San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

APR 0 1 2015

Randy Parreira
Parreira Farms Dairy
9995 Avenue 120
Pixley, CA 93256

Re: Notice of Preliminary Decision - Authority to Construct
Facility Number: S-5602
Project Number: S-1074408

Dear Mr. Parreira:

Enclosed for your review and comment is the District's analysis of Parreira Farms Dairy's application for an Authority to Construct for a dairy operation with a milking parlor, freestall barn housing a maximum of 1,900 mature cows, commodity barns, and the implementation of District Rule 4570 emission mitigation measures, at Avenue 120 and Road 104 in Pixley, CA.

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

Thank you for your cooperation in this matter. If you have any questions regarding this matter, please contact Ms. Andrea Ogden of Permit Services at (559) 230-5886.

Sincerely,

Arnaud Marjollet
Director of Permit Services

AM:ao

Enclosures

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

San Joaquin Valley Air Pollution Control District
Authority to Construct
Application Review
Construction of a New Dairy

Facility Name:	Parreira Farms Dairy	Date:	March 3, 2015
Mailing Address:	9995 Avenue 120 Pixley CA, 93256	Engineer:	Andrea Ogden
		Lead Engineer:	Joven Refuerzo
Contact Person:	Randy Parreira		
Telephone:	(559) 280-2236		
Application #s:	S-5602-1-0, -2-0, -3-0, -4-0 & -5-0		
Project #:	S-1074408		
Deemed Complete:	March 18, 2010		

I. Proposal

Parreira Farms Dairy has requested Authority to Construct (ATC) permits to construct a new 1,650 milk cow, 250 dry cow, 483 large heifer, 484 medium heifer, 483 small heifer and 0 calf (3,350 total head) dairy operation.

Pursuant to Senate Bill 700 and District Rule 2201, *New Source Review Rule*, all agricultural operations including Confined Animal Feeding Operations (CAFO) that commenced construction after January 1, 2004 with emissions greater than ½ the major source threshold levels (5 tons of NOx or VOC) were required to obtain an Authority to Construct (ATC) permit.

Additionally, the mitigation measures that the applicant has selected to comply with District Rule 4570, will also be incorporated into the ATCs for the new dairy.

Construction of the dairy will result in an increase in VOC, NH_3, H_2S and PM_{10} emissions at the site resulting in an increase in emissions greater than 2.0 lbs/day from the cow housing, the liquid manure handling system, solid manure handling system and feed storage and handling. Therefore, BACT is triggered for VOC, NH_3, and PM_{10} emissions from these permit units.

The project triggers the public notice requirements of District Rule 2201. Therefore, the preliminary decision for the project will be submitted to the California Air Resources Board (CARB), a public notice will be published in a local newspaper of general circulation in the county of the project, and a 30-day public comment period will be completed prior to issuance of the ATCs.

The construction of the dairy is a discretionary project subject to the requirements of the California Environmental Quality Act (CEQA). As a public agency with discretionary authority, the District must determine that the requirements of the California Environmental Quality Act (CEQA) have been properly satisfied prior to the issuance of any dairy permits. The District

has determined that since Tulare County requires dairy projects to perform a site-specific review, the District has reviewed the Environmental Impact Report (EIR) prior to issuance of an Authority to Construct (ATC) permit. Therefore, since Tulare County is the lead agency, the District has become a responsible agency for this dairy construction project.

II. Applicable Rules

Rule 1070 Inspections (12/17/92)
Rule 2010 Permits Required (12/17/92)
Rule 2201 New and Modified Stationary Source Review Rule (4/21/11)
Rule 2410 Prevention of Significant Deterioration (PSD) (11/26/12)
Rule 2520 Federally Mandated Operating Permits (6/21/01)
Rule 2550 Federally Mandated Preconstruction Review for Major Sources of Air Toxics (6/18/98)
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
Senate Bill 700 (SB 700)
California Environmental Quality ACT (CEQA)

III. Project Location

The facility is located at Avenue 120 and Road 104 in Pixley, in Tulare County. The equipment is not located within 1,000 feet of the outer boundary of a K-12 school. Therefore, the public notification requirement of California Health and Safety Code 42301.6 is not applicable to this project.

IV. Process Description

The primary function of Parreira Farms Dairy is the production of milk, which is used to make 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, which is why there will be different ages and types of cows at the dairy, including, heifers, lactating cows, and dry cows. The applicant has not proposed to have any calves or mature bulls on site.

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 (dry lots), 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.

Cow Housing

All of the 1,650 milk cows and the 250 dry cows will be housed in freestall barns with flushed lanes. In freestall barns, cows are grouped in large pens with free access to feed bunks, water, and stalls for resting. A standard freestall barn design has a feed alley in the center of the barn separating two feed bunks on each side. All of the 483 heifers 15-24 months, 484 heifers 7-14 months, and 483 heifers 4-6 months are housed in open corrals with flushed lanes.

Special Needs Housing

The special needs area serves the gestating cows at the dairy or any cows that are in need of medical attention. This area acts as a veterinary area. It is also the area in which cows are given special attention as they progress from dry cow, a mature cow that is gestating and not lactating, to maternity, to milking status or until their health improves.

Milking Parlor

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. The cows are milked in a 50 stall herringbone stall milk parlor. The lactating cows will be milked two times per day in the milking parlor. The milking parlor will have concrete floors sloped to a drain. Manure that is deposited in the milking parlor will be sprayed or flushed into the drain using fresh water after each milking. The effluent from the milking parlor will be carried through pipes to the lagoon system.

Liquid Manure Handling System

The liquid manure handling system includes the following:

- A mechanical Separator with a dewatering press
- One processing pit
- One anaerobic treatment lagoon
- One storage pond

Solids Separation

Solids separation removes material from the waste stream that would prematurely fill a lagoon or storage pond. The efficiency of treatment would be significantly lower without separation, resulting in more odors and potentially more VOC emissions from the liquid manure handling system. Most of the separated solids are fibrous material that leads to excessive sludge buildup or the formation of crusts on the surface of the storage ponds, both of which interfere with pumping operations. Separation reduces the land area required when designing a liquid manure treatment system since the volume to be treated is less. As a final benefit, the separated solids may be recycled and used for soil amendments, re-feeding, bedding, etc.

Mechanical Separator:

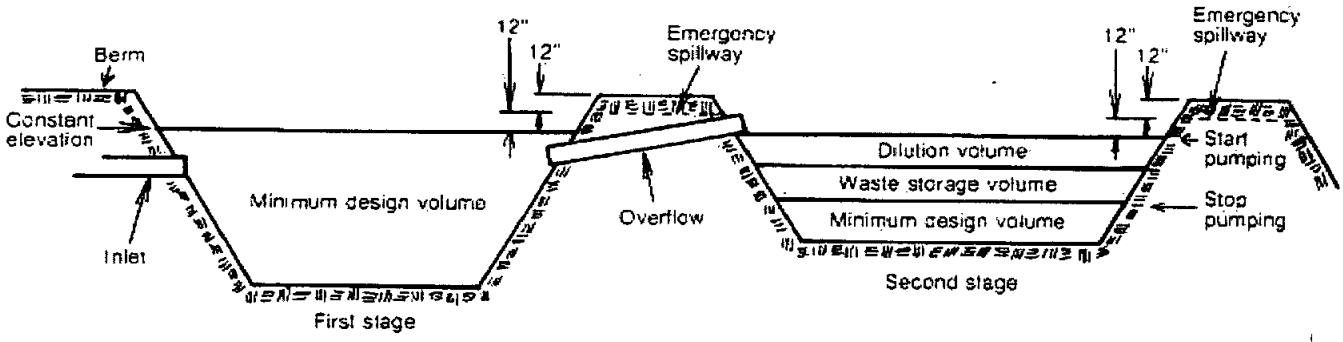
Liquid manure from all flushed areas of the dairy is collected at a central location, from where it will be pumped up onto a mechanical screen separator for solids separation prior to entering the lagoon system. A mechanical separator may achieve a solids removal rate of 50%. The mechanical separator is equipped with roller presses to minimize the moisture content of the separated solids. Conveyors will pile the solids onto the concrete stacking pad. The pad will be sloped to ensure drainage of any remaining liquid. The separated solids will be removed from the stacking pad on a weekly basis. The solids are generally spread out in thin layers to dry. The dried solids are then piled up for storage, and used as needed for bedding in the freestalls.

Anaerobic Treatment Lagoon

Parreira Farms Dairy is proposing to construct an anaerobic treatment lagoon system. The anaerobic treatment lagoon will require that the secondary lagoon be utilized to store the effluent from the primary lagoon. The effluent from only the secondary lagoon will be used for irrigation purposes. In addition, this anaerobic treatment system will be maintained and operated to meet the anaerobic treatment lagoon criteria listed below. 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. This process of anaerobic decomposition results in the preferential conversion of organic compounds in the manure into methane, carbon dioxide, and water rather than intermediate metabolites (VOCs). The National Resource Conservation Service (NRCS) California Field Office Technical Guide Code 359 - Waste Treatment Lagoon specifies the following criteria for anaerobic treatment lagoons:

1) Minimum treatment volume - The minimum design volume must account for all potential sludge, treatment, precipitation, and runoff volumes;
2) Minimum hydraulic retention time – The retention time of the material in the lagoon must be adequate to provide environmentally safe utilization of waste;
3) Maximum Volatile Solids (VS) loading rate – The VS loading rate shall be based on maximum daily loading considering all waste sources that will be treated by the lagoon. The suggested loading rate for the San Joaquin Valley is 6.5-11 lb-VS/1000 ft^3/day depending on the type of system and solids separation; and
4) Minimum operating depth of at least 12 feet - Maximizing the depth of the lagoon has the following advantages: 1) The surface area in contact with the atmosphere is minimized, which will reduce volatilization of air pollutants; 2) The smaller surface area reduces the effects of the environment on the lagoon, which provides a more stable and favorable environment for anaerobic bacteria; 3) There is better mixing of lagoon due to rising gas bubbles; 4) and A deeper lagoon requires less land for the required treatment volume.

The anaerobic treatment lagoon system consists of two stages, a treatment lagoon (primary lagoon) and a storage pond (secondary lagoon). The effluent from the treatment lagoon (2,640' x 200' x 20') overflows into the storage pond/secondary lagoon (375' x 50' x 20'), which is designed for liquid storage. The liquid level of the storage pond/secondary lagoon fluctuates and can be emptied when necessary. Effluent from the storage pond is used for the irrigation of cropland. All the liquid manure at the dairy is pumped to the processing pit, through the mechanical separator and then into the anaerobic treatment lagoon system.



Storage Pond/Secondary Lagoon

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.

Solid Manure Handling System Manure Stock Piles (Storage)

The scraped manure will either be immediately applied and incorporated into cropland at the dairy or will be dried and stockpiled for use as fertilizer at a later time. The separated solids will be dried and used as fertilizer or as bedding in the freestalls. The applicant proposes to cover the separated solid piles with weatherproof coverings from October through May, so that the solids will remain dry until it is ready to be used.

