times when heifers are fed at or near dusk. [District Rule 2201]
33. Permittee shall establish windbreaks adjacent to and along the entire west side (824 ft) and south side (2,288 ft) of Corrals 16, 17, 19, 20, and 21, and along the entire east side (480 ft) and south side (1,888 ft) of Corrals 22 through 26. The windbreaks shall consist of evergreen trees, planted 10 to 15 feet apart. [District Rule 2201]
34. Trees/shrubs that are initially planted as part of the windbreak shall have a minimum container size of five gallons. [District Rule 2201]
35. Windbreaks shall be irrigated and maintained for survivability and rapid growth. Dead trees and shrubs shall be replaced as necessary to maintain a windbreak density of 65%. [District Rule 2201]
36. 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 Rules 2201 and 4570]
37. 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 Rules 2201 and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

38. {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: C-5289-3-6

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: DIAMOND H DAIRY
MAILING ADDRESS: 9730 AVENUE 18-1/2
CHOWCHILLA, CA 93610

LOCATION: 9564 AVENUE 18-1/2
CHOWCHILLA, CA 93610

EQUIPMENT DESCRIPTION:
MODIFICATION OF LIQUID MANURE HANDLING SYSTEM CONSISTING OF SETTLING BASIN(S); DOUBLE MECHANICAL SEPARATOR(S); AND THREE STORAGE PONDS; MANURE IS LAND APPLIED THROUGH FLOOD IRRIGATION: INCREASE IN LIQUID MANURE DUE TO INCREASE IN HERD SIZE AND CONVERSION OF 2 SETTLING BASINS INTO A COVERED ANAEROBIC TREATMENT DIGESTER LAGOON AS AUTHORIZED BY ATC C-9220-1-0

CONDITIONS

1. This Authority to Construct (ATC) cancels and replaces ATC C-5289-3-5. [District Rule 2201]
2. Upon implementation of the modification(s) authorized by this Authority to Construct (ATC), the following permits shall be surrendered to the District: C-5701-1-0, '-2-0, '-3-0, '-4-0, and '-5-0. [District Rule 2201]
3. {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]
4. {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]
5. {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]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (559) 230-5950 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.

Samir Sheikh, Executive Director / APCO

DRAFT

Arnaud Marjollet, Director of Permit Services

C-5289-3-6 : Nov 15 2019 9:02AM – AIYABEIJ : Joint Inspection Required with AIYABEIJ

6. Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rule 2201]
7. 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]
8. Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rules 2201 and 4570]
9. Permittee shall not allow liquid manure to stand in the fields for more than twenty-four (24) hours after irrigation. [District Rules 2201 and 4570]
10. Permittee shall maintain records to demonstrate liquid manure did not stand in the fields for more than twenty-four (24) hours after irrigation. [District Rules 2201 and 4570]
11. All liquid manure shall be treated in the covered anaerobic digester lagoon. [District Rule 2201]
12. The covered anaerobic digester lagoon shall be configured and operated in accordance with National Resource Conservation Service (NRCS) California Field Office Technical Guide Code 366: Anaerobic Digester or other standards approved by the District. [District Rule 2201]
13. Permittee shall only apply liquid manure that has been treated in the covered anaerobic digester lagoon. [District Rule 2201]
14. Permittee shall maintain records to demonstrate that only liquid manure that has been treated in the covered anaerobic digester lagoon is applied to fields. [District Rule 2201]
15. 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 Rules 2201 and 4570]
16. {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: C-5289-4-5

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: DIAMOND H DAIRY
MAILING ADDRESS: 9730 AVENUE 18-1/2
CHOWCHILLA, CA 93610

LOCATION: 9564 AVENUE 18-1/2
CHOWCHILLA, CA 93610

EQUIPMENT DESCRIPTION:
MODIFICATION OF SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND: INCREASE IN SOLID MANURE DUE TO INCREASE IN HERD SIZE

CONDITIONS

1. This Authority to Construct (ATC) cancels and replaces ATC C-5289-4-4. [District Rule 2201]
2. Upon implementation of the modification(s) authorized by this Authority to Construct (ATC), the following permits shall be surrendered to the District: C-5701-1-0, '-2-0, '-3-0, '-4-0, and '-5-0. [District Rule 2201]
3. {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]
4. {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]
5. {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]
6. Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (559) 230-5950 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.

Samir Sheikh, Executive Director / APCO

DRAFT

Arnaud Marjollet, Director of Permit Services

C-5289-4-5 : Nov 15 2019 9:02AM – AIYABEIJ : Joint Inspection Required with AIYABEIJ

7. 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 Rules 2201 and 4570]
8. Within seventy two (72) hours of removal of solid manure from housing, permittee shall either 1) remove dry manure from the facility, or 2) 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 twenty-four (24) hours per event. [District Rules 2201 and 4570]
9. Permittee shall keep records of dates when manure is removed from the facility or permittee shall maintain records to demonstrate that dry manure piles outside the pens are covered with a weatherproof covering from October through May. [District Rules 2201 and 4570]
10. If weatherproof coverings are used, permittee shall maintain records, such as manufacturer warranties or other documentation, demonstrating that the weatherproof covering over dry manure are installed, used, and maintained in accordance with manufacturer recommendations and applicable standards listed in NRCS Field Office Technical Guide Code 313 or 367, or any other applicable standard approved by the APCO, ARB, and EPA. [District Rules 2201 and 4570]
11. Solid manure applied to fields shall be incorporated into the soil within two hours after application. [District Rules 2201 and 4570]
12. Permittee shall maintain records to demonstrate that all solid manure has been incorporated within two hours of land application. [District Rules 2201 and 4570]
13. 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 Rules 2201 and 4570]
14. {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

PERMIT NO: C-5289-13-4

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: DIAMOND H DAIRY
MAILING ADDRESS: 9730 AVENUE 18-1/2
CHOWCHILLA, CA 93610

LOCATION: 9564 AVENUE 18-1/2
CHOWCHILLA, CA 93610

EQUIPMENT DESCRIPTION:
MODIFICATION OF FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARN(S), SILAGE PILE(S), AND TOTAL MIXED RATION FEEDING: INCREASE IN THROUGHPUT DUE TO INCREASE IN HERD SIZE

CONDITIONS

1. This Authority to Construct (ATC) cancels and replaces ATC C-5289-13-3. [District Rule 2201]
2. Upon implementation of the modification(s) authorized by this Authority to Construct (ATC), the following permits shall be surrendered to the District: C-5701-1-0, '-2-0, '-3-0, '-4-0, and '-5-0. [District Rule 2201]
3. {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]
4. {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]
5. {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]
6. Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (559) 230-5950 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.

Samir Sheikh, Executive Director / APCO

Arnaud Marjollet, Director of Permit Services

Central Regional Office • 1990 E. Gettysburg Ave. • Fresno, CA 93726 • (559) 230-5900 • Fax (559) 230-6061

7. 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 Rules 2201 and 4570]
8. Permittee shall push feed so that it is within three feet of feedlane fence within two hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the animals. [District Rules 2201 and 4570]
9. Permittee shall maintain an operating plan or record that requires feed to be pushed within three feet of feedlane fence within two hours of putting out the feed, or use of a feed trough or other structure designed to maintain feed within reach of the animals. [District Rules 2201 and 4570]
10. Permittee shall begin feeding total mixed rations within two hours of grinding and mixing rations. [District Rules 2201 and 4570]
11. Permittee shall maintain an operating plan or record of when feeding of total mixed rations began within two hours of grinding and mixing rations. [District Rules 2201 and 4570]
12. Permittee shall store grain in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rules 2201 and 4570]
13. Permittee shall maintain records demonstrating grain is/was stored in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rules 2201 and 4570]
14. Permittee shall feed steam-flaked, dry rolled, cracked or ground corn or other steam-flaked, dry rolled, cracked or ground cereal grains. [District Rules 2201 and 4570]
15. Permittee shall maintain records to demonstrate animals are fed steam-flaked, dry rolled, cracked or ground corn or other steam-flaked, dry rolled, cracked or ground cereal grains. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]
16. For bagged silage/feedstuff, permittee shall utilize a sealed feed storage system (e.g., ag bag). [District Rules 2201 and 4570]
17. Permittee shall cover all silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least five (5) mils (0.005 inches) thick, 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. Silage piles shall be covered within seventy-two (72) hours of last delivery of material to the pile. Sheets of material used to cover silage shall overlap so that silage is not exposed where the sheets meet. [District Rules 2201 and 4570]
18. Permittee shall maintain records of the thickness and type of cover used to cover each silage pile. Permittee shall also maintain records of the date of the last delivery of material to each silage pile and the date each pile is covered. [District Rules 2201 and 4570]
19. Permittee shall select and implement one of the following mitigation measures for building each silage pile at the facility: Option 1) build the silage pile 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 7.11 of District Rule 4570; Option 2) Adjust filling parameters when creating the silage pile to achieve an average bulk density of at least 44 lb/cu ft for corn silage and at least 40 lb/cu ft for other silage types as determined using a District-approved spreadsheet; or Option 3) build silage piles using crops harvested with the applicable minimum moisture content, maximum Theoretical Length of Chop (TLC), and roller opening identified in District Rule 4570, Table 4.1, 1.d and manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. Records of the option chosen as a mitigation measure for building each silage pile shall be maintained. [District Rules 2201 and 4570]
20. For each silage pile that Option 1 (Measured Bulk Density) is chosen as a mitigation measure for building the pile, records of the measured bulk density shall be maintained. [District Rules 2201 and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

21. For each silage pile that Option 2 (Bulk Density Determined by Spreadsheet) is chosen as a mitigation measure for building the pile, records of the filling parameters entered into the District-approved spreadsheet to determine the bulk density shall be maintained. [District Rules 2201 and 4570]

22. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall harvest corn used for the pile at an average moisture content of at least 65% and harvest other silage crops for the pile at an average moisture content of at least 60%. [District Rules 2201 and 4570]

23. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records of the average percent moisture of crops harvested for silage shall be maintained. [District Rules 2201 and 4570]

24. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall adjust setting of equipment used to harvest crops for the pile to incorporate the following parameters for Theoretical Length of Chop (TLC) and roller opening, as applicable: 1) Corn with no processing: TLC not exceeding 1/2 inch, 2) Processed Corn: TLC not exceeding 3/4 inch and roller opening of 1-4 mm, 3) Alfalfa/Grass: TLC not exceeding 1.0 inch, 4) Other silage crops: TLC not exceeding 1/2 inch. [District Rules 2201 and 4570]

25. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records that equipment used to harvest crops for the pile was set to the required TLC and roller opening for the type of crop harvested shall be maintained. [District Rules 2201 and 4570]

26. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rules 2201 and 4570]

27. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall maintain a plan that requires that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rules 2201 and 4570]

28. Permittee shall select and implement at least two of the following mitigation measures for management of silage piles at the facility: Option 1) manage silage piles such that only one silage pile has an uncovered face and the total exposed surface area is less than 2,150 square feet, or manage multiple uncovered silage piles such that the total exposed surface area of all uncovered silage piles is less than 4,300 square feet; Option 2) use a shaver/facer to remove silage from the silage pile, or shall use another method to maintain a smooth vertical surface on the working face of the silage pile; or Option 3) inoculate silage with homolactic lactic acid bacteria in accordance with manufacturer recommendations to achieve a concentration of at least 100,000 colony forming units per gram of wet forage, apply propionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at the rate specified by the manufacturer to reduce yeast counts when forming silage piles, or apply other additives at 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. Records of the options chosen for managing each silage pile shall be maintained. [District Rules 2201 and 4570]

29. If Option 1 (Limiting Exposed Area of Silage) is chosen as a mitigation measure for managing silage piles, the permittee shall calculate and record the maximum (largest part of pile) total exposed area of each silage pile. Records of the maximum calculated area shall be maintained. [District Rules 2201 and 4570]

30. For each silage pile that Option 2 (Shaver/Facer or Smooth Face) is chosen as a mitigation measure for managing the pile, the permittee shall maintain records that a shaver/facer was used to remove silage from the pile or shall visually inspect the pile at least daily to verify that the working face was smooth and maintain records of the visual inspections. [District Rules 2201 and 4570]

31. For each silage pile that Option 3 (Silage Additives) is chosen as a mitigation measure for managing the pile, records shall be maintained of the type additive (e.g. inoculants, preservative, other District & EPA-approved additive), the quantity of the additive applied to the pile, and a copy of the manufacturers instructions for application of the additive. [District Rules 2201 and 4570]

32. 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 Rules 2201 and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

33. {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]

APPENDIX B

Current PTOs

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: C-5289-1-2 **EXPIRATION DATE:** 12/31/2021

EQUIPMENT DESCRIPTION:
4,900 COW MILKING OPERATION WITH ONE DOUBLE 34 HERRINGBONE (68 STALLS) MILKING PARLOR AND ONE DOUBLE 45 PARALLEL (90 STALLS) MILKING PARLOR

PERMIT UNIT REQUIREMENTS

1. 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]
2. 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]
3. 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]
4. 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]
5. Permittee shall flush or hose milk parlor immediately prior to, immediately after, or during each milking. [District Rule 4570]
6. Permittee shall provide verification that milk parlors are flushed or hosed prior to, immediately after, or during each milking. [District Rule 4570]
7. 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: C-5289-2-3 **EXPIRATION DATE:** 12/31/2021

EQUIPMENT DESCRIPTION:
COW HOUSING - 4,900 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 5,650 MATURE COWS (MILK AND DRY); 6,260 SUPPORT STOCK (HEIFERS, CALVES AND BULLS); AND 8 FREESTALL BARNS WITH FLUSH/SCRAPE

PERMIT UNIT REQUIREMENTS

1. 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]
2. 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]
3. 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]
4. 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]
5. 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]
6. Permittee shall flush or scrape freestall flush lanes at least three (3) times per day. [District Rule 4570]
7. Permittee shall keep records or maintain an operating plan that requires freestall flush lanes to be flushed or scraped at least three times per day. [District Rule 4570]
8. Permittee shall remove manure that is not dry from individual cow freestall beds or shall rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rule 4570]
9. Permittee shall record either of the following: 1) the dates when manure that is not dry is removed from individual cow freestall beds or 2) the dates when the freestall bedding is raked, harrowed, scraped, or graded. [District Rule 4570]
10. Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [District Rule 4570]
11. 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]
12. 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]

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

13. 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]
14. 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]
15. 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]
16. 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]
17. 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]
18. 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]
19. If permittee has selected to comply using shades constructed with a light permeable roofing material, then permittee shall maintain records, such as design specifications, demonstrating that the shade structures are equipped with such roofing material or if Permittee has selected to comply by cleaning the manure from under the corral shades, then Permittee shall maintain records demonstrating that manure is cleaned from under the shades at least once every fourteen (14) days, as long as weather permits access to corrals. [District Rule 4570]
20. Permittee shall knockdown fence line manure build-up prior to it exceeding a height of twelve (12) inches at any time or point. 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]
21. Permittee shall measure and document the depth of manure at the fence line at least once every ninety (90) days. [District Rule 4570]
22. 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]
23. 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: C-5289-3-4 **EXPIRATION DATE:** 12/31/2021

EQUIPMENT DESCRIPTION:
LIQUID MANURE HANDLING SYSTEM CONSISTING OF SETTLING BASIN(S); DOUBLE MECHANICAL SEPARATOR(S); AND THREE STORAGE PONDS; MANURE IS LAND APPLIED THROUGH FLOOD IRRIGATION

PERMIT UNIT REQUIREMENTS

1. 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]
2. 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]
3. 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]
4. 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]
5. The liquid manure handling system shall handle flush manure from no more than 4,900 milk cows; not to exceed a combined total of 5,650 mature cows (milk and dry cows); and 6,270 total support stock (heifers, calves, and bulls). [District Rule 2201]
6. Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rule 4570]
7. Permittee shall not allow liquid manure to stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570]
8. 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]
9. 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: C-5289-4-2 **EXPIRATION DATE:** 12/31/2021

EQUIPMENT DESCRIPTION:
SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND

PERMIT UNIT REQUIREMENTS

1. 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]
2. 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]
3. 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]
4. 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]
5. Within seventy two (72) hours of removal of solid manure from housing, permittee shall either 1) remove dry manure from the facility, or 2) 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 twenty-four (24) hours per event. [District Rule 4570]
6. Permittee shall keep records of dates when manure is removed from the facility or permittee shall maintain records to demonstrate that dry manure piles outside the pens are covered with a weatherproof covering from October through May. [District Rule 4570]
7. If weatherproof coverings are used, permittee shall maintain records, such as manufacturer warranties or other documentation, demonstrating that the weatherproof covering over dry manure are installed, used, and maintained in accordance with manufacturer recommendations and applicable standards listed in NRCS Field Office Technical Guide Code 313 or 367, or any other applicable standard approved by the APCO, ARB, and EPA. [District Rule 4570]
8. Permittee shall incorporate all solid manure within seventy-two (72) hours of land application. [District Rule 4570]
9. Permittee shall maintain records to demonstrate that all solid manure has been incorporated within seventy-two (72) hours of land application. [District Rule 4570]
10. 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: C-5289-13-1 **EXPIRATION DATE:** 12/31/2021

EQUIPMENT DESCRIPTION:
FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARN(S) AND SILAGE PILE(S)

PERMIT UNIT REQUIREMENTS

1. 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]
2. 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]
3. 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]
4. 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]
5. Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rule 4570]
6. 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 4570]
7. Permittee shall push feed so that it is within three feet of feedlane fence within two hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the animals. [District Rule 4570]
8. Permittee shall maintain an operating plan or record that requires feed to be pushed within three feet of feedlane fence within two hours of putting out the feed, or use of a feed trough or other structure designed to maintain feed within reach of the animals. [District Rule 4570]
9. Permittee shall begin feeding total mixed rations within two hours of grinding and mixing rations. [District Rule 4570]
10. Permittee shall maintain an operating plan or record of when feeding of total mixed rations began within two hours of grinding and mixing rations. [District Rule 4570]
11. Permittee shall store grain in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rule 4570]
12. Permittee shall maintain records demonstrating grain is/was stored in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rule 4570]

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

13. Permittee shall feed steam-flaked, dry rolled, cracked or ground corn or other steam-flaked, dry rolled, cracked or ground cereal grains. [District Rule 4570]
14. Permittee shall maintain records to demonstrate animals are fed steam-flaked, dry rolled, cracked or ground corn or other steam-flaked, dry rolled, cracked or ground cereal grains. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rule 4570]
15. For bagged silage/feedstuff, permittee shall utilize a sealed feed storage system (e.g., ag bag). [District Rule 4570]
16. Permittee shall cover all silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least five (5) mils (0.005 inches) thick, 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. Silage piles shall be covered within seventy-two (72) hours of last delivery of material to the pile. Sheets of material used to cover silage shall overlap so that silage is not exposed where the sheets meet. [District Rule 4570]
17. Permittee shall maintain records of the thickness and type of cover used to cover each silage pile. Permittee shall also maintain records of the date of the last delivery of material to each silage pile and the date each pile is covered. [District Rule 4570]
18. Permittee shall select and implement one of the following mitigation measures for building each silage pile at the facility: Option 1) build the silage pile 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 7.11 of District Rule 4570; Option 2) Adjust filling parameters when creating the silage pile to achieve an average bulk density of at least 44 lb/cu ft for corn silage and at least 40 lb/cu ft for other silage types as determined using a District-approved spreadsheet; or Option 3) build silage piles using crops harvested with the applicable minimum moisture content, maximum Theoretical Length of Chop (TLC), and roller opening identified in District Rule 4570, Table 4.1, 1.d and manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. Records of the option chosen as a mitigation measure for building each silage pile shall be maintained. [District Rule 4570]
19. For each silage pile that Option 1 (Measured Bulk Density) is chosen as a mitigation measure for building the pile, records of the measured bulk density shall be maintained. [District Rule 4570]
20. For each silage pile that Option 2 (Bulk Density Determined by Spreadsheet) is chosen as a mitigation measure for building the pile, records of the filling parameters entered into the District-approved spreadsheet to determine the bulk density shall be maintained. [District Rule 4570]
21. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall harvest corn used for the pile at an average moisture content of at least 65% and harvest other silage crops for the pile at an average moisture content of at least 60%. [District Rule 4570]
22. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records of the average percent moisture of crops harvested for silage shall be maintained. [District Rule 4570]
23. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall adjust setting of equipment used to harvest crops for the pile to incorporate the following parameters for Theoretical Length of Chop (TLC) and roller opening, as applicable: 1) Corn with no processing: TLC not exceeding 1/2 inch, 2) Processed Corn: TLC not exceeding 3/4 inch and roller opening of 1-4 mm, 3) Alfalfa/Grass: TLC not exceeding 1.0 inch, 4) Other silage crops: TLC not exceeding 1/2 inch. [District Rule 4570]
24. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records that equipment used to harvest crops for the pile was set to the required TLC and roller opening for the type of crop harvested shall be maintained. [District Rule 4570]
25. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rule 4570]

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

26. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall maintain a plan that requires that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rule 4570]

27. Permittee shall select and implement at least two of the following mitigation measures for management of silage piles at the facility: Option 1) manage silage piles such that only one silage pile has an uncovered face and the total exposed surface area is less than 2,150 square feet, or manage multiple uncovered silage piles such that the total exposed surface area of all uncovered silage piles is less than 4,300 square feet; Option 2) use a shaver/facer to remove silage from the silage pile, or shall use another method to maintain a smooth vertical surface on the working face of the silage pile; or Option 3) inoculate silage with homolactic lactic acid bacteria in accordance with manufacturer recommendations to achieve a concentration of at least 100,000 colony forming units per gram of wet forage, apply propionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at the rate specified by the manufacturer to reduce yeast counts when forming silage piles, or apply other additives at 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. Records of the options chosen for managing each silage pile shall be maintained. [District Rule 4570]

28. If Option 1 (Limiting Exposed Area of Silage) is chosen as a mitigation measure for managing silage piles, the permittee shall calculate and record the maximum (largest part of pile) total exposed area of each silage pile. Records of the maximum calculated area shall be maintained. [District Rule 4570]

29. For each silage pile that Option 2 (Shaver/Facer or Smooth Face) is chosen as a mitigation measure for managing the pile, the permittee shall maintain records that a shaver/facer was used to remove silage from the pile or shall visually inspect the pile at least daily to verify that the working face was smooth and maintain records of the visual inspections. [District Rule 4570]

30. For each silage pile that Option 3 (Silage Additives) is chosen as a mitigation measure for managing the pile, records shall be maintained of the type additive (e.g. inoculants, preservative, other District & EPA-approved additive), the quantity of the additive applied to the pile, and a copy of the manufacturers instructions for application of the additive. [District Rule 4570]

31. 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

HEALTHY AIR LIVING™

Permit to Operate

FACILITY: C-5701

EXPIRATION DATE: 12/31/2019

LEGAL OWNER OR OPERATOR: DEFENSE RANCH
MAILING ADDRESS: 9730 AVENUE 18-1/2
CHOWCHILLA, CA 93610

FACILITY LOCATION: 10726 AVENUE 19
CHOWCHILLA, CA 93610

FACILITY DESCRIPTION: DAIRY FARM AND CROPS

The Facility's Permit to Operate may include Facility-wide Requirements as well as requirements that apply to specific permit units.

This Permit to Operate remains valid through the permit expiration date listed above, subject to payment of annual permit fees and compliance with permit conditions and all applicable local, state, and federal regulations. This permit is valid only at the location specified above, and becomes void upon any transfer of ownership or location. Any modification of the equipment or operation, as defined in District Rule 2201, will require prior District approval. This permit shall be posted as prescribed in District Rule 2010.

Samir Sheikh
Executive Director / APCO

Arnaud Marjollet
Director of Permit Services

Nov 5 2019 1:37PM – AIYABEIJ

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: C-5701-1-0 **EXPIRATION DATE:** 12/31/2019

EQUIPMENT DESCRIPTION:
DORMANT COW MILKING OPERATION WITH ONE 20 STALL FLAT MILKING PARLOR

PERMIT UNIT REQUIREMENTS

1. The permittee shall submit an application for Authority to Construct (ATC) and receive ATCs prior to placing any mature cows on the dairy. [District Rule 4570]
2. 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]
3. 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]
4. 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

PERMIT UNIT: C-5701-2-0 **EXPIRATION DATE:** 12/31/2019

EQUIPMENT DESCRIPTION:
COW HOUSING - NO MATURE COWS (MILK AND DRY COWS) PRESENT AT THIS TIME; TOTAL SUPPORT STOCK NOT TO EXCEED 1,210 HEIFERS, CALVES, AND BULLS

PERMIT UNIT REQUIREMENTS

1. The permittee shall submit an application for Authority to Construct (ATC) and receive ATCs prior to placing any mature cows on the dairy. [District Rule 4570]
2. 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]
3. 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]
4. 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

PERMIT UNIT: C-5701-3-0 **EXPIRATION DATE:** 12/31/2019

EQUIPMENT DESCRIPTION:
LIQUID MANURE HANDLING SYSTEM CONSISTING OF ONE STORAGE POND; MANURE LAND APPLIED THROUGH FLOOD IRRIGATION AND FURROW IRRIGATION

PERMIT UNIT REQUIREMENTS

1. The permittee shall submit an application for Authority to Construct (ATC) and receive ATCs prior to placing any mature cows on the dairy. [District Rule 4570]
2. 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]
3. 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]
4. 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

PERMIT UNIT: C-5701-4-0 **EXPIRATION DATE:** 12/31/2019

EQUIPMENT DESCRIPTION:
SOLID MANURE HANDLING CONSISTING OF OPEN MANURE STOCK PILES; COMPOSTING; SOLID MANURE APPLICATION TO LAND AND HAULED OFFSITE

PERMIT UNIT REQUIREMENTS

1. The permittee shall submit an application for Authority to Construct (ATC) and receive ATCs prior to placing any mature cows on the dairy. [District Rule 4570]
2. 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]
3. 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]
4. 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

PERMIT UNIT: C-5701-5-0 **EXPIRATION DATE:** 12/31/2019

EQUIPMENT DESCRIPTION:
FEED STORAGE AND HANDLING CONSISTING OF COVERED FEED STORAGE OR COMMODITY BARN AND SILAGE PILES

PERMIT UNIT REQUIREMENTS

1. The permittee shall submit an application for Authority to Construct (ATC) and receive ATCs prior to placing any mature cows on the dairy. [District Rule 4570]
2. 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]
3. 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]
4. 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]

APPENDIX C

Emission Calculations

Diamond H Dairy

C-5289

Rev. May 7, 2019

Pre-Project Facility Information

1. Does this facility house Holstein or Jersey cows? Holstein
   Most facilities house Holstein cows unless explicitly stated on the PTO or application.
2. Does the facility have an anaerobic treatment lagoon? no
3. Does the facility land apply liquid manure? yes
   Answering "yes" assumes worst case.
4. Does the facility land apply solid manure? yes
   Answering "yes" assumes worst case.
5. Is any scraped manure sent to a lagoon/storage pond? facility does not scrape manure
   Answering "yes" assumes worst case.

Pre-Project Herd Size

Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows	4,900				4,900
Dry Cows			750		750
Support Stock (Heifers, Calves, and Bulls)			6,260		6,260
Large Heifers					0
Medium Heifers					0
Small Heifers					0
Bulls					0

	Calf Hutches				Calf Corrals		
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Flushed	Scraped	Total # of Calves
Calves							0

Total Herd Summary

Total Milk Cows	4,900
Total Mature Cows	5,650
Support Stock (Heifers, Calves, and Bulls)	6,260
Total Calves	0
Total Dairy Head	11,910

Pre-Project Silage Information

Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn	1	20	200
Alfalfa	1	12	120
Wheat	1	20	150

Post-Project Facility Information

1. Does this facility house Holstein or Jersey cows? Holstein
   Most facilities house Holstein cows unless explicitly stated on the PTO or application.
2. Does the facility have an anaerobic treatment lagoon? yes
3. Does the facility land apply liquid manure? yes
   Answering "yes" assumes worst case.
4. Does the facility land apply solid manure? yes
   Answering "yes" assumes worst case.
5. Is any scraped manure sent to a lagoon/storage pond? facility does not scrape manure
   Answering "yes" assumes worst case.
6. Does this project result in an increase or relocation of uncovered surface area for any lagoon/storage pond? no

Post-Project Herd Size

Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows	7,278				7,278
Dry Cows	626		378		1,004
Support Stock (Heifers, Calves, and Bulls)			8,544		8,544
Large Heifers					0
Medium Heifers					0
Small Heifers					0
Bulls					0

	Calf Hutches				Calf Corrals		
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Flushed	Scraped	Total # of Calves
Calves							0

Total Herd Summary

Total Milk Cows	7,278
Total Mature Cows	8,282
Support Stock (Heifers, Calves, and Bulls)	8,544
Total Calves	0
Total Dairy Head	16,826

Post-Project Silage Information

Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn	1	20	200
Alfalfa	1	12	120
Wheat	1	20	150

This spreadsheet serves only as a resource to calculate potential emissions from dairies, and may not reflect the final emissions used by the District due to parameters not addressed in this spreadsheet and/or omissions from the spreadsheet. Any other permittable equipment (e.g. IC engines, gasoline tanks, etc.) at a facility will need to be calculated separately. All final calculations used in permitting projects will be conducted by District staff.