Feed Handling and Storage

The majority of dairies store the silage piles underneath a tarp or in an Ag-bag. The entire pile is covered except for the face of the pile. The face of the pile is kept open due to the continual need to extract the silage for feed purposes. The silage pile is disturbed 2-3 times per day.

V. Equipment Listing

S-5602-1-0: 1,650 COW MILKING OPERATION WITH ONE 50 STALL HERRINGBONE MILKING PARLOR

S-5602-2-0: COW HOUSING – 1,650 MILK COWS, NOT TO EXCEED A COMBINED TOTAL OF 1,900 MATURE COWS (MILK AND DRY), HOUSED IN FREESTALLS AND A FLUSH SYSTEM, 1,450 SUPPORT STOCK (HEIFERS) HOUSED IN OPEN CORRALS WITH SHADE STRUCTURES AND A FLUSH SYSTEM; INCLUDING SPECIAL NEEDS HOUSING

S-5602-3-0: LIQUID MANURE HANDLING SYSTEM CONSISTING OF ONE PROCESSING PIT, MECHANICAL SEPARATOR, ONE STORAGE POND AND ONE LAGOON. MANURE IS LAND APPLIED THROUGH FLOOD IRRIGATION

S-5602-4-0: SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND AND HAULED OFFSITE

S-5602-5-0: .FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARNS AND SILAGE PILES

VI. Emission Control Technology Evaluation

PM_{10}, VOC, H_2S and NH_3 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. Some of these practices are discussed below:

Milking Parlor (S-5602-1-0)

This dairy uses a flush/spray system to wash out the manure from the milking parlor after each group of cows is milked. Since the milking parlor is 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 parlor will also be reduced by flushing after each milking.

Cow Housing and Feed (S-5602-2-0)

Housing
All of the milk cows and dry cows will be housed in freestall barns with concrete lanes. 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. All heifers are housed in open corrals with flushed lanes.

Shade Structures and Scraping
All heifers are housed in open corrals with shade structures. Providing shade for the animals reduces movement and unnecessary activity during hot weather, which reduces PM_{10} emissions. The surfaces of exercise corrals from the freestall barns and all other the corrals will be scraped in the morning hours on a bi-weekly basis except during wet conditions. Frequent scraping of the corrals will reduce the amount of dry manure on the corral surfaces that may be pulverized by the cows' hooves and emitted as PM_{10}. This practice will also reduce the chance of anaerobic conditions developing in the manure pack of the corral surface, potentially reducing VOC emissions.

Corral Sprinkling

In addition, the applicant has proposed to sprinkle water over 45% area of the heifer corrals, to match the evaporation rate. Water will be applied to the open corral surfaces to moisten loose soil and dried manure. By applying water at appropriate rates, a significant amount of PM10 emissions reductions can be achieved. Water application has to be strictly controlled since excess water has the potential of forming VOC and ammonia emissions. In addition, application of water in corrals may pose a health risk for the animals.

Windbreaks

Parreira Farms Dairy has proposed to install a downwind windbreak. Windbreaks are single or multiple rows of trees in linear configurations planted on the windward or downwind side of a given site. The windbreaks are proposed in accordance with the National Research Conservation Service (NRCS) standard #380. Guidelines from this standard in conjunction with guidelines discussed with the local NRCS office are summarized as follows:

- Windbreak density on the leeward side of the source and windward of the area to be protected should be at least 65%. This density will provide the optimum PM interception. "Density", when viewing through the windbreak from 60 feet to 100 feet away upwind of the rows, is the percentage of the background view that is obscured or hidden.
- In order to reach a density of 65%, three rows are required consisting of the following:

Row	Type of tree/shrub	Spacing[1]	Height
First Row	Low shrubs Tall shrubs	3' to 5' apart 8' to 12' apart	5' + 8' +
Second Row	Tall shrubs or medium size trees	8' to 12' apart	25' - 35'
Third Row	Large Evergreens	Varies	35' +

  - Spacing between rows should be sufficient to accommodate cultivation equipment.
  - Windbreaks should be irrigated to provide the greatest survivability and the most rapid growth of the trees and shrubs.
  - Weed control in the windbreak must be completed as well as rapid replacement of any dead trees or shrubs.
  - Each row should plant trees that are offset of one another.

A downwind windbreak/shelterbelt will be established along the South and West sides of the dairy.

The applicant has proposed to plant one row of shrubs (Togon Shrub), one row of medium evergreen trees (Chinese Elm) and one row of tall evergreen trees (Deodar Cedar). The applicant will maintain an irrigation system for greater survivability and rapid growth of the trees and shrubs. The following conditions will be placed on the permit:

- Permittee shall establish windbreaks along the direction of the prevailing wind for the upwind and downwind sides of the cow housing at the dairy. Windbreaks shall consist of the following rows with the first row closest to the dairy: first row shall consist of the Togon Shrub, planted 6 feet apart and the second row shall consist of Chinese Elm trees, planted

[1] These are general spacing requirements and vary depending on type of tree.

8 feet apart and the third row shall consist of Deodar Cedar trees, planted 12 feet apart. Each row should be offset from the adjacent row. Spacing between rows shall be sufficient to accommodate cultivation equipment. This spacing shall not exceed 20 feet. A site specific plan shall be submitted and approved prior to animal occupancy. An alternative windbreak proposal must be approved by the District. [District Rule 2201] N

- Windbreak density on the windward side of the source shall be greater than 50% at maturity. This density will reduce airflow into the source area.
- Upwind windbreaks shall consist of a minimum of two irrigated rows, except as provided below.
- The upwind windbreak must include one row of evergreen shrubs and one row of tall (35+ ft) trees (evergreen). The order of rows should be as follows, with the first row being closest to the dairy/feedlot: first row – tall trees and second row – shrubs.
- For upwind windbreaks that include a row of tall evergreen trees that maintain low foliage close enough to the ground to provide adequate low coverage, the row of shrubs may be eliminated and a minimum of only one irrigated row will be required.
- Upwind windbreaks shall be located as close as possible to the source of the particulate pollution (cow housing - corrals). To be effective upwind windbreaks must be located within a distance of 10H of the cow housing. Where H is the effective height of the windbreak at maturity.
- The following spacing and height requirements must be met:

Row	Type of tree/shrub	Spacing	Height
First Row	Low Shrubs Tall shrubs	3 to 5 ft apart 8 to 12 ft apart	5-8 ft 8 ft +
Second Row	Tall Trees	8 to14 ft apart	35+ ft

Additional Requirements

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

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] N

Density is the percentage of the background view that is obscured or hidden when viewing through the windbreak from 60 ft to 100 ft upwind of the rows. [District Rule 2201] N

Frequent Flushing

Manure, which is a source of emissions, will be removed from the freestall and corral lanes by flushing. Because of ammonia's high affinity for and solubility in water, flushing the lanes and walkways will also reduce volatilization of ammonia from the manure deposited in the corral lanes. The lanes and walkways in the freestalls for the mature cows (lactating and dry cows)

will be flushed four times per day and the lanes and walkways in the corrals for the heifers will be flushed once per day.

Feeding Animals in Accordance with the NRC Guidelines
All animals will be fed in accordance with National Research Council (NRC) guidelines using routine nutritional analysis for rations. Feeding the cows in accordance with NRC guidelines minimizes undigested protein and other undigested nutrients in the manure, which would emit NH_3 and VOCs upon decomposition. Refused feed will be removed from the feed lanes on a daily basis to minimize gaseous emissions from decomposition. The surface area of silage exposed to the atmosphere will be minimized by enclosing silage or covering it with tarps, except for the face of the pile where feed is being removed.

Liquid Manure Handling System (S-5602-3-0)

All emissions from the liquid manure handling system are the result of manure decomposition.

Anaerobic Treatment Lagoon
Parreira Farms Dairy has proposed to construct an anaerobic treatment lagoon, which consists of a two-stage anaerobic lagoon treatment system designed in accordance with the specifications set forth in NRCS practice standard 359. A properly designed and operated anaerobic treatment lagoon system will reduce VOC emissions because the organic compounds in the manure will be mostly converted into methane, carbon dioxide, and water rather than a significant amount of VOCs. A two-stage anaerobic treatment lagoon system also has an air pollution benefit over single lagoon systems. Odorous emissions are reduced with a two-stage system since the primary lagoon has a constant treatment volume, which promotes more efficient anaerobic digestion. The proposed anaerobic treatment lagoon meets the design requirements (see design check in Appendix B).

Solids Separation
The liquid manure handling system is equipped with a mechanical separator for solids separation. Solids separation prevents excessive loading of volatile solids in lagoon treatment systems. Excessive loading of volatile solids in lagoons inhibits the activity of the methanogenic bacteria and leads to increased rates of volatile solids production. When the activity of the methanogenic bacteria is not inhibited, most of the VOCs are metabolized to simpler compounds, and the potential for VOC emissions is reduced.

Liquid Manure Land Application
Liquid manure from the storage pond will be applied through flood irrigation. The dairy will apply liquid manure to cropland at agronomic rates. Liquid manure will be applied in thin layers and will be blended with irrigation water in compliance with the dairy's comprehensive nutrient management plan and the requirements of the Regional Water Quality Control Board. These practices will reduce odors and result in faster uptake of nutrients, including organic nitrogen, which can emit VOCs and ammonia during decomposition, and ammonium nitrogen, which is readily lost to the atmosphere as gaseous ammonia.

Rapid Incorporation of Solid Manure Applied to Land
Based on the information currently available, emissions from solid manure applied to cropland are expected to be small. However, to ensure that any possible emissions are minimized, this dairy will be required to incorporate solid manure applied to cropland immediately (within two

hours) after application. Immediate incorporation of the manure into the soil will reduce any volatilization of gaseous pollutants, including ammonia and VOC. Reduction in gaseous emissions is achieved by minimizing the amount of time that the manure is exposed to the atmosphere. Once manure has been incorporated into the soil, VOC is absorbed onto particles of soil providing the opportunity for the VOC to be oxidized into carbon dioxide and water[2].

Feed Handling and Storage (S-5602-5-0):
The proposed emission reduction measures for feed handling and storage include best management practices such as minimizing the surface area of silage exposed to the atmosphere. This can be done by covering the silage pile securely with a tarp and removing feed only from a small area of the pile (face of pile). Leftover feed at the feed bunks will also be cleaned up and disposed of appropriately to avoid decomposition that can result in increased emissions.