VOC Mitigation Measures and Control Efficiencies

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

Cow Housing				
Measure Proposed?		Mitigation Measure(s) per Emissions Point	VOC Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Enteric Emissions Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
		Total Control Efficiency	10%	10%
		Corrals/Pens Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
☑	☑	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%
☑	☑	**Dairies:** Clean manure from corrals at least four times per year with at least 60 days between cleaning, or clean corrals at least once between April and July and at least once between September and December. Note: If selected for dairies > 999 milk cows, CE is already included in EF. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement). **Heifer/Calf Ranches:** Scrape corrals twice a year with at least 90 days between cleanings, excluding in-corral mounds. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement).	0%	0%
☑	☑	Scrape, vacuum, or flush concrete lanes in corrals at least once every day for mature cows and every seven days for support stock, or clean concrete lanes such that the depth of manure does not exceed 12 inches at any point or time. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement).	10%	10%
☑	☑	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.	5%	5%
☐	☐	Install all shade structures uphill of any slope in the corral. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.		
☐	☐	Clean manure from under corral shades at least once every 14 days, when weather permits access into corral. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.		
☑	☑	Install shade structure so that the structure has a North/South orientation. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.		
☐	☐	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 manure depth of 12 inches or lower immediately upon the corral becoming accessible.	10%	10%
☐	☐	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	30.75%	30.75%
		Bedding Mitigations		

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

Liquid Manure Handling				
Measure Proposed?		**Mitigation Measure(s) per Emissions Point**	**VOC Control Efficiency (%)**	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Lagoons/Storage Ponds Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
☐	☐	Use phototropic lagoon	0%	0%
☐	☑	Use an anaerobic treatment lagoon designed according to NRCS Guideline No. 359, or aerobic treatment lagoon, or mechanically aerated lagoon, or covered lagoon digester vented to a control device with minimum 95% control	0%	40%
☑	☑	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%	46.00%
		Liquid Manure Land Application Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
☐	☑	Only apply liquid manure that has been treated with an anaerobic or aerobic treatment lagoon, aerobic lagoon, or digester system	0%	40%
☑	☑	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%	46.00%

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

Silage and TMR				
Measure Proposed?		**Mitigation Measure(s) per Emissions Point**	**VOC Control Efficiency (%)**	
Pre-Project	Post-Project		Pre-Project	Post-Project

		Corn/Alfalfa/Wheat Silage Mitigations		
☑	☑	1. Utilize a sealed feed storage system (e.g. Ag-Bag) for bagged silage, or 2. Cover the surface of silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least 5 mils thick (0.005 inches), multiple plastic tarps with a cumulative thickness of at least 5 mils (0.005 inches), or an oxygen barrier film covered with a UV resistant material within 72 hours of last delivery of material to the pile, and implement one of the following: a) build silage piles such that the average bulk density is at least 44 lb/cu-ft for corn silage and 40 lb/cu-ft for other silage types, as measured in accordance with Section 7.10 of Rule 4570, b) when creating a silage pile, adjust filling parameters to assure a calculated average bulk density of at least 44 lb/cu-ft for corn silage and at least 40 lb/cu-ft for other silage types, using a spreadsheet approved by the District, c) harvest silage crop at > or = 65% moisture for corn; and >= 60% moisture for alfalfa/grass and other silage crops; manage silage material delivery such that no more than 6 inches of materials are uncompacted on top of the pile; and incorporate the applicable Theoretical Length of Chop (TLC) and roller opening for the crop being harvested. For dairies - implement two of the following: For heifer/calf ranches - implement one 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 accordance 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.	39.0%	39.0%
		Total Control Efficiency*	39.00%	39.00%

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

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

Ammonia Mitigation Measures and Control Efficiencies

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

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

Liquid Manure Handling				
Measure Proposed?		Mitigation Measure(s) per Emissions Point	NH3 Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Lagoons/Storage Ponds Mitigations		
☑	☑	Feed according to NRC guidelines	28%	28%
☑	☑	Use phototropic lagoon **OR** Remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon.	80%	80%
		Total Control Efficiency	85.6%	85.6%
		Liquid Manure Land Application Mitigations		
☑	☑	Feed according to NRC guidelines	28%	28%
☐	☑	Only apply liquid manure that has been treated with an anaerobic treatment lagoon	0%	42%
		Total Control Efficiency	28.00%	58.24%

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

Dairy Emission Factors

lb/hd-yr Dairy Emissions Factors for Holstein Cows

			Milk Cows				Dry Cows				Large Heifers (15 to 24 months)				Medium Heifers (7 to 14 months)				Small Heifers (3 to 6 months)				Calves (0 - 3 months)				Bulls			
			Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled	
			<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2
Milking Parlor	VOC	Enteric Emissions in Milking Parlors	0.43	0.41	0.37	0.37	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-		-	-	-
		Milking Parlor Floor	0.04	0.03	0.03	0.03	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-		-	-	-
		Total	**0.47**	**0.44**	**0.40**	**0.40**	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-		-	-	-
	NH3	**Total**	**0.19**	**0.19**	**0.14**	**0.14**	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-		-	-	-
Cow Housing	VOC	Enteric Emissions in Cow Housing	3.89	3.69	3.32	3.32	2.33	2.23	2.01	2.01	1.81	1.71	1.54	1.54	1.23	1.17	1.05	1.05	0.69	0.65	0.58	0.58	0.32	0.31	0.28	0.28	1.10	1.04	0.94	0.94
		Corrals/Pens	10.00	6.60	4.57	4.57	5.40	3.59	2.49	2.49	4.20	2.76	1.91	1.91	2.85	1.88	1.30	1.30	1.60	1.04	0.72	0.72	0.75	0.50	0.35	0.35	2.55	1.67	1.16	1.16
		Bedding	1.05	1.00	0.81	0.81	0.57	0.54	0.44	0.44	0.44	0.42	0.34	0.34	0.30	0.28	0.23	0.23	0.17	0.16	0.13	0.13	0.08	0.08	0.06	0.06	0.27	0.25	0.20	0.20
		Lanes	0.84	0.80	0.65	0.65	0.45	0.44	0.35	0.35	0.35	0.33	0.27	0.27	0.24	0.23	0.18	0.18	0.13	0.13	0.10	0.10	0.06	0.06	0.05	0.05	0.21	0.20	0.16	0.16
		Total	**15.78**	**12.09**	**9.35**	**9.35**	**8.75**	**6.80**	**5.29**	**5.29**	**6.81**	**5.22**	**4.06**	**4.06**	**4.62**	**3.56**	**2.77**	**2.77**	**2.69**	**1.98**	**1.54**	**1.54**	**1.22**	**0.95**	**0.74**	**0.74**	**4.13**	**3.16**	**2.46**	**2.46**
	NH3	Enteric Emissions in Cow Housing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Corrals/Pens	41.90	41.90	15.08	15.08	21.20	21.20	7.63	7.63	11.00	11.00	3.96	3.96	7.90	7.90	2.84	2.84	6.00	6.00	2.16	2.16	1.80	1.80	0.65	0.65	15.30	15.30	5.51	5.51
		Bedding	6.30	6.30	2.37	2.37	3.20	3.20	1.20	1.20	1.70	1.70	0.64	0.64	1.20	1.20	0.45	0.45	0.90	0.90	0.34	0.34	0.30	0.30	0.11	0.11	2.30	2.30	0.87	0.87
		Lanes	5.10	5.10	3.67	3.67	2.60	2.60	1.87	1.87	1.30	1.30	0.94	0.94	1.00	1.00	0.72	0.72	0.70	0.70	0.50	0.50	0.20	0.20	0.14	0.14	1.90	1.90	1.37	1.37
		Total	**53.30**	**53.30**	**21.13**	**21.13**	**27.00**	**27.00**	**10.71**	**10.71**	**14.00**	**14.00**	**5.54**	**5.54**	**10.10**	**10.10**	**4.02**	**4.02**	**7.60**	**7.60**	**3.00**	**3.00**	**2.30**	**2.30**	**0.90**	**0.90**	**19.50**	**19.50**	**7.74**	**7.74**
Liquid Manure Handling	VOC	Lagoons/Storage Ponds	1.52	1.30	1.17	0.70	0.82	0.71	0.64	0.38	0.64	0.54	0.49	0.29	0.43	0.37	0.33	0.20	0.24	0.21	0.19	0.11	0.11	0.10	0.09	0.05	0.40	0.33	0.30	0.18
		Liquid Manure Land Application	1.64	1.40	1.26	0.76	0.89	0.76	0.69	0.41	0.69	0.58	0.53	0.32	0.47	0.40	0.36	0.22	0.26	0.22	0.20	0.12	0.12	0.11	0.10	0.06	0.42	0.35	0.32	0.19
		Total	**3.16**	**2.70**	**2.43**	**1.46**	**1.71**	**1.47**	**1.33**	**0.79**	**1.33**	**1.13**	**1.02**	**0.61**	**0.90**	**0.77**	**0.69**	**0.42**	**0.51**	**0.43**	**0.38**	**0.23**	**0.24**	**0.21**	**0.18**	**0.11**	**0.82**	**0.68**	**0.61**	**0.37**
	NH3	Lagoons/Storage Ponds	8.20	8.20	1.18	1.18	4.20	4.20	0.60	0.60	2.20	2.20	0.32	0.32	1.50	1.50	0.22	0.22	1.20	1.20	0.17	0.17	0.35	0.35	0.05	0.05	3.00	3.00	0.43	0.43
		Liquid Manure Land Application	8.90	8.90	6.41	3.72	4.50	4.50	3.24	1.88	2.30	2.30	1.66	0.96	1.70	1.70	1.22	0.71	1.30	1.30	0.94	0.54	0.37	0.37	0.27	0.15	3.23	3.23	2.33	1.35
		Total	**17.10**	**17.10**	**7.59**	**4.90**	**8.70**	**8.70**	**3.84**	**2.48**	**4.50**	**4.50**	**1.97**	**1.28**	**3.20**	**3.20**	**1.44**	**0.93**	**2.50**	**2.50**	**1.11**	**0.72**	**0.72**	**0.72**	**0.32**	**0.20**	**6.23**	**6.23**	**2.76**	**1.78**
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	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.04	0.04	0.03	0.03
		Separated Solids Piles	0.06	0.06	0.05	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02
		Solid Manure Land Application	0.39	0.33	0.30	0.30	0.21	0.18	0.16	0.16	0.16	0.14	0.12	0.12	0.11	0.09	0.08	0.08	0.06	0.05	0.05	0.05	0.03	0.03	0.02	0.02	0.10	0.08	0.07	0.07
		Total	**0.61**	**0.54**	**0.47**	**0.47**	**0.33**	**0.29**	**0.26**	**0.26**	**0.26**	**0.23**	**0.20**	**0.20**	**0.17**	**0.15**	**0.13**	**0.13**	**0.10**	**0.09**	**0.07**	**0.07**	**0.05**	**0.04**	**0.04**	**0.04**	**0.16**	**0.14**	**0.12**	**0.12**
	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	0.18	0.18	0.18	0.18	0.13	0.13	0.13	0.13	0.04	0.04	0.04	0.04	0.35	0.35	0.35	0.35
		Separated Solids Piles	0.38	0.38	0.38	0.38	0.19	0.19	0.19	0.19	0.10	0.10	0.10	0.10	0.07	0.07	0.07	0.07	0.05	0.05	0.05	0.05	0.02	0.02	0.02	0.02	0.14	0.14	0.14	0.14
		Solid Manure Land Application	2.09	2.09	1.50	1.50	1.06	1.06	0.76	0.76	0.55	0.55	0.40	0.40	0.39	0.39	0.28	0.28	0.30	0.30	0.22	0.22	0.09	0.09	0.06	0.06	0.76	0.76	0.55	0.55
		Total	**3.42**	**3.42**	**2.83**	**2.83**	**1.73**	**1.73**	**1.43**	**1.43**	**0.90**	**0.90**	**0.75**	**0.75**	**0.64**	**0.64**	**0.53**	**0.53**	**0.48**	**0.48**	**0.40**	**0.40**	**0.15**	**0.15**	**0.12**	**0.12**	**1.25**	**1.25**	**1.04**	**1.04**

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

		Silage Type	Uncontrolled	EF1	EF2
Feed Storage and Handling	VOC	Corn Silage	34,681	21,155	21,155
		Alfalfa Silage	17,458	10,649	10,649
		Wheat Silage	43,844	26,745	26,745
		TMR	13,056	10,575	10,575

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

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

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

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

PM10 Mitigation Measures and Control Efficiencies

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

Pre-Project PM10 Mitigation Measures

Pre-Project PM10 Mitigation Measures

	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	# of Combined Housing Structures in row	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk
1	FS 1	freestall	milk cows	263	419	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	FS 12 (Ex. Pens)	open corral	milk cows	262	609	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
3	FS 3	freestall	milk cows	350	800	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
4	FS 10 (Ex. Pens)	open corral	milk cows	350	800	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
5	FS 5	freestall	milk cows	350	800	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
6	FS 14 (Ex. Pens)	open corral	milk cows	350	800	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
7	FS 7	freestall	milk cows	525	800	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
8	FS 2	freestall	milk cows	263	419	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
9	FS 13 (Ex. Pens)	open corral	milk cows	262	609	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
10	FS 4	freestall	milk cows	350	800	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
11	FS 11 (Ex. Pens)	open corral	milk cows	350	750	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
12	FS 6	freestall	milk cows	525	700	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
13	FS 8	freestall	milk cows	700	700	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
14	FS 9	loafing barn	dry cows	279	377	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
15	LB 10 (A - C)	open corral	dry cows	157	157	3	☑	☐	☐	☐	☐	☐	☐	☐	☐
16	OC 11 (A - E)	open corral	support stock	53	71	5	☑	☐	☐	☐	☐	☐	☐	☐	☐
17	OC 12 (A & B)	open corral	support stock	198	300	2	☑	☐	☐	☐	☐	☐	☐	☐	☐
18	OC 13	open corral	support stock	175	175	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
19	OC 14 (Hutches)	open corral	support stock	500	500	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
20	OC 15 (A & B)	open corral	support stock	532	633	2	☐	☐	☐	☐	☐	☐	☐	☐	☐
21	OC 16 (A & B)	open corral	support stock	532	633	2	☐	☐	☐	☐	☐	☐	☐	☐	☐
22	OC 17 (B & C)	open corral	support stock	155	185	2	☐	☐	☐	☐	☐	☐	☐	☐	☐
23	OC 18	open corral	support stock	840	840	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
24	OC 19 (A - C)	open corral	support stock	280	280	3	☐	☐	☐	☐	☐	☐	☐	☐	☐
25	OC 20	open corral	support stock	414	414	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
26	OC 21 (A & B)	open corral	support stock	196	196	2	☐	☐	☐	☐	☐	☐	☐	☐	☐
			Pre-Project Total # of Cows	11,910											

Pre-Project PM10 Control Efficiencies and Emission Factors

	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)
1	FS 1	freestall	milk cows	263	419	1.370										1.37
2	FS 12 (Ex. Pens)	open corral	milk cows	262	609	5.460										5.46
3	FS 3	freestall	milk cows	350	800	1.370										1.37
4	FS 10 (Ex. Pens)	open corral	milk cows	350	800	5.460										5.46
5	FS 5	freestall	milk cows	350	800	1.370										1.37
6	FS 14 (Ex. Pens)	open corral	milk cows	350	800	5.460										5.46
7	FS 7	freestall	milk cows	525	800	1.370										1.37
8	FS 2	freestall	milk cows	263	419	1.370										1.37
9	FS 13 (Ex. Pens)	open corral	milk cows	262	609	5.460										5.46
10	FS 4	freestall	milk cows	350	800	1.370										1.37
11	FS 11 (Ex. Pens)	open corral	milk cows	350	750	5.460										5.46
12	FS 6	freestall	milk cows	525	700	1.370										1.37
13	FS 8	freestall	milk cows	700	700	1.370										1.37
14	FS 9	loafing barn	dry cows	279	377	2.730										2.73
15	LB 10 (A - C)	open corral	dry cows	157	157	5.460	16.7%									4.55
16	OC 11 (A - E)	open corral	support stock	53	71	10.550	8.3%									9.67
17	OC 12 (A & B)	open corral	support stock	198	300	10.550	8.3%									9.67
18	OC 13	open corral	support stock	175	175	10.550										10.55
19	OC 14 (Hutches)	open corral	support stock	500	500	10.550										10.55
20	OC 15 (A & B)	open corral	support stock	532	633	10.550										10.55
21	OC 16 (A & B)	open corral	support stock	532	633	10.550										10.55
22	OC 17 (B & C)	open corral	support stock	155	185	10.550										10.55
23	OC 18	open corral	support stock	840	840	10.550										10.55
24	OC 19 (A - C)	open corral	support stock	280	280	10.550										10.55
25	OC 20	open corral	support stock	414	414	10.550										10.55
26	OC 21 (A & B)	open corral	support stock	196	196	10.550										10.55
			Pre-Project Total # of Cows	11,910												

Post-Project PM10 Mitigation Measures

Post-Project PM10 Mitigation Measures

	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	# of Combined Housing Structures in row	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk
1	FS 1	freestall	milk cows	119	419	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	FS 12	freestall	milk cows	420	420	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
3	FS 3	freestall	milk cows	800	800	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
4	FS 10	freestall	milk cows	400	400	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
5	FS 5	freestall	milk cows	800	800	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
6	FS 14	freestall	milk cows	800	800	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
7	FS 7	freestall	milk cows	800	800	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
8	FS 2	freestall	milk cows	419	419	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
9	FS 13	freestall	milk cows	420	420	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
10	FS 4	freestall	milk cows	800	800	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
11	FS 11	freestall	milk cows	800	800	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
12	FS 6	freestall	milk cows	700	700	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
13	FS 8	freestall	dry cows	626	700	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
14	FS 9 (A & B)	loafing barn	dry cows	189	189	2	☐	☐	☐	☐	☐	☐	☐	☐	☐
15	LB 10 (A - C)	open corral	support stock	109	157	3	☑	☑	☐	☐	☐	☐	☐	☐	☐
16	OC 11 (A - G)	open corral	support stock	51	51	7	☑	☑	☐	☐	☐	☐	☐	☐	☐
17	OC 12 (A & B)	open corral	support stock	297	300	2	☑	☑	☐	☐	☐	☐	☐	☐	☐
19	OC 14 (Hutches)	open corral	support stock	750	750	1	☐	☑	☐	☐	☐	☐	☐	☐	☐
20	OC 15 (A & B)	open corral	support stock	362	633	2	☐	☑	☐	☐	☐	☐	☐	☐	☐
21	OC 16 (A & B)	open corral	support stock	362	633	2	☐	☑	☐	☐	☐	☐	☐	☐	☐
22	OC 17 (B & C)	open corral	support stock	183	185	2	☐	☑	☐	☐	☐	☐	☐	☐	☐
23	OC 17A (replaced 18)	open corral	support stock	355	837	1	☐	☑	☐	☐	☐	☐	☐	☐	☐
24	OC 19 (A - C)	open corral	support stock	198	279	3	☐	☑	☐	☐	☐	☐	☐	☐	☐
25	OC 20	open corral	support stock	267	413	1	☐	☑	☐	☐	☐	☐	☐	☐	☐
26	OC 21 (A & B)	open corral	support stock	175	195	2	☐	☑	☐	☐	☐	☐	☐	☐	☐

Post-Project PM10 Mitigation Measures for New Housing Units at an Expanding Dairy

	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	# of Combined Housing Structures in row	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk
1	OC 22 (A & B)	open corral	support stock	375	375	2	☑	☑	☑	☐	☐	☐	☑	☐	☑
2	OC 23 (A & B)	open corral	support stock	375	375	2	☑	☑	☑	☐	☐	☐	☑	☐	☑
3	OC 24 (A - C)	open corral	support stock	283	283	3	☑	☑	☑	☐	☐	☐	☑	☐	☑
4	OC 25	open corral	support stock	149	149	1	☑	☑	☑	☐	☐	☐	☑	☐	☑
5	OC 26 (A & B)	open corral	support stock	234	234	2	☑	☑	☑	☐	☐	☐	☑	☐	☑
6	OC 27 (A & B)	loafing barn	support stock	85	85	2	☐	☑	☐	☐	☐	☐	☑	☐	☐
		Post-Project Total # of Cows		16,826	(The post-project total includes					dairy cows already on-site and			new cows from the expansion.)		

Post-Project PM10 Control Efficiencies and Emission Factors

	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)
1	FS 1	freestall	milk cows	119	419	1.370										1.37
2	FS 12	freestall	milk cows	420	420	1.370										1.37
3	FS 3	freestall	milk cows	800	800	1.370										1.37
4	FS 10	freestall	milk cows	400	400	1.370										1.37
5	FS 5	freestall	milk cows	800	800	1.370										1.37
6	FS 14	freestall	milk cows	800	800	1.370										1.37
7	FS 7	freestall	milk cows	800	800	1.370										1.37
8	FS 2	freestall	milk cows	419	419	1.370										1.37
9	FS 13	freestall	milk cows	420	420	1.370										1.37
10	FS 4	freestall	milk cows	800	800	1.370										1.37
11	FS 11	freestall	milk cows	800	800	1.370										1.37
12	FS 6	freestall	milk cows	700	700	1.370										1.37
13	FS 8	freestall	dry cows	626	700	1.370										1.37
14	FS 9 (A & B)	loafing barn	dry cows	189	189	2.730										2.73
15	LB 10 (A - C)	open corral	support stock	109	157	10.550	8.3%	12.5%								8.47
16	OC 11 (A - G)	open corral	support stock	51	51	10.550	8.3%	12.5%								8.47
17	OC 12 (A & B)	open corral	support stock	297	300	10.550	8.3%	12.5%								8.47
19	OC 14 (Hutches)	open corral	support stock	750	750	10.550		12.5%								9.23

20	OC 15 (A & B)	open corral	support stock	362	633	10.550		12.5%								9.23
21	OC 16 (A & B)	open corral	support stock	362	633	10.550		12.5%								9.23
22	OC 17 (B & C)	open corral	support stock	183	185	10.550		12.5%								9.23
23	OC 17A (replaced 18)	open corral	support stock	355	837	10.550		12.5%								9.23
24	OC 19 (A - C)	open corral	support stock	198	279	10.550		12.5%								9.23
25	OC 20	open corral	support stock	267	413	10.550		12.5%								9.23
26	OC 21 (A & B)	open corral	support stock	175	195	10.550		12.5%								9.23

Post-Project PM10 Control Efficiencies and Emission Factors for New Housing Emissions Units

	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)
1	OC 22 (A & B)	open corral	support stock	375	375	10.550	8.3%	12.5%	10%				15%		10%	5.83
2	OC 23 (A & B)	open corral	support stock	375	375	10.550	8.3%	12.5%	10%				15%		10%	5.83
3	OC 24 (A - C)	open corral	support stock	283	283	10.550	8.3%	12.5%	10%				15%		10%	5.83
4	OC 25	open corral	support stock	149	149	10.550	8.3%	12.5%	10%				15%		10%	5.83
5	OC 26 (A & B)	open corral	support stock	234	234	10.550	8.3%	12.5%	10%				15%		10%	5.83
6	OC 27 (A & B)	loafing barn	support stock	85	85	5.280		12.5%					15%			3.93

Pre-Project Potential to Emit - Cow Housing

	Pre-Project Potential to Emit - Cow Housing												
	Housing Name(s) or #(s)	Type of Cow	# of Cows	Controlled VOC EF (lb/hd-yr)	Controlled NH3 EF (lb/hd-yr)	Controlled PM10 EF (lb/hd-yr)	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)	
1	FS 1	milk cows	263	9.35	21.13	1.37	6.7	2,459	15.2	5,557	1.0	360	
2	FS 12 (Ex. Pens)	milk cows	262	9.35	21.13	5.46	6.7	2,450	15.2	5,536	3.9	1,431	
3	FS 3	milk cows	350	9.35	21.13	1.37	9.0	3,273	20.3	7,395	1.3	480	
4	FS 10 (Ex. Pens)	milk cows	350	9.35	21.13	5.46	9.0	3,273	20.3	7,395	5.2	1,911	
5	FS 5	milk cows	350	9.35	21.13	1.37	9.0	3,273	20.3	7,395	1.3	480	
6	FS 14 (Ex. Pens)	milk cows	350	9.35	21.13	5.46	9.0	3,273	20.3	7,395	5.2	1,911	
7	FS 7	milk cows	525	9.35	21.13	1.37	13.4	4,909	30.4	11,092	2.0	719	
8	FS 2	milk cows	263	9.35	21.13	1.37	6.7	2,459	15.2	5,557	1.0	360	
9	FS 13 (Ex. Pens)	milk cows	262	9.35	21.13	5.46	6.7	2,450	15.2	5,536	3.9	1,431	
10	FS 4	milk cows	350	9.35	21.13	1.37	9.0	3,273	20.3	7,395	1.3	480	
11	FS 11 (Ex. Pens)	milk cows	350	9.35	21.13	5.46	9.0	3,273	20.3	7,395	5.2	1,911	
12	FS 6	milk cows	525	9.35	21.13	1.37	13.4	4,909	30.4	11,092	2.0	719	
13	FS 8	milk cows	700	9.35	21.13	1.37	17.9	6,545	40.5	14,790	2.6	959	
14	FS 9	dry cows	279	5.29	10.71	2.73	4.0	1,476	8.2	2,988	2.1	762	
15	LB 10 (A - C)	dry cows	471	5.29	10.71	4.55	6.8	2,492	13.8	5,044	5.9	2,142	*
16	OC 11 (A - E)	support stock	265	4.06	5.54	9.67	2.9	1,076	4.0	1,467	7.0	2,564	*
17	OC 12 (A & B)	support stock	396	4.06	5.54	9.67	4.4	1,608	6.0	2,192	10.5	3,831	*
18	OC 13	support stock	175	4.06	5.54	10.55	1.9	711	2.7	969	5.1	1,846	
19	OC 14 (Hutches)	support stock	500	4.06	5.54	10.55	5.6	2,030	7.6	2,768	14.5	5,275	
20	OC 15 (A & B)	support stock	1,064	4.06	5.54	10.55	11.8	4,320	16.1	5,890	30.8	11,225	*
21	OC 16 (A & B)	support stock	1,064	4.06	5.54	10.55	11.8	4,320	16.1	5,890	30.8	11,225	*
22	OC 17 (B & C)	support stock	310	4.06	5.54	10.55	3.4	1,259	4.7	1,716	9.0	3,271	*
23	OC 18	support stock	840	4.06	5.54	10.55	9.3	3,410	12.7	4,650	24.3	8,862	
24	OC 19 (A - C)	support stock	840	4.06	5.54	10.55	9.3	3,410	12.7	4,650	24.3	8,862	*
25	OC 20	support stock	414	4.06	5.54	10.55	4.6	1,681	6.3	2,292	12.0	4,368	
26	OC 21 (A & B)	support stock	392	4.06	5.54	10.55	4.4	1,592	5.9	2,170	11.3	4,136	*
	Pre-Project Total # of Cows		11,910				205.7	75,204	400.7	146,216	223.5	81,521	

*Multiple emissions units (freestalls, corrals, calf hutch areas, etc.) are combined in these rows.

Pre-Project Totals						
Total # of Cows	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
11,910	205.7	75,204	400.7	146,216	223.5	81,521

Calculations:

Annual PE 1 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)
Daily PE1 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

Post-Project Potential to Emit - Cow Housing

Post-Project Potential to Emit - Cow Housing

	Housing Name(s) or #(s)	Type of Cow	# of Cows	Controlled VOC EF (lb/hd-yr)	Controlled NH3 EF (lb/hd-yr)	Controlled PM10 EF (lb/hd-yr)	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)	
1	FS 1	milk cows	119	9.35	21.13	1.37	3.0	1,113	6.9	2,514	0.4	163	
2	FS 12	milk cows	420	9.35	21.13	1.37	10.8	3,927	24.3	8,874	1.6	575	
3	FS 3	milk cows	800	9.35	21.13	1.37	20.5	7,480	46.3	16,903	3.0	1,096	
4	FS 10	milk cows	400	9.35	21.13	1.37	10.2	3,740	23.2	8,451	1.5	548	
5	FS 5	milk cows	800	9.35	21.13	1.37	20.5	7,480	46.3	16,903	3.0	1,096	
6	FS 14	milk cows	800	9.35	21.13	1.37	20.5	7,480	46.3	16,903	3.0	1,096	
7	FS 7	milk cows	800	9.35	21.13	1.37	20.5	7,480	46.3	16,903	3.0	1,096	
8	FS 2	milk cows	419	9.35	21.13	1.37	10.7	3,918	24.3	8,853	1.6	574	
9	FS 13	milk cows	420	9.35	21.13	1.37	10.8	3,927	24.3	8,874	1.6	575	
10	FS 4	milk cows	800	9.35	21.13	1.37	20.5	7,480	46.3	16,903	3.0	1,096	
11	FS 11	milk cows	800	9.35	21.13	1.37	20.5	7,480	46.3	16,903	3.0	1,096	
12	FS 6	milk cows	700	9.35	21.13	1.37	17.9	6,545	40.5	14,790	2.6	959	
13	FS 8	dry cows	626	5.29	10.71	1.37	9.1	3,312	18.4	6,704	2.4	858	
14	FS 9 (A & B)	dry cows	378	5.29	10.71	2.73	5.5	2,000	11.1	4,048	2.8	1,032	*
15	LB 10 (A - C)	support stock	327	4.06	5.54	8.47	3.6	1,328	5.0	1,810	7.6	2,768	*
16	OC 11 (A - G)	support stock	357	4.06	5.54	8.47	4.0	1,449	5.4	1,976	8.3	3,022	*
17	OC 12 (A & B)	support stock	594	4.06	5.54	8.47	6.6	2,412	9.0	3,288	13.8	5,028	*
18	OC 13 (Removed)	support stock	0	4.06	5.54	0.00	0.0	0	0.0	0	0.0	0	
19	OC 14 (Hutches)	support stock	750	4.06	5.54	9.23	8.3	3,045	11.4	4,152	19.0	6,923	
20	OC 15 (A & B)	support stock	724	4.06	5.54	9.23	8.1	2,939	11.0	4,008	18.3	6,683	*
21	OC 16 (A & B)	support stock	724	4.06	5.54	9.23	8.1	2,939	11.0	4,008	18.3	6,683	*
22	OC 17 (B & C)	support stock	366	4.06	5.54	9.23	4.1	1,486	5.6	2,026	9.3	3,379	*
23	OC 17A (replaced 18)	support stock	355	4.06	5.54	9.23	3.9	1,441	5.4	1,965	9.0	3,277	
24	OC 19 (A - C)	support stock	594	4.06	5.54	9.23	6.6	2,412	9.0	3,288	15.0	5,483	*
25	OC 20	support stock	267	4.06	5.54	9.23	3.0	1,084	4.0	1,478	6.8	2,465	
26	OC 21 (A & B)	support stock	350	4.06	5.54	9.23	3.9	1,421	5.3	1,938	8.9	3,231	*
	Post-Project # of Cows (non-expansion)		**13,690**				**261.2**	**95,318**	**532.9**	**194,463**	**166.8**	**60,802**	

*Multiple emissions units (freestalls, corrals, calf hutch areas, etc.) are combined in these rows.

Post-Project Potential to Emit - Cow Housing: New Housing Units at an Expanding Dairy

	Housing Name(s) or #(s)	Type of Cow	# of Cows	Controlled VOC EF (lb/hd-yr)	Controlled NH3 EF (lb/hd-yr)	Controlled PM10 EF (lb/hd-yr)	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)	
1	OC 22 (A & B)	support stock	750	4.06	5.54	5.83	8.3	3,045	11.4	4,152	12.0	4,371	*
2	OC 23 (A & B)	support stock	750	4.06	5.54	5.83	8.3	3,045	11.4	4,152	12.0	4,371	*
3	OC 24 (A - C)	support stock	849	4.06	5.54	5.83	9.4	3,447	12.9	4,700	13.6	4,948	*
4	OC 25	support stock	149	4.06	5.54	5.83	1.7	605	2.3	825	2.4	868	
5	OC 26 (A & B)	support stock	468	4.06	5.54	5.83	5.2	1,900	7.1	2,591	7.5	2,728	*
6	OC 27 (A & B)	support stock	170	4.06	5.54	3.93	1.9	690	2.6	941	1.8	668	*
	Total # of Cows From Expansion		**3,136**				**34.8**	**12,732**	**47.7**	**17,361**	**49.3**	**17,954**	

*Multiple emissions units (freestalls, corrals, calf hutch areas, etc.) are combined in these rows.

Post-Project Totals

Total # of Cows	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
16,826	296.0	108,050	580.6	211,824	216.1	78,756

Calculations:

Annual PE 2 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)
Daily PE2 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

Pre-Project Potential to Emit (PE1)

Pre-Project Herd Size

Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows	4,900	0	0	0	4,900
Dry Cows	0	0	750	0	750
Support Stock (Heifers, Calves and Bulls)	0	0	6,260	0	6,260
Large Heifers	0	0	0	0	0
Medium Heifers	0	0	0	0	0
Small Heifers	0	0	0	0	0
Bulls	0	0	0	0	0

	Calf Hutches				Calf Corrals		
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Flushed	Scraped	Total # of Calves
Calves	0	0	0	0	0	0	0

Silage Information

Feed Type	Maximum # Open Piles	Maximum Height (ft)	Maximum Width (ft)	Open Face Area (ft^2)
Corn	1	20	200	2,720
Alfalfa	1	12	120	979
Wheat	1	20	150	2,135

Milking Parlor

Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	5.4	1,960	1.8	670

Cow Housing

Cow	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Total	205.7	75,204	400.7	146,216	223.5	81,521

Liquid Manure Handling

Cow	VOC		NH3		H2S*	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	32.6	11,907	101.9	37,191	2.4	859
Dry Cows	2.7	998	7.9	2,880	0.2	61
Support Stock (Heifers, Calves and Bulls)	17.5	6,385	33.8	12,332	0.7	271
Large Heifers	0.0	0	0.0	0	0	0
Medium Heifers	0.0	0	0.0	0	0	0
Small Heifers	0.0	0	0.0	0	0	0
Calves	0.0	0	0.0	0	0	0
Bulls	0.0	0	0.0	0	0	0
Total	52.8	19,290	143.6	52,403	3.3	1,191

Solid Manure Handling

Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	6.3	2,303	38.0	13,867
Dry Cows	0.5	195	2.9	1,073
Support Stock (Heifers, Calves and Bulls)	3.4	1,252	12.9	4,695
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
Bulls	0.0	0	0.0	0
Total	10.2	3,750	53.8	19,635

Feed Handling and Storage

	Daily PE (lb-VOC/day)	Annual PE (lb-VOC/yr)
Corn Emissions	16.9	6,181
Alfalfa Emissions	1.5	560
Wheat Emissions	16.8	6,135
TMR	262.6	95,832
Total	297.8	108,708

Calculations for milking parlor:

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

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

Calculations for cow housing:

See detailed calculations under Cow Housing Calculations worksheet.

Calculations for liquid manure and solid manure handling:

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

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

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

Calculations for silage emissions:

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

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

Calculation for TMR emissions:

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

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

Calves are not included in TMR calculation.

*Since there will be no change to the lagoons/storage ponds surface area, no change in H2S emissions is expected. Therefore, it will be assumed that PE1 for H2S emissions is equal to PE2 for H2S emissions.

Total Daily Pre-Project Potential to Emit (lb/day)

Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0.0	0.0	0.0	0.0	5.4	1.8	0.0
Cow Housing	0.0	0.0	223.5	0.0	205.7	400.7	0.0
Liquid Manure	0.0	0.0	0.0	0.0	52.8	143.6	3.3
Solid Manure	0.0	0.0	0.0	0.0	10.2	53.8	0.0
Feed Handling	0.0	0.0	0.0	0.0	297.8	0.0	0.0
Total	0.0	0.0	223.5	0.0	571.9	599.9	3.3

Major Source Emissions (lb/yr)

Permit	NOx	SOx	PM10	CO	VOC
Milk Parlor	0	0	0	0	0
Cow Housing	0	0	0	0	0
Liquid Manure	0	0	0	0	9,280
Solid Manure	0	0	0	0	0
Feed Handling	0	0	0	0	0
Total	0	0	0	0	9,280

Total Annual Pre-Project Potential to Emit (lb/yr)

Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	1,960	670	0
Cow Housing	0	0	81,521	0	75,204	146,216	0
Liquid Manure	0	0	0	0	19,290	52,403	1,191
Solid Manure	0	0	0	0	3,750	19,635	0
Feed Handling	0	0	0	0	108,708	0	0
Total	0	0	81,521	0	208,912	218,924	1,191

Post-Project Potential to Emit (PE2)

Post-Project Herd Size					
Herd	**Flushed Freestalls**	**Scraped Freestalls**	**Flushed Corrals**	**Scraped Corrals**	**Total # of Animals**
Milk Cows	7,278	0	0	0	7,278
Dry Cows	626	0	378	0	1,004
Support Stock (Heifers, Calves, and Bulls)	0	0	8,544	0	8,544
Large Heifers	0	0	0	0	0
Medium Heifers	0	0	0	0	0
Small Heifers	0	0	0	0	0
Bulls	0	0	0	0	0

	Calf Hutches				Calf Corrals		
	Aboveground Flushed	**Aboveground Scraped**	**On-Ground Flushed**	**On-Ground Scraped**	**Flushed**	**Scraped**	**Total # of Calves**
Calves	0	0	0	0	0	0	0

Silage Information				
Feed Type	Maximum # Open Piles	Maximum Height (ft)	Maximum Width (ft)	Open Face Area (ft^2)
Corn	1	20	200	2,720
Alfalfa	1	12	120	979
Wheat	1	20	150	2,135

Milking Parlor				
Cow	VOC		NH3	
Milk Cows	lb/day	lb/yr	lb/day	lb/yr
Total	**8.0**	**2,911**	**2.7**	**996**

Cow Housing						
	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Total	**296.0**	**108,050**	**581**	**211,824**	**216**	**78,756**

Liquid Manure Handling						
Cow	VOC		NH3		H2S	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	29.1	10,626	97.7	35,662	2.4	859
Dry Cows	2.2	793	6.8	2,490	0.2	61
Support Stock (Heifers, Calves, and Bulls)	14.3	5,212	30.0	10,936	0.7	271
Large Heifers	0.0	0	0.0	0	0	0
Medium Heifers	0.0	0	0.0	0	0	0
Small Heifers	0.0	0	0.0	0	0	0
Calves	0.0	0	0.0	0	0	0
Bulls	0.0	0	0.0	0	0	0
Total	**45.6**	**16,631**	**134.5**	**49,088**	**3.3**	**1,191**

Solid Manure Handling				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	9.4	3,421	56.4	20,597
Dry Cows	0.7	261	3.9	1,436
Support Stock (Heifers, Calves, and Bulls)	4.7	1,709	17.6	6,408
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
Bulls	0.0	0	0.0	0
Total	**14.8**	**5,391**	**77.9**	**28,440**

Feed Handling and Storage		
	Daily PE (lb-VOC/day)	Annual PE (lb-VOC/yr)
Corn Emissions	16.9	6,181
Alfalfa Emissions	1.5	560
Wheat Emissions	16.8	6,135
TMR	370.9	135,388
Total	**406.1**	**148,264**

Calculations for milking parlor:

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

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

Calculations for cow housing:

See detailed calculations under Cow Housing Calculations worksheet.

Calculations for liquid manure and solid manure handling:

Annual PE = [(# milk cows) x (EF1 lb-pollutant/hd-yr)] + [(# dry cows) x (EF2 lb-pollutant/hd-yr)] + [(# large heifers) x (EF2 lb-pollutant/hd-yr)] + [(# medium heifers) x (EF2 lb-pollutant/hd-yr)] + [(# small heifers) x (EF2 lb-pollutant/hd-yr)] + [(# calves) x (EF2 lb-pollutant/hd-yr)] + [(# bulls) x (EF2 lb-pollutant/hd-yr)]

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

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

Calculations for silage emissions:

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

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

Calculation for TMR emissions:

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

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

Calves are not included in TMR calculation.

Total Daily Post-Project Potential to Emit (lb/day)							
Permit	**NOx**	**SOx**	**PM10**	**CO**	**VOC**	**NH3**	**H2S**
Milking Parlor	0.0	0.0	0.0	0.0	8.0	2.7	0.0
Cow Housing	0.0	0.0	216.1	0.0	296.0	580.6	0.0
Liquid Manure	0.0	0.0	0.0	0.0	45.6	134.5	3.3
Solid Manure	0.0	0.0	0.0	0.0	14.8	77.9	0.0
Feed Handling	0.0	0.0	0.0	0.0	406.1	0.0	0.0
Total	**0.0**	**0.0**	**216.1**	**0.0**	**770.5**	**795.7**	**3.3**

Major Source Emissions (lb/yr)					
Permit	**NOx**	**SOx**	**PM10**	**CO**	**VOC**
Milk Parlor	0	0	0	0	0
Cow Housing	0	0	0	0	0
Liquid Manure	0	0	0	0	7,954
Solid Manure	0	0	0	0	0
Feed Handling	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**7,954**

Total Annual Post-Project Potential to Emit (lb/yr)							
Permit	**NOx**	**SOx**	**PM10**	**CO**	**VOC**	**NH3**	**H2S**
Milking Parlor	0	0	0	0	2,911	996	0
Cow Housing	0	0	78,756	0	108,050	211,824	0
Liquid Manure	0	0	0	0	16,631	49,088	1,191
Solid Manure	0	0	0	0	5,391	28,440	0
Feed Handling	0	0	0	0	148,264	0	0
Total	**0**	**0**	**78,756**	**0**	**281,246**	**290,349**	**1,191**

Defense Ranch

C-5701

Rev. May 7, 2019

Pre-Project Facility Information

1. Does this facility house Holstein or Jersey cows? Holstein
   Most facilities house Holstein cows unless explicitly stated on the PTO or application.
2. Does the facility have an anaerobic treatment lagoon? no
3. Does the facility land apply liquid manure? yes
   Answering "yes" assumes worst case.
4. Does the facility land apply solid manure? yes
   Answering "yes" assumes worst case.
5. Is any scraped manure sent to a lagoon/storage pond? facility does not scrape manure
   Answering "yes" assumes worst case.

Pre-Project Herd Size

Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows					0
Dry Cows					0
Support Stock (Heifers, Calves, and Bulls)			1,210		1,210
Large Heifers					0
Medium Heifers					0
Small Heifers					0
Bulls					0

	Calf Hutches				Calf Corrals		
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Flushed	Scraped	Total # of Calves
Calves							0

Total Herd Summary	
Total Milk Cows	0
Total Mature Cows	0
Support Stock (Heifers, Calves, and Bulls)	1,210
Total Calves	0
Total Dairy Head	1,210

Pre-Project Silage Information

Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn	1	15	70
Alfalfa			
Wheat	1	15	70

Dairy Emission Factors

lb/hd-yr Dairy Emissions Factors for Holstein Cows

			Milk Cows				Dry Cows				Large Heifers (15 to 24 months)				Medium Heifers (7 to 14 months)				Small Heifers (3 to 6 months)				Calves (0 - 3 months)				Bulls			
			Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled	
			<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2
Milking Parlor	VOC	Enteric Emissions in Milking Parlors	0.43	0.41	0.43	0.43	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-		-	-	-
		Milking Parlor Floor	0.04	0.03	0.04	0.04	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-		-	-	-
		Total	**0.47**	**0.44**	**0.47**	**0.47**	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-		-	-	-
	NH3	**Total**	**0.19**	**0.19**	**0.19**	**0.19**	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-		-	-	-
Cow Housing	VOC	Enteric Emissions in Cow Housing	3.89	3.69	3.89	3.89	2.33	2.23	2.33	2.33	1.81	1.71	1.81	1.81	1.23	1.17	1.23	1.23	0.69	0.65	0.69	0.69	0.32	0.31	0.32	0.32	1.10	1.04	1.10	1.10
		Corrals/Pens	10.00	6.60	8.10	8.10	5.40	3.59	4.37	4.37	4.20	2.76	3.40	3.40	2.85	1.88	2.31	2.31	1.60	1.04	1.30	1.30	0.75	0.50	0.61	0.61	2.55	1.67	2.07	2.07
		Bedding	1.05	1.00	0.85	0.85	0.57	0.54	0.46	0.46	0.44	0.42	0.36	0.36	0.30	0.28	0.24	0.24	0.17	0.16	0.14	0.14	0.08	0.08	0.06	0.06	0.27	0.25	0.22	0.22
		Lanes	0.84	0.60	0.84	0.84	0.45	0.44	0.45	0.45	0.35	0.33	0.35	0.35	0.24	0.23	0.24	0.24	0.13	0.13	0.13	0.13	0.06	0.06	0.06	0.06	0.21	0.20	0.21	0.21
		Total	**15.78**	**12.09**	**13.68**	**13.68**	**8.75**	**6.80**	**7.62**	**7.62**	**6.81**	**5.22**	**5.93**	**5.93**	**4.62**	**3.56**	**4.02**	**4.02**	**2.59**	**1.98**	**2.26**	**2.26**	**1.22**	**0.95**	**1.06**	**1.06**	**4.13**	**3.16**	**3.59**	**3.59**
	NH3	Enteric Emissions in Cow Housing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Corrals/Pens	41.90	41.90	41.90	41.90	21.20	21.20	21.20	21.20	11.00	11.00	11.00	11.00	7.90	7.90	7.90	7.90	6.00	6.00	6.00	6.00	1.80	1.80	1.80	1.80	15.30	15.30	15.30	15.30
		Bedding	6.30	6.30	6.30	6.30	3.20	3.20	3.20	3.20	1.70	1.70	1.70	1.70	1.20	1.20	1.20	1.20	0.90	0.90	0.90	0.90	0.30	0.30	0.30	0.30	2.30	2.30	2.30	2.30
		Lanes	5.10	5.10	5.10	5.10	2.60	2.60	2.60	2.60	1.30	1.30	1.30	1.30	1.00	1.00	1.00	1.00	0.70	0.70	0.70	0.70	0.20	0.20	0.20	0.20	1.90	1.90	1.90	1.90
		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**	**10.10**	**10.10**	**10.10**	**10.10**	**7.60**	**7.60**	**7.60**	**7.60**	**2.30**	**2.30**	**2.30**	**2.30**	**19.50**	**19.50**	**19.50**	**19.50**
Liquid Manure Handling	VOC	Lagoons/Storage Ponds	1.52	1.30	1.52	1.52	0.82	0.71	0.82	0.82	0.64	0.54	0.64	0.64	0.43	0.37	0.43	0.43	0.24	0.21	0.24	0.24	0.11	0.10	0.11	0.11	0.40	0.33	0.40	0.40
		Liquid Manure Land Application	1.64	1.40	1.64	1.64	0.89	0.76	0.89	0.89	0.69	0.58	0.69	0.69	0.47	0.40	0.47	0.47	0.26	0.22	0.26	0.26	0.12	0.11	0.12	0.12	0.42	0.35	0.42	0.42
		Total	**3.16**	**2.70**	**3.16**	**3.16**	**1.71**	**1.47**	**1.71**	**1.71**	**1.33**	**1.13**	**1.33**	**1.33**	**0.90**	**0.77**	**0.90**	**0.90**	**0.51**	**0.43**	**0.51**	**0.51**	**0.24**	**0.21**	**0.24**	**0.24**	**0.82**	**0.68**	**0.82**	**0.82**
	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	1.50	1.50	1.50	1.50	1.20	1.20	1.20	1.20	0.35	0.35	0.35	0.35	3.00	3.00	3.00	3.00
		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	1.70	1.70	1.70	1.70	1.30	1.30	1.30	1.30	0.37	0.37	0.37	0.37	3.23	3.23	3.23	3.23
		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**	**3.20**	**3.20**	**3.20**	**3.20**	**2.50**	**2.50**	**2.50**	**2.50**	**0.72**	**0.72**	**0.72**	**0.72**	**6.23**	**6.23**	**6.23**	**6.23**
Solid Manure Handling	VOC	Solid Manure Storage	0.16	0.15	0.16	0.16	0.09	0.08	0.09	0.09	0.07	0.06	0.07	0.07	0.05	0.04	0.05	0.05	0.03	0.02	0.03	0.03	0.01	0.01	0.01	0.01	0.04	0.04	0.04	0.04
		Separated Solids Piles	0.06	0.06	0.06	0.06	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02
		Solid Manure Land Application	0.39	0.33	0.39	0.39	0.21	0.18	0.21	0.21	0.16	0.14	0.16	0.16	0.11	0.09	0.11	0.11	0.06	0.05	0.06	0.06	0.03	0.03	0.03	0.03	0.10	0.08	0.10	0.10
		Total	**0.61**	**0.54**	**0.61**	**0.61**	**0.33**	**0.29**	**0.33**	**0.33**	**0.26**	**0.23**	**0.26**	**0.26**	**0.17**	**0.15**	**0.17**	**0.17**	**0.10**	**0.09**	**0.10**	**0.10**	**0.05**	**0.04**	**0.05**	**0.05**	**0.16**	**0.14**	**0.16**	**0.16**
	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	0.18	0.18	0.18	0.18	0.13	0.13	0.13	0.13	0.04	0.04	0.04	0.04	0.35	0.35	0.35	0.35
		Separated Solids Piles	0.38	0.38	0.38	0.38	0.19	0.19	0.19	0.19	0.10	0.10	0.10	0.10	0.07	0.07	0.07	0.07	0.05	0.05	0.05	0.05	0.02	0.02	0.02	0.02	0.14	0.14	0.14	0.14
		Solid Manure Land Application	2.09	2.09	2.09	2.09	1.06	1.06	1.06	1.06	0.55	0.55	0.55	0.55	0.39	0.39	0.39	0.39	0.30	0.30	0.30	0.30	0.09	0.09	0.09	0.09	0.76	0.76	0.76	0.76
		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**	**0.64**	**0.64**	**0.64**	**0.64**	**0.48**	**0.48**	**0.48**	**0.48**	**0.15**	**0.15**	**0.15**	**0.15**	**1.25**	**1.25**	**1.25**	**1.25**

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

		Silage Type	Uncontrolled	EF1	EF2
Feed Storage and Handling	VOC	Corn Silage	34,681	34,681	34,681
		Alfalfa Silage	17,458	17,458	17,458
		Wheat Silage	43,844	43,844	43,844
		TMR	13,056	13,056	13,056

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

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

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

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

PM10 Mitigation Measures and Control Efficiencies

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

Pre-Project PM10 Mitigation Measures

Pre-Project PM10 Mitigation Measures														
	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	# of Combined Housing Structures in row	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk
1	Support Stock Housing	open corral	support stock	1,210	1,210	1	☑	☐	☐	☐	☐	☐	☐	☐	☐
			Pre-Project Total # of Cows	1,210											

Pre-Project PM10 Control Efficiencies and Emission Factors

	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)
1	Support Stock Housing	open corral	support stock	1,210	1,210	10.550	8.3%									9.67
			Pre-Project Total # of Cows	1,210												

Pre-Project Potential to Emit (PE1)

Pre-Project Herd Size							
Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals		
Milk Cows	0	0	0	0	0		
Dry Cows	0	0	0	0	0		
Support Stock (Heifers, Calves and Bulls)	0	0	1,210	0	1,210		
Large Heifers	0	0	0	0	0		
Medium Heifers	0	0	0	0	0		
Small Heifers	0	0	0	0	0		
Bulls	0	0	0	0	0		
	Calf Hutches				Calf Corrals		
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Flushed	Scraped	Total # of Calves
Calves	0	0	0	0	0	0	0

Silage Information				
Feed Type	Maximum # Open Piles	Maximum Height (ft)	Maximum Width (ft)	Open Face Area (ft^2)
Corn	1	15	70	803
Alfalfa	0	0	0	
Wheat	1	15	70	803

Milking Parlor				
Cow	VOC		NH3	
Milk Cows	lb/day	lb/yr	lb/day	lb/yr
	0.0	0	0.0	0

Cow Housing						
Cow	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Total	19.7	7,175	46.4	16,940	32.1	11,706

Liquid Manure Handling						
Cow	VOC		NH3		H2S*	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	0.0	0	0.0	0	0	0
Dry Cows	0.0	0	0.0	0	0	0
Support Stock (Heifers, Calves and Bulls)	4.4	1,609	14.9	5,445	0.7	266
Large Heifers	0.0	0	0.0	0	0	0
Medium Heifers	0.0	0	0.0	0	0	0
Small Heifers	0.0	0	0.0	0	0	0
Calves	0.0	0	0.0	0	0	0
Bulls	0.0	0	0.0	0	0	0
Total	4.4	1,609	14.9	5,445	0.7	266

Solid Manure Handling				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	0.0	0	0.0	0
Dry Cows	0.0	0	0.0	0
Support Stock (Heifers, Calves and Bulls)	0.9	315	3.0	1,089
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
Bulls	0.0	0	0.0	0
Total	0.9	315	3.0	1,089

Feed Handling and Storage		
	Daily PE (lb-VOC/day)	Annual PE (lb-VOC/yr)
Corn Emissions	8.2	2,991
Alfalfa Emissions	0.0	0
Wheat Emissions	10.4	3,782
TMR	32.9	12,020
Total	51.5	18,793

Calculations for milking parlor:

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

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

Calculations for cow housing:

See detailed calculations under Cow Housing Calculations worksheet.

Calculations for liquid manure and solid manure handling:

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

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

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

Calculations for silage emissions:

Annual PE = (EF1) x (area ft^3) x (0.0929 m^2/ft^3) x (8,760 hr/yr) x (60 min/hr) x 2.20E-9 lb/µg

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

Calculation for TMR emissions:

Annual PE = (# cows) x (EF1) x (0.658 m^3) x (525,600 min/yr) x (2.20E-9 lb/µg)

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

Calves are not included in TMR calculation.

*Since there will be no change to the lagoons/storage ponds surface area, no change in H2S emissions is expected. Therefore, it will be assumed that PE1 for H2S emissions is equal to PE2 for H2S emissions.

Total Daily Pre-Project Potential to Emit (lb/day)							
Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cow Housing	0.0	0.0	32.1	0.0	19.7	46.4	0.0
Liquid Manure	0.0	0.0	0.0	0.0	4.4	14.9	0.7
Solid Manure	0.0	0.0	0.0	0.0	0.9	3.0	0.0
Feed Handling	0.0	0.0	0.0	0.0	51.5	0.0	0.0
Total	0.0	0.0	32.1	0.0	76.5	64.3	0.7

Major Source Emissions (lb/yr)					
Permit	NOx	SOx	PM10	CO	VOC
Milk Parlor	0	0	0	0	0
Cow Housing	0	0	0	0	0
Liquid Manure	0	0	0	0	772
Solid Manure	0	0	0	0	0
Feed Handling	0	0	0	0	0
Total	0	0	0	0	772

Total Annual Pre-Project Potential to Emit (lb/yr)							
Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	0	0	0
Cow Housing	0	0	11,706	0	7,175	16,940	0
Liquid Manure	0	0	0	0	1,609	5,445	266
Solid Manure	0	0	0	0	315	1,089	0
Feed Handling	0	0	0	0	18,793	0	0
Total	0	0	11,706	0	27,892	23,474	266

APPENDIX D

BACT Calculations

Pre-Project Worst Case BACT Calculations - Cow Housing

This table uses the worst case emission factor for each cow type and the maximum design capacity of the housing unit. This should only be used for BACT calculation purposes.

Worst-Case Pre-Project Potential to Emit - Cow Housing

	Housing Name(s) or #(s)	Type of Cow	Capacity per housing unit	Controlled VOC EF (lb/hd-yr)	Controlled NH3 EF (lb/hd-yr)	Controlled PM10 EF (lb/hd-yr)	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)	
1	FS 1	milk cows	419	9.35	21.13	10.55	10.7	3,918	24.3	8,853	12.1	4,420	
2	FS 12 (Ex. Pens)	milk cows	609	9.35	21.13	10.55	15.6	5,694	35.3	12,867	17.6	6,425	
3	FS 3	milk cows	800	9.35	21.13	10.55	20.5	7,480	46.3	16,903	23.1	8,440	
4	FS 10 (Ex. Pens)	milk cows	800	9.35	21.13	10.55	20.5	7,480	46.3	16,903	23.1	8,440	
5	FS 5	milk cows	800	9.35	21.13	10.55	20.5	7,480	46.3	16,903	23.1	8,440	
6	FS 14 (Ex. Pens)	milk cows	800	9.35	21.13	10.55	20.5	7,480	46.3	16,903	23.1	8,440	
7	FS 7	milk cows	800	9.35	21.13	10.55	20.5	7,480	46.3	16,903	23.1	8,440	
8	FS 2	milk cows	419	9.35	21.13	10.55	10.7	3,918	24.3	8,853	12.1	4,420	
9	FS 13 (Ex. Pens)	milk cows	609	9.35	21.13	10.55	15.6	5,694	35.3	12,867	17.6	6,425	
10	FS 4	milk cows	800	9.35	21.13	10.55	20.5	7,480	46.3	16,903	23.1	8,440	
11	FS 11 (Ex. Pens)	milk cows	750	9.35	21.13	10.55	19.2	7,013	43.4	15,846	21.7	7,913	
12	FS 6	milk cows	700	9.35	21.13	10.55	17.9	6,545	40.5	14,790	20.2	7,385	
13	FS 8	milk cows	700	9.35	21.13	10.55	17.9	6,545	40.5	14,790	20.2	7,385	
14	FS 9	dry cows	377	9.35	21.13	5.28	9.7	3,525	21.8	7,965	5.5	1,991	
15	LB 10 (A - C)	dry cows	157	9.35	21.13	9.67	4.0	1,468	9.1	3,317	4.2	1,519	*
16	OC 11 (A - E)	support stock	71	9.35	21.13	9.67	1.8	664	4.1	1,500	1.9	687	*
17	OC 12 (A & B)	support stock	300	9.35	21.13	9.67	7.7	2,805	17.4	6,338	8.0	2,902	*
18	OC 13	support stock	175	9.35	21.13	10.55	4.5	1,636	10.1	3,697	5.1	1,846	
19	OC 14 (Hutches)	calves	500	0.74	0.90	0.07	1.0	370	1.2	450	0.1	35	
20	OC 15 (A & B)	support stock	633	9.35	21.13	10.55	16.2	5,919	36.6	13,374	18.3	6,678	*
21	OC 16 (A & B)	support stock	633	9.35	21.13	10.55	16.2	5,919	36.6	13,374	18.3	6,678	*
22	OC 17 (B & C)	support stock	185	9.35	21.13	10.55	4.7	1,730	10.7	3,909	5.3	1,952	*
23	OC 18	support stock	840	9.35	21.13	10.55	21.5	7,854	48.6	17,748	24.3	8,862	
24	OC 19 (A - C)	support stock	280	9.35	21.13	10.55	7.2	2,618	16.2	5,916	8.1	2,954	*
25	OC 20	support stock	414	9.35	21.13	10.55	10.6	3,871	24.0	8,747	12.0	4,368	
26	OC 21 (A & B)	support stock	196	9.35	21.13	10.55	5.0	1,833	11.3	4,141	5.7	2,068	*
							340.7	**124,419**	**769.1**	**280,760**	**376.9**	**137,553**	

*Multiple emissions units (freestalls, corrals, calf hutch areas, etc.) are combined in these rows. BACT applicability has been calculated for EACH emissions unit in this row.