VII. General Calculations

A. Assumptions

- Potential to Emit for the dairy will be based on the maximum design capacity of the number and types of cows at the dairy.
- Only emissions from the lagoons/storage ponds (Permit # S-5602-3-0) and engines will be used to determine if the facility is a major source since these units are considered to be the only sources of non-fugitive emissions at dairies, as discussed in section VII.C.5
- All milk cows and dry cows will be housed in freestall barns with a flush system. The heifers are housed in open corrals with shades and a flush system.
- The applicant has proposed the following PM_{10} mitigation measures:
  - Provide shade structures for heifers
  - Feed heifers near dusk (10% control)
  - Scrape corrals on a bi-weekly basis with a pull type scraper in the morning hours (15% control)
  - Install downwind windbreaks (12.5%) for all cows
  - Install sprinklers in the open corrals for heifers and supply a sufficient amount of water/moisture to match the daily evaporation rate. The applicant is proposing to cover 45% of the area in the corrals. (22.5% control). [3]
- The PM_{10} control efficiencies for the proposed practices and mitigation measures are based on the SJVAPCD memo – *Dairy and Feedlot PM_{10} Mitigation Practices and their Control Efficiencies.*
- All PM_{10} emissions from the dairy will be allocated to the cow housing permit unit (S-5602-2-0).
- Because of the moisture content of the separated solids, PM_{10} emissions from solid manure handling are considered negligible.

[2] Page 9-38 of U.S. EPA's Draft Document Emissions From Animal Feeding Operations (http://www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf)
[3] (CE of 50% x 45% = 22.5%).

- The PM_{10} emission factors for the dairy animals are based on a District document entitled "Dairy and Feedlot PM_{10} Emissions Factors", which compiled data from studies performed by Texas A & M ASAE and a USDA/UC Davis report quantifying dairy and feedlot emissions.
- The VOC and NH_3 emission factors for milk cows are based on an internal document entitled "*Breakdown of Dairy VOC Emission Factor into Permit Units*". The VOC and NH_3 emission factors for the other cows were developed by taking the ratio of manure generated by the different types of cows to the milk cow and multiplying it by the milk cow emission factor.
- For BACT analysis purposes, only the milking parlor permit unit at the dairy will also be treated as a single emissions unit. For BACT analysis purposes,the cow housing permit unit will treat each corral as an emission unit, the liquid manure handling permit unit will contain two emissions units: lagoons/storage ponds and liquid manure land application, the solid manure handling permit will contain two emissions units storage piles and solid manure land application and the feed handling and storage will contain two emission units, the Total Mixed Rations (TMR) and silage piles.
- Mitigation measures from the BACT analysis for the cow housing permit unit (S-5602-2-0), which are expected to reduce feed emissions, will be placed on the feed storage and handling permit.
- Feeding animals in accordance with the National Research Council (NRC) guidelines is a feed formulation practice used to improve animal health and productivity. This typically limits the overfeeding of certain feed that have the potential of increasing emissions. This mitigation measure has the potential of reducing a significant amount of emissions, however, since there is not much data available, a conservative control efficiency of 10% will be applied to the overall dairy EF.
- An anaerobic treatment lagoon designed in accordance with the NRCS Guideline (359) has the potential of reducing significant amount of emissions, since the system is designed to promote the conversion of Volatile Solids (VS) into methane by methanogenic bacteria. Although VOC emission reductions are expected to be high, to be conservative, a control efficiency of 40% will be applied to this mitigation measure for both the lagoon(s) and land application until better data becomes available.

B. Emission Factors

Dairy Permits (S-5602-1, -2, -3, -4 and, -5)

The emission factors for PM_{10}, VOC, and NH_3 given Appendix A will be used to calculate the combined emissions from the dairy and the pre/post-project emissions from the following permit units: the milking parlor (permit S-5602-1-0); the cow housing (permit S-5602-2-0); the liquid manure handling system (permit S-5602-3-0); the solid manure handling system (permit S-5602-4-0); and the feed handling system (permit S-5602-5-0).

PM_{10} Emission Factors for the Dairy

The tables in Appendix A list the PM_{10} emission factors for the animals at the dairy. The control efficiencies for the different management practices proposed for this dairy will be

applied to the uncontrolled emission factors to arrive at the controlled emission factors that will be used to calculate post-project PM_{10} emissions from the dairy.

VOC and NH_3 Emission Factors for the Dairy

The tables in Appendix A list the VOC and NH_3 emission factors for the animals and feed at the dairy. These emission factors and the control efficiencies given in the assumptions above will be used to calculate the pre-project and post-project VOC and NH_3 emissions from the dairy.

Hydrogen Sulfide (H_2S)
Currently, there is no approved emission factor or data for Hydrogen Sulfide (H_2S) emissions. Therefore, H_2S emissions will be assumed to be 10% of the NH_3 emissions from the lagoon for this project. The District expects that research will be completed in the near future, which may be used to establish an emission factor for Hydrogen Sulfide.

C. Calculations

1. Pre-Project Potential to Emit (PE1)

Since this is a new dairy, Pre-Project Potential to Emit (PE1) is zero for all units.

2. Post-Project Potential to Emit (PE2)

Post-Project Potential to Emit (PE2) for the dairy will be calculated below based on the maximum design capacity for each type of cow at the dairy and the controls required and proposed by the dairy.

Milking Parlor (S-5602-1-0)

As a condition of approval, this dairy will be required to feed all animals at the dairy in accordance with NRC guidelines. This dairy will also be required to flush the milking parlor after each milking. Therefore, the control efficiency for these practices will be used to calculate post-project VOC emissions from the milking parlor.

The post-project emissions from the milking parlor are calculated in Appendix A and summarized as follows:

Post-Project Potential to Emit (PE2) S-5602-1-0		
	Daily Emissions (lb/day)	Annual Emissions (lb/year)
NO_X	0	0
SO_X	0	0
PM_{10}	0	0
CO	0	0
VOC	1.8	660
NH_3	0.6	226

Cow Housing (S-5602-2-0)

VOC

As a condition of approval, this dairy will be required to feed all animals in accordance with NRC guidelines, flush the freestalls for milk cows and dry cows at least four times per day, have concrete lanes, sloped corrals and the required Rule 4570 measures. Therefore, the control efficiencies shown in Appendix A will be used to calculate post-project VOC emissions from the cow housing permit unit.

PM_{10} and NH_3

As a condition of approval, this dairy will be required to plant trees (shelterbelt) around the downwind sides of the dairy in accordance with the NRCS specifications and standards. In addition, the applicant will install shade structures in all open corrals, feed cattle near dusk, scrape the open corrals and freestall exercise pens bi-weekly in the morning hours, construct freestalls, and sprinkle water over 45% of the heifer corrals area to match the evaporation rate to keep constant moisture content in the soil. Therefore, the post-project PM_{10} emissions from the cow-housing permit will be based on the controlled PM_{10} emission factors given in Appendix A.

The post-project emissions from the cow housing permit unit are calculated in Appendix A and summarized as follows:

Post-Project Potential to Emit (PE2) S-5602-2-0		
	Daily Emissions (lb/day)	Annual Emissions (lb/year)
NO_X	0	0
SO_X	0	0
PM_{10}	24.5	8,926
CO	0	0
VOC	60.0	21,914
NH_3	204.8	74,736

Liquid Manure Handling System (S-5602-3-0: Lagoon, Storage Pond, and Liquid Manure Land Application)

As a condition of approval, this dairy will be required to feed all animals at the dairy in accordance with the NRC guidelines. Therefore, the control efficiency for feeding all animals in accordance with NRC guidelines will be used to calculate post-project VOC emissions from liquid manure land application.

The post-project emissions from liquid manure are calculated in Appendix A and summarized as follows:

Post-Project Potential to Emit (PE2) S-5602-3-0		
	Daily Emissions (lb/day)	Annual Emissions (lb/year)
NO_X	0	0
SO_X	0	0
PM_{10}	0	0
CO	0	0
VOC	14.6	5,352
NH_3	42.9	15,668
H_2S	0.5	244

Solid Manure Handling System (S-5602-4-0)

As a condition of approval, this dairy will be required to feed all animals at the dairy in accordance with the NRC guidelines. Therefore, the control efficiency for feeding all animals in accordance with NRC guidelines will be used to calculate post-project VOC emissions from solid manure land application.

The post-project emissions from solid manure are calculated in Appendix A and summarized as follows:

Post-Project Potential to Emit (PE2) S-5602-4-0		
	Daily Emissions (lb/day)	Annual Emissions (lb/year)
NO_X	0	0
SO_X	0	0
PM_{10}	0	0
CO	0	0
VOC	1.1	376
NH_3	7.5	2,739

Feed Storage and Handling Permit Unit (S-5602-5-0)

As a condition of approval, this dairy will be required to feed all animals at the dairy in accordance with the NRC guidelines. Therefore, the control efficiency for feeding all animals in accordance with NRC guidelines will be used to calculate post-project VOC emissions from feed storage and handling.

The post-project emissions from feed storage and handling are calculated in Appendix A and summarized as follows:

Post-Project Potential to Emit (PE2) S-5602-5-0		
	Daily Emissions (lb/day)	Annual Emissions (lb/year)
NO_X	0	0
SO_X	0	0
PM_{10}	0	0
CO	0	0
VOC	91.1	33,298
NH_3	0	0

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

Pursuant to Section 4.9 of District Rule 2201, the Pre-Project Stationary Source Potential to Emit (SSPE1) is the Potential to Emit (PE) from all units with valid Authorities to Construct (ATC) or Permits to Operate (PTO) at the Stationary Source and the quantity of emission reduction credits (ERC) which have been banked since September 19, 1991 for Actual Emissions Reductions that have occurred at the source, and which have not been used on-site.

Pre-Project Stationary Source Potential to Emit [SSPE1] (lb/year)						
	NO_X	SO_X	PM_{10}	CO	VOC	NH_3
S-5602-6-0 120 hp Diesel-fired irigation pump engine	10,317	5	490	3,137	1,176	0
S-5602-7-0 120 hp Diesel-fired irigation pump engine	1,978	15	99	7,227	383	0
Pre-Project SSPE (SSPE1)	**12,295**	**20**	**589**	**10,364**	**1,559**	**0**

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

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

Post-Project Stationary Source Potential to Emit [SSPE2] (lb/year)							
	NO_X	SO_X	PM_{10}	CO	VOC	NH_3	H_2S
S-5602-1-0 (Milk Parlor)	0	0	0	0	660	226	0
S-5602-2-0 (Cow Housing)	0	0	8,926	0	21,914	74,736	0
S-5602-3-0 (Liquid manure Handling)	0	0	0	0	5,352	15,668	244
S-5602-4-0 (Solid Manure Handling)	0	0	0	0	376	2,739	0
S-5602-5-0 (Feed Storage and Handling)	0	0	0	0	33,298	0	0
S-5602-6-0 120 hp Diesel-fired irigation pump engine	10,317	5	490	3,137	1,176	0	0
S-5602-7-0 275 hp Diesel-fired irigation pump engine	1,978	15	99	7,227	383	0	0
Post-Project SSPE (SSPE2)	**12,295**	**20**	**9,515**	**10,364**	**63,159**	**93,369**	**244**

5. Major Source Determination

Rule 2201 Major Source Determination:

Pursuant to District Rule 2201, a Major Source is a stationary source with a SSPE2 equal to or exceeding one or more of the following threshold values. 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 IC engines (i.e. IC engines at a particular site at the facility for less than 12 months)
- Fugitive emissions, except for the specific source categories specified in 40 CFR 51.165

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

collection technologies do exist for liquid waste systems at dairies, *"... the VOC emissions from waste lagoons and storage ponds are considered non-fugitive."* The District has researched this issue and concurs with the CAPCOA assessment, as discussed in more detail below.