Pre-Project Totals

VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
340.7	**124,419**	**769.1**	**280,760**	**376.9**	**137,553**

Calculations:

Annual PE 1 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)
Daily PE1 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

Post-Project Worst Case BACT Calculations - Existing Cow Housing

This table uses the worst case emission factor for each cow type and the maximum design capacity of the housing unit. This should only be used for BACT calculation purposes.

Post-Project Worst Case BACT Calculations - Existing Cow Housing

	Housing Name(s) or #(s)	Type of Cow	Capacity per housing unit	Controlled VOC EF (lb/hd-yr)	Controlled NH3 EF (lb/hd-yr)	Controlled PM10 EF (lb/hd-yr)	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)	VOC AIPE	NH3 AIPE	PM10 AIPE	BACT Triggered for VOC?	BACT Triggered for NH3?	BACT Triggered for PM10?
1	FS 1	milk cows	419	9.35	21.13	10.55	10.7	3,918	24.3	8,853	12.1	4,420	0.0	0.0	0.0	No	No	No
2	FS 12	milk cows	420	9.35	21.13	10.55	10.8	3,927	24.3	8,874	12.1	4,431	-4.8	-11.0	-5.5	No	No	No
3	FS 3	milk cows	800	9.35	21.13	10.55	20.5	7,480	46.3	16,903	23.1	8,440	0.0	0.0	0.0	No	No	No
4	FS 10	milk cows	400	9.35	21.13	10.55	10.2	3,740	23.2	8,451	11.6	4,220	-10.3	-23.1	-11.5	No	No	No

5	FS 5	milk cows	800	9.35	21.13	10.55	20.5	7,480	46.3	16,903	23.1	8,440	0.0	0.0	0.0	No	No	No
6	FS 14	milk cows	800	9.35	21.13	10.55	20.5	7,480	46.3	16,903	23.1	8,440	0.0	0.0	0.0	No	No	No
7	FS 7	milk cows	800	9.35	21.13	10.55	20.5	7,480	46.3	16,903	23.1	8,440	0.0	0.0	0.0	No	No	No
8	FS 2	milk cows	419	9.35	21.13	10.55	10.7	3,918	24.3	8,853	12.1	4,420	0.0	0.0	0.0	No	No	No
9	FS 13	milk cows	420	9.35	21.13	10.55	10.8	3,927	24.3	8,874	12.1	4,431	-4.8	-11.0	-5.5	No	No	No
10	FS 4	milk cows	800	9.35	21.13	10.55	20.5	7,480	46.3	16,903	23.1	8,440	0.0	0.0	0.0	No	No	No
11	FS 11	milk cows	800	9.35	21.13	10.55	20.5	7,480	46.3	16,903	23.1	8,440	1.3	2.9	1.4	No	Yes	No
12	FS 6	milk cows	700	9.35	21.13	10.55	17.9	6,545	40.5	14,790	20.2	7,385	0.0	0.0	0.0	No	No	No
13	FS 8	dry cows	700	9.35	21.13	10.55	17.9	6,545	40.5	14,790	20.2	7,385	0.0	0.0	0.0	No	No	No
14	FS 9 (A & B)	dry cows	189	9.35	21.13	5.28	4.8	1,767	10.9	3,993	2.7	998	-4.9	-10.9	-2.8	No	No	No
15	LB 10 (A - C)	support stock	157	9.35	21.13	8.47	4.0	1,468	9.1	3,317	3.6	1,329	0.0	0.0	-0.1	No	No	No
16	OC 11 (A - G)	support stock	51	9.35	21.13	8.47	1.3	477	3.0	1,078	1.2	432	-0.5	-1.1	-0.5	No	No	No
17	OC 12 (A & B)	support stock	300	9.35	21.13	8.47	7.7	2,805	17.4	6,338	7.0	2,540	0.0	0.0	0.0	No	No	No
18	OC 13 (Removed)	support stock	0	9.35	21.13	8.47	0.0	0	0.0	0	0.0	0	-4.5	-10.1	-4.1	No	No	No
19	OC 14 (Hutches)	calves	750	0.74	0.90	0.06	1.5	555	1.8	675	0.1	45	0.5	0.6	0.0	No	No	No
20	OC 15 (A & B)	support stock	633	9.35	21.13	9.23	16.2	5,919	36.6	13,374	16.0	5,843	0.0	0.0	0.0	No	No	No
21	OC 16 (A & B)	support stock	633	9.35	21.13	9.23	16.2	5,919	36.6	13,374	16.0	5,843	0.0	0.0	0.0	No	No	No
22	OC 17 (B & C)	support stock	185	9.35	21.13	9.23	4.7	1,730	10.7	3,909	4.7	1,708	0.0	0.0	0.1	No	No	No
23	OC 17A (replaced 18)	support stock	837	9.35	21.13	9.23	21.4	7,826	48.4	17,684	21.2	7,726	-0.1	-0.2	-0.1	No	No	No
24	OC 19 (A - C)	support stock	279	9.35	21.13	9.23	7.1	2,609	16.2	5,895	7.1	2,575	-0.1	0.0	0.0	No	No	No
25	OC 20	support stock	413	9.35	21.13	9.23	10.6	3,862	23.9	8,726	10.4	3,812	0.0	-0.1	-0.1	No	No	No
26	OC 21 (A & B)	support stock	195	9.35	21.13	9.23	5.0	1,823	11.3	4,120	4.9	1,800	0.0	0.0	-0.1	No	No	No
							312.5	**114,160**	**705.1**	**257,386**	**333.9**	**121,983**						

*Multiple emissions units (freestalls, corrals, calf hutch areas, etc.) are combined in these rows. BACT applicability has been calculated for EACH emissions unit in this row.

Calculations:

Annual PE 2 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)
Daily PE2 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

	Housing Name(s) or #(s)	Type of Cow	Capacity per housing unit	Controlled VOC EF (lb/hd-yr)	Controlled NH3 EF (lb/hd-yr)	Controlled PM10 EF (lb/hd-yr)	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)	BACT Triggered for VOC?	BACT Triggered for NH3?	BACT Triggered for PM10?	
1	OC 22 (A & B)	support stock	375	9.35	21.13	6.48	9.6	3,506	21.7	7,923	6.7	2,430	Yes	Yes	Yes	*
2	OC 23 (A & B)	support stock	375	9.35	21.13	6.48	9.6	3,506	21.7	7,923	6.7	2,430	Yes	Yes	Yes	*
3	OC 24 (A - C)	support stock	283	9.35	21.13	6.48	7.2	2,646	16.4	5,979	5.0	1,834	Yes	Yes	Yes	*
4	OC 25	support stock	149	9.35	21.13	6.48	3.8	1,393	8.6	3,148	2.6	966	Yes	Yes	Yes	
5	OC 26 (A & B)	support stock	234	9.35	21.13	6.48	6.0	2,188	13.5	4,944	4.2	1,516	Yes	Yes	Yes	*
6	OC 27 (A & B)	support stock	85	9.35	21.13	3.93	2.2	795	4.9	1,796	0.9	334	Yes	Yes	No	*
7																
8																
9																
10																
11																
12																
13																
14																
							38.4	**14,034**	**86.8**	**31,713**	**26.1**	**9,510**				

*Multiple emissions units (freestalls, corrals, calf hutch areas, etc.) are combined in these rows. BACT applicability has been calculated for EACH emissions unit in this row.

Post-Project Totals					
VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
350.9	**128,194**	**791.9**	**289,099**	**360.0**	**131,493**

Calculations:

Annual PE 2 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)
Daily PE2 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

BACT Applicability

Milking Parlor					
VOC Emissions					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	8.0	5.4	0.40	0.40	2.6
BACT triggered for VOC for milking parlor				Total	2.6
NH3 Emissions					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	2.7	1.8	0.14	0.14	0.9
				Total	0.9

Cow Housing
See detailed cow housing AIPE calculations on the BACT Calcs page.

Liquid Manure Handling					
VOC Emissions - Lagoon/Storage Pond(s)					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	14.0	15.7	0.70	1.17	4.6
Dry Cows	1.0	1.3	0.38	0.64	0.2
Support Stock (Heifers, Calves, and Bulls)	6.8	8.4	0.29	0.49	1.8
Large Heifers	0.0	0.0	0.29	0.49	0.0
Medium Heifers	0.0	0.0	0.20	0.33	0.0
Small Heifers	0.0	0.0	0.11	0.19	0.0
Calves	0.0	0.0	0.05	0.09	0.0
Bulls	0.0	0.0	0.18	0.30	0.0
BACT triggered for VOC for Lagoon/Storage Ponds				Total	6.7
VOC Emissions - Land Application					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	15.1	16.9	0.76	1.26	5.0
Dry Cows	1.1	1.4	0.41	0.69	0.3
Support Stock (Heifers, Calves, and Bulls)	7.4	9.0	0.32	0.53	2.0
Large Heifers	0.0	0.0	0.32	0.53	0.0
Medium Heifers	0.0	0.0	0.22	0.36	0.0
Small Heifers	0.0	0.0	0.12	0.20	0.0
Calves	0.0	0.0	0.06	0.10	0.0
Bulls	0.0	0.0	0.19	0.32	0.0
BACT triggered for VOC for Liquid Manure Land Application				Total	7.2
NH3 Emissions - Lagoon/Storage Pond(s)					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	23.5	15.9	1.18	1.18	7.6
Dry Cows	1.7	1.2	0.60	0.60	0.5
Support Stock (Heifers, Calves, and Bulls)	7.4	5.4	0.32	0.32	2.0
Large Heifers	0.0	0.0	0.32	0.32	0.0
Medium Heifers	0.0	0.0	0.22	0.22	0.0
Small Heifers	0.0	0.0	0.17	0.17	0.0
Calves	0.0	0.0	0.05	0.05	0.0
Bulls	0.0	0.0	0.43	0.43	0.0
BACT triggered for NH3 for Lagoon/Storage Ponds				Total	10.1
NH3 Emissions - Land Application					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	74.1	86.0	3.72	5.41	24.2
Dry Cows	5.2	6.7	1.86	3.24	1.3
Support Stock (Heifers, Calves, and Bulls)	22.5	28.4	0.96	1.66	6.0
Large Heifers	0.0	0.0	0.96	1.66	0.0
Medium Heifers	0.0	0.0	0.71	1.22	0.0
Small Heifers	0.0	0.0	0.54	0.94	0.0
Calves	0.0	0.0	0.15	0.27	0.0
Bulls	0.0	0.0	1.35	2.33	0.0
BACT triggered for NH3 for Liquid Manure Land Application				Total	31.6
H2S Emissions - Lagoon/Storage Pond(s)					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	2.4	2.4	0.12	0.12	0.0
Dry Cows	0.2	0.2	0.06	0.06	0.0
Support Stock (Heifers, Calves, and Bulls)	0.7	0.7	0.03	0.03	0.0
Large Heifers	0.0	0.0	0.03	0.03	0.0
Medium Heifers	0.0	0.0	0.02	0.02	0.0
Small Heifers	0.0	0.0	0.02	0.02	0.0
Calves	0.0	0.0	0.01	0.01	0.0
Bulls	0.0	0.0	0.04	0.04	0.0
				Total	0.0

Solid Manure Handling					
VOC Emissions - Solid Manure Storage/Separated Solids Piles					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	3.5	2.4	0.18	0.18	1.1
Dry Cows	0.3	0.2	0.10	0.10	0.1
Support Stock (Heifers, Calves, and Bulls)	1.7	1.3	0.10	0.07	0.4
Large Heifers	0.0	0.0	0.07	0.07	0.0
Medium Heifers	0.0	0.0	0.05	0.05	0.0
Small Heifers	0.0	0.0	0.03	0.03	0.0
Calves	0.0	0.0	0.01	0.01	0.0
Bulls	0.0	0.0	0.05	0.05	0.0
				Total	1.6
VOC Emissions - Land Application					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	5.9	4.0	0.30	0.30	1.9
Dry Cows	0.4	0.3	0.16	0.16	0.1
Support Stock (Heifers, Calves, and Bulls)	2.9	2.1	0.12	0.12	0.8
Large Heifers	0.0	0.0	0.12	0.12	0.0
Medium Heifers	0.0	0.0	0.08	0.08	0.0
Small Heifers	0.0	0.0	0.05	0.05	0.0
Calves	0.0	0.0	0.02	0.02	0.0
Bulls	0.0	0.0	0.07	0.07	0.0
BACT triggered for VOC for Solid Manure Land Application				Total	2.8
NH3 Emissions - Solid Manure Storage/Separated Solids Piles					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	26.5	17.9	1.33	1.33	8.6
Dry Cows	1.8	1.4	0.67	0.67	0.4
Support Stock (Heifers, Calves, and Bulls)	8.2	6.0	0.35	0.35	2.2
Large Heifers	0.0	0.0	0.35	0.35	0.0
Medium Heifers	0.0	0.0	0.25	0.25	0.0
Small Heifers	0.0	0.0	0.18	0.18	0.0
Calves	0.0	0.0	0.06	0.06	0.0
Bulls	0.0	0.0	0.49	0.49	0.0
BACT triggered for NH3 for Solid Manure Storage				Total	11.2
NH3 Emissions - Land Application					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	30.0	20.2	1.50	1.50	9.8
Dry Cows	2.1	1.6	0.76	0.76	0.5
Support Stock (Heifers, Calves, and Bulls)	9.3	6.8	0.40	0.40	2.5
Large Heifers	0.0	0.0	0.40	0.40	0.0
Medium Heifers	0.0	0.0	0.28	0.28	0.0
Small Heifers	0.0	0.0	0.22	0.22	0.0
Calves	0.0	0.0	0.06	0.06	0.0
Bulls	0.0	0.0	0.55	0.55	0.0
BACT triggered for NH3 for Solid Manure Land Application				Total	12.8

Feed Storage and Handling					
VOC Emissions - Silage					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Corn Silage	16.9	16.9	21,155	21,155	0.0
Alfalfa Silage	1.5	1.5	10,649	10,649	0.0
Wheat Silage	16.8	16.8	26,745	26,745	0.0
				Total	0.0
VOC Emissions - TMR					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
TMR	370.9	262.6	10,575	10,575	108.3
BACT triggered for VOC for TMR				Total	108.3

APPENDIX E

BACT Guidelines

San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 5.8.1*

Last Update: 12/18/2013

Milking Parlor

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Flush/Spray before, after, or during milking each group of cows	1) Enclosure of milk parlor with biogas vented to incinerator with 95% control 2) Enclosure of milk parlor with biogas vented to biofilter with minimum 80% control	
NH3	Flush/Spray before, after, or during milking each group of cows		

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 5.8.3*

Last Update: 03/17/2015

Cow Housing - Open Corrals

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	1) Concrete feed lanes and walkways; 2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, Scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day); 3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines; 4) Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface; 5) Scraping corrals and exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions; and 6) Rule 4570 Measures (only for facilities subject to Rule 4570)		

PM10	1) Concrete feed lanes and walkways; 2) Scraping of open corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; 3) Shade structures in open corrals; 4) Feeding heifers in corrals near dusk (within 1 hour of dusk); and 5) Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities); or 6) An alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%) may be applied as a replacement for the previous measures	

NH3	1) Concrete feed lanes and walkways; 2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, Scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day); 3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines; 4) Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface; and 5) Scraping corrals and exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions;

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 5.8.4*

Last Update: 03/17/2015

Cow Housing - Loafing Barns

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	1) Concrete feed lanes and walkways; 2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, Scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day); 3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines; 4) Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface; 5) Scraping pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions; and 6) Rule 4570 Measures		

PM10	1) Concrete feed lanes and walkways; 2) Scraping exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions; 3) Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities); or 4) An alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%) may be applied as a replacement for the previous measures	

NH3	1) Concrete feed lanes and walkways; 2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, Scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day); 3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines; 4) Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface; 5) Scraping pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions.	

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 5.8.6*

Last Update: 12/18/2013

Liquid Manure Handling - Lagoon/Storage Pond

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Anaerobic treatment lagoon designed according to NRCS Guideline, and solids removal/separation system (mechanical separator(s) or settling basin(s)/weeping wall(s))	1) Aerobic treatment lagoon or mechanically aerated lagoon; 2) Covered lagoon digester vented to a control device with minimum 95% control	
NH3	All animals fed in accordance with NRCS or other District-approved guidelines		

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 5.8.7*

Last Update: 12/18/2013

Liquid Manure Handling - Liquid/Slurry Land Application

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Irrigation of crops using liquid/slurry manure from the secondary lagoon/holding/storage pond preceded by an uncovered anaerobic treatment lagoon designed to meet Natural Resources Conservation Service (NRCS) standards	1) Irrigation of crops using liquid manure from an aerobic treatment lagoon or mechanically aerated lagoon (95% VOC control efficiency) 2) Irrigation of crops using liquid manure from a holding/storage pond after being treated in a covered lagoon/digester (80% VOC control efficiency)	
NH3	All animals fed in accordance with NRCS or other District-approved guidelines		

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 5.8.8*

Last Update: 12/18/2013

Solid Manure Handling - Storage/Separated Solids Piles

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
NH3	All animals fed in accordance with NRCS or other District-approved guidelines		

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 5.8.9*

Last Update: 12/18/2013

Solid Manure Handling - Land Application

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Rapid incorporation of solid manure into the soil after land application	1a) Land Application of Solid Manure Processed by Either an Open or Enclosed Negatively-Aerated Static Pile (ASP) Vented to a biofilter (or equivalent) ≥ 80% destruction efficiency With Rapid Incorporation of the Manure Into the Soil After Land Application; 1b) Land Application of Solid Manure Processed by In-Vessel/Enclosed Negatively-Aerated Static Piles vented to biofilter ≥ 80% destruction efficiency; 2) Land Application of Solid Manure Processed by Open Negatively-Aerated Static Piles vented to biofilter ≥ 80% destruction efficiency; 3) Land Application of Solid Manure Processed by an Open Negatively-Aerated Static Piles (ASP) (With Thick Layer of Bulking Agent or Equivalent) With Rapid Incorporation of the Manure Into the Soil After Land Application	
NH3	Rapid incorporation of solid manure into the soil after land application, and all animals fed in accordance with NRCS or other District-approved guidelines		

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a State Implementation Plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

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San Joaquin Valley
Unified Air Pollution Control District

Best Available Control Technology (BACT) Guideline 5.8.11*

Last Update: 12/18/2013

Feed Storage and Handling - Feed/TMR

Pollutant	Achieved in Practice or contained in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	District Rule 4570 Measures for Feed/TMR		

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a State Implementation Plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

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APPENDIX F

BACT Analysis

I. Top-Down BACT Analysis for Milking Parlors

BACT Analysis for VOC Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.1 identifies the following controls for VOC emissions from milking parlors:

1) Enclosure of milk parlor with biogas vented to incinerator with minimum 95% control – Technologically Feasible

2) Enclosure of milk parlor with biogas vented to biofilter with minimum 80% control – Technologically Feasible

3) Flush/spray before, after, or during milking each group of cows – Achieved in Practice

Description of Control Technologies

Milking Parlors Vented to an Incinerator

Milking parlors can be either naturally or mechanically ventilated. According to some dairy designers, mechanical ventilation is more reliable than natural ventilation. Mechanical ventilation can be easily applied to all areas of the milking parlors, except the holding area. 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. Although the feasibility of such a technology is in question, it will be considered in this analysis.

The captured VOC emissions could then be sent to an incinerator. Thermal incineration is a well-established VOC control technique. During combustion, gaseous hydrocarbons are oxidized to form CO_2 and water. It is assumed that 95% of the gasses emitted from the milking parlor will be captured by the mechanical ventilation system and that 98% of the captured VOCs will be eliminated by thermal incineration[1]; therefore the total control for VOCs from the milking parlor = 0.95 x 0.98 = 93.1%.

Milking Parlor Vented to a Biofilter

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.

[1] OAQPS Control Cost Manual, 4th Edition, EPA 450/3-90-006, January 1990, page 3-8.

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 prevent 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 the 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.

It is assumed that 95% 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 80% of the captured VOC emissions[2]; therefore, the total control for VOCs from the enclosed animal housing = 0.95 x 0.80 = 76%.

Flush/Spray Milking Parlor Before, After, or During Milking Each Group of Cows

Almost all dairy operations utilize some type of flush or spray system to wash out the manure that dairy cows deposit in the milking parlors. The primary purpose of the flush or spray system is to maintain the minimum level of sanitation required in the milking parlors. However, this system also serves as an emission control for reducing VOC and ammonia emissions. The manure deposited in the milking parlor, which is a source of VOC emissions, is removed from the milking parlors many times a day by flushing after each milking. 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 milking parlors. 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.

[2] 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/docs/default-source/rule-book/support-documents/rule-1133/staff-report.pdf?sfvrsn=2

It must be noted that flushing or spraying out the milking parlors before, after, or during each group of cows is milked 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. It will be assumed that the control efficiency for VOCs emitted from manure is 75%. Enteric emissions compose approximately 78% of the VOC emissions from the milking parlor and VOC emissions from the manure make up the remaining 22%; therefore the total control for VOCs from the milking parlor = 0.75 x 0.22 = 16.5%.

b. Step 2 - Eliminate technologically infeasible options

All the options identified in step 1 are technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

1) Enclosure of milk parlor with biogas vented to incinerator (93% VOC control efficiency)
2) Enclosure of milk parlor with biogas vented to biofilter (76% VOC control efficiency)
3) Flush/spray before, after, or during milking each group of cows (16.5% VOC control efficiency)

d. Step 4 - Cost Effectiveness Analysis

1) Milking Parlor Vented to an Incinerator

The following cost analysis will be performed to determine whether the cost of natural gas alone, not including any capital costs, causes catalytic incineration to exceed the District VOC cost effectiveness threshold. The temperature required for catalytic incineration is 600 °F. The temperature required for thermal incineration is 1,400 °F. Since the fuel requirements and fuel cost for thermal incineration are greater than catalytic incineration, if catalytic incineration is determined not to be cost effective, then it can logically be reasoned that thermal incineration will not be cost effective as well.

Air Flow Rate of Milking Parlor

In order to effectively calculate the costs of this control option, the airflow rate of the milking parlors must be determined. According to Cornell University's publication "Environmental Controls for Today's Milking Center", the minimum ventilation rate required for milking parlors is 15 room exchanges per hour in the winter and 60 to 90 room exchanges per hour in the summer. For calculation purposes, an average airflow rate of 35 room exchanges will assumed for the milking parlor.

The following analysis is based on the cost of emission reductions for 1,000 milk cows. It will assume a conservatively sized milking parlor of 100 ft long by 40 ft wide and a height of 20 feet. The total exhaust airflow rate can be calculated as follows:

Total exhaust airflow rate = 100 ft x 40 ft x 20 ft x 35/hr
= 2,800,000 ft^3/hr

Fuel Requirement for Thermal Incineration:

The gas leaving the milking parlor is principally air, with a volumetric specific heat of 0.0194 Btu/scf -°F under standard conditions.

Natural Gas Requirement = (flow)(Cp_{Air})(ΔT)(1-HEF)

Where:

Flow (Q) = exhaust flow rate of VOC
CpAir = specific heat of air: 0.0194 Btu/scf
ΔT = increase in the temperature of the contaminated air stream required for catalytic oxidation to occur (It will be assumed that the air stream would increase in temperature from 100 °F to 600 °F.)
HEF = heat exchanger factor: 0.7

Natural Gas Requirement = (2,800,000 scf/hr)(0.0194 Btu/scf)(600 °F - 100 °F)(1-0.7)
= 8,148,000 Btu/hr

Fuel Cost for Thermal Incineration

The cost for natural gas shall be based upon the average industrial price in California reported by the Energy Information Administration (EIA), taken from the EIA website at: http://www.eia.gov/dnav/ng/ng_pri_sum_dcu_SCA_a.htm.

Average industrial price for natural gas in California for the year 2017[3]
= $7.05/1,000 scf

$7.05/1,000 scf x 1 scf/1,000 Btu x 1,000,000 Btu/MMBtu
= $7.05/MMBtu

The oxidizer is assumed to operate 16 hours per day (2 shifts) and 365 days per year.

The fuel costs to operate the incinerator are calculated as follows:

8,148,000 Btu/hr x 1 MMBtu/10^6 Btu x 16 hr/day x 365 day/year x $7.05/MMBtu
= $335,469/year

[3] This is the most recent year for which the price data has been published.

VOC Emission Reductions for Thermal Incineration

The annual VOC Emission Reductions for the milking parlor is calculated as follows:

[Number of milk cows] x [Uncontrolled Milking Parlor VOC EF (lb/milk cow-year)] x [Capture Efficiency] x [Thermal Incinerator Control Efficiency]

= (7,278 milk cows) x (0.44 lb-VOC/milk cow-year) x (0.95) x (0.98)
= 2,981 lb-VOC/year

Cost of VOC Emission Reductions

Cost of reductions = ($335,469/year)/[(2,981 lb-VOC/year)(1 ton/2000 lb)]
= $225,071/ton of VOC reduced

As shown above, the natural gas cost alone for thermal or catalytic incineration 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.

2) Milking Parlor Vented to a Biofilter

The following analysis is based on the cost of emission reductions for confining 7,278 milk cows in a conservatively sized milking parlor of 100 ft long by 40 ft wide and a height of 20 feet, and venting the milking parlor to a biofilter. Costs for larger dairies would be linearly proportional.

Biofiltration can control both VOC and ammonia emissions. Although, this technology can control both pollutants, a cost effectiveness threshold has not been established for ammonia. Therefore, only achieved-in-practice options will be considered for ammonia at this time and a multi-pollutant cost effectiveness analysis for VOC and ammonia will not be performed.

Air Flow Rate of Milking Parlor

In order to effectively calculate the costs of this control option, the airflow rate of the milking parlors must be determined. According to Cornell University's publication "Environmental Controls for Today's Milking Center", the minimum ventilation rate required for milking parlors is 15 room exchanges per hour in the winter and 60 to 90 room exchanges per hour in the summer. For calculation purposes, an average airflow rate of 35 room exchanges will assumed for the milking parlor.

The total exhaust airflow rate can be calculated as follows:

Total exhaust airflow rate = 100 ft x 40 ft x 20 ft x 35/hr x 1/60 min
= 46,667 cfm

Cost of Biofiltration

The table below summarizes the cost information for biofilters found in literature. The references follow the table:

Biofilter Costs from Literature					
Article Number	Year published	Capital Cost Range ($/cfm)	Adj 2019 Capital Cost ($/cfm)	Operating Cost Range ($/cfm/yr)	Adj 2019 Operating Cost ($/yr)
1	2003	$2.35 - $7.74 biofilter	$3.26 - $10.75	$3.31 biofilter	$4.60
2	2003	$20.20 - 30.30 biotrickling filter	$28.20 - $33.34	$6.35 biotrickling filter	$8.82
3	1991	$12.79 - $20.93 open biofilter	$24.00 - $39.27		
4	1991	$20.93 - $116.28 enclosed biofilter	$39.27 - $218.17		
5	1998	-	-	$2 - $14	$3.14 - $21.95
6	2008	$15	$17.80	$2	$2.37
7	2005	$16.99 - $118.93	$22.23 - $155.62	$5.10 - $16.99	$6.67 - $22.23
8	1996	$2.50 - $5.00	$4.07 - $8.14	$'2 - $14	$3.26 - $22.80
9	1999	$13.30 - $18.00	$20.40 - $27.61	$3.33 - $6.67	$5.11 - $10.23
10	2002	$2.79	$3.96	10% of capital cost	
11	2004	$0.15 - $0.25	$0.20 - $0.34	$0.005 -$ 0.015	$.01 - $0.03

The articles referenced in the previous table are cited below:

1 & 2. 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/dir1/fbiorect.pdf

3.U.S. Environmental Protection Agency, "Emissions from Animal Feeding Operations" (Draft), EPA Contract No. 68-D6-0011, August 15, 2001, Section 9.2.3 - Biofiltration of Confinement Housing Exhaust, http://www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf

4.Leson, G. and A.M. Winer. 1991. "Biofiltration: An Innovative Air Pollution Control Technology for VOC Emissions". Journal of the Air and Waste Management Association. 41(8):1045-54.)