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

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

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

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

Feed Handling and Storage
The majority of dairies store the silage piles underneath a tarp or in an agbag. The entire pile is covered except for the face of the pile. The face of the pile is kept open due to the continual need to extract the silage for feed purposes. The silage pile is disturbed 2-3 times per day. Because of the ongoing disturbance to these piles, it makes it extremely difficult to design a system to capture the emissions from these

piles. In fact, as far as the District is aware, no system has been designed to successfully extract the gases from the face of the pile to capture them, and, as important, no study has assessed the potential impacts on silage quality of a continuous air flow across the silage pile, as would be required by such a collection system. Therefore, the District cannot demonstrate that these emissions can be reasonably expected to pass through a stack, chimney, vent, or other functionally equivalent opening.

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

The post-project emissions from the lagoons/storage ponds at this dairy were calculated in Section VII.C.2 above. The following table shows the non-fugitive Post-Project Stationary Source Potential to Emit for the dairy.

Major Source Determination (lb/year) **Non-Fugitive Post-Project Stationary Source Potential to Emit [SSPE2] (lb/year)**					
	NO_X	SO_X	PM_{10}	CO	VOC
S-5602-1-0 (Milk Parlor)	0	0	0	0	0
S-5602-2-0 (Cow Housing)	0	0	0	0	0
S-5602-3-0 (Lagoon/Storage Pond)	0	0	0	0	1,541
S-5602-4-0 (Solid Manure Handling)	0	0	0	0	0
S-5602-5-0 (Feed Storage and Handling)	0	0	0	0	0
S-5602-6-0 120 hp Diesel-fired irigation pump engine	10,317	5	490	3,137	1,176
S-5602-7-0 275 hp Diesel-fired irigation pump engine	1,978	15	99	7,227	383
Non Fugitive Post Project SSPE (SSPE2)	**12,295**	**20**	**589**	**10,364**	**3,100**
Major Source Threshold	20,000	140,000	140,000	200,000	20,000
Major Source?	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 becoming a Major Source as a result of this project. For Lagoon/Storage Pond Calculations, see Appendix A.

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)						
	NO2	VOC	SO2	CO	PM	PM10
Estimated Facility PE before Project Increase	6.15	1.55	0.01	5.18	0.29	0.29
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. This project is exempt from offsets pursuant to Rule 2201, Section 4.6.9. Therefore, BE calculations are not required.

7. SB 288 Major Modification

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

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. Additionally, since the facility is not a major source for PM_{10} (140,000 lb/year), it is not a major source for PM2.5 (200,000 lb/year).

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
- PM10
- Hydrogen sulfide (H2S)
- Total reduced sulfur (inlcuding H2S)

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)							
	NO2	VOC	SO2	CO	PM	PM10	H2S
Total PE from New and Modified Units	0	30.8	0	0	4.46	4.46	0.12
PSD Major Source threshold	250	250	250	250	250	250	250
New PSD Major Source?	N	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 C.

VIII. Compliance

Rule 1070 Inspections

This rule applies to any source operation, which emits or may emit air contaminants.

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. Therefore, the following conditions will be listed on the permit to ensure compliance:

> {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
>
> {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]

Rule 2010 Permits Required

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

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

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 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

As discussed in Section VII.A above, only the milking parlor permit unit at the dairy will also be treated as a single emissions unit. For BACT analysis purposes,the cow housing permit unit will treat each corral as an emission unit, the liquid manure handling permit unit will contain two emissions units: lagoons/storage ponds and liquid manure land application, the solid manure handling permit will contain two emissions units storage piles and solid manure land application and the feed handling and storage will contain two emission units, the Total Mixed Rations (TMR) and silage piles. The following permit units are new:

Milking Parlor (S-5602-1-0):
As seen in Appendix A of this evaluation, the applicant is proposing to install a new milk parlor with a PE less than 2.0 lbs/day for VOC and NH_3; therefore, BACT is not triggered for VOC and NH_3 from the milk parlor.

Cow Housing (S-5602-2-0):
As seen in Appendix A of this evaluation, the applicant is proposing to install new freestall cow housing for milk cows with a PE greater than 2.0 lbs/day for VOC, and NH_3; therefore, BACT is triggered for VOC and NH_3 from the freestall milk cow housing. The applicant is proposing to install new freestall cow housing for dry cows with a PE greater than 2.0 lbs/day for NH_3; therefore, BACT is triggered for NH_3 from the freestall dry cow housing. The PE for the new freestall cow housing for dry cows is less than 2.0 lbs/day for VOC; therefore, BACT is not triggered for VOC from the freestall dry cow housing. The PE for PM_{10} all emissions units in the Cow Housing is less than 2.0 lb/day ; therefore, BACT is not triggered for PM_{10} from any of the emissions units for cow housing. The PE for the open corrals housing the heifers for VOC and NH_3 is less than 2.0 lbs/day therefore, BACT is not triggered for VOC and NH_3 from the open corral heifer housing.

Liquid Manure Handling System (S-5602-3-0):
As seen in Appendix A of this evaluation, the applicant is proposing to install new liquid manure handling system (lagoon/storage pond) with a PE greater than 2.0 lbs/day for VOC and NH_3, therefore, BACT is triggered for VOC and NH_3 from the liquid manure handling system (lagoon/storage pond).

Liquid Manure Handling System (S-5602-3-0):
As seen in Appendix A of this evaluation, the applicant is proposing to install new liquid manure handling system (land application) with a PE greater than 2.0 lbs/day for VOC; therefore, BACT is triggered for VOC from the liquid manure handling system (land application). The PE for the liquid manure handling system (land application) for NH_3 is less than 2.0 lbs/day therefore, BACT is not triggered for NH_3 from the liquid manure handling system (land application).

Solid Manure Handling System (S-5602-4-0):
As seen in Appendix A of this evaluation, the applicant is proposing to install new solid manure/separated solids piles with a PE greater than 2.0 lbs/day for NH_3; therefore, BACT is triggered for NH_3 from the solid manure/separated solids piles.

Solid Manure Handling System (S-5602-4-0):
As seen in Appendix A of this evaluation, the applicant is proposing to install new solid manure (land application) with a PE less than 2.0 lbs/day for VOC and NH_3; therefore, BACT is not triggered for VOC or NH_3 from the solid manure (land application).

Feed Handling and Storage (S-5602-5-0):
As seen in Appendix A of this evaluation, the applicant is proposing to install new feed storage and handling (silage) with a PE greater than 2.0 lbs/day for VOC; therefore, BACT is triggered for VOC from the feed storage and handling (silage).

Feed Handling and Storage (S-5602-5-0):
As seen in Appendix A of this evaluation, the applicant is proposing to install new feed storage and handling (Total Mixed Rations) with a PE greater than 2.0 lbs/day for VOC; therefore, BACT is triggered for VOC from the feed storage and handling (Total Mixed Rations).

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 relocation of an emissions unit.

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

As discussed in Section I above, there are no modified emissions units associated with this project. Therefore BACT is not triggered.

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 NO_X emissions. Therefore BACT is not triggered for any pollutant.

2. Top-Down BACT Analysis

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

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

Milking Parlor (S-5602-1-0)

Emissions from the Milking Parlor are less than 2 lb/day per the calculations in Appendix A therefore BACT is not required for the Milking Parlor.

Cow Housing (S-5602-2-0)

PM_{10}: Emissions from all emissions units in the cow housing permit unit are less than 2 lb/day per the calculations in Appendix A therefore BACT is not required.

BACT for VOC is only triggered for the milk cows housed in freestalls

VOC: 1) Concrete feed lanes and walkways for all cows
2) Freestall feed lanes and walkways for milk cows and dry cows flushed four times per day and feed lanes and walkways in the corrals and hutches for the remaining animals flushed at least one time per day
3) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.
4) All open corrals adequately sloped to promote drainage (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.)
5) Bi-Weekly scraping of freestall exercise pens and open corrals using a pull-type scraper in the morning hours except when prevented by wet conditions.

BACT for NH_3 is triggered for the milk cows and dry cows housed in freestalls

NH_3: 1) Concrete feed lanes and walkways in freestall barns
2) Freestall feed lanes and walkways for milk and dry cows flushed four times per day and feed lanes and walkways in the corrals and hutches for the remaining animals flushed at least one time per day
3) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.
4) All open corrals adequately sloped to promote drainage (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.)
5) Bi-Weekly scraping of freestall exercise pens and open corrals using pull-type scraper in the morning hours except when prevented by wet conditions.

Liquid Manure Handling System (ATC S-5602-3-0)

Lagoon & Storage Pond

VOC: Anaerobic treatment lagoon with solids separation.

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

Land Application

VOC: Irrigation of crops using liquid and slurry manure after treatment in an anaerobic treatment lagoon or an anaerobic digester.

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

Solid Manure Handling and Land Application (ATC S-5602-4-0)

VOC: Daily incorporation or injection of solid manure into cropland (within 2 hours).

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

Feed Storage and Handling (ATC S-5602-5-0)

Silage

VOC: Implement District Rule 4570 management practices for silage.

Feed/Total Mixed Rations (TMR)

VOC: Implement District Rule 4570 management practices for feed.

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

B. Offsets

Pursuant to Section 4.6.9 of District Rule 2201, agricultural sources, to the extent provided by California Health and Safety Code, section 42301.18 are exempt from offsets as long as nothing in this Health and Safety Code section circumvents the requirements of Section 42301.16(a). Therefore, offsets are not required for this project.

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, and/or
d. Any project with an SSIPE of greater than 20,000 lb/year for any pollutant.
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.

b. PE > 100 lb/day

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

The PE2 for this new unit is compared to the daily PE Public Notice thresholds in the following table:

PE > 100 lb/day Public Notice Thresholds			
Pollutant	PE2 (lb/day)	Public Notice Threshold	Public Notice Triggered?
NO_X	0	100 lb/day	No
SO_X	0	100 lb/day	No
PM_{10}	24.5	100 lb/day	No
CO	0	100 lb/day	No
VOC	156.4	100 lb/day	Yes
NH_3	160.2	100 lb/day	Yes
H_2S	0.5	100 lb/day	No

Therefore, public noticing for PE > 100 lb/day purposes is required.

c. Offset Threshold

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

Offset Threshold				
Pollutant	SSPE1 (lb/year)	SSPE2 (lb/year)	Offset Threshold	Public Notice Required?
NO_X	12,295	12,295	20,000 lb/year	No
SO_X	20	20	54,750 lb/year	No
PM_{10}	589	9,515	29,200 lb/year	No
CO	10,364	10,364	200,000 lb/year	No
VOC	1,559	63,159	20,000 lb/year	Yes
NH_3	0	93,369	NA	No

As detailed above, the threshold for VOC was surpassed with this project; therefore public noticing is 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.