5.Operating Cost Estimate for a Biofilter (1998): $2-14/cfm (from Boyette, R. A. 1998. "Getting Down to (Biofilter) Basics". Biocycle 39(5):58-62)

6. Bohn, Hinrich, "Biofilter Technology Offers Emissions Abatement Option", Distillers Grain Quarterly, 3rd Qtr 2008, http://www.ethanolproducer.com/dgq/article-print.jsp?article_id=1257

7. Delhoménie, Marie-Caroline; Heitz, Michèle, "Biofiltration of Air: A Review", Critical Reviews in Biotechnology, 1549-7801, Volume 25, Issue 1, 2005, Pages 53 – 72

8. Boyette, R. Allen – E&A Environmental Consultants Inc., "Biofilter Economics and Performance", 1996, http://www.p2pays.org/ref/12/11505.pdf

9. Govind, Rakesh – PRD Tech Inc., White Paper - "Biofilteration: An Innovative Technology for the Future", 1999, http://www.prdtechinc.com/PDF/PRDBIOFILTERR&DMAGAZINEPAPER.pdf

10. South Coast Air Quality Management District, "Technology Assessment for: Proposed Rule 1133: Emission Reductions from Composting and Related Operations", March 22, 2002, http://www.aqmd.gov/rules/doc/r1133/r1133_techassessment.pdf

11. Schmidt, David. Janni, Kevin. Nicolai, Richard. "Biofilter Design Information". Biosystems and Agricultural Engineering Update: BAEU-18, Revised March 2004. University of Minnesota Department of Biosystems and Agricultural Engineering, College of Agricultural, Food and Environmental Sciences, http://www.manure.umn.edu/assets/baeu18.pdf

Note: The capital cost estimate obtained from article number 11 was ten times lower than the low-end of the cost estimates given in other sources listed above and the estimates from biofilter suppliers presented below and the operating cost estimate from this source was more than 100 times lower than the lowest the cost estimates given in the other sources listed above. Because of this significant difference in costs, the design of this biofilter was evaluated to determine if it would meet District and EPA standards for an add-on VOC control device. This preliminary evaluation is discussed below.

Reference #11 describes a biofilter designed to reduce odors not total VOCs. The document recommends that an open-bed biofilter used to control exhaust from animal housing have a depth of 10-18 inches and an empty bed contact time of 3-5 seconds. For an open-bed biofilter used for VOC control, the recommended depth and contact time are generally 3-5 feet and 30-60 seconds, respectively. The lower recommended depth is the result of limitations with typical exhaust fans used for ventilation in animal housing, which are not designed for the larger pressure drops that would be caused by a deeper biofilter bed. It is likely that the much smaller recommended contact time is related to the fact that the biofilter is only designed to reduce odors. Many odorous compounds are branched-chain volatile fatty acids (VFAs) that consist of large molecules with a strong tendency to adhere to any surfaces that they contact; thus shortening the contact time required to treat these compounds. Although VFAs are largely responsible for objectionable odors from agricultural facilities, recent studies have shown that alcohols comprise the majority of VOC emissions. The biofilter

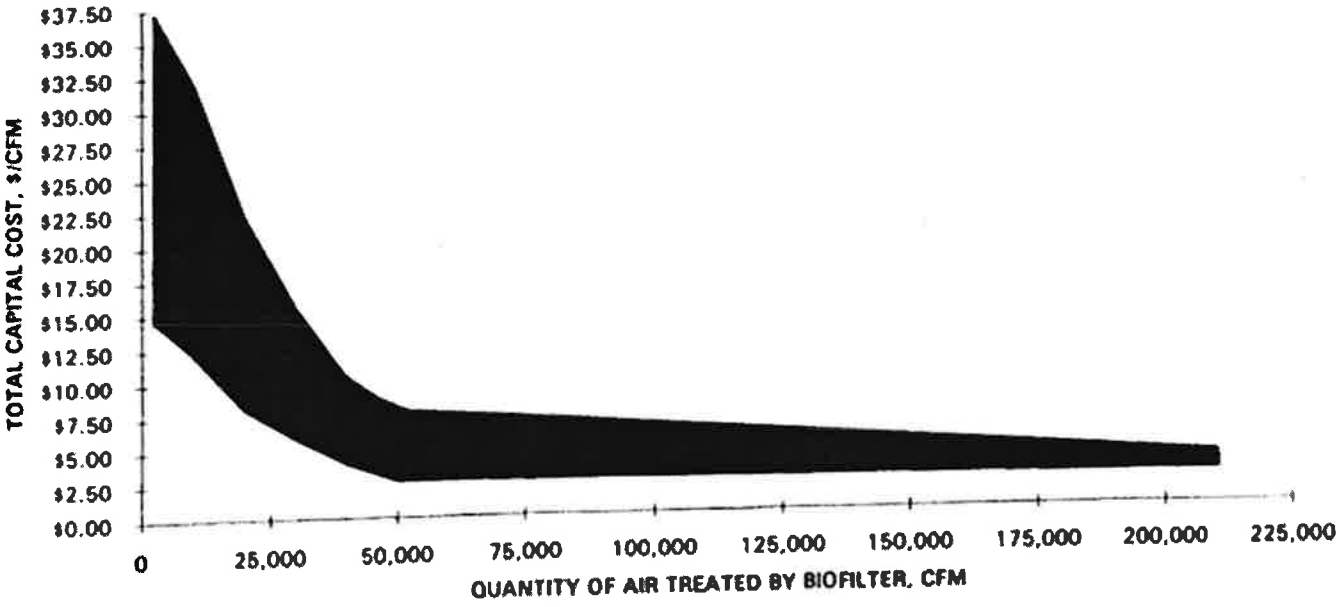
design recommended in the document would not be as effective for reducing alcohols or other VOCs which are more volatile and do not have a strong tendency to adhere to surfaces. The biofilter does not appear to be designed to handle the total flow rates from the animal housing but is probably intended to handle smaller flow rates from high-odor areas such as manure pits. Another limitation with the design is that there is no dedicated outlet to allow measurement and determination of control efficiency; thus there isn't any way to accurately assess if the biofilter is functioning properly. Because of the substantial deviation from established criteria for the design of biofilters for control of VOCs and the lack of information to support and quantify total VOC reductions from this particular design, the cost estimates associated with this design will be removed from further consideration. This design may be re-evaluated at a later time if the necessary information is provided or becomes available.

Reduced Capital Cost from Economy of Scale

The potential for reduced dollar-per-cfm capital costs was considered based on the large airflow rates that would be handled by biofilters for confined animal facilities. Based on the information reviewed, it was determined that there is not any additional cost reduction benefit related to economy of scale for biofilters handling such large flow rates.

The information available indicates significant reductions in biofilter costs per cfm as the flow rate treated increases to a few thousand cfm but diminishing reductions in cost after this until there is no further benefit. This is illustrated in the graph below. The graph shows no additional cost reductions benefits after approximately 50,000 cfm. Also, in a phone conversation with Jim Cash of MEGTEC Systems, Inc. he stated that economy of scale cost reductions for biofilter systems were insignificant after approximately 20,000 cfm. This was because multiple individual units are generally required to treat flows greater than this and each unit would still cost about the same. Additionally, single units, and sometimes even multiple units, handling such large flow rates would not be pre-fabricated but would have to be specially constructed on site, which can increase costs. This was also supported by the information provided by other biofilter suppliers. Therefore, any potential cost reduction benefits related to economy of scale have already been captured in the lower biofilter cost estimates given above and no additional cost benefits will be realized at higher flow rates. As a result, the cost estimates for biofilters will be directly proportional to the airflow rate treated and the number of animals housed.

FIGURE 1 BIOFILTER CAPITAL COST PER CFM OF AIR TREATED



Boyette, R. Allen – E&A Environmental Consultants Inc., "Biofilter Economics and Performance", 1996

Cost Estimate for Biofilters for this Analysis

For purposes of this analysis, the following biofilter cost estimate will be used. The cost estimate is conservative and significantly lower than many of the capitol cost estimates given in the references listed above.

Capital Cost (2019): $3.00/cfm

Capital Cost

The cost estimate for the biofilter includes the costs of the fans, media, plenum, engineering, and labor but does not include installation of the required ductwork. As stated above, a conservative capital cost of $3.00 per cfm will be assumed in this cost analysis.

Based on the required airflow previously determined, the capital cost of the biofilter is calculated as follows:

$3.00 cfm x 46,667 cfm = $140,001

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 biofilter media (e.g., soil, compost, wood chips) must be replaced after 3-5 years in order to remain effective. This is an additional cost that is

not being considered in this cost analysis. Therefore, 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
I = Interest Rate (10%)
N = Equipment Life (10 years)

$A = [\$140,001 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1]$
$= \$22,785$/year

VOC Emission Reductions for Biofiltration

The annual VOC Emission Reductions for the milking parlor is calculated as follows:

[Number of milk cows] x [Uncontrolled Milking Parlor VOC EF (lb/milk cow-year)] x [Capture Efficiency] x [Biofilter Control Efficiency]

= (7,278 milk cows) x (0.44 lb-VOC/milk cow-year) x (0.95) x (0.80)
= 2,434 lb-VOC/year

Cost of VOC Emission Reductions

Cost of reductions = ($22,785/year)/[(2,434 lb-VOC/year)(1 ton/2000 lb)]
= $302,241/ton of VOC reduced

As shown above, the capital cost alone for a biofilter would cause the cost of the VOC reductions to be greater than the $17,500/ton cost effectiveness threshold of the District BACT policy. Therefore, this option is not cost effective and is being removed from consideration at this time.

3) Flush/Spray Before, After, or During Milking Each Group of Cows

Since this control option is achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

Since the higher-ranked options are not cost effective, the remaining Achieved in Practice option is determined to be BACT. Therefore, BACT for this operation is flush/spray milking parlor before, after, or during milking each group of cows.

II. Top-Down BACT Analysis for Open Corrals

1. BACT Analysis for VOC Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.3 identifies the following controls for VOC emissions from open corrals:

- Concrete feed lanes and walkways;
- Flushing feed lanes and walkways for mature cows (milk and dry cows) at least four times per day and flushing feed lanes and walkways for support stock at least once per day;
- Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
- Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet) or managing corrals to maintain a dry surface;
- Scraping corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and
- Rule 4570 measures.

Description of Control Technologies

Concrete feed lanes and walkways

Dairy cows spend a large proportion of time on the feed lanes and walkways. A significant proportion of manure is consequently deposited in these areas. The concrete lanes and walkways are necessary for an effective flush system, which in turn is a key component of management practices used for the control of VOC and ammonia emissions (see below).

Increased flushing of feed lanes and walkways

Many dairy operations use a flush system to remove manure from the feed lanes and walkways. The flush system introduces a large volume of water at the head of the paved area, and the cascading water carries the manure downslope. The required volume of flush water varies with the size and slope of the area to be flushed.

In addition to cleaning the feed lanes and walkways, the flush system also serves as an emissions control method. 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 proportion of these compounds will dissolve in the flush water instead of being emitted directly from the housing areas. The flush water then carries the manure and the dissolved volatile compounds into an anaerobic treatment system where they are digested and converted into less polluting byproducts by microbial activity.

Feed lanes and walkways are typically flushed once or twice per day in the mature cow housing areas; and as infrequently as once a week in the support stock housing areas. Flushing the lanes four times per day for mature cows and once per day for support stock will increase the frequency with which manure is removed from the housing areas, which should result in a higher percentage of soluble volatile compounds being captured in the flush water, and therefore higher control efficiency. Although the control efficiency may actually be much higher, increasing the cleaning frequency of the lanes will be conservatively assumed to have a control efficiency of 10% for VOCs emitted from manure in cow housing areas, until better data becomes available.

Feeding all animals 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 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.[4] This undigested protein also produces ammonia 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 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.

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 cows in accordance with National Research Council (NRC) or other District-approved guidelines will be conservatively assumed to have a control efficiency of only 5-10% for both enteric[5] and manure VOC emissions.

Properly sloping corrals

Accumulation of water on corral surfaces, due to rain or on-farm activities, could result in anaerobic conditions and thereby increase emissions. Keeping corral surfaces dry and properly aerated, on the other hand, promotes the aerobic conditions that reduce emissions. Proper slope design is therefore required to ensure that drainage of any water deposited on the exercise pen surfaces will be as rapid as possible.

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

[5] Enteric emissions are those emitted directly from the animal (primarily via belching and flatulence), due to feed digestion processes.

Scraping Corrals Every Two Weeks

Frequent scraping of the corrals will reduce the amount of manure on the corral surfaces, which will reduce VOC and ammonia emissions resulting from decomposition of this manure. This practice will also provide a uniform surface that promotes aerobic conditions on the corral surface, which will reduce gaseous pollutants from this area.

b. Step 2 - Eliminate technologically infeasible options

All the options identified in step 1 are technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

Since all the options identified in step 1 have been proposed, ranking is not necessary.

d. Step 4 - Cost Effectiveness Analysis

Since all the options identified in step 1 are achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed the following control measures:

- Concrete feed lanes and walkways;
- Flushing feed lanes and walkways for mature cows (milk and dry cows) at least four times per day and flushing feed lanes and walkways for support stock at least once per day;
- Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
- Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet) or managing corrals to maintain a dry surface;
- Scraping corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and
- Rule 4570 measures.

The proposal satisfies BACT for this category.

2. BACT Analysis for Ammonia (NH_3) Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.3 identifies the following controls for ammonia emissions from open corrals:

- Concrete feed lanes and walkways;
- Flushing feed lanes and walkways for mature cows (milk and dry cows) at least four times per day and flushing feed lanes and walkways for support stock at least once per day;
- Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
- Properly sloping exercise pens/corrals (minimum slope of 3% where the available space for each animal is 400 square feet or less and 1.5% where the available space for each animal is more than 400 square feet) or managing exercise pens/corrals to maintain a dry surface; and
- Scraping exercise pens/corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions.

Description of Control Technologies

Concrete feed lanes and walkways

Dairy cows spend a large proportion of time on the feed lanes and walkways. A significant proportion of manure is consequently deposited in these areas. The concrete lanes and walkways are necessary for an effective flush system, which in turn is a key component of management practices used for the control of 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 feed lanes and walkways. The flush system introduces a large volume of water at the head of the paved area, and the cascading water carries the manure downslope. The required volume of flush water varies with the size and slope of the area to be flushed.

In addition to cleaning the feed lanes and walkways, the flush system also serves as an emissions control method. Ammonia is highly soluble in water. Therefore, a large proportion of ammonia in manure will dissolve in the flush water instead of being emitted directly from the housing areas. The flush water then carries the manure and the dissolved ammonia into the liquid manure storage system, where ammonia can be sequestered until it is applied to cropland as a nitrogen fertilizer.

Feed lanes and walkways are typically flushed once or twice per day in the mature cow housing areas; and as infrequently as once a week in the support stock housing areas. Flushing the lanes four times per day for mature cows and once per day for support stock will increase the frequency with which manure is removed from the housing areas, which should result in a higher percentage of ammonia being captured in the flush water, and therefore higher control efficiency.

Feeding all animals 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 present, hence the lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia.

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 VOC 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.

Properly sloping exercise pens/corrals

Accumulation of water on exercise pen/corral surfaces, due to rain or on-farm activities, could result in anaerobic conditions and thereby increase emissions. Keeping exercise pen/corral surfaces dry and properly aerated, on the other hand, promotes the aerobic conditions that reduce emissions. Proper slope design is therefore required to ensure that drainage of any water deposited on the exercise pen surfaces will be as rapid as possible.

b. Step 2 - Eliminate technologically infeasible options

All the options identified in step 1 are technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

Since all the options identified in step 1 have been proposed, ranking is not necessary.

d. Step 4 - Cost Effectiveness Analysis

Since all the options identified in step 1 are achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed the following control measures:

- Concrete feed lanes and walkways;
- Flushing feed lanes and walkways for mature cows (milk and dry cows) at least four times per day and flushing feed lanes and walkways for support stock at least once per day;
- Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
- Properly sloping exercise pens/corrals (minimum slope of 3% where the available space for each animal is 400 square feet or less and 1.5% where the available space for each animal is more than 400 square feet) or managing exercise pens/corrals to maintain a dry surface; and
- Scraping exercise pens/corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions.

The proposal satisfies BACT for this category.

3. BACT Analysis for PM_{10} Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.3 identifies the following controls for PM_{10} emissions from open corrals:

- Concrete feed lanes and walkways;
- Scraping corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions;
- Shade structures in open corrals;
- Feeding heifers in corrals near dusk (within 1 hour of dusk); and
- Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities); or
- An alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%) may be applied as a replacement for the previous measure.

Description of Control Technologies:

Concrete Feed Lanes and Walkways

Constructing the feed lanes and walkways of concrete causes the dairy animals to spend an increased amount of time on a paved surface rather than dry dirt, thus reducing PM_{10}

emissions. Additionally, the manure that is deposited in the lanes and walkways will be flushed, which will prevent PM_{10} emissions from drying manure.

Scraping Corrals Every Two Weeks

Other than the paved feed lanes and walkways, corral surfaces are composed of earth and deposited manure, both of which have the potential for particulate matter emissions due to wind or animal activities. Frequent scraping of these surfaces will reduce the amount of dry manure that may be pulverized by the cows' hooves and subsequently emitted as PM_{10}.

Feeding Heifers Near Dusk

Heifers are generally most active during late evening hours when the heat of the day has subsided slightly. This increased evening activity results in dust and associated PM10 emissions. This high propensity for increased evening activity can be counteracted by scheduling the afternoon feeding at this time, such that majority of the heifers will be occupied at the feeding lanes instead of moving around the dryer dirt areas of the corrals.

Windbreaks

A windbreak, or shelterbelt, is composed of one or more rows of trees or shrubs, which are planted in a manner that breaks up wind and reduces the force of wind on downwind of the windbreak. Windbreaks can be used to prevent soil erosion, improve air quality by intercepting dust, chemicals, and odors, to protect crops, and to provide habitat for wildlife. The District has worked with NRCS to establish guidelines for windbreaks used for dust control around dairies. In general, the guidelines require that a downwind shelterbelt with three rows be installed, the first row consisting of shrubs, second row consisting of a medium size tree and the last row consisting of an evergreen (larger tree). NRCS also requires that an irrigation system be maintained so that there is greater survivability and rapid growth of the trees and shrubs. A windbreak will reduce the amount of particulate matter entrained into the atmosphere.

There may be instances where windbreaks are not practical or feasible for a particular operation such as existing dairy facilities that is expanding but lacks adequate space for a windbreak. The soil conditions in the area where installation of the windbreak would be required should also be considered when determining if establishment of windbreaks is feasible for a particular dairy. Soil properties that should be considered include, but are not limited to, the pH and salinity or electrical conductivity of the soil. It is best to consult the National Resources Conservation Services (NRCS) or other experts to determine if a particular area can reasonably sustain windbreaks. NRCS also maintains information on the soil properties and vegetative productivity of agricultural areas, which is available online through their Web Soil Survey[6]. Another possible factor that may need to be considered when determining if windbreaks are feasible in a particular area is if insufficient water is available for establishment of a windbreak because of sustained

[6] The NRCS Web Soil Survey can be accessed at http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

drought conditions. Windbreaks will not be required if an operation demonstrates satisfactorily that they are infeasible or impractical for the particular operation. Additionally, because there are a number of factors (soil conditions, drought/water availability of sufficient water, climate, etc) that are specific to each site that must be considered when determining if an effective windbreak can be established and maintained, as with other BACT requirements dairies will be allowed to substitute an alternative measure that can achieve equivalent PM10 reductions.

Corral Sprinkling/Water Application

When done at a rate sufficient to match the evaporation rate, sprinkling will keep corral surfaces consistently moist. This will reduce PM_{10} emissions by preventing any loose soil and dried manure from being entrained into the air by wind movement and/or cow activities. Water application rates must be properly adjusted, since excess water could potentially increase VOC and NH_3 emissions; and may also pose a health risk for the animals.

b. Step 2 - Eliminate technologically infeasible options

The options listed in Step 1 above are all technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

Since all the options identified in step 1 have been proposed, ranking is not necessary.

d. Step 4 - Cost Effectiveness Analysis

Since all the options identified in step 1 are achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed the following control measures:

- Concrete feed lanes and walkways;
- Scraping corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions;
- Shade structures in open corrals;
- Feeding heifers in corrals near dusk (within 1 hour of dusk); and
- Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities).

The proposal satisfies BACT for this category

III. Top-Down BACT Analysis for Loafing Barns

1. BACT Analysis for VOC Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.4 identifies the following controls for VOC emissions from loafing barns:

- Concrete feed lanes and walkways;
- Flushing feed lanes and walkways for mature cows (milk and dry cows) at least four times per day and flushing feed lanes and walkways for support stock at least once per day;
- Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
- Properly sloping corrals (minimum slope of 3% where the available space for each animal is 400 square feet or less and 1.5% where the available space for each animal is more than 400 square feet) or managing exercise pens/corrals to maintain a dry surface;
- Scraping pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and
- Rule 4570 measures.

Description of Control Technologies

Concrete feed lanes and walkways

Dairy cows spend a large proportion of time on the feed lanes and walkways. A significant proportion of manure is consequently deposited in these areas. The concrete lanes and walkways are necessary for an effective flush system, which in turn is a key component of management practices used for the control of VOC and ammonia emissions (see below).

Increased flushing of feed lanes and walkways

Many dairy operations use a flush system to remove manure from the feed lanes and walkways. The flush system introduces a large volume of water at the head of the paved area, and the cascading water carries the manure downslope. The required volume of flush water varies with the size and slope of the area to be flushed.

In addition to cleaning the feed lanes and walkways, the flush system also serves as an emissions control method. 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 proportion of these compounds will dissolve in the flush water instead of being emitted directly from the housing areas. The flush water then carries the manure and the dissolved volatile compounds into an anaerobic treatment system where they are digested and converted into less polluting byproducts by microbial activity.

Feed lanes and walkways are typically flushed once or twice per day in the mature cow housing areas; and as infrequently as once a week in the support stock housing areas. Flushing the lanes four times per day for mature cows and once per day for support stock will increase the frequency with which manure is removed from the housing areas, which should result in a higher percentage of soluble volatile compounds being captured in the flush water, and therefore higher control efficiency. Although the control efficiency may actually be much higher, increasing the cleaning frequency of the lanes will be conservatively assumed to have a control efficiency of 10% for VOCs emitted from manure in cow housing areas, until better data becomes available.

Feeding all animals 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 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.[7] This undigested protein also produces ammonia 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 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 nutrients 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 cows in accordance with National Research Council (NRC) or other District-approved guidelines will be conservatively assumed to have a control efficiency of only 5-10% for both enteric[8] and manure VOC emissions.

Properly sloping Corrals

Accumulation of water on corral surfaces, due to rain or on-farm activities, could result in anaerobic conditions and thereby increase emissions. Keeping exercise pen/corral surfaces dry and properly aerated, on the other hand, promotes the aerobic conditions that reduce emissions. Proper slope design is therefore required to ensure that drainage of any water deposited on the exercise pen surfaces will be as rapid as possible.

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

[8] Enteric emissions are those emitted directly from the animal (primarily via belching and flatulence), due to feed digestion processes.

Scraping of pens with a pull-type scraper

Frequent scraping of the pens reduces the amount of manure on the pen/corral surfaces, which will reduce VOC and ammonia emissions resulting from decomposition of this manure. This practice will also provide a uniform surface that promotes aerobic conditions on the pen/corral surface, which will reduce gaseous pollutants from this area.

b. Step 2 - Eliminate technologically infeasible options

All the options identified in step 1 are technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

Since all the options identified in step 1 have been proposed, ranking is not necessary.

d. Step 4 - Cost Effectiveness Analysis

Since all the options identified in step 1 are achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed the following control measures:

- Concrete feed lanes and walkways;
- Flushing feed lanes and walkways for mature cows (milk and dry cows) at least four times per day and flushing feed lanes and walkways for support stock at least once per day;
- Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
- Properly sloping corrals (minimum slope of 3% where the available space for each animal is 400 square feet or less and 1.5% where the available space for each animal is more than 400 square feet) or managing exercise pens/corrals to maintain a dry surface;
- Scraping pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and
- Rule 4570 measures.

The proposal satisfies BACT for this category.

2. BACT Analysis for Ammonia (NH_3) Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.4 identifies the following controls for ammonia emissions from loafing barns:

- Concrete feed lanes and walkways;
- Flushing feed lanes and walkways for mature cows (milk and dry cows) at least four times per day and flushing feed lanes and walkways for support stock at least once per day;
- Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
- Properly sloping corrals (minimum slope of 3% where the available space for each animal is 400 square feet or less and 1.5% where the available space for each animal is more than 400 square feet) or managing exercise pens/corrals to maintain a dry surface; and
- Scraping pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions.

Description of Control Technologies

Concrete feed lanes and walkways

Dairy cows spend a large proportion of time on the feed lanes and walkways. A significant proportion of manure is consequently deposited in these areas. The concrete lanes and walkways are necessary for an effective flush system, which in turn is a key component of management practices used for the control of 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 feed lanes and walkways. The flush system introduces a large volume of water at the head of the paved area, and the cascading water carries the manure downslope. The required volume of flush water varies with the size and slope of the area to be flushed.

In addition to cleaning the feed lanes and walkways, the flush system also serves as an emissions control method. Ammonia is highly soluble in water. Therefore, a large proportion of ammonia in manure will dissolve in the flush water instead of being emitted directly from the housing areas. The flush water then carries the manure and the dissolved ammonia into the liquid manure storage system, where ammonia can be sequestered until it is applied to cropland as a nitrogen fertilizer.

Feed lanes and walkways are typically flushed once or twice per day in the mature cow housing areas; and as infrequently as once a week in the support stock housing areas. Flushing the lanes four times per day for mature cows and once per day for support stock will increase the frequency with which manure is removed from the housing areas, which should result in a higher percentage of ammonia being captured in the flush water, and therefore higher control efficiency.

Feeding all animals 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 present, hence the lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia.

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 VOC 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.

Properly sloping corrals

Accumulation of water on corral surfaces, due to rain or on-farm activities, could result in anaerobic conditions and thereby increase emissions. Keeping exercise pen/corral surfaces dry and properly aerated, on the other hand, promotes the aerobic conditions that reduce emissions. Proper slope design is therefore required to ensure that drainage of any water deposited on the exercise pen surfaces will be as rapid as possible.

b. Step 2 - Eliminate technologically infeasible options

All the options identified in step 1 are technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

Since all the options identified in step 1 have been proposed, ranking is not necessary.

d. Step 4 - Cost Effectiveness Analysis

Since all the options identified in step 1 are achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed the following control measures:

- Concrete feed lanes and walkways;
- Flushing feed lanes and walkways for mature cows (milk and dry cows) at least four times per day and flushing feed lanes and walkways for support stock at least once per day;
- Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
- Properly sloping corrals (minimum slope of 3% where the available space for each animal is 400 square feet or less and 1.5% where the available space for each animal is more than 400 square feet) or managing exercise pens/corrals to maintain a dry surface; and
- Scraping pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions.

The proposal satisfies BACT for this category.

IV. Top-Down BACT Analysis for Liquid Manure Handling - Lagoon/Storage Pond

1. BACT Analysis for VOC Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.6 identifies the following controls for VOC emissions from lagoons and storage ponds:

1) Anaerobic treatment lagoon designed according to NRCS guideline, and solids removal/separation system (mechanical separator(s) or settling basin(s)/weeping wall(s)) – Achieved in Practice

2) Aerobic treatment lagoon or mechanically aerated lagoon – Technologically Feasible

3) Covered lagoon digester vented to a control device with minimum 95% control - Technologically Feasible

Description of Control Technologies

Aerobic Treatment Lagoon or Mechanically Aerated Lagoon

An aerobic 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, sulfates, and inert biomass (sludge). This process is sometimes referred to as nitrification (especially when

discussing NH_3 transformation). Complete aerobic decomposition (100% aeration) removes nearly all malodors and also virtually eliminates VOC, H_2S, and NH_3 emissions.

In completely aerated lagoons, sufficient oxygen must be provided to sustain the aerobic microorganisms. NRCS Practice Standard Code 359 specifies that naturally aerobic lagoons have a minimum surface area determined by regional climate and daily Biological Oxygen Demand (BOD_5) and requires naturally aerobic lagoons to have a maximum depth no greater than five feet. For mechanically aerated lagoons, NRCS Practice Standard Code 359 specifies that the aeration equipment shall provide a minimum of 1 pound of oxygen for each pound of daily BOD_5 loading. The mechanical aerators that provide the required oxygen 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) concentration of the liquid manure is 2.0 mg/L or more. However, the DO concentrations achieved in mechanically aerated lagoons treating manure are typically much less than this and the control efficiencies will therefore be lower.