Stationary Source Increase in Permitted Emissions [SSIPE] – Public Notice					
Pollutant	SSPE2 (lb/year)	SSPE1 (lb/year)	SSIPE (lb/year)	SSIPE Public Notice Threshold	Public Notice Required?
NO_x	12,295	12,295	0	20,000 lb/year	No
SO_x	20	20	0	20,000 lb/year	No
PM_{10}	9,515	589	8,926	20,000 lb/year	No
CO	10,364	10,364	0	20,000 lb/year	No
VOC	63,159	1,559	61,600	20,000 lb/year	Yes
NH_3	93,369	0	93,369	20,000 lb/year	Yes
H_2S	244	0	244	20,000 lb/year	No

As demonstrated above, the SSIPE for VOC and NH_3 is 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 because potential to emit from the cow housing permit (S-5602-2-0) is greater than 100 lbs/day for VOC and NH_3, SSPE2 for VOC exceeds the offsets threshold and the SSIPE for VOC and NH_3 are greater than 20,000 lb/year. Therefore, public notice documents will be submitted to the

California Air Resources Board (CARB) and a public notice will be published in a local newspaper of general circulation in Tulare County prior to the issuance of the ATCs for the dairy construction.

D. Daily Emission Limits (DELs)

Daily Emissions Limitations (DELs) and other enforceable conditions are required by Section 3.16 to restrict a unit's maximum daily emissions, to a level at or below the emissions associated with the maximum design capacity. Per Sections 3.16.1 and 3.16.2, the DEL must be contained in the latest ATC and contained in or enforced by the latest PTO and enforceable, in a practicable manner, on a daily basis. 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 the required controls and mitigation measures. The number and types of cows are listed in the permit equipment description for the Cow Housing (Permit S-5602-2).

Milking Parlor (S-5602-1-0)

For the milking parlor the DEL is satisfied by the number of cows listed in the permit description. Additionally, the following conditions will be placed on the ATC:

> Permittee shall flush or hose milk parlor immediately prior to, immediately prior to, immediately after or during each milking. [District Rules 2201 and 4570]

Cow Housing (S-5602-2-0)

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

> The total number of cattle housed at this dairy at any one time shall not exceed any of the following: 1,650 milk cows; 250 dry cows; 483 heifers (15-24 months); 484 heifers (7-14 months); and 483 heifers (4-6 months). [District Rule 2201]

Additionally, the following conditions will be placed on the ATC to ensure that the DEL requirements for PM_{10} are met:

> {4493} Permittee shall record the date that manure that is not dry is removed from individual cow freestall beds or raked, harrowed, scraped, or freestall bedding is graded at least once every seven (7) days. [District Rules 2201 and 4570] N
>
> {4490} 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] N
>
> Open corrals shall be scraped every other week using a pull-type scraper in the morning hours, except when this is prevented by wet conditions. [District Rules 2201 and 4570]
>
> Permittee shall establish windbreaks along the South and West sides of the dairy. Windbreaks shall consist of the following rows with the first row closest to the dairy: first row shall consist of the Togon Shrub, planted 6 feet apart and the second row shall

consist of Chinese Elm trees, planted 8 feet apart and the third row shall consist of Deodar Cedar trees, planted 12 feet apart. Each row should be offset from the adjacent row. Spacing between rows shall be sufficient to accommodate cultivation equipment. This spacing shall not exceed 20 feet. An alternative windbreak proposal must be approved by the District. [District Rule 2201] N

The open corrals shall be equipped with shade structures for the all cows. [District Rule 2201] N

At least one of the feedings of the heifers at this dairy shall be near (within one hour of) dusk. [District Rule 2201] N

Permittee shall sprinkle water over 45% of area of the heifer corrals. Sprinkling rate shall match with the local evaporation rate to keep sufficient moisture content in the surface of the corrals. [District Rule 2201] N

Permittee shall maintain records of the daily local evaporation rate and the amount of water (inches or cm) applied to the corral surface. Records of sprinkler run time and flow rate may be used to satisfy this requirement. [District Rule 2201] N

The following conditions will be placed on the ATC to ensure that the DEL requirements for VOC are met:

The concrete feed lanes and walkways for mature cows shall be flushed at least four times per day. [District Rules 2201 and 4570] N

The concrete feed lanes and walkways for all heifers and calves shall be flushed at least two times per day. [District Rules 2201 and 4570] N

Permittee shall maintain an operating plan that requires the feed lanes and walkways to be flushed at least four times per day for mature cows and at least two times per day for all other cows. [District Rules 2201 and 4570] N

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

Liquid Manure Handling System (S-5602-3-0)

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

The liquid manure handling system shall handle flush manure from no more than 1,650 milk cows; 250 dry cows; 483 heifers (15-24 months); 484 heifers (7-14 months); and 483 heifers (4-6 months). [District Rule 2201]

Permittee shall operate the lagoon as an anaerobic treatment lagoon designed according to NCRCS Guideline No. 359. [District Rule 2201] N

Permittee shall only apply liquid manure that has been treated with an anaerobic treatment lagoon, an aerobic lagoon or a digester system. [District Rules 2201 and 4570]N

Solid Manure Handling System (S-5602-4-0)

For the solid manure handling system the conditions imposed under Rule 4570 are sufficient to enforce the DEL. Rule 2201 will be added as a rule reference to the conditions listed in the Rule 4570 compliance discussion.

Feed Storage and Handling (S-5602-5-0)

For feed storage and handling the conditions imposed under Rule 4570 are sufficient to enforce the DEL. Rule 2201 will be added as a rule reference to the conditions listed in the Rule 4570 compliance discussion.

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

The conditions imposed under Rule 4570 are sufficient to enforce the monitoring requirements of Rule 2201. Rule 2201 will be added as a rule reference to the conditions listed in the Rule 4570 compliance discussion.

3. Recordkeeping

Recordkeeping is required to demonstrate compliance with the public notification and daily emission limit requirements of Rule 2201. In general, recordkeeping for the Milking Parlor (S-5602-1-0), the Liquid Manure Handling System (S-5602-3-0), and the Solid Manure Handling System (S-5602-4-0) is satisfied with the records that must be kept to demonstrate compliance with the numbers and types of cows listed in the permit equipment description for the Cow Housing (S-5602-2-0). The following conditions will be placed on the ATC permits:

Milking Parlor (S-5602-1-0)
The following condition will appear on the ATC for the Milking Parlor:

- Permittee shall maintain daily records of the number of cows milked in the milking parlor. [District Rules 1070 and 2201]

Cow Housing (S-5602-2-0)
The following conditions will appear on the ATC for the Cow Housing Permit:

- Permittee shall maintain a record of the number of animals of each production group at the Facility and shall maintain quarterly records of any changes to this information. [District Rules 2201 and 4570]
- Permittee shall maintain records of: (1) the number of times feed lanes are flushed per day and (2) the frequency of scraping and manure removal from open corrals. [District Rules 2201 and 4570]
- Permittee shall maintain records of the date that water pipes and troughs are inspected and leaks are repaired. [District Rules 2201 and 4570]
- Permittee shall maintain records of: (1) the date that animal waste that is not dry is removed from individual cow freestall beds; (2) the date that water pipes and troughs are inspected and leaks are repaired. [District Rules 2201 and 4570
- Permittee shall maintain records of 1) daily local evaporation rate/soil evaporation rate, 2) the amount of water (inches or cm) applied to the corral surface, and 3) records of the required moisture content samples including the date the samples were taken. Records of sprinkler run time and flow rate may be used to satisfy item 2. [District Rule 2201]
- All records shall be kept and maintained for a minimum of five (5) years and shall be made available to the APCO, ARB and EPA upon request. [District Rules 1070 and 4570]

Additional recordkeeping conditions are included under the Rule 4570 compliance section.

Liquid Manure Handling System (S-5602-3-0)
To ensure that the lagoon system is designed and operating properly, the following condition will be placed on the ATC for the Liquid Manure Handling System:

- Permittee shall maintain records of design specifications and calculations for the Anaerobic Treatment Lagoon system in order to demonstrate that the system has been designed and is operating in accordance with the applicable National Resource Conservation Service (NRCS) technical guide. [District Rule 2201]
- Permittee shall maintain records that only liquid animal waste treated with an anaerobic treatment lagoon is applied to fields. [District Rules 2201 and 4570]
- Permittee shall maintain records to demonstrate liquid animal waste does not stand in the fields for more than twenty-four (24) hours after irrigation. [District Rules 2201 and 4570] N

Solid Manure Handling System (S-5602-4-0)
To ensure that the solid manure is handled properly, the following condition will be placed on the ATC for the Solid Manure Handling System:

- {4527} Permittee shall keep records of dates when manure is removed from the dairy 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]
- {4528} Permittee shall maintain records, such as manufacturer warranties or other documentation, demonstrating that the weatherproof covering over solid animal waste and/or weatherproof covering over separated solids, 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 keep records of dates when animal waste is removed from the pens/corrals and the dairy. Manure hauling invoices may be used to meet this requirement. [District Rule 4570] N
- All records shall be kept and maintained for a minimum of five (5) years and shall be made available to the APCO, ARB, and EPA upon request. [District Rule 2201]

Feed Storage and Handling (S-5602-5-0)
To ensure that the BACT requirements are satisfied, the following conditions will be placed on the ATC for the Feed Storage and Handling Permit:

- {4455} 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 records of dates when feed was removed from the area where animals stand to eat. [District Rules 2201 and 4570]
- Permittee shall maintain records of when uneaten wet feed was removed from feed bunks. [District Rules 2201 and 4570] N
- Permittee shall maintain records of when feed was either fed to animals or disposed of within forty-eight (48) hours of grinding and mixing rations. [District Rules 2201 and 4570] N
- {4461} Permittee shall maintain records when grain is stored in a weatherproof storage structure from October through May. [District Rules 2201 and 4570]
- All records shall be kept and maintained for a minimum of five (5) years and shall be made available to the APCO, ARB 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

Section 4.14.1 of this Rule requires that an ambient air quality analysis (AAQA) 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 Technical Services Division of the SJVAPCD conducted the required analysis. Refer to Appendix E of this document for the AAQA summary sheet.

The proposed location is in an attainment area for NO_X, CO, and SO_X. The proposed dairy construction will not cause a violation of an air quality standard for NO_X, CO, or SO_X.

The proposed location is in a non-attainment area for PM_{10}. The increase in the ambient PM_{10} concentration due to the proposed dairy construction is shown on the table titled Calculated Contribution. The District level of significance is shown on the table titled Significance Levels.

Significance Levels				
Pollutant	District Significance Level ($\mu g/m^3$)			
	24 hr Avg.	8 hr Avg.	3 hr Avg.	1 hr Avg.
PM_{10}	10.4	N/A	N/A	N/A

Calculated Contribution				
Pollutant	Calculated Contributions ($\mu g/m^3$)			
	24 hr Avg.	8 hr Avg.	3 hr Avg.	1 hr Avg.
PM_{10}	10.19	N/A	N/A	N/A

As shown above, the calculated contribution of PM_{10} will not exceed the District significance level. Therefore, this project is not expected to cause or make worse a violation of an air quality standard.

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 2550 Federally Mandated Preconstruction Review for Major Sources of Air Toxics

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

Under Rule 2550, newly constructed facilities or reconstructed units or sources[4] at existing facilities would be subject to preconstruction review requirements if they have the potential to emit hazardous air pollutants (air toxics) in "major" amounts (10 tons or more of an individual pollutant or 25 tons or more of a combination of pollutants) and the new units are not already subject to a standard promulgated under Section 112(d), 112(j), or 112(h) of the Clean Air Act." Facilities or sources subject to Rule 2550 would be subject to stringent air pollution control requirements, referred to Maximum Achievable Control Technology.

[4] Reconstruction" is defined as a change that costs 50 percent of the cost of constructing a new unit or source like the one being rebuilt.

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

Hazardous Air Pollutant Emissions		
HAP	lb-milk cow-yr	Source
Methanol	1.35	UC Davis - *VOC Emission from Dairy Cows and their Excreta*, 2005
Carbon disulfide	0.027	Dr. Schmidt - *Dairy Emissions using Flux Chambers (Phase I & II)*, 2005
Eythylbenzene	0.003	
o-Xylene	0.005	
1,2-Dibromo-3chloropropane	0.011	
1,2,4-Trichlorobenzene	0.025	
Napthalene	0.012	
Hexachlorobutadiene	0.012	
Formaldehyde	0.005	
Acetaldehyde	0.029	
Chloroform	0.017	California State University Fresno (CSUF) - *Monitoring and Modeling of ROG at California Dairies*, 2005
Styrene	0.01	
Vinyl acetate[5]	0.08	Dr. Schmidt - *Dairy Emissions using Flux Chambers (Phase I & II)* & California State University Fresno (CSUF) - *Monitoring and Modeling of ROG at California Dairies*, 2005
Toluene[6]	0.162	
Cadmium	0.009	Air Resources Board's Profile No. 423, Livestock Operations Dust
Hexavalent Chromium	0.004	
Nickel	0.026	
Arsenic	0.005	
Cobalt	0.003	
Lead	0.033	
Total	**1.828**	

Although some of the pollutants listed above may have been misidentified as HAPs due to similarities of many compounds consisting of very similar spikes (as measured through the gas Chromatograph Mass Spectroscopy - GCMS), all of these pollutants will be used in calculating the worst-case HAP emissions. Since this dairy is complying with all of the Best Available Control Technology (BACT) requirements and Rule 4570 mitigation measures, many of the

[5] 0.01 + 0.07 = 0.08 lbs/hd-yr
[6] 0.012 + 0.15 = 0.162 lbs/hd-yr

pollutants listed above are expected to be mitigated, however, no control is being applied to these factors at this time in order to calculate the worst-case emissions. The emission calculations are shown below:

HAP Emissions						
Type of Cow	**Number of cows**		**Emission Factor lbs/hd-yr[7]**		**lbs/yr**	**tons/yr**
Milking Cow	1,650	x	1.828	=	3,016	1.5
Dry Cow	250	x	1.123	=	281	0.14
Heifer (15-24 mo)	483	x	0.786	=	380	0.19
Heifer (7-14 mo)	484	x	0.686	=	332	0.16
Heifer (4-6 mo)	483	x	0.621	=	300	0.15
Calf (under 3 mo)	0	x	0.584	=	0	0
Bulls	0	x	1.123	=	0	0
Total	3,350			=	**4,309**	**2.15**

As shown above, each individual HAP is expected to be below 10 tons per year and total HAP emissions are expected to be below 25 tons per year. The largest individual HAP would be methanol, at 1.59 tons per year (2.15 tons x (1.35 lb-methanol/1.828 lb-HAPs)). Therefore, this facility will not be a major air toxics source and the provisions of Rule 2550 do not apply.

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

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

Rule 4101 Visible Emissions

Section 5.0 stipulates that no person shall discharge into the atmosphere emissions of any air contaminant aggregating more than 3 minutes in any 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 PM10 Prohibitions) are considered to be exempt.

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

Pursuant to District Rule 8081, Section 4.1, on-field agricultural sources are exempt from the requirements of Regulation VIII.

An on-field agricultural source is 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;

The units involved in this project are used solely for the raising of dairy animals. Therefore, these units are exempt from the provisions of this rule.

Rule 4102 Nuisance

Section 4.0 prohibits discharge of air contaminants which could cause injury, detriment, nuisance or annoyance to the public.

This project is proposing BACT and has proposed all mitigation measures required by Rule 4570. Therefore, this dairy is expected to comply with this rule.

California Health and Safety Code 41700 (Health Risk Assessment)

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

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

Risk Summary			
Categories	**New Dairy Units 1-0 through 5-0**	**Project Totals**	**Facility Totals**
Prioritization Score	0.51	0.51	0.51
Acute Hazard Index	N/A	N/A	N/A
Chronic Hazard Index	N/A	N/A	N/A
Maximum Individual Cancer Risk (10^{-6})	N/A	N/A	N/A
T-BACT Required?	**No**		
Special Permit Conditions?	**No**		

District policy APR 1905 also specifies that the increase in emissions associated with a proposed new source or modification not have acute or chronic indices, or a cancer risk

greater than the District's significance levels (i.e. acute and/or chronic indices greater than 1 and a cancer risk greater than 10 in a million).

The following conclusions were drawn from these analyses:

1. There will be no significant contributions to a violation of the State Ambient Air Standards for PM10 because the maximum predicted 24-hour PM10 concentration is less than the District's draft interim significance threshold.
2. Cancer, chronic non-carcinogenic, and acute risks from emissions of toxic air contaminants at the proposed dairy construction will not be significant. The maximum impacts are below the District's significance levels for CEQA (i.e., a cancer risk less than 10 in a million and chronic non-carcinogenic and acute HIs less than 1).

Therefore, the emissions increases for this project was determined to be less than significant. The HRA Summary are attached in Appendix E of this report.

Rule 4550 Conservation Management Practices (CMP)

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

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

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

The facility received District approval for its current CMP plan on July 15, 2013. Continued compliance with the requirements of District Rule 4550 is expected.

Rule 4570 Confined Animal Facilities (CAF)

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

Section 5.0 Requirements

Pursuant to Section 5.1, owners/operators of any CAF shall submit, for approval by the APCO, a permit application for each Confined Animal Facility.

Pursuant to Section 5.1.2, a thirty-day public noticing and commenting period shall be required for all large CAF's receiving their initial Permit-to-Operate or Authority-to-Construct.

The applicant has submitted an application containing all the requirements above. Since public noticing is required for this project, a public notice will be published in a local newspaper of general circulation prior to the issuance of these ATC's.

Pursuant to Section 5.1.3, owners/operators shall submit a facility emissions mitigation plan of the Permit-to-Operate application or Authority-to-Construct application. The mitigation plan shall contain the following information:

- The name, business address, and phone number of the owners/operators responsible for the preparation and the implementation of the mitigation measures listed in the permit.
- The signature of the owners/operators attesting to the accuracy of the information provided and adherence to implementing the activities specified in the mitigation plan at all times and the date that the application was signed.
- A list of all mitigation measures shall be chosen from the application portions of Sections 5.5 or 5.6.

Pursuant to Section 5.1.4, the Permit-to-Operate or Authority-to-Construct application shall include the following information, which is in addition to the facility emission mitigation plan:

- The maximum number of animals at the facility in each production stage (facility capacity).
- Any other information necessary for the District to prepare an emission inventory of all regulated air pollutants emitted from the facility as determined by the APCO.
- The approved mitigation measures from the facility's mitigation plan will be listed on the Permit to Operate or Authority-to-Construct as permit conditions.
- The District shall act upon the Authority to Construct application or Permit to Operate application within six (6) months of receiving a complete application.

Pursuant to Section 5.1.6, the District shall act upon the Authority to Construct application or Permit to Operate application within six (6) months of receiving a complete application.

Pursuant to Section 5.3, owners/operators of any CAF shall implement all VOC emission mitigation measures, as contained in the permit application, on and after 365 days from the date of issuance of either the Authority-to-Construct or the Permit-to Operate whichever is sooner.

Pursuant to Section 5.4, an owner/operator may temporarily suspend use of mitigation measure(s) provided all of the following requirements are met:

- It is determined by a licensed veterinarian, certified nutritionist, CDFA, or USDA that any mitigation measure being suspended is detrimental to animal health or necessary for the animal to molt, and a signed written copy of this determination shall be retained on-site and made available for inspection upon request.
- The owner/operator notifies the District, within forty-eight (48) hours of the determination that the mitigation measure is being temporarily suspended; the specific health condition requiring the mitigation measure to be suspended; and the duration that the measure must be suspended for animal health reasons,
- The emission mitigation measure is not suspended for longer than recommended by the licensed veterinarian or certified nutritionist for animal health reasons,
- If such a situation exists, or is expected to exist for longer than thirty (30) days, the owners/operators shall, within that thirty (30) day period, submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the mitigation measure that was suspended, and

- The APCO, ARB, and EPA approve the temporary suspension of the mitigation measure for the time period requested by the owner/operator and a signed written copy of this determination shall be retained on site.

The following condition will be placed on each permit.

- {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 permittee shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570] N

Section 7.0 Administrative Requirements

Section 7.2 General Records for CAFs Subject to Section 5.0 Requirements:

- Copies of all of the facility's permits
- Copies of all laboratory tests, calculations, logs, records, and other information required to demonstrate compliance with all applicable requirements of this rule, as determined by the APCO, ARB, EPA.
- Records of the number of animals of each species and production group at the facility on the permit issuance date. Quarterly records of any changes to this information shall also be maintained, (e.g. Dairy Herd Improvement Association records, animal inventories done for financial purposes, etc.)

The following condition will be placed on the cow housing permit:

- {4449} 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] N

Specific recordkeeping and monitoring conditions are shown below under the appropriate mitigation measures.

Pursuant to Section 7.9, owners/operators of a CAF subject to the requirements of Section 5.0 shall keep and maintain the required records in Sections 7.1 through 7.8.4, as applicable, for a minimum of five (5) years and the records shall be made available to the APCO and EPA upon request. Therefore, the following condition will be placed on the permit:

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

Section 7.10 requires specific monitoring or source testing conditions for each mitigation measure. These conditions are shown below with each mitigation measure.

The Dairy has chosen the following Mitigation Measures. All conditions required for compliance with Rule 4570 for the mitigation measures selected by the applicant are shown below. These conditions will be placed on the appropriate permits.

General Conditions

- {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 permittee shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570] N

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

Feed Mitigation Measures Required

Feed according to National Research Council (NRC) guidelines.

- {4454} Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rule 4570] N

- {4455} 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] N

Push feed so that it is within three (3) 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.

- {4456} 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] N

- {4457} Permittee shall maintain an operating plan/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] N

Begin feeding total mixed rations within two (2) hours of grinding and mixing rations.