Covered Lagoon Digester

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 (VOC). 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 anaerobic digester can be captured and then sent to a suitable combustion device. During combustion, gaseous hydrocarbons are oxidized to form CO_2 and water. The VOC 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 VOC emitted 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 some VOC will also be emitted from the storage pond and as fugitive emissions. For this analysis, the overall control efficiency is assumed to be 80% of the emissions that would have been emitted from the lagoon system.

Anaerobic Treatment Lagoon and Solids Removal/Separation System

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 (VOC). The Natural Resources Conservation Service (NRCS) Field Office Technical Guide No. 359, Waste Treatment Lagoon, for California specifies the following criteria for the design of anaerobic treatment lagoons:

- Required volume - the minimum design volume should account for all potential sludge, treatment, precipitation, and runoff volumes.
- Treatment period - retention time of the material in the lagoon shall be the time required to provide environmentally safe utilization of waste. The minimum hydraulic retention time for a covered lagoon in the San Joaquin Valley is about 38 days.
- Waste loading shall be based on the maximum daily loading considering all waste sources that will be treated by the lagoon. The loading rate is typically based on volatile solids (VS) loading per unit of volume. The suggested loading rate for the San Joaquin Valley is 6.5-11 lb-VS/1000 ft^3/day depending on separation and type of system.
- The operating depth of the lagoon shall be 12 feet or greater. Maximizing the depth of the lagoon minimizes the surface area, which in turn minimizes the cover size and cost. Increasing the lagoon depth has the following advantages:
    - Minimizes surface area in contact with the atmosphere, thus reducing surface available to convection, evaporation
    - Smaller surface areas provide a more favorable and stable environment for methane bacteria
    - Better mixing of lagoon due to rising gas bubbles
    - Requires less land
    - More efficient for mechanical mixing

The lagoon design shall also consider location, soils and foundation, erosion, and depth to groundwater as required by the regional water control board.

The NRCS guideline suggests that this system consist of two cells, a treatment lagoon (primary lagoon) and a storage pond (secondary lagoon). The first stage of the lagoon system is the biological treatment stage and is designed with a constant liquid level to stabilize the anaerobic digestion. The effluent from the first stage overflows into a second lagoon designed for liquid storage capacity. Effluent from the second lagoon is used in the flush lanes and for the irrigation of cropland. The secondary (overflow) lagoon acts as the storage pond, which can be emptied when necessary. However, a single lagoon can also be considered an anaerobic lagoon as long as all the criteria are met and that the liquid manure is not drawn less than 6 feet at any time.

A properly designed anaerobic treatment lagoon will reduce the volatile solids (VS) by at least 50%. This will reduce the biological oxygen demand (BOD) and increase the efficiency at which organic compounds are converted into methane and carbon dioxide rather than VOC. Although the VS reduction is expected to be at least 50%, a conservative control efficiency of 40% will be assumed, until better data becomes available.

Mechanical separators separate solids out from the liquid/slurry stream. There are many different versions of separators on the market. The percentage of separation varies depending on screen size and type of separation system. However, a 50% solid removal efficiency is used as a general rule of thumb. Although the separation efficiency can be improved by better separation or addition of separators or screens, it does not necessarily result in an increase in VOC emission reduction. The type of solids removed are generally non-digestible (lignins, cellulose, etc.) materials that do not easily degrade in the lagoons. The amount of volatiles solids that ends up in the lagoon will most likely not change even though there is an increase in solid removal efficiency. In addition, there is no data that links higher removal efficiency with an increase in VOC emission reduction.

b. Step 2 - Eliminate technologically infeasible options

The options listed in Step 1 above are all technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

The remaining options are ranked below according to their control effectiveness:

1) Aerobic treatment lagoon or mechanically aerated lagoon (95% control efficiency)

2) Covered lagoon digester vented to a control device (80% control efficiency)

3) Anaerobic treatment lagoon designed to meet Natural Resources Conservation Service (NRCS) standards (40% control efficiency)

d. Step 4 - Cost Effectiveness Analysis

1) Aerobic Treatment Lagoon or Mechanically Aerated Lagoon

The following analysis is based on the treatment of manure from 7,278 milk cows in naturally aerobic lagoons and mechanically aerated lagoons.

Space Requirement for a Naturally Aerobic Lagoon Treating Manure from 7,278 Dairy Cows

NRCS Practice Standard Code 359 requires that naturally aerobic lagoons be designed to have a minimum treatment surface area as determined on the basis of daily BOD5 loading per unit of lagoon surface. The standard specifies that the maximum loading rate of naturally aerobic lagoons shall not exceed the loading rate indicated by the NRCS Agricultural Waste Management Field Handbook (AWMFH) or the maximum loading rate according to state regulatory requirements, whichever is

more stringent. According to Figure 10-30 (August 2009) of the latest version of the AWMFH, the maximum aerobic lagoon loading rate for the San Joaquin Valley is 45 - 55 lb-BOD_5/acre-day. According to Table 4-5 (March 2008) of the NRCS AWMFH, the total daily manure produced by a milk cow will have 2.9 lb-BOD_5/day. Assuming that 80% of the manure will be flushed to the lagoon system, the minimum lagoon surface area required for a naturally aerobic lagoon treating manure from 7,278 milk cows in the San Joaquin Valley can be calculated as follows:

BOD_5 loading (lb/day) = 7,278 milk cows x 2.9 lb-BOD_5/cow-day x 0.80
= 16,885 lb-BOD/day

Minimum Surface Area (acres) in areas of the San Joaquin Valley with a maximum loading rate of 55 lb-BOD_5/acre-day =

16,885 lb-BOD_5/day ÷ 55 lb-BOD_5/acre-day = 307 acres

Minimum Surface Area (acres) in areas of the San Joaquin Valley with a maximum loading rate of 45 lb-BOD_5/acre-day =

16,885 lb-BOD_5/day ÷ 45 lb-BOD_5/acre-day = 375 acres

As shown above the minimum surface area required for a naturally aerobic lagoon treating manure from 7,278 milk cows in the San Joaquin Valley would range from approximately 307 to 375 acres. This does not include the additional surface area that would be required to treat manure from support stock onsite. Based on the space requirements alone it is clear that this option cannot reasonably be required and no further analysis is needed.

Analysis for a Mechanically Aerated Lagoon Treating Manure from 7,278 Dairy Cows

As discussed above, the very large space requirements for naturally aerobic lagoons cause this option to be infeasible for most confined animal facilities. Mechanically aerating a lagoon can achieve some of the benefits of a naturally aerobic lagoon without the large space requirements. However, the costs of energy for complete aeration have also caused this option to be infeasible. The amount of energy required for aeration is based on the amount of volatile solids excreted by animals that must be treated; thus, this cost will be directly proportional to the number of animals at a site. The following analysis will determine the cost of emission reductions that can be achieved from a mechanically aerated lagoon treating manure from 7,278 milk cows.

Biological Oxygen Demand (BOD_5)

In order to effectively calculate the costs of this control option, the energy requirement for complete aeration must be determined. It should be noted that approximately 1.5 to 2.5 pounds of oxygen is required to digest 1 pound of Biological Oxygen Demand (BOD_5) with additional oxygen required for conversion of ammonia to nitrate (nitrification). It is generally accepted that at least twice the BOD should be provided for complete aeration. According to Dr. Ruihong Zhang of the University of California,

Davis, 2.4 lbs (1.1 kg) of oxygen (O2) per cow must be provided each day for removal of BOD and an additional 3 lbs (1.4 kg) per cow for oxidation of 70% of the nitrogen.

The proposed rule specifies that an aerobic lagoon be designed and operated in accordance with NRCS Practice Standard Code 359. NRCS Practice Standard Code 359 requires that mechanically aerated lagoons use aeration equipment that provides a minimum of one pound of oxygen for each pound of daily BOD loading. As discussed above, the total daily manure produced by a milk cow will have a BOD_5 of 2.9 lb/day and a lagoon handling flushed manure from 7,278 milk cows will have a loading rate of approximately 16,885 lb-BOD_5/day (7,675 kg-BOD_5/day).

Energy Requirement a Mechanically Aerated Lagoon Treating Manure from 7,278 Milk Cows

Based on the data gathered in a UC Davis study on aerator performance for wastewater lagoons, aeration efficiencies for mechanical aerators ranged from 0.10 to 0.68 kg of oxygen provided per kW-hr of energy utilized. The most efficient aerator tested that had been installed in dairy lagoons had an aeration efficiency of 0.49 kg-O2/kW-hr. These efficiency tests were performed in clean water and lower aeration efficiencies are expected in liquid manure because of the significant amount of solids that it contains. The yearly energy requirement mechanically aerated lagoon treating flushed manure from 7,278 milk cows is calculated as follows:

High Efficiency Aerator

7,675 kg-BOD_5/day ÷ (0.68 kg-O2/kW-hr) x (365 day/year) = 4,119,669 kW-hr/year

Low Efficiency Aerator

7,675 kg-BOD_5/day ÷ (0.10 kg-O2/kW-hr) x (365 day/year) = 28,013,750 kW-hr/year

Cost of Electricity for a Mechanically Aerated Lagoon Treating Manure from 7,278 Milk cows:

The cost for electricity will be based upon the average price for industrial electricity in California as of July 2019, as taken from the Energy Information Administration (EIA) Website:
http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_06_b

Average Cost for electricity = $0.1277/kW-hr

The electricity costs for complete aeration are calculated as follows:

Low Cost Estimate (High Efficiency Aerator)

4,119,669 kW-hr/year x $0.1277/kW-hr = $526,082/year

High Cost Estimate (Low Efficiency Aerator)

28,013,750 kW-hr/year x $0.1277/kW-hr = $3,577,356/year

VOC Emission Reductions from a Mechanically Aerated Lagoon Treating Manure from 7,278 Milk Cows:

It will be conservatively assumed that a mechanically aerated lagoon providing 1 lb of oxygen for every 1 lb of BOD_5 loading will control 90% of the VOC emissions from the lagoon/storage pond. However, as noted above, it is generally accepted that the oxygen provided should be twice the BOD_5 loading rate for complete aeration; therefore, the actual control from providing 1 lb of oxygen for every 1 lb of BOD_5 loading is probably closer to 50%.

The annual VOC Emission Reductions for mechanically aerated lagoon(s) treating the manure from 7,278 milk cows are calculated as follows and shown in the table below:

[Number of cows] x [Lagoon/Storage Pond VOC EF (lb/cow-year)] x [Complete Aeration Control Efficiency for Lagoon/Storage Pond]

VOC Reductions for a Mechanically Aerated Lagoon							
Type of Animal	**# of cows**	**x**	**Lagoon EF (lb/cow-yr)**	**x**	**Control (%)**	**=**	**lb-VOC/yr**
Milk Cow (freestall)	7,278	x	1.3	x	90%	=	**8,515**

Cost of VOC Emission Reductions

Low Estimate = ($526,082/year)/[(8,515 lb-VOC/year)(1 ton/2000 lb)]
= $123,566/ton of VOC reduced

High Estimate = ($3,577,356/year)/[(8,515 lb-VOC/year)(1 ton/2000 lb)]
= $840,248/ton of VOC reduced

As shown in the preceding section, the electricity cost alone for a mechanically aerated lagoon would cause the cost of the VOC reductions to be greater than the cost effectiveness threshold. This cost does not include the additional electricity cost for nitrification that would naturally occur as the lagoons were aerated or equipment costs. Even without these costs, this control technology would not be cost effective.

2) Covered Lagoon Digester Vented to a Control Device

The facility has proposed to construct a covered anaerobic digester lagoon that will be used to treat all the liquid manure at the dairy. The digester gas will be captured and vented a control device with minimum 95% VOC control efficiency (internal combustion engine, or flare when engine is not available). Since the facility has proposed to implement this option, a cost effectiveness analysis is not required.

3) Anaerobic Treatment Lagoon Designed to Meet Natural Resources Conservation Service (NRCS) Standards and Solids Removal/Separation

Since this option is achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

Out of the control options that are proposed, cost effective, or achieved in practice, the control option with the highest control efficiency is selected as BACT. Therefore, the proposed covered anaerobic digester lagoon is selected as BACT for this operation.

2. BACT Analysis for Ammonia (NH_3) Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.6 identifies the following control for ammonia emissions from lagoons and storage ponds:

- All animals fed in accordance with NRC or other District-approved guidelines

Description of Control Technology

All 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, which will reduce ammonia emissions from the liquid manure in the lagoon and storage pond.

b. Step 2 - Eliminate technologically infeasible options

The option listed in Step 1 above is technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

Since only one control option has been identified, ranking is not applicable.

d. Step 4 - Cost Effectiveness Analysis

Since the control option identified is achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed to feed all animals in accordance with NRC or other District-approved guidelines. The proposal satisfies BACT for this category.

V. Top-Down BACT Analysis for Liquid Manure Handling - Liquid/Slurry Land Application

1. BACT Analysis for VOC Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.7 identifies the following controls for VOC emissions from liquid manure land application:

1) Irrigation of crops using liquid manure from an aerobic treatment lagoon or mechanically aerated lagoon – Technologically Feasible
2) Irrigation of crops using liquid manure from a holding/storage pond after being treated in a covered lagoon/digester – Technologically Feasible
3) Irrigation of crops using liquid/slurry manure from the secondary lagoon/holding/storage pond preceded by an uncovered anaerobic treatment lagoon designed to meet Natural Resources Conservation Service (NRCS) standards – Achieved in Practice

Description of Control Technologies

Irrigation of crops using liquid/slurry manure from an aerobic treatment lagoon or mechanically aerated lagoon

An aerobic 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, sulfates, and inert biomass (sludge). This process is sometimes referred to as nitrification (especially when discussing NH_3 transformation). Complete aerobic decomposition (100% aeration) removes nearly all malodors and also virtually eliminates VOC, H_2S, and NH_3 emissions.

In completely aerated lagoons, sufficient oxygen must be provided to sustain the aerobic microorganisms. NRCS Practice Standard Code 359 specifies that naturally aerobic lagoons have a minimum surface area determined by regional climate and daily Biological Oxygen Demand (BOD_5) and requires naturally aerobic lagoons to have a maximum depth no greater than five feet. For mechanically aerated lagoons, NRCS Practice Standard Code 359 specifies that the aeration equipment shall provide a minimum of 1 pound of oxygen for each pound of daily BOD_5 loading. The mechanical aerators that

provide the required oxygen 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) concentration of the liquid manure is 2.0 mg/L or more. However, the DO concentrations achieved in mechanically aerated lagoons treating manure are typically much less than this and the control efficiencies will therefore be lower.

Irrigation of crops using liquid/slurry manure from a holding/storage pond after being treated in a covered lagoon/digester

This practice would only allow the irrigation of liquid manure to cropland from the secondary lagoon after proper treatment has taken place in a covered lagoon/anaerobic digester. 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 (VOC). 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 VOC that remain from incomplete digestion of the volatile solids in the incoming wastewater. The small amounts of undigested solids are removed from the digester as sludge.

Assumptions:

- 80% of the Volatile Solids (VS) can be removed from the covered anaerobic digestion process.
- 20% of the remaining VS will be assumed to be in the manure during land application. This will be considered worst-case because further digestion of the VS is likely to occur in the secondary lagoon.
- As a worst-case scenario, it will be assumed that all remaining VS will be emitted as VOC during land application.

Since 80% of the VS is removed or digested in the covered lagoon and the remaining VS have been assumed to be emitted as VOC, a control efficiency of 80% can be used for land application of liquid manure from a holding/storage pond after treatment in a covered lagoon.

Irrigation of crops using liquid/slurry manure from the secondary lagoon/holding/storage pond where preceded by an uncovered anaerobic treatment lagoon designed to meet Natural Resources Conservation Service (NRCS) standards

This practice would only allow the irrigation of liquid manure to cropland from the secondary lagoon after going through a treatment phase in an anaerobic treatment lagoon, or the primary 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 (VOC).

The NRCS Field Office Technical Guide No. 359, Waste Treatment Lagoon, for California specifies the following criteria for anaerobic treatment lagoons:

- Required volume - the minimum design volume should account for all potential sludge, treatment, precipitation, and runoff volumes.
- Treatment period - retention time of the material in the lagoon shall be the time required to provide environmentally safe utilization of waste. The minimum hydraulic retention time for a covered lagoon in the San Joaquin Valley is about 38 days.
- Waste loading shall be based on the maximum daily loading considering all waste sources that will be treated by the lagoon. The loading rate is typically based on volatile solids (VS) loading per unit of volume. The suggested loading rate for the San Joaquin Valley is 6.5-11 lb-VS/1000 ft^3/day depending on separation and type of system.
- The operating depth of the lagoon shall be 12 feet or greater. Maximizing the depth of the lagoon minimizes the surface area, which in turn minimizes the cover size and cost. Increasing the lagoon depth has the following advantages:
    - Minimizes surface area in contact with the atmosphere, thus reducing surface available to convection, evaporation
    - Smaller surface areas provide a more favorable and stable environment for methane bacteria
    - Better mixing of lagoon due to rising gas bubbles
    - Requires less land
    - More efficient for mechanical mixing

The lagoon design shall also consider location, soils and foundation, erosion, and depth to groundwater as required by the regional water control board.

The NRCS guideline suggests that this system consist of two cells, a treatment lagoon (primary lagoon) and a storage pond (secondary lagoon). The first stage of the lagoon system is the biological treatment stage and is designed with a constant liquid level to stabilize the anaerobic digestion. The effluent from the first stage overflows into a second lagoon designed for liquid storage capacity. Effluent from the second lagoon is used in the flush lanes and for the irrigation of cropland. The secondary (overflow) lagoon acts as the storage pond, which can be emptied when necessary.

A properly designed anaerobic treatment lagoon will reduce the volatile solids (VS) by at least 50%. This will reduce the biological oxygen demand (BOD) and increase the efficiency at which organic compounds are converted into methane and carbon dioxide rather than VOC. Since 50% of the VS in the liquid manure will have been removed or digested in the lagoon, there will be less VS remaining in the effluent to decompose into VOC. Although, the VS reduction will be at least 50%, a conservative control efficiency of 40% will be applied to irrigation from a storage pond after an anaerobic treatment lagoon.

b. Step 2 - Eliminate technologically infeasible options

The options listed in Step 1 above are all technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

The remaining options are ranked below according to their control effectiveness:

1) Irrigation of crops using liquid/slurry manure from an aerobic treatment lagoon or mechanically aerated lagoon (95% control efficiency)

2) Irrigation of crops using liquid/slurry manure from a holding/storage pond after being treated in a covered lagoon/digester (80% control efficiency)

3) Irrigation of crops using liquid/slurry manure from the secondary lagoon/holding/storage pond where preceded by an uncovered anaerobic treatment lagoon designed to meet Natural Resources Conservation Service (NRCS) standards (40% control efficiency)

d. Step 4 - Cost Effectiveness Analysis

1) Irrigation of crops using liquid/slurry manure from an aerobic treatment lagoon or mechanically aerated lagoon

The following analysis is based on the treatment of manure from 7,278 milk cows in naturally aerobic lagoons and mechanically aerated lagoons. Because the liquid/slurry manure applied to land will come from an aerobic treatment lagoon or mechanically aerated lagoon, it will be assumed the reduction in VOC emissions from the lagoon will result in similar VOC reductions to land application.

Space Requirement for a Naturally Aerobic Lagoon Treating Manure from 7,278 Dairy Cows

NRCS Practice Standard Code 359 requires that naturally aerobic lagoons be designed to have a minimum treatment surface area as determined on the basis of daily BOD5 loading per unit of lagoon surface. The standard specifies that the maximum loading rate of naturally aerobic lagoons shall not exceed the loading rate indicated by the NRCS Agricultural Waste Management Field Handbook (AWMFH) or the maximum loading rate according to state regulatory requirements, whichever is more stringent. According to Figure 10-30 (August 2009) of the latest version of the AWMFH, the maximum aerobic lagoon loading rate for the San Joaquin Valley is 45 -

55 lb-BOD_5/acre-day. According to Table 4-5 (March 2008) of the NRCS AWMFH, the total daily manure produced by a milk cow will have 2.9 lb-BOD_5/day. Assuming that 80% of the manure will be flushed to the lagoon system, the minimum lagoon surface area required for a naturally aerobic lagoon treating manure from 7,278 milk cows in the San Joaquin Valley can be calculated as follows:

BOD_5 loading (lb/day) = 7,278 milk cows x 2.9 lb-BOD_5/cow-day x 0.80
= 16,885 lb-BOD_5/day

Minimum Surface Area (acres) in areas of the San Joaquin Valley with a maximum loading rate of 55 lb-BOD_5/acre-day =

16,885 lb-BOD_5/day ÷ 55 lb-BOD_5/acre-day = 307 acres

Minimum Surface Area (acres) in areas of the San Joaquin Valley with a maximum loading rate of 45 lb-BOD_5/acre-day =

16,885 lb-BOD5/day ÷ 45 lb-BOD5/acre-day = 375 acres

As shown above the minimum surface area required for a naturally aerobic lagoon treating manure from 7,278 milk cows in the San Joaquin Valley would range from approximately 307 to 375 acres. This does not include the additional surface area that would be required to treat manure from support stock onsite. Based on the space requirements alone it is clear that this option cannot reasonably be required and no further analysis is needed.

Analysis for a Mechanically Aerated Lagoon Treating Manure from 7,278 Dairy Cows

As discussed above, the very large space requirements for naturally aerobic lagoons cause this option to be infeasible for most confined animal facilities. Mechanically aerating a lagoon can achieve some of the benefits of a naturally aerobic lagoon without the large space requirements. However, the costs of energy for complete aeration have also caused this option to be infeasible. The amount of energy required for aeration is based on the amount of volatile solids excreted by animals that must be treated; thus, this cost will be directly proportional to the number of animals at a site. The following analysis will determine the cost of emission reductions that can be achieved from a mechanically aerated lagoon treating manure from 7,278 milk cows.

Biological Oxygen Demand (BOD_5)

In order to effectively calculate the costs of this control option, the energy requirement for complete aeration must be determined. It should be noted that approximately 1.5 to 2.5 pounds of oxygen is required to digest 1 pound of Biological Oxygen Demand (BOD_5) with additional oxygen required for conversion of ammonia to nitrate (nitrification). It is generally accepted that at least twice the BOD should be provided for complete aeration. According to Dr. Ruihong Zhang of the University of California, Davis, 2.4 lbs (1.1 kg) of oxygen (O2) per cow must be provided each day for removal of BOD and an additional 3 lbs (1.4 kg) per cow for oxidation of 70% of the nitrogen.

The proposed rule specifies that an aerobic lagoon be designed and operated in accordance with NRCS Practice Standard Code 359. NRCS Practice Standard Code 359 requires that mechanically aerated lagoons use aeration equipment that provides a minimum of one pound of oxygen for each pound of daily BOD loading. As discussed above, the total daily manure produced by a milk cow will have a BOD_5 of 2.9 lb/day and a lagoon handling flushed manure from 7,278 milk cows will have a loading rate of approximately 16,885 lb-BOD_5/day (7,675 kg-BOD_5/day).

Energy Requirement a Mechanically Aerated Lagoon Treating Manure from 7,278 Milk cows:

Based on the data gathered in a UC Davis study on aerator performance for wastewater lagoons, aeration efficiencies for mechanical aerators ranged from 0.10 to 0.68 kg of oxygen provided per kW-hr of energy utilized. The most efficient aerator tested that had been installed in dairy lagoons had an aeration efficiency of 0.49 kg-O2/kW-hr. These efficiency tests were performed in clean water and lower aeration efficiencies are expected in liquid manure because of the significant amount of solids that it contains. The yearly energy requirement mechanically aerated lagoon treating flushed manure from 7,278 milk cows is calculated as follows:

High Efficiency Aerator

7,675 kg-BOD_5/day ÷ (0.68 kg-O2/kW-hr) x (365 day/year) = 4,119,669 kW-hr/year

Low Efficiency Aerator

7,675 kg-BOD_5/day ÷ (0.10 kg-O2/kW-hr) x (365 day/year) = 28,013,750 kW-hr/year

Cost of Electricity for a Mechanically Aerated Lagoon Treating Manure from 7,278 Milk cows:

The cost for electricity will be based upon the average price for industrial electricity in California as of July 2019, as taken from the Energy Information Administration (EIA) Website:
http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_06_b

Average Cost for electricity = $0.1277/kW-hr

The electricity costs for complete aeration are calculated as follows:

Low Cost Estimate (High Efficiency Aerator)

4,119,669 kW-hr/year x $0.1277/kW-hr = $526,082/year

High Cost Estimate (Low Efficiency Aerator)

28,013,750 kW-hr/year x $0.1277/kW-hr = $3,577,356/year

VOC Emission Reductions from a Mechanically Aerated Lagoon Treating Manure from 7,278 Milk Cows that will be applied to land

It will be conservatively assumed that a mechanically aerated lagoon providing 1 lb of oxygen for every 1 lb of BOD_5 loading will control 90% of the VOC emissions from the lagoon/storage pond. However, as noted above, it is generally accepted that the oxygen provided should be twice the BOD_5 loading rate for complete aeration; therefore, the actual control from providing 1 lb of oxygen for every 1 lb of BOD_5 loading is probably closer to 50%.

The annual VOC Emission Reductions for a mechanically aerated lagoon treating land applied manure from 7,278 milk cows are calculated as follows and shown in the table below:

[Number of cows] x [Liquid Manure Land Application VOC EF (lb/cow-year)] x [Complete Aeration Control Efficiency for Lagoon/Storage Pond]

VOC Reductions for a Mechanically Aerated Lagoon							
Type of Animal	**# of cows**	**x**	**Liquid Manure Land Application EF (lb/cow-yr)**	**x**	**Control (%)**	**=**	**lb-VOC/yr**
Milk Cow (freestall)	7,278	x	1.4	x	90%	=	**9,170**

Cost of VOC Emission Reductions

Low Estimate = ($526,082/year)/[(9,170 lb-VOC/year)(1 ton/2000 lb)]
= $114,740/ton of VOC reduced

High Estimate = ($3,577,356/year)/[(9,170 lb-VOC/year)(1 ton/2000 lb)]
= $780,230/ton of VOC reduced

As shown above, the electricity cost alone for a mechanically aerated lagoon would cause the cost of the VOC reductions to be greater than the cost effectiveness threshold. This cost does not include the additional electricity cost for nitrification that would naturally occur as the lagoons were aerated or equipment costs. Even without these costs, this control technology would not be cost effective.

2) Irrigation of crops using liquid/slurry manure from a holding/storage pond after being treated in a covered lagoon/digester

The facility has proposed to irrigate their crops using liquid/slurry manure from a lagoon after being treated in a covered lagoon/digester. Since the facility has proposed to implement this option, a cost effectiveness analysis is not required.

3) Irrigation of crops using liquid/slurry manure from the secondary lagoon/holding/storage pond where preceded by an uncovered anaerobic treatment lagoon designed to meet Natural Resources Conservation Service (NRCS) standards

Since this option is achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

Out of the control options that are proposed, cost effective, or achieved in practice, the control option with the highest control efficiency is selected as BACT. Therefore, the proposed irrigation of crops using liquid/slurry manure from a holding/storage pond after being treated in a covered lagoon/digester is selected as BACT for this operation.

2. BACT Analysis for Ammonia (NH_3) Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.7 identifies the following control for ammonia emissions from liquid manure land application:

- All animals fed in accordance with NRC or other District-approved guidelines

Description of Control Technology

All 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, which will reduce ammonia emissions from liquid manure applied to cropland.

b. Step 2 - Eliminate technologically infeasible options

The option listed in Step 1 above is technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

Since only one control option has been identified, ranking is not applicable.

a. Step 4 - Cost Effectiveness Analysis

Since the control option identified is achieved in practice, a cost effectiveness analysis is not required.

b. Step 5 - Select BACT

The applicant has proposed to feed all animals in accordance with NRC or other District-approved guidelines. The proposal satisfies BACT for this category.

VI. Top-Down BACT Analysis for Solid Manure Handling – Storage Piles

BACT Analysis for Ammonia (NH_3) Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.8 identifies the following control for ammonia emissions from solid manure storage piles:

- All Animals Fed in Accordance NRC or other District-Approved Guidelines

Description of Control Technology

All 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, which will reduce ammonia emissions from solid manure.

b. Step 2 - Eliminate technologically infeasible options

The option listed in Step 1 above is technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

Since only one control option has been identified, ranking is not applicable.

d. Step 4 - Cost Effectiveness Analysis

Since the control option identified is achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed to feed all animals in accordance with NRC or other District-approved guidelines. The proposal satisfies BACT for this category.