- {4458} Permittee shall begin feeding total mixed rations within two hours of grinding and mixing rations. [District Rule 4570] N

- {4459} Permittee shall maintain an operating plan/record of when feeding of total mixed rations began within two hours of grinding and mixing rations. [District Rule 4570] N

Store grain in a weatherproof storage structure or under a weatherproof covering from October through May.

- {4460} Permittee shall store grain in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rule 4570] N

- {4461} 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] N

Remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event.

- {4464} Permittee shall remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rule 4570] N

- {4465} Permittee shall maintain records demonstrating that uneaten wet feed was removed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rule 4570] N

Silage

Utilize a sealed feed storage system (e.g., Ag-Bag) for bagged silage.

- {4468} For bagged silage/feedstuff, permittee shall utilize a sealed feed storage system (e.g., ag bag). [District Rule 4570] N

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.

- {4469} 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] N

- {4470} 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] N

Build silage piles such that the average bulk density of silage piles 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, or 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, or incorporate the following practices when creating silage piles:

- Harvest silage crop at ≥ 65% moisture for corn; and ≥ 60% moisture for alfalfa/grass and other silage crops; and

- Manage silage material delivery such that no more than six (6) inches of materials are un-compacted on top of the pile.

- Incorporate the following parameters for Theoretical Length of Chop (TLC) and roller opening, as applicable, for the crop being harvested:

Crop Harvested	TLC (inches)	Roller Opening(mm)
Corn with no processing	≤ 1/2 in	N/A
Processed Corn <35% dry matter	≤ 3/4 in	1 – 4 mm
Alfalfa/Grass	≤ 1.0 in	N/A
Wheat/Cereal Grains/Other	≤ 1/2 in	N/A

- {4471} 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] N

- {4472} 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] N

- {4473} 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] N

- {4474} 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] N

- {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 Rule 4570] N

- {4476} 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] N

- {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 Rule 4570] N

- {4478} 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] N

- {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 Rule 4570] N

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 square feet.

Manage multiple uncovered silage piles such that the total exposed surface area of all silage piles is less than 4,300 square feet.

Maintain silage working face use a shaver/facer to remove silage from the silage pile.

Maintain silage working face; maintain a smooth vertical surface on the working face of the silage pile.

Silage Additives: 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.

Silage Additives: Apply propionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at a rate specified by the manufacturer to reduce yeast counts when forming silage pile.

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.

- {4480} 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] N

- {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 Rule 4570] N

- {4482} For each silage pile that Option 2 (Shaver/Facer or Smooth Face) is chosen as a mitigation measure for building 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] N

- {4483} For each silage pile that Option 3 (Silage Additives) is chosen as a mitigation measure for building 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] N

Milking Parlor

Since the milking parlor does not trigger BACT the facility will be given 365 days to implement the required mitigation measures.

Flush or hose milk parlor immediately prior to, immediately after, or during each milking.

- Permittee shall implement and maintain all the Mitigation Measures contained in this permit no later than 365 days from the date of issuance. [District Rule 4570] N

- {4484} Permittee shall flush or hose milk parlor immediately prior to, immediately prior to, immediately after or during each milking. [District Rule 4570] N

- {4485} Permittee shall provide verification that milk parlors are flushed or hosed prior to, immediately after, or during each milking. [District Rule 4570] N

Freestall Barn

Pave feed lanes, 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.

- {4486} Permittee shall pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers. [District Rule 4570] N

Flush or scrape freestall flush lanes at least three times per day.

- {4489} Permittee shall flush or scrape freestall flush lanes at least three (3) times per day. [District Rule 4570] N

- {4490} 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] N

For a LARGE dairy only (1000 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 seven (7) days.

- {4492} Permittee shall remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rule 4570] N

- {4493} Permittee shall record the date that manure that is not dry is removed from individual cow freestall beds or raked, harrowed, scraped, or freestall bedding is graded at least once every seven (7) days. [District Rule 4570] N

Corral

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 feed along the corral side of the feedlane for heifers.

- {4486} Permittee shall pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers. [District Rule 4570] N

Inspect water pipes and troughs and repair leaks at least once every seven (7) days.

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

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

Clean manure from corrals at least four (4) times per year with at least sixty (60) days between cleaning, or clean corrals at least once between April and July and at least once between September and December.

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

- {4502} Permittee shall record the date that animal waste is cleaned from corrals or demonstrate that manure from corrals are cleaned at least four (4) times per year with at least sixty (60) days between each cleaning. [District Rule 4570] N

Implement one of the following three 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 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.

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

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

Scrape, vacuum or flush concrete lanes in corrals at least once every day for mature cows and every seven (7) days for support stock.

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

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

Install all shade structures uphill of any slope in the corral.

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

Manage corrals such that the manure depth in the corral does not exceed twelve (12) inches at any time or point, except for in-corral mounding. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. The facility must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible.

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

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

Solid Manure

Remove dry manure from the facility within seventy-two (72) hours of removal from housing.

Within seventy two (72) hours of solid manure removal from housing, 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.

- {4526} Within seventy two (72) hours of removal of solid manure from housing, permittee shall either 1) remove dry manure from the dairy, 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] N

- {4527} Permittee shall keep records of dates when manure is removed from the dairy 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] N

- {4528} 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] N

  Remove separated solids from the facility within seventy-two (72) hours of removal from the drying process. Within seventy two (72) hours of removal from the drying process, 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.

- {4529} Within seventy two (72) hours of removal of separated solids from the drying process, permittee shall either 1) remove separated solids from the dairy, or 2) 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 twenty-four (24) hours per event. [District Rule 4570] N

- {4530} Permittee shall keep records of dates when separated solids are removed from the dairy or permittee shall maintain records to demonstrate that separated solids piles outside the pens are covered with a weatherproof covering from October through May. [District Rule 4570] N

- {4531} Permittee shall maintain records, such as manufacturer warranties or other documentation, demonstrating that the weatherproof covering over separated solids 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] N

Liquid Manure

Remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon.

- {4538} Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rule 4570] N

Land Application

Solid

Apply no solid manure with a moisture content of more than 50%.

- {4545} Permittee shall not apply solid manure with a moisture content of more than 50%. [District Rule 4570] N

- {4546} Permittee shall maintain records of the moisture content of the solid manure each time solid manure is land applied. [District Rule 4570] N

- {4547} Moisture content shall be determined using test Methods for the examination of compost and Composting (TMECC) Method 3.09 or any other alternative test method approved by the APCO, ARB, and EPA. [District Rule 4570] N

Liquid

Allow liquid manure to stand in the fields for no more than twenty-four (24) hours after irrigation.

- {4550} Permittee shall not allow liquid manure to stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570] N

- {4551} Permittee shall maintain records to demonstrate liquid manure did not stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570] N

California Health and 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 Senate Bill 700(SB 700)

Parreira Farms Dairy is an agricultural operation that raises dairy cows for the production of milk for human consumption. Pursuant to Senate Bill (SB) 700, all agricultural operations, including Confined Animal Facilities (CAF), with emissions greater than ½ the major source emissions threshold levels (5 ton/year of NO_X or VOC), are required to obtain a District permit.

The post-project emissions from the dairy exceed the 5 ton-VOC/year threshold and the dairy is classified as a large CAF by the California Air Resources Board (ARB). The facility has applied for ATC permits for the proposed construction; therefore compliance with the requirements of SB 700 is expected.

California Environmental Quality ACT (CEQA)

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

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

The County of Tulare (County) is the Agency which has principal responsibility for approving this dairy project. The County determined that the Project would have a significant adverse environmental impact and prepared an Environmental Impact Report (EIR) for the Project. In certifying the Final EIR, the County determined that after implementing all feasible mitigation measures certain impacts on air quality would be significant and unavoidable. The County approved the Project and adopted a Statement of Overriding Considerations (SOC), in accordance with CEQA Guidelines §15093(a), stating that economic, legal, social,

technological, and other benefits resulting from the project will outweigh the unavoidable adverse environmental effects.

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) Rule 2010 requires operators of emission sources to obtain an Authority to Construct (ATC) and Permit to Operate (PTO) from the District. Rule 2201 requires that new and modified stationary sources of emissions mitigate their emissions using best available control technology (BACT) and for non-agricultural sources offsetting emissions when above certain thresholds (SB 700). As a responsible agency the District complies with CEQA by considering the EIR prepared by the Lead Agency, and by reaching its own conclusion on whether and how to approve the project involved (CEQA Guidelines §15096).

The District has prepared an Authority to Construct Application Review, this document, and has determined that compliance with District rules and required mitigation measures will reduce project specific stationary source emissions to the extent feasible. Before reaching a final decision to approve the project and issue ATCs the District will prepare findings and file a Notice of Determination consistent with CEQA Guidelines §15096 requirements.

IX. Recommendation

Compliance with all applicable rules and regulations is expected. Pending a successful Public Noticing period, issue Authorities to Construct S-5602-1-0, -2-0, -3-0, -4-0, and -5-0 subject to the permit conditions on the attached draft Authorities to Construct in Appendix F.

X. Billing Information

Annual Permit Fees			
Permit Number	Fee Schedule	Fee Description	Annual Fee
S-5602-1-0	3020-06	Milking Parlor	$105
S-5602-2-0	3020-06	Cow Housing	$105
S-5602-3-0	3020-06	Liquid Manure Handling System	$105
S-5602-4-0	3020-06	Solid Manure Handling System	$105
S-5602-5-0	3020-06	Feed Storage and Handling	$105

Appendixes

A: Emission Factors and Calculations
B: Anaerobic Treatment lagoon Design Check
C: Quarterly Net Emissions Change
D: BACT Analysis
E: Summary of Health Risk Assessment (HRA) and Ambient Air Quality Analysis (AAQA)
F: Draft ATCs

APPENDIX A

Emission Factors and Detailed Calculations

Pre-Project Dairy Information

1. Does this dairy house Holstein or Jersey cows? Holstein
   Most dairies 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? no
   Answering "yes" assumes worst case.
4. Does the facility land apply solid manure? no
   Answering "yes" assumes worst case.
5. Is any scraped manure sent to a lagoon? facility does net 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 and Bulls)					0		
Large Heifers					0		
Medium Heifers					0		
Small Heifers					0		
Dulls					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 and Bulls)	0
Total Calves	0
Total Dairy Head	0

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

Post-Project Dairy Information

1. Does this dairy house Holstein or Jersey cows? Holstein
   Most dairies 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? facility does not scrape manure
   Answering "yes" assumes worst case.