VII. Top-Down BACT Analysis for Solid Manure Handling - Land Application

1. BACT Analysis for VOC Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.9 identifies the following controls for VOC emissions from solid manure land application:

1) Land Application of solid manure processed by either an open or enclosed negatively-aerated static pile (ASP) vented to a biofilter (or equivalent) ≥ 80% destruction efficiency; with rapid incorporation of the manure into the soil after land application – Technologically Feasible

2) Land application of solid manure processed by in-vessel/enclosed negatively-aerated static piles vented to a biofilter ≥ 80% destruction efficiency – Technologically Feasible
3) Land application of solid manure processed by open negatively-aerated static piles vented to a biofilter ≥ 80% destruction efficiency – Technologically Feasible

4) Land application of solid manure processed by open negatively-aerated static piles (ASP) (with thick layer of bulking agent or equivalent) with rapid incorporation of the manure into the soil after land application – Technologically Feasible

5) Rapid incorporation of solid manure into the soil after land application – Achieved in Practice

Description of Control Technologies

Rapid incorporation of solid manure into the soil after land application

Various types of spreading techniques, such as box spreaders, flail type spreaders, side discharge spreaders, and spinner spreaders, are used to apply solid manure to cropland. Regardless of which technique is used, this practice requires the immediate

incorporation of the manure into the soil, reducing emissions and surface run-off while minimizing the loss of nitrogen into the atmosphere. Based on a study by a local Valley dairy, there is a great potential of reducing emissions by incorporating slurry manure rapidly into the soil. A similar reduction may be obtained by the rapid incorporation of solid manure. This technology is expected to yield a VOC control efficiency of up to 58%.[9]

Land Application of Solid Manure Processed by Open Negatively-Aerated Static Piles (ASP) (With Thick Layer of Bulking Agent or Equivalent)

Aerated static piles are piles that are aerated directly with forced or drawn air systems to speed up the compost process. The aerated static pile is constructed to allow forced airflow (low pressure-high volume blowers and a piping system) so that the oxygen supply can be more accurately controlled. The material is piled over perforated pipes connected to a blower to withdraw air from the pile. The result is improved control of aerobic degradation or decomposition of organic waste and biomass bulking agents. This is considered a more efficient composting method than the industry standard of windrow composting.

VOC emissions primarily occur during the active and curing phases of the composting. To ensure consistent temperatures and prevent escape of odors and VOCs, the piles should be covered with a thick layer (12 to 18 inches) of finished compost or bulking agent.

With positive pressure aeration, contaminated air is pushed through the pile to the outer surface; therefore, making it difficult to be collected for odor treatment. However, positive pressure aeration is more effective at cooling the pile because it provides better airflow.

With negative aeration, air is pulled through the pile from the outer surface. Contaminated air is collected in the aeration pipes and can be directed to an odor treatment system. To avoid clogging, condensed moist air drawn from the pile must be removed before reaching the blower. Negative aeration might create uneven drying of the pile due to its airflow patterns.

A study conducted by City of Columbus, Ohio, demonstrated that the weighted-average odor emissions from an outdoor negative aeration pile is approximately 67% lower than those from an outdoor positive aeration pile. Negative aeration is usually used during the beginning of the composting process to greatly reduce odors. In enclosed active composting area, negative pressure aeration also reduces moisture released into the building, and thus, reduces fogging. Positive aeration is used mostly near the end of the composting cycle for more efficient drying of the compost.[10]

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[9] Page 87 of "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).

[10] Technology Assessment for SCAQMD proposed Rule 1133 Table 3-2

An odor and emissions study done at the City of Philadelphia biosolids co-composting facility by the Department of Water[11] also concluded that controlling the temperature by controlling the oxygen availability using negative aeration composting is expected to result in lower emissions than those from open windrow composting.

The control efficiency can be estimated from the Technology Assessment for SCAQMD Proposed Rule 1133 Table 3-2 which uses a capture efficiency of 25 to 33% from an open ASP and multiplies it by a conservative 80% control equipment efficiency. The average control efficiency for open aerated static piles based on the Technology Assessment is 23.2%. Additional emission reduction potential from open ASPs cannot be quantified at this time. Therefore, a conservative control efficiency of 23.2% will be applied to the ASP.

No control is expected from the land application of the manure since the manure is not being injected or incorporated into the soil. However, since the manure has gone through a pre-control system, the control efficiency of that system would carry over to land application

Land Application of Solid Manure Processed by an Open Negatively-Aerated Static Piles (ASP) (With Thick Layer of Bulking Agent or Equivalent) Vented to a Biofilter (or Equivalent)

This technology is the same as that described above for negatively aerated static piles except that the exhaust gases are vented to a biofilter. As discussed above negative aeration appears to be more efficient in reducing odors and emissions than positive aeration.

Biofiltration is an air pollution control technology that uses a solid media to absorb and adsorb compounds in the air stream and retains them for subsequent biological oxidation. A biofilter consists of a series of perforated pipes laid in a bed of gravel and covered with an organic media. As the air stream flows up through the media, the odorous compounds are removed by a combination of physical, chemical and biological processes. However, depending upon the airflow from the composting material and the design and material selection for the biofilter, the organic matter could quickly deteriorate.

In the biofiltration process, live bacteria biodegrade organic contaminants from air into carbon dioxide and water. Bacterial cultures (microorganisms that typically consist of several species coexisting in a colony) that use oxygen to biodegrade organics are called aerobic cultures. These bacteria are found in soil, peat, compost and natural water bodies including ponds, lakes, rivers and oceans. They are environmentally friendly and non-harmful to humans unless ingested. Chemically, the biodegradation reaction for aerobic cultures is written as:

[11] Conclusion # 2, "Measurement and Control of Odor and VOC emissions from the largest municipal aerated-static pile biosolids composting facility in the United States". William Toffey, Philadelphia Water Department; Lawrence Hentz, Post, Buckley, Shuh and Jerigan.

Organic(s) + Oxygen + Nutrients + Microorganisms => CO_2 + H_2O + Microorganisms

The organic(s) are air contaminants, the oxygen is in air, the nutrients are nitrogen and phosphorus mineral salts needed for microbial growth and the microorganisms are live bacteria on the biofilter media.

Biofiltration is a well-established emission and control technology in Europe where over two hundred biofilters were in use as of 1984 and even more are expected today. In the United States, biofilters have been mainly utilized for the treatment of odors as well as VOCs in wastewater treatment plants. Based on the information collected by SCAQMD, existing biofilter composting applications have achieved control efficiencies of about 80% to 90% for VOC and 70% to over 90% for ammonia (one of this composting applications reported an initial control efficiency of 65 percent for VOC but was later improved to achieve an 80 percent control efficiency). This specific field example along with other available data presented in SCAQMD's Technology Assessment Report demonstrates that a well-designed, well-operated, and well-maintained biofilter is capable of achieving 80% control efficiency for VOC and ammonia.[12]

No control is expected from the land application of the manure since the manure is not being injected or incorporated into the soil. However, since the manure has gone through an ASP vented to biofilter, the 80% control efficiency of that system would carry over to land application.

Land Application of Solid Manure Processed by an Enclosed Aerated Static Piles (AgBag, Gore Cover, or Equivalent)

An enclosed aerated static pile uses the same forced aeration principle of an open ASP, except that the entire pile is fully enclosed, either inside a building or with a tarp around it.

There are a few companies that are promoting this type of system. In this analysis, the following two companies will be discussed: AgBag International Ltd and the Gore Cover. Both technologies are briefly described below:

AgBag International Ltd.

The AgBag system was developed by Compost Technology International and is based in Oregon. The system has controlled aeration capabilities and has minimal space requirements. It is suited for small to mid-size composting. The system is comprised of the following components:

- Large sealed bags (pods) of adjustable length up to 200 ft, either 5 ft or 10 ft diameter
- 9 mm recyclable plastic (not re-usable)

[12] SCAQMD Final Staff Report for Rule 1133, page 18

- Adjustable aeration system with inserted valved vents
- Hopper, mixer & compost compactor

The Ag-Bag Environmental system provides a cycle time of as little as 8 weeks. Curing adds another 30 to 60 days. AgBag states that three annual composting cycles could be obtained. The area needed to compost is determined by the volume of waste material.

Mixing – A composite mix of materials needs to be balanced for proper carbon to nitrogen (C:N) ratio. This means a mix of greens (nitrogen sources) to browns (carbon sources). The best ratio that AgBag recommends is between 20 to 40:1, with 30:1 being ideal.

The oxygen supply is replenished by forced aeration. This eliminates the labor-intensive need to turn piles. Temperature monitors indicate when the airflow needs adjusting to maintain proper temperatures. Moisture is adjusted at time of filling or added to the total mixture upon blending. The compost matrix is sufficient in size to maintain heat, even in cold climates. The system contains vents throughout to allow air to escape. These vents are controlled by the operator. Ag-Bag is considered an in-vessel system.

After 8-12 weeks of composting, the compost cycle is completed. The "Pod", as AgBag likes to call it, is opened and the material is static piled for 30-60 days to cure or mature.

A representative of AgBag has claimed very high control efficiencies for both VOCs and ammonia and has claimed that the system acts as its own biofilter, thus reducing emissions. However, VOC and ammonia control efficiencies are not readily available at this time. Furthermore, AgBag has not provided any technical information to support their claimed level of control.

AgBag is working closely with SCAQMD and the Milk Producers Council to perform a pilot study to evaluate the efficiency of this technology. Until the study is completed, this technology will be conservatively assumed to control emissions by at least 10% more than open aerated static piles, with a minimum control efficiency of 33.2%. Once the study is completed, the District will be able to more accurately determine the control efficiency for this technology.

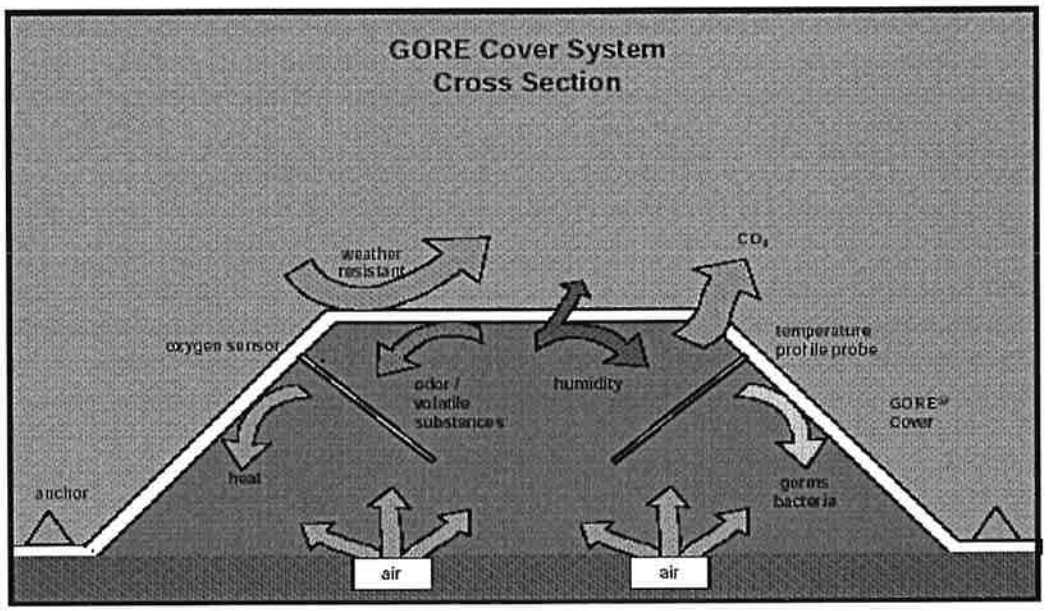
Gore Cover

The Gore Cover, manufactured by Gore Creative Technologies Worldwide, utilizes positive aeration and a specially designed cover to create an enclosed system that controls odors, microorganisms and creates a consistent product unaffected by outside environmental conditions. Medium pressure aerators connect to aeration pipes on the floor or aeration ducts in the floor. Stainless steel probes inserted into the pile monitor oxygen and temperature parameters. The data is relayed to and stored in a computer. This data controls the aerators to keep pile conditions consistent. The

Gore Cover system can significantly reduce odors by the controlled use of a semi permeable membrane that is permeable to oxygen but impermeable to large molecules. The cover protects the pile from weather conditions, but allows release of CO_2. These controlled conditions allow consistent product to be produced without risk of damp pockets that may create anaerobic conditions and increased odors.

In addition to the membrane, which covers the organic material during composting, the system includes a concrete floor and wall, blowers for aeration, and a winder for efficient movement of the cover. The system also requires consistent management including preparation of materials to achieve a homogenous mixture with moisture content of 55 - 60% and monitoring of temperature and oxygen levels. With this system, the composting process takes eight weeks. The "heap" of organic material is covered by the membrane, which is secured to the ground, allowed to compost for four weeks, then moved and re-covered for two weeks for stabilization. During the final two weeks of curing, the heap is uncovered.

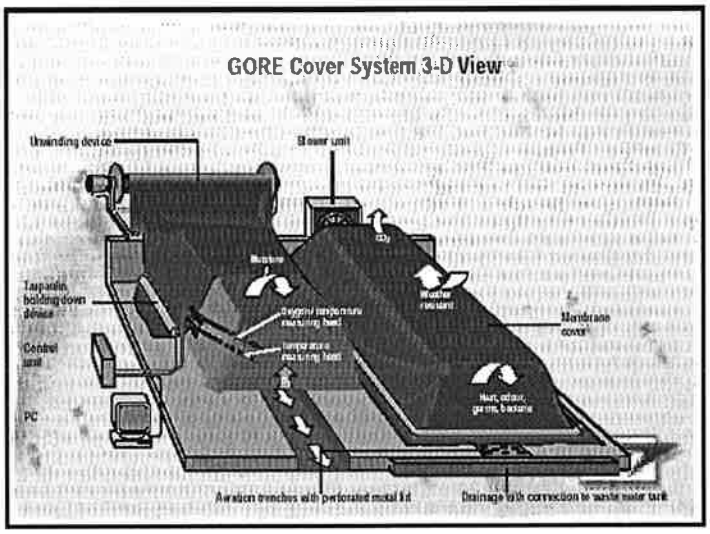
A fine film of condensation develops during the composting process that collects on the inside cover. According to the manufacturer, the moisture helps to dissolve the gases. The condensation then drips back onto the pile, where they can continue to be broken down by the composting process.



The system, according to Gore Cover, shortens the time required to produce finished, premium compost, as follows:

- First zone – Four weeks – Material stays on the initial placement zone in-vessel
- Second zone – Two weeks – Material moved to another in-vessel zone with minimizing addition of water. Water addition is nominal because the in-vessel system retains the initial moisture within the system and only releases minimal amounts.
- Third zone – Two weeks – the final move is to a third uncovered zone.

- Screening – Material will be screened then ready to sell within 15 days.



There is no control efficiency available at this time for enclosed aerated static piles. A study is under way by SQAQMD and the Milk Producers Council to determine the control efficiencies for VOC and ammonia emissions from enclosed aerated composting systems. Until the study is completed, this technology will be conservatively assumed to control emissions by 10% more than open aerated static piles, with a minimum control efficiency of 33.2% until additional data are available.

No control is expected from the land application of the manure since the manure is not being injected or incorporated into the soil. However, since the manure has gone through a pre-control system, the control efficiency of that system would carry over to land application

Land Application of Solid Manure Processed by an In-Vessel/Enclosed (Building, AgBag, Gore Cover, or Equivalent) Negatively-Aerated Static Piles Vented to a Biofilter

An in-vessel aerated static pile uses the same forced aeration principle of an open ASP, except that the entire pile is fully enclosed, either inside of a building or with a tarp around it. In addition to the in-vessel ASP, the biogas must be sent to a biofilter capable of reducing at least 80% emissions.

According to the SCAQMD Rule 1133.2 final staff report (page 18) "Technology Assessment Report states a well-designed, well operated, and well-maintained biofilter is capable of achieving 80% destruction efficiency for VOC and NH3." The overall control efficiency of this technology is equal to the combined control efficiencies of the enclosed aerated system (33.2% - calculated above in section 19) and the biofilter (80%), calculated as follows:

$$CE = (0.332) + (1-0.332)*0.8 = 86.6\%$$

No control is expected from the land application of the manure since the manure is not being injected or incorporated into the soil. However, since the manure has gone through a pre-control system, the control efficiency of that system would carry over to land application.

Land Application of Solid Manure Processed by Either an Open or Enclosed Negatively-Aerated Static Pile (ASP) Vented to a Biofilter With Rapid Incorporation of the Manure Into the Soil After Land Application

This technology is the same as those previously described, but with the added control of rapid incorporation of the manure into the soil.

As discussed in the first option, the VOC control efficiency from immediate incorporation is up to 58%. The overall control efficiency of the combination of both practices is equal to the combined control efficiencies of the ASP and biofilter system (80%) and the control efficiency of immediate incorporation.

VOC Overall Control efficiency (0.80) + (1-0.80) x (58%) = 91.6%

b. Step 2 - Eliminate technologically infeasible options

The options listed in Step 1 above are all technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

1) Land Application of Solid Manure Processed by Either an Open or Enclosed Negatively-Aerated Static Pile (ASP) Vented to a Biofilter ≥ 80% destruction efficiency; With Rapid Incorporation of the Manure Into the Soil After Land Application (91.6%)
2) Land Application of Solid Manure Processed by In-Vessel/Enclosed Negatively-Aerated Static Piles vented to biofilter ≥ 80% destruction efficiency (86.6%)
3) Land Application of Solid Manure Processed by Open Negatively-Aerated Static Piles vented to biofilter ≥ 80% destruction efficiency (80%)
4) Land Application of Solid Manure Processed by an Open Negatively-Aerated Static Piles (ASP) (With Thick Layer of Bulking Agent or Equivalent) With Rapid Incorporation of the Manure Into the Soil After Land Application (67.7%)
5) Rapid incorporation of solid manure into the soil after land application (58%)

d. Step 4 - Cost Effectiveness Analysis

1) Options 1, 2, and 3: Land Application of In-Vessel/Enclosed Negatively-Aerated Static Piles Vented to Biofilter or Open Negatively-Aerated Static Piles Vented to Biofilter (With Rapid Incorporation of the Manure Into the Soil After Land Application)

The following costs are taken from the final staff report for District Rule 4565 - Biosolids, Animal Manure, and Poultry Litter Operations (May 30, 2007).[13] The cost information is based on a large composting facility with a throughput of 200,000 wet tons per year. On a per ton basis the costs for smaller composting facilities would be higher since there would not be the economies of scale for building and operations created by large composting facilities.

Low Cost Scenario: ASP & Biofilter (200,000 wet ton/yr)	
Total Capital Cost	$7,775,000
Annualized capital cost (10% interest - 10 years)	$1,265,345
Total Annual O & M Cost	$124,305
Total Annualized Cost - ASP & Biofilter (Low-Estimate of Annual Costs) ($/yr/facility)	**$1,389,650**
Inflation-Adjust Total Annualized Cost[14]	**$1,761,352**

High Cost Scenario: In-Vessel and RTO (200,000 wet ton/yr)	
Total Capital Cost	$21,185,000
Annualized capital cost (10% interest - 10 years)	$3,447,761
Total Annual O & M Cost	$285,910
Total Annualized Cost - In-Vessel & RTO (High-Estimate of Annual Costs) ($/yr/facility)	**$3,733,671**
Inflation-Adjust Total Annualized Cost[31]	**$4,732,349**

The final staff report for District Rule 4565 stated that the use of ASPs and in-vessel composting would have unreasonably high costs for facilities that have a throughput of less than 100,000 wet tons per year. The costs given above are for a facility with a throughput of 200,000 wet tons per year. It will conservatively be assumed that the cost for a facility with a throughput of 100,000 wet tons per year will be half of the

[13] The capitol and operation costs for ASP and in-vessel composting given in the final staff report were taken from: United States Environmental Protection Agency, "Biosolids Technology Fact Sheet: Use of Composting for Biosolids Management" EPA 832-F-02-024, September 2002, http://water.epa.gov/scitech/wastetech/upload/2002_10_15_mtb_combioman.pdf. These costs were not adjusted for inflation

[14] Adjustment using the Bureau of Labor Statistics CPI inflation calculator at https://data.bls.gov/cgi-bin/cpicalc.pl?cost1=585&year1=200901&year2=201908.

values given above. Therefore, the cost estimates for a facility with a throughput of 100,000 are as follows:

Low Annual Capital Cost Estimate (100,000 wet ton/yr) = $880,676/year

High Annual Capital Cost Estimate (100,000 wet ton/yr) = $2,366,175/year

Because it has been determined that composting or storing solid manure removed from dairy cow housing in an ASP or enclosure vented to a control device would not be cost-effective for a facility with a throughput of less than 100,000 tons per year, this analysis will be based on a dairy facility that can produce 100,000 tons of solid manure per year.

Number of Cows to Produce 100,000 ton/yr of Solid Manure

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Agricultural Waste Management Field Handbook (AWMFH), Chapter 4 - Agricultural Waste Characteristics (March 2008), dairy cows in scraped open corrals produce approximately 77 lb per day of solid manure that can be removed and transferred for storage or composting. The amount of solid manure removed for dairy cows housed in corrals or freestall barns with a flush system would be much less. The number of cows needed to produce 100,000 ton/year of solid manure is calculated as follows:

(100,000 ton/year x 2,000 lb/ton) ÷ (77 lb/cow-day x 365 day/yr) = 7,116 cows

VOC Emission Reductions from an ASP or Enclosure Handling Solid Manure from 7,116 Milk Cows:

The annual VOC Emission Reductions for ASP or in-vessel enclosure handling the solid manure from 7,116 milk cows are calculated as follows and shown in the table below:

[Number of cows] x [Solid Manure VOC EF (lb/cow-year)] x [ASP/In-Vessel Capture Efficiency] x [Control Device VOC Control Efficiency]

VOC Reductions for Dairy Solid Manure in ASP or Enclosure Vented to a Biofilter									
Type of Animal	**# of cows**	**x**	**Solid Manure Land Application EF (lb/cow-yr)**	**x**	**Capture (%)***	**x**	**Control (%)**	**=**	**lb-VOC/yr**
Milk Cow	7,116	x	0.33	x	50%	x	80%	=	939

*The capture efficiency is conservatively assumed to be 50%. The technical assessment of SCAQMD Rule 1133.2 and the staff report for District Rule 4565 give a capture efficiency of 33% for composting facilities, which would result in lower emission reductions.

Cost of VOC Emission Reductions

Low Estimate = ($880,676/year)/[(939 lb-VOC/year)(1 ton/2,000 lb)]
= $1,875,774/ton of VOC reduced

High Estimate = ($2,366,175/year)/[(939 lb-VOC/year)(1 ton/2,000 lb)]
= $5,039,776/ton of VOC reduced

As shown above, the cost alone of an ASP or in-vessel enclosure vented to a biofilter to handle the solid manure at a dairy would cause the cost of the VOC reductions to be greater than the cost effectiveness threshold. The excessively high costs of this option make it impractical for most confined animal facilities. Therefore, this control technology is not cost effective.

2) Option 4: Land Application of Solid Manure Processed by an Open Negatively-Aerated Static Pile (ASP) or With Thick Layer of Bulking Agent; With Rapid Incorporation of the Manure Into the Soil After Land Application

A cost effectiveness was evaluated by SCAQMD for a variety of controls for new and existing co-composting facilities based on implementation of several possible scenarios. The cost effectiveness for new co-composting facilities was estimated to be about $24,000 to $27,000 per ton of VOC reduced or $11,000 to $12,000 per ton of VOC and ammonia reduced based on fabric or concrete type of enclosure for the active phase of composting and forced aeration system for the active and curing phases vented to a bio-filter.[15]

For existing co-composting operations, SCAQMD analyzed a few different scenarios. Under one of the scenarios, assuming enclosure without an aeration system for active phase of composting and a forced aeration system for curing phase (both vented to a biofilter) and depending on the type of enclosure, the cost-effectiveness ranged from $11,400 to $15,400 per ton of VOC and ammonia reduced, or $30,000 to $40,000 per ton of VOC reduced. Under another scenario, using enclosure and aeration system for active phase, and aeration system for curing phase, both vented to biofilter, the cost effectiveness ranged from $8,700 to $10,000 per ton of VOC and ammonia reduced or $23,000 to $26,500 per ton of VOC reduced (depending on the type of enclosure). Under another scenario, assuming that forced aeration system (in combination with process controls, optimized feedstock mix ratios, and best management practices) for both active and curing phases (combined with a biofiltration system) could achieve the required reductions (i.e., 70% for VOC and ammonia), the cost-effectiveness could be as low as $6,500 per ton of VOC and ammonia reduced or $17,000 per ton of VOC reduced. However, SCAQMD stated that additional test data would be necessary to validate the efficiency of such control methods.[16]

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[15] Final Staff report for proposed Rule 1133, 1133.1, and 1133.2)

[16] The cost assumptions used in this analysis (capital and operating cost) are included in the Technology Assessment Report for SCAQMD PR1133 (Attachment A to the Final Staff Report)

The VOC and ammonia baseline emission factors, used in determining the cost effective analysis (also included in Rule 1133.2), were developed based on the AQMD source tests conducted in 1995 and 1996 for three windrow co-composting facilities (1.78 pounds of VOC and 2.93 pounds of ammonia per ton of throughput). These emission factors do not accurately represent the baseline emissions of manure storage piles from dairy/calf facilities. The emission factor for manure piles may in fact be lower.

Enclosed ASP or in-vessel systems with control equipment, while feasible and effective at significantly reducing emissions, are costly. There may be additional emission reductions associated with ASP systems that have not been quantified in this evaluation. Additional testing of ASP systems, such as the ones discussed in this evaluation would allow the emission reduction potential of all control scenarios to be refined.

Therefore, these aerated static composting systems will be eliminated at this time.

3) Rapid incorporation of solid manure into the soil after land application

Since the control option is achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed rapid incorporation of solid manure into the soil after land application. The proposal satisfies BACT for this category.

2. BACT Analysis for Ammonia (NH3) Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.9 identifies the following control for ammonia emissions from solid manure land application:

- Rapid incorporation of solid manure into the soil after land application, and all animals fed in accordance with NRC or other District-approved guidelines

Description of Control Technology

Rapid incorporation of solid manure into the soil after land application

Various types of spreading techniques, such as box spreaders, flail type spreaders, side discharge spreaders, and spinner spreaders, are used to apply solid manure to cropland. Regardless of which technique is used, this practice requires the immediate incorporation of the manure into the soil, reducing emissions and surface run-off while minimizing the loss of nitrogen into the atmosphere. Based on a study by a local Valley dairy, there is a great potential of reducing emissions by incorporating slurry manure rapidly into the soil. A similar reduction may be obtained by the rapid incorporation of solid manure. This

technology is expected to yield a NH3 control efficiency ranging from 49% to upwards of 98%.[17]

All 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, which will reduce ammonia emissions from solid manure.

b. Step 2 - Eliminate technologically infeasible options

The option listed in Step 1 above is technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

Since only one control option has been identified, ranking is not applicable.

d. Cost Effectiveness Analysis

Since the control option identified is achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed rapid incorporation of solid manure into the soil after land application, and all animals fed in accordance with NRC or other District-approved guidelines. The proposal satisfies BACT for this category.

[17] Page 81 of "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).

VIII. Top-Down BACT Analysis for the Feed Storage and Handling System – Feed/TMR

BACT Analysis for VOC Emissions

a. Step 1 - Identify all control technologies

BACT Guideline 5.8.11 identifies the following control for VOC emissions from feed/TMR:

- District Rule 4570 Measures for Feed/TMR

Description of Control Technology

District Rule 4570 Measures for Feed/TMR

District Rule 4570 requires the implementation of various management practices to reduce VOC emissions from TMR. These practices include pushing feed so that it is within three feet of feedlane fence within two hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the animals, so the area of the feed is minimized and the feed can be consumed by the cows in a shorter time period instead of continuing to emit VOCs; beginning feeding total mixed rations within two hours of grinding and mixing rations, reducing the time that fresh feed emits VOCs; storing grain in a weatherproof storage structure or under a weatherproof covering from October through May; feeding stream-flaked, dry rolled, cracked or ground corn or other ground cereal grains; removal of uneaten wet feed from feeding areas; and preparing TMR with a minimum moisture content, which reduces VOC since most of the compounds emitted are higly soluble in water.

b. Step 2 - Eliminate technologically infeasible options

The option listed in Step 1 above is technologically feasible.

c. Step 3 - Rank remaining options by control effectiveness

Since only one control option has been identified, ranking is not applicable.

d. Step 4 - Cost Effectiveness Analysis

Since the control option identified is achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed to implement District Rule 4570 measures. The proposal satisfies BACT for this category.

APPENDIX G

HRA and AAQA Summary

San Joaquin Valley Air Pollution Control District
Risk Management Review and Ambient Air Quality Analysis

To:	Jonah Aiyabei – Permit Services
From:	Seth Lane – Technical Services
Date:	November 18, 2019
Facility Name:	DIAMOND H DAIRY
Location:	9564 AVENUE 18-1/2, CHOWCHILLA
Application #(s):	C-5289-1-5, -2-6, -3-6, -4-5, -13-4
Project #:	C-1191298

1. Summary

1.1 RMR

Units	Prioritization Score	Acute Hazard Index	Chronic Hazard Index	Maximum Individual Cancer Risk	T-BACT Required	Special Permit Requirements
1	0.09	0.00	0.00	1.82E-08	No	No
2	3.76	0.11	0.02	8.71E-07	No	No
3	0.01	0.00	0.00	N/A[1]	No	No
4	0.02	0.00	0.00	N/A[1]	No	No
13	N/A[2]	N/A[2]	N/A[2]	N/A[2]	No	No
Project Totals	0.00	0.18	0.03	8.89E-07		
Facility Totals	6.34	0.27	0.08	3.90E-06		

Notes:
1. Cancer risk not calculated for Units 3 and 4 since there is no risk factor or the risk factor is so low that it has been determined to be insignificant for these units.
2. There is no risk associated with Unit 13 as the District does not have an approved toxic speciation profile for dairy feed and storage handling operations.

1.2 AAQA

Pollutant	Air Quality Standard (State/Federal)				
	1 Hour	3 Hours	8 Hours	24 Hours	Annual
CO	Pass		Pass		
NO_x	Pass				Pass
SO_x	Pass	Pass		Pass	Pass
PM10				Pass	Pass
PM2.5				Pass	Pass

Notes:
1. The criteria pollutants are below EPA's level of significance as found in 40 CFR Part 51.165 (b)(2) unless otherwise noted below.
2. Modeled PM10 concentrations were below the District SIL for fugitive sources of 10.4 $\mu g/m^3$ for the 24-hour average concentration and 2.08 $\mu g/m^3$ for the annual concentration.
3. Modeled PM2.5 concentrations were below the District SIL for fugitive sources of 2.5 $\mu g/m^3$ for the 24-hour average concentration and 0.63 $\mu g/m^3$ for the annual concentration.

To ensure that human health risks will not exceed District allowable levels; the following shall be included as requirements for:

Unit # 1-5, 2-6, 3-6, 4-5, & 13-4

1. No special requirements.

2. Project Description

Technical Services received a request on November 18, 2019 to perform a Risk Management Review (RMR) and Ambient Air Quality Analysis (AAQA) for the following:

- Unit -1-5: MODIFICATION OF 4,900 COW MILKING OPERATION WITH ONE DOUBLE 34 HERRINGBONE (68 STALLS) MILKING PARLOR AND ONE DOUBLE 45 PARALLEL (90 STALLS) MILKING PARLOR: INCREASE MAXIMUM NUMBER OF MILK COWS FROM 4,900 TO 7,278 AND CONSTRUCT 10 ROBOTIC MILKING CENTERS IN FREESTALL BARNS FS 3, FS 5, FS 10, AND FS 14
- Unit -2-6: MODIFICATION OF COW HOUSING - 4,900 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 5,650 MATURE COWS (MILK AND DRY); 6,260 TOTAL SUPPORT STOCK (HEIFERS, CALVES, AND BULLS); AND 8 FREESTALL BARNS AND 1 LOAFING BARN WITH FLUSH/SCRAPE SYSTEM: INCREASE MILK COWS TO 7,278, MATURE COWS TO 8,282, SUPPORT STOCK TO 8,544; INCREASE NUMBER OF CALF HUTCHES (ONGROUND) FROM 500 TO 750; CONSTRUCT 5 FREESTALL BARNS AND 1 LOAFING BARN WITH FLUSH SYSTEMS OVER EXISTING EXERCISE PENS; CONSTRUCT 2 NEW LOAFING BARNS AND 10 NEW OPEN CORRALS WITH FLUSH SYSTEMS; AND SUBDIVIDE 5 EXISTING OPEN CORRALS INTO 7 SMALLER CORRALS
- Unit -3-6: MODIFICATION OF LIQUID MANURE HANDLING SYSTEM CONSISTING OF SETTLING BASIN(S); DOUBLE MECHANICAL SEPARATOR(S); AND THREE STORAGE PONDS; MANURE IS LAND APPLIED THROUGH FLOOD IRRIGATION: INCREASE IN LIQUID MANURE DUE TO INCREASE IN HERD SIZE AND CONVERSION OF 2 SETTLING BASINS INTO A COVERED ANAEROBIC TREATMENT DIGESTER LAGOON AS AUTHORIZED BY ATC C-9220-1-0
- Unit -4-5: MODIFICATION OF SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND: INCREASE IN SOLID MANURE DUE TO INCREASE IN HERD SIZE
- Unit -13-4: MODIFICATION OF FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARN(S), SILAGE PILE(S), AND TOTAL MIXED RATION FEEDING: INCREASE IN THROUGHPUT DUE TO INCREASE IN HERD SIZE

3. RMR Report

3.1 Analysis

The District performed an analysis pursuant to the District's Risk Management Policy for Permitting New and Modified Sources (APR 1905, May 28, 2015) to determine the possible cancer and non-cancer health impact to the nearest resident or worksite. This policy requires that an assessment be performed on a unit by unit basis, project basis, and on a facility-wide basis. If a preliminary prioritization analysis demonstrates that:

- A unit's prioritization score is less than the District's significance threshold and;

- The project's prioritization score is less than the District's significance threshold and;
- The facility's total prioritization score is less than the District's significance threshold

Then, generally no further analysis is required.

The District's significant prioritization score threshold is defined as being equal to or greater than 1.0. If a preliminary analysis demonstrates that either the unit(s) or the project's or the facility's total prioritization score is greater than the District threshold, a screening or a refined assessment is required

If a refined assessment is greater than one in a million but less than 20 in one million for carcinogenic impacts (Cancer Risk) and less than 1.0 for the Acute and Chronic hazard indices(Non-Carcinogenic) on a unit by unit basis, project basis and on a facility-wide basis the proposed application is considered less than significant. For unit's that exceed a cancer risk of 1 in one million, Toxic Best Available Control Technology (TBACT) must be implemented.

Toxic emissions for this project were calculated using the following methods:

- Toxic emissions for the Cow Housing, Lagoon, and Milk Parlor were calculated using emission factors derived from the District's evaluation of dairy research studies conducted by California colleges and universities. PM based toxic emissions for the Cow Housing were calculated using emission factors generated from using the worst case composite of the 1997 EPA speciation of Kern County feedlot soil. PM_{10} and $PM_{2.5}$ Emissions for the AAQA were calculated and provided by the processing engineer.

These emissions were input into the San Joaquin Valley APCD's Hazard Assessment and Reporting Program (SHARP). In accordance with the District's Risk Management Policy, risks from the proposed unit's toxic emissions were prioritized using the procedure in the 2016 CAPCOA Facility Prioritization Guidelines. The prioritization score for this proposed facility was greater than 1.0 (see RMR Summary Table). Therefore, a refined health risk assessment was required.

The AERMOD model was used, with the parameters outlined below and meteorological data for 2007-2011 from Mendota (rural dispersion coefficient selected) to determine the dispersion factors (i.e., the predicted concentration or X divided by the normalized source strength or Q) for a receptor grid. These dispersion factors were input into the SHARP Program, which then used the Air Dispersion Modeling and Risk Tool (ADMRT) of the Hot Spots Analysis and Reporting Program Version 2 (HARP 2) to calculate the chronic and acute hazard indices and the carcinogenic risk for the project.

The following parameters were used for the review:

Housing Names	Type of Cow	# of Cows	VOC (lb/hr)	VOC (lb/yr)	NH3 (lb/hr)	NH3 (lb/yr)	PM10 (lb/hr)	PM10 (lb/yr)
FS 12	milk cows	158	0.17	1477	0.38	3338	0.00	0
FS 3	milk cows	100	0.11	935	0.24	2113	0.02	137
FS 10	milk cows	50	0.05	467	0.12	1056	0.00	0
FS 5	milk cows	100	0.11	935	0.24	2113	0.02	137
FS 14	milk cows	450	0.48	4207	1.08	9508	0.00	0
FS 7	milk cows	0	0.00	0	0.00	0	0.00	0
FS 2	milk cows	69	0.07	645	0.17	1458	0.01	94
FS 13	milk cows	158	0.17	1477	0.38	3338	0.00	0
FS 4	milk cows	100	0.11	935	0.24	2113	0.02	137

FS 11	milk cows	450	0.48	4207	1.08	9508	0.00	0
FS 6	milk cows	0	0.00	0	0.00	0	0.00	0
FS 9	dry cows	99	0.06	524	0.12	1060	0.03	270
OC 11	support stock	92	0.05	373	0.06	509	0.05	458
OC 12	support stock	198	0.09	804	0.13	1096	0.14	1197
OC 14	calves	250	0.02	185	0.03	227	0.00	10
OC 17	support stock	56	0.03	227	0.04	310	0.01	108
OC 22	support stock	750	0.35	3045	0.48	4152	0.50	4371
OC 23	support stock	750	0.35	3045	0.48	4152	0.50	4371
OC 24	support stock	849	0.39	3447	0.54	4700	0.57	4948
OC 25	support stock	149	0.07	605	0.10	825	0.10	868
OC 26	support stock	468	0.22	1900	0.30	2591	0.31	2728
OC 27	support stock	170	0.08	690	0.11	941	0.08	668

Area Source Parameters

Unit ID	Unit Description	Release Height (m)	X-Length (m)	Y -Length (m)	Area (m^2)
2	FS 13	1.00	170.65	46.65	7960.82

Polygon Area Source Parameters

Unit ID	Unit Description	Release Height (m)	No. Vertices	Area (m^2)
1	Milk Parlor	1.00	4	3916
2	FS 2	1.00	5	11171
2	FS 5	1.00	4	7461
2	FS 14	1.00	5	12016
2	FS 7	1.00	4	8244
2	LB 10	1.00	5	27633
2	FS 6	1.00	4	9700
2	OC 17	1.00	4	33475
2	OC 22	1.00	4	14283
2	OC 23	1.00	4	15431
2	OC 24	1.00	4	19259
2	OC 25	1.00	4	6501
2	OC 27	1.00	4	4530
2	FS 10	1.00	4	8064
2	FS 9	1.00	4	6472
2	OC 12	1.00	4	12155
2	OC 11	1.00	4	6474
2	OC 14 Hutches	1.00	4	3432
2	FS 4	1.00	4	7782
2	FS 11	1.00	4	11893
2	FS 12	1.00	4	7770
2	FS 13	1.00	4	7820
2	FS 3	1.00	4	7603
2	OC 26	1.00	4	11968
3	Lagoon	0.00	4	73228
4	Land App Solid	0.00	27	11016128
4	Solid Pile Storage	0.00	5	30139

4. AAQA Report

AAQA. In addition to the RMR, Technical Services performed modeling for the criteria pollutant PM_{10} and $PM_{2.5}$ using AERMOD. The results from the Criteria Pollutant Modeling are as follows:

*4.1.1.1 PM_{10} Pollutant Modeling Results**

Values are in $\mu g/m^3$

Category	24 Hours	Annual
Net Value	8.72	0.59
Interim Significance Level	10.4[1]	2.08[1]
Result	Pass	Pass

[1]The District has decided on an interim basis to use a SIL threshold for fugitive dust sources of 10.4 $\mu g/m^3$ for the 24-hour average concentration and 2.08 $\mu g/m^3$ for the annual concentration.

*4.1.1.2 $PM_{2.5}$ Pollutant Modeling Results**

Values are in $\mu g/m^3$

Category	24 Hours	Annual
Net Value	2.5	0.17
Interim Significance Level	2.5[1]	0.63[1]
Result	Pass	Pass

[1]The District has decided on an interim basis to use a SIL threshold for fugitive dust sources of 2.5 $\mu g/m^3$ for the 24-hour average concentration and 0.63 $\mu g/m^3$ for the annual concentration.

5. Conclusion

5.1 RMR

The cumulative acute and chronic indices for this facility, including this project, are below 1.0; and the cumulative cancer risk for this facility, including this project, is less than 20 in a million. In addition, the cancer risk for each unit in this project is less than 1.0 in a million. **In accordance with the District's Risk Management Policy, the project is approved without Toxic Best Available Control Technology (T-BACT).**

These conclusions are based on the data provided by the applicant and the project engineer. Therefore, this analysis is valid only as long as the proposed data and parameters do not change.

5.2 AAQA

The ambient air quality impacts from PM_{10} and $PM_{2.5}$ emissions at the proposed dairy modification does not exceed the District's 24-hour or Annual interim threshold for fugitive dust sources.

6. Attachments

A. Modeling request from the project engineer

B. Additional information from the applicant/project engineer

C. Prioritization score w/ toxic emissions summary

D. Facility Summary

APPENDIX H

PE Calculations for Permit Units C-5289-9-0 and 10-0

Permit Unit C-5289-9-0

Equipment Description

C-5289-9-0: 755 BHP CATERPILLAR MODEL 3412 DIESEL-FIRED EMERGENCY STANDBY IC ENGINE POWERING AN ELECTRICAL GENERATOR

Assumptions

Non-emergency operating schedule:	100 hours/year
Density of diesel fuel:	7.1 lb/gal
EPA F-factor (adjusted to 60°F):	9,051 dscf/MMBtu
Fuel heating value:	137,000 Btu/gal
BHP to Btu/hr conversion:	2,542.5 Btu/hp·hr
Thermal efficiency of engine:	commonly ≈ 30%
PM_{10} fraction of diesel exhaust:	0.96 (CARB, 1988)

Emission Factors

No emission factors are listed on the permit for this unit. The following worst-case emission factors for similar units will be used:

Emission Factors for Uncontrolled Tier 0 Engines		
Pollutant	**g/bhp·hr**	**Source**
NO_x	10.00	Carl Moyer Program
SO_x	0.0051	Mass Balance Equation Below
PM_{10}	0.475	Carl Moyer Program
CO	3.04	AP-42 (10/96) Table 3.3-1
VOC	1.14	AP-42 (10/96) Table 3.3-1

The SOx emission factor is calculated as follows:

$$\frac{0.000015\ lb-S}{lb-fuel}\times\frac{7.1\ lb-fuel}{gallon}\times\frac{2\ lb-SO_2}{1\ lb-S}\times\frac{1\ gal}{137{,}000\ Btu}\times\frac{1\ bhp\ input}{0.35\ bhp\ out}\times\frac{2{,}542.5\ Btu}{bhp-hr}\times\frac{453.6\ g}{lb}=0.0051\ \frac{g-SO_x}{bhp-hr}$$

Calculations

For diesel-fired emergency standby engines, the annual PE for each pollutant is calculated using the following equation:

Annual PE = Emission Factor (g/bhp-hr) x Engine Rating (bhp) x Operating Hours (hrs/yr) ÷ 453.6 g/lb

Based on the current permit requirements and the emission factors above, the PE calculations are summarized in the following table:

Annual PE Calculations Summary								
NO_x	10.00	(g/hp·hr) x	755	(hp) x	100	(hr/yr) ÷ 453.6 (g/lb) =	1,664	(lb/yr)
SO_x	0.0051	(g/hp·hr) x	755	(hp) x	100	(hr/yr) ÷ 453.6 (g/lb) =	1	(lb/yr)
PM_{10}	0.475	(g/hp·hr) x	755	(hp) x	100	(hr/yr) ÷ 453.6 (g/lb) =	79	(lb/yr)
CO	3.04	(g/hp·hr) x	755	(hp) x	100	(hr/yr) ÷ 453.6 (g/lb) =	506	(lb/yr)
VOC	1.14	(g/hp·hr) x	755	(hp) x	100	(hr/yr) ÷ 453.6 (g/lb) =	190	(lb/yr)

Permit Unit C-5289-10-0

Equipment Description

AGRICULTURAL GASOLINE DISPENSING OPERATION WITH ONE 350 GALLON PHASE I EXEMPT ABOVEGROUND STORAGE TANK AND 1 FUELING POINT WITH 1 PHASE II EXEMPT GASOLINE DISPENSING NOZZLE (IMPLEMENTS OF HUSBANDRY)

Assumptions

- VOC is the only pollutant emitted from this operation.
- This operation is not equipped with any emission controls.
- The annual gasoline throughput is 2,400 gallons (per applicant, project C-1042985).

Emission Factors

The emission factors used are from Appendix A - Emission Factors for Gasoline Stations, published by CAPCOA Air Toxic "Hot Spots" Program in the Gasoline Service Station Industrywide Risk Assessment Guidelines dated December 1997. The emission factors are summarized in the following table:

Category	Emission Factor (lb/1,000 gallons)
Tank filling loss:	8.4
Breathing loss:	2.1
Vehicle fueling loss:	8.4
Spillage:	0.61
Total VOC losses:	**19.5**

Calculations

Annual PE = (19.5 lb/1,000 gallons) x (2,400 gallons/yr)
= 47 lb/yr.

APPENDIX I

QNEC

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

The quaterly PE values are calculated as follows: PE (lb/yr) ÷ 4 (qtr/yr)

Using the annual PE2 and PE1 values previously calculated, the QNEC (lb/qtr) for each permit unit is shown below:

	Milking Parlor					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	0	0	2,911	996
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	8.0	2.7
1:	0.0	0.0	0.0	0.0	237.75	81.50
Quarterly Net Emissions Change 2:	0.0	0.0	0.0	0.0	237.75	81.50
(lb/qtr) 3:	0.0	0.0	0.0	0.0	237.75	81.50
4:	0.0	0.0	0.0	0.0	237.75	81.50

	Cow Housing					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	78,756	0	108,050	211,824
Daily PE2 (lb/day)	0.0	0.0	216.1	0.0	296.0	580.6
1:	0.0	0.0	-691.25	0.0	8,211.50	16,402.00
Quarterly Net Emissions Change 2:	0.0	0.0	-691.25	0.0	8,211.50	16,402.00
(lb/qtr) 3:	0.0	0.0	-691.25	0.0	8,211.50	16,402.00
4:	0.0	0.0	-691.25	0.0	8,211.50	16,402.00

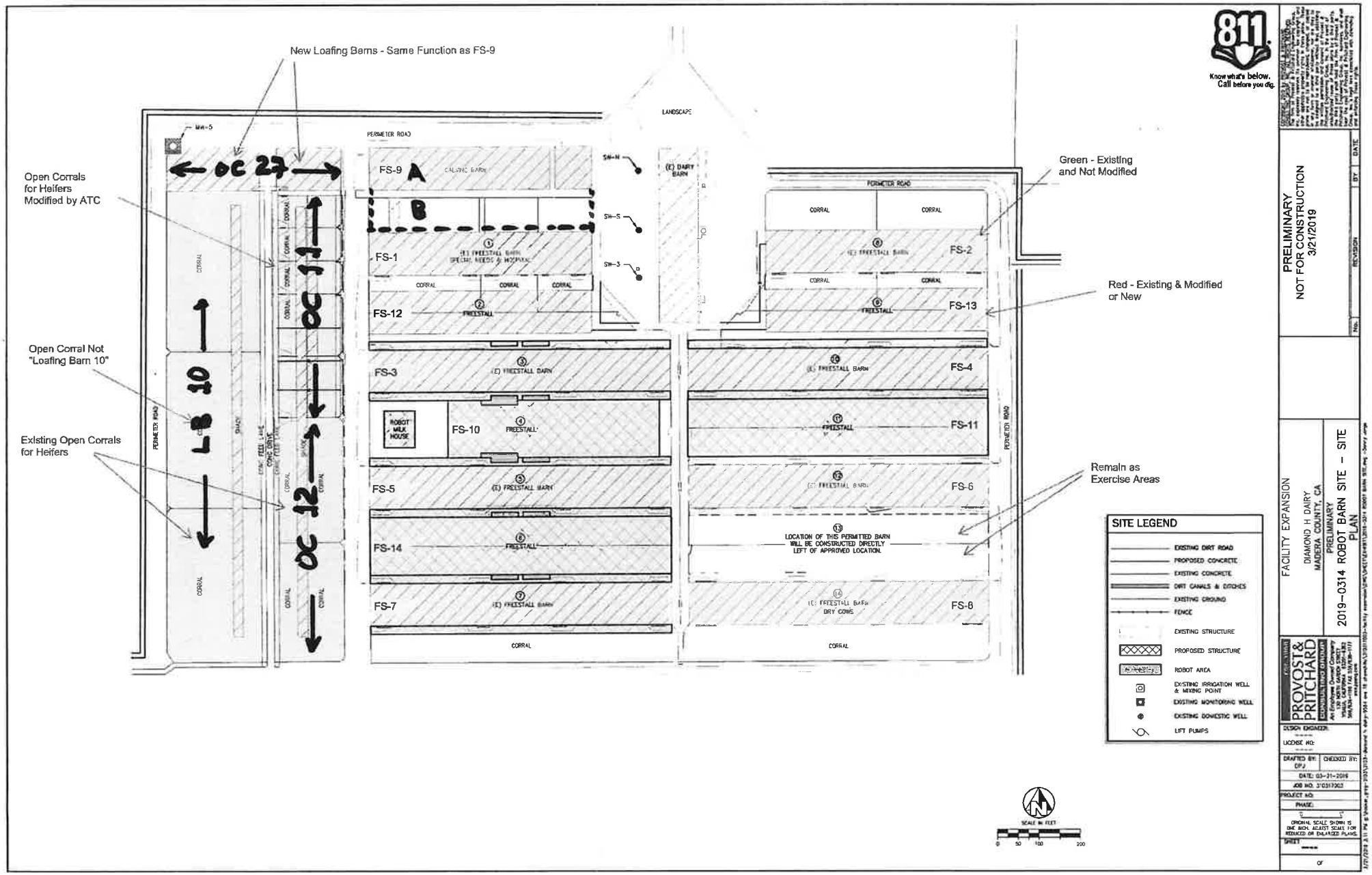
	Liquid Manure Handling						
	NOx	SOx	PM10	CO	VOC	NH3	H2S
Annual PE2 (lb/yr)	0	0	0	0	16,631	49,088	1,191
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	45.6	134.5	3.3
1:	0.0	0.0	0.0	0.0	-664.75	-828.75	0.0
Quarterly Net Emissions Change 2:	0.0	0.0	0.0	0.0	-664.75	-828.75	0.0
(lb/qtr) 3:	0.0	0.0	0.0	0.0	-664.75	-828.75	0.0
4:	0.0	0.0	0.0	0.0	-664.75	-828.75	0.0

	Solid Manure Handling					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	0	0	5,391	28,440
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	14.8	77.9
1:	0.0	0.0	0.0	0.0	410.25	2,201.25
Quarterly Net Emissions Change 2:	0.0	0.0	0.0	0.0	410.25	2,201.25
(lb/qtr) 3:	0.0	0.0	0.0	0.0	410.25	2,201.25
4:	0.0	0.0	0.0	0.0	410.25	2,201.25

	Feed Storage and Handling					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	0	0	148,264	0
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	406.1	0.0
1:	0.0	0.0	0.0	0.0	9,889.00	0.0
Quarterly Net Emissions Change 2:	0.0	0.0	0.0	0.0	9,889.00	0.0
(lb/qtr) 3:	0.0	0.0	0.0	0.0	9,889.00	0.0
4:	0.0	0.0	0.0	0.0	9,889.00	0.0

APPENDIX J

Project Site Plans



811 Know what's below. Call before you dig.

PRELIMINARY
NOT FOR CONSTRUCTION
3/21/2019

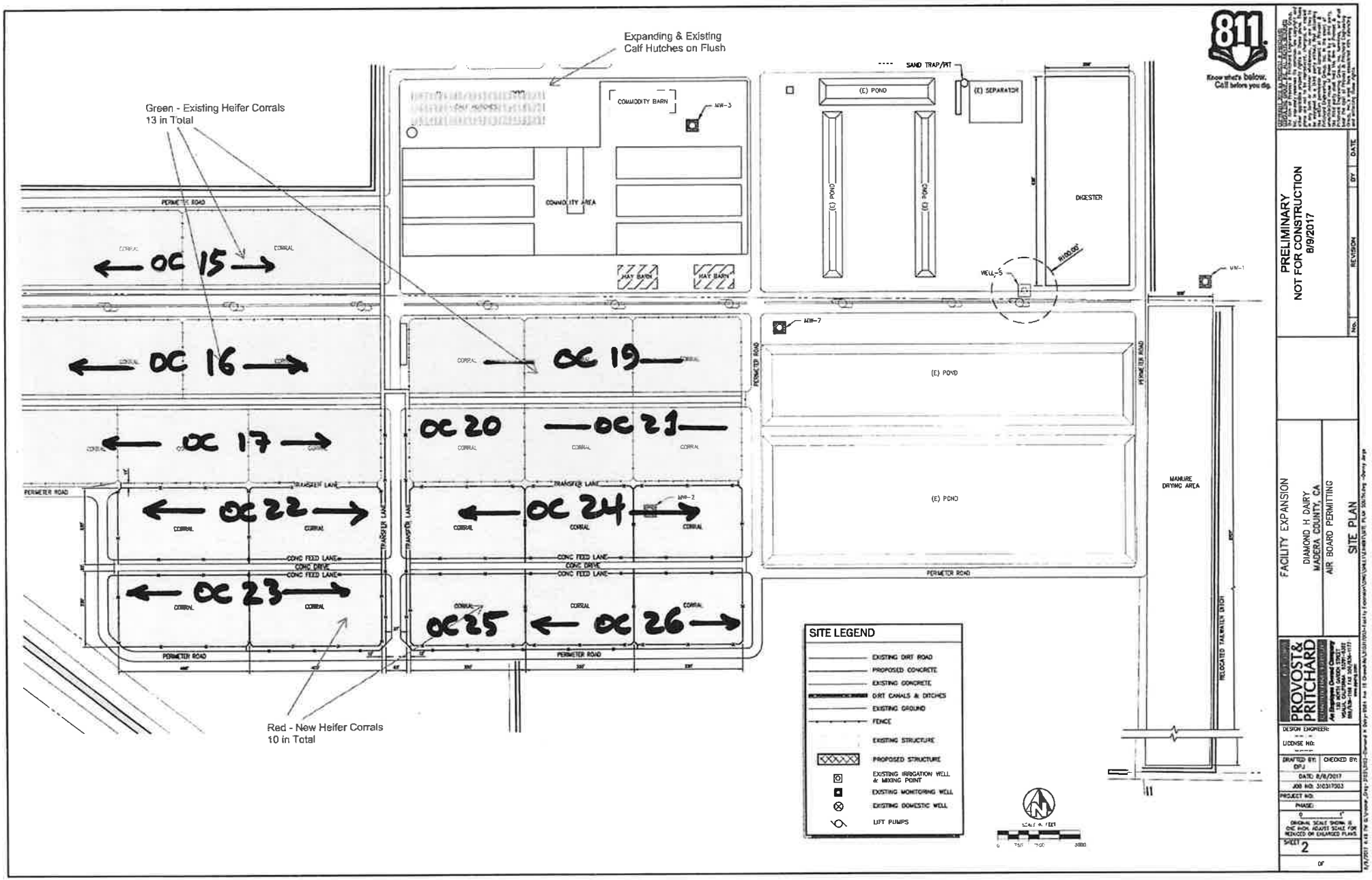
No.	REVISION	BY	DATE

FACILITY EXPANSION
DIAMOND H DAIRY
MADERA COUNTY, CA
PRELIMINARY
2019-0314 ROBOT BARN SITE - SITE PLAN

PROVOST & PRITCHARD CONSULTING GROUP
630 N. MAIN STREET, SUITE 102
VISALIA, CALIFORNIA 93291-6321
559.636.1166 FAX 559.636.1177

DESIGN ENGINEER:
LICENSE NO:

DRAFTED BY: DPJ | CHECKED BY:
DATE: 03-31-2019
JOB NO: 3'0317002
PROJECT NO:
PHASE:
ORIGINAL SCALE SHOWN IS ONE INCH. ADJUST SCALE FOR REDUCED OR ENLARGED PLANS.
SHEET
OF


Expanding & Existing
Calf Hutches on Flush
Green - Existing Heifer Corrals
13 in Total
Red - New Heifer Corrals
10 in Total
OC 15
OC 16
OC 17
OC 19
OC 20
OC 21
OC 22
OC 23
OC 24
OC 25
OC 26
COMMODITY BARN
COMMODITY AREA
HAY BARN
HAY BARN
MW-3
MW-7
MW-2
MW-1
SAND TRAP/PIT
(E) POND
(E) SEPARATOR
(E) POND
(E) POND
DIGESTER
R100.00'
WELL-5
(E) POND
(E) POND
MANURE
DRYING AREA
RELOCATED TAKWATER DITCH
PERIMETER ROAD
TRANSFER LANE
CONC FEED LANE
CONC DRIVE
CORRAL
SITE LEGEND
EXISTING DIRT ROAD
PROPOSED CONCRETE
EXISTING CONCRETE
DIRT CANALS & DITCHES
EXISTING GROUND
FENCE
EXISTING STRUCTURE
PROPOSED STRUCTURE
EXISTING IRRIGATION WELL & MIXING POINT
EXISTING MONITORING WELL
EXISTING DOMESTIC WELL
LIFT PUMPS
SCALE IN FEET
811
Know what's below.
Call before you dig.
PRELIMINARY
NOT FOR CONSTRUCTION
8/9/2017
No.
REVISION
BY
DATE
FACILITY EXPANSION
DIAMOND H DAIRY
MADERA COUNTY, CA
AIR BOARD PERMITTING
SITE PLAN
PROVOST&
PRITCHARD
DESIGN ENGINEER:
LICENSE NO:
DRAFTED BY:
DPJ
CHECKED BY:
DATE: 8/8/2017
JOB NO: 510317003
PROJECT NO:
PHASE:
ORIGINAL SCALE SHOWN IS ONE INCH. ADJUST SCALE FOR REDUCED OR ENLARGED PLANS.
SHEET
2
OF