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

6. Does this project result in any new lagoon/storage pond(s) or an increase in surface area for any existing lagoon/storage pond(s)? yes

Post-Project Herd Size							
Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals		
Milk Cows	1,650				1,650		
Dry Cows	250				250		
Support Stock (Heifers and Bulls)					0		
Large Heifers			403		483		
Medium Heifers			484		484		
Small Heifers			483		403		
Dulls					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	1,650
Total Mature Cows	1,900
Support Stock (Heifers and Bulls)	1,450
Total Calves	0
Total Dairy Head	3,350

Post-Project Silage Information			
Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn	1	10	95
Alfalfa	1	9	80
Wheat	1	9	90

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		
☐	☑ TRUE	Feed according to NRC guidelines	0%	10%
		Total Control Efficiency	0%	10%
		Milking Parlor Floor Mitigations		
☐	☑ TRUE	Feed according to NRC guidelines	0%	10%
☐	☑ TRUE	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	0%	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	0%	10%
		Total Control Efficiency	0%	10%
		Corrals/Pens Mitigations		
☐	☑	Feed according to NRC guidelines	0%	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%
☐	☑	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 requiremsnt).	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).	0%	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 s light permeable roofing material. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.	0%	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 mansgement 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.	0%	0%
☐	☐	Use lime or a similar absorbent material in the corral according to the manufacturer's recommendation to minimize moisture in the corrals.	0%	0%
☐	☐	Apply thymol to the corral soil in accordance with the manufacturer's recommendation.	0%	0%
		Total Control Efficiency	0.00%	23.05%
		Bedding Mitigations		
☐	☑	Feed according to NRC guidelines	0%	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 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.	0%	10%
☐	☐	For a medium dairy only (500 to 999 milk cows) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 14 days.	0%	0%
		Total Control Efficiency	0.00%	19.00%
		Lanes Mitigations		
☐	☑	Feed according to NRC guidelines	0%	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%
☐	☑	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.	0%	10%
☐	☐	Have no animals in exercise pens or corrals at any time.	0%	0%
		Total Control Efficiency	0.00%	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	0%	10%
☐	☐	Use phototropic lagoon	0%	0%
☐	☑	Use an anaerobic treatment lagoon designed according to NRCS Guideline No. 359	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	0.00%	46.00%
		Liquid Manure Land Application Mitigations		
☐	☑	Feed according to NRC guidelines	0%	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 apperatus	0%	0%
		Total Control Efficiency	0.00%	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	0%	10%
☐	☑	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.	0%	10%
		Total Control Efficiency	0.00%	19.00%
		Separated Solids Piles Mitigations		
☐	☑	Feed according to NRC guidelines	0%	10%
☐	☑	Within 72 hours of removal from the drying process, either a) remove separated solids from the facility, or b) cover separated solids outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed 24 hours per event.	0%	10%
		Total Control Efficiency	0.00%	19.00%
		Solid Manure Land Application Mitigations		
☐	☑	Feed according to NRC guidelines	0%	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%	40%
☐	☑	Apply no solid manure with a moisture content of more than 50%	0%	10%
		Total Control Efficiency	0.00%	51.40%

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. Implement two of the following: Manage Exposed Silage. a) manage silage piles such that only one silage pile has an uncovered face and the uncovered face has a total exposed surface area of less than 2,150 sq. ft., or b) manage multiple uncovered silage piles such that the total exposed surface area of all silage piles is less than 4,300 sq ft. Maintain Silage Working Face. a) use a shaver/facer to remove silage from the silage pile, or b) maintain a smooth vertical surface on the working face of the silage pile Silage Additive: a) inoculate silage with homolactic acid bacteria in 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.	0%	39%
		Total Control Efficiency*	0.00%	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		
☐	☑	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.	0%	10%
☐	☑	Begin feeding total mixed rations within 2 hrs of grinding and mixing rations. Note: If selected for dairies > 999 milk cows, control efficiency already included in EF.	0%	0%
☐	☐	Feed steam-flaked, dry rolled, cracked or ground corn or other ground cereal grains.	0%	0%
☐	☑	Remove uneaten wet feed from feed bunks within 24 hrs after then end of a rain event.	0%	10%
☐	☐	For total mixed rations that contain at least 30% by weight of silage, feed animals total mixed rations that contain at least 45% moisture.	0%	0%
		Total Control Efficiency	0.00%	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		
FALSE	TRUE	Feed according to NRC guidelines	0%	28%
		Total Control Efficiency	0%	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	0%	28%
☐	☑	Clean manure from corrals at least four times per year with at least 60 days between cleaning, or clean corrals at least once between April and July and at least once between September and December. **OR** Use lime or a similar absorbent material in the corral according to the manufacturer's recommendation to minimize moisture in the corrals. **OR** Apply thymol to the corral soil in accordance with the manufacturer's recommendation.	0%	50%
		Total Control Efficiency	0%	64%
		Bedding Mitigations		
☐	☑	Feed according to NRC guidelines	0%	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.	0.0%	47.7%
		Total Control Efficiency	0.00%	62.34%
		Lanes Mitigations		
☐	☑	Feed according to NRC guidelines	0%	28%
		Total Control Efficiency	0%	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	0%	28%
☐	☑	Use phototropic lagoon **OR** Remove solids from the waste system with a solid separator system, prior to the wasta entering the lagoon.	0%	80%
		Total Control Efficiency	0.0%	85.6%
		Liquid Manure Land Application Mitigations		
☐	☑	Feed according to NRC guidelines	0%	28%
☐	☑	Only apply liquid manure that has been treated with an anaerobic treatment lagoon	0%	42%
		Total Control Efficiency	0.00%	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	0%	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%	42%
		Total Control Efficiency	0.00%	58.24%

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%
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	22.5%
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	# of Combined Housing Units in row	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk
		Pre-Project Total # of Cows	Zero										

Pre-Project PM10 Control Efficiencies and Emission Factors for Freestalls														
Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)
		Pre-Project Total # of Cows	Zero											

Post-Project PM10 Mitigation Measures

	Post-Project PM10 Mitigation Measures													
	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows	# of Combined Freestalls in row	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk
1	Milk Cows	freestall	milk cows	1,650	4	☐	T☑E	T☑E	☐	☐	☐	T☑E	☐	☐
2	Dry Cows	freestall	dry cows	250	2	☐	T☑E	T☑E	☐	☐	☐	T☑E	☐	☐
3	Lg Heifers	open corral	large heifers	483	8	T☑E	T☑E	T☑E	☐	☐	F☐SE	T☑E	TR☑E	TR☑E
4	Med Heifers	open corral	medium heifers	484	7	T☑E	T☑E	T☑E	☐	☐	☐	T☑E	TR☑E	TR☑E
5	Small Heifers	open corral	small heifers	483	5	T☑E	T☑E	T☑E	☐	☐	☐	T☑E	TR☑E	TR☑E
	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	# of Combined Freestalls in row	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk
			Post-Project Total # of Cows	3,350										

	Post-Project PM10 Control Efficiencies and Emission Factors for Freestalls														
	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)
1	Milk Cows	freestall	milk cows	1,650	1.370		12.5%	10%				15%			0.92
2	Dry Cows	freestall	dry cows	250	1.370		12.5%	10%				15%			0.92
3	Lg Heifers	open corral	large heifers	483	10.550	8.3%	12.5%	10%				15%	23%	10%	4.52
4	Med Heifers	open corral	medium heifers	484	10.550	8.3%	12.5%	10%				15%	23%	10%	4.52
5	Small Heifers	open corral	small heifers	483	10.550	8.3%	12.5%	10%				15%	23%	10%	4.52
	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	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)

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	0.37	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-		-	-	-
		Milking Parlor Floor	0.04	0.03	0.04	0.03	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-		-	-	-
		Total	**0.47**	**0.44**	**0.47**	**0.40**	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-		-	-	-
	NH3	**Total**	**0.19**	**0.16**	**0.19**	**0.14**	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-		-	-	-		-	-	-
Cow Housing	VOC	Enteric Emissions in Cow Housing	3.89	3.89	3.89	3.32	2.33	2.23	2.33	2.01	1.81	1.71	1.81	1.54	1.23	1.17	1.23	1.05	0.89	0.65	0.69	0.58	0.32	0.31	0.32	0.28	1.10	1.04	1.10	0.94
		Corrals/Pens	10.00	6.90	10.00	5.08	5.40	3.59	5.40	2.76	4.20	2.76	4.20	2.12	2.85	1.89	2.85	1.45	1.90	1.04	1.60	0.90	0.75	0.50	0.75	0.39	2.55	1.67	2.55	1.29
		Bedding	1.05	1.00	1.06	0.81	0.57	0.54	0.57	0.44	0.44	0.42	0.44	0.34	0.30	0.28	0.30	0.23	0.17	0.16	0.17	0.13	0.08	0.08	0.08	0.05	0.27	0.25	0.27	0.20
		Lanes	0.84	0.90	0.84	0.65	0.45	0.44	0.45	0.35	0.35	0.33	0.35	0.27	0.24	0.23	0.24	0.18	0.13	0.13	0.13	0.10	0.06	0.06	0.06	0.05	0.21	0.20	0.21	0.16
		Total	**15.76**	**12.09**	**15.78**	**9.86**	**8.75**	**6.80**	**8.75**	**5.57**	**6.81**	**5.22**	**6.81**	**4.27**	**4.62**	**3.56**	**4.62**	**2.91**	**2.59**	**1.98**	**2.59**	**1.62**	**1.22**	**0.95**	**1.22**	**0.78**	**4.13**	**3.16**	**4.13**	**2.59**
	NH3	Enteric Emissions in Cow Housing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Corrals/Pens	41.90	41.90	41.90	15.08	21.20	21.20	21.20	7.63	11.00	11.00	11.00	3.96	7.90	7.90	7.90	2.84	6.00	6.00	6.00	2.16	1.80	1.80	1.90	0.65	15.30	15.30	15.30	5.51
		Bedding	6.30	6.30	6.30	2.37	3.20	3.20	3.20	1.20	1.70	1.70	1.70	0.64	1.20	1.20	1.20	0.45	0.90	0.90	0.90	0.34	0.30	0.30	0.30	0.11	2.30	2.30	2.30	0.87
		Lanes	5.10	5.10	5.10	3.67	2.60	2.60	2.60	1.87	1.30	1.30	1.30	0.94	1.00	1.00	1.00	0.72	0.70	0.70	0.70	0.50	0.20	0.20	0.20	0.14	1.90	1.90	1.90	1.37
		Total	**53.30**	**53.30**	**53.30**	**21.13**	**27.00**	**27.00**	**27.00**	**10.71**	**14.00**	**14.00**	**14.00**	**5.54**	**10.10**	**10.10**	**10.10**	**4.02**	**7.60**	**7.60**	**7.60**	**3.00**	**2.30**	**2.30**	**2.30**	**0.90**	**19.50**	**19.50**	**19.50**	**7.74**
Liquid Manure Handling	VOC	Lagoons/Storage Ponds	1.52	1.30	1.52	0.70	0.82	0.71	0.82	0.38	0.64	0.54	0.64	0.29	0.43	0.37	0.43	0.20	0.24	0.21	0.24	0.11	0.11	0.10	0.11	0.06	0.40	0.33	0.40	0.18
		Liquid Manure Land Application	1.64	1.40	N/A	0.76	0.89	0.76	N/A	0.41	0.69	0.58	N/A	0.32	0.47	0.40	N/A	0.22	0.26	0.22	N/A	0.12	0.12	0.11	N/A	0.05	0.42	0.35	N/A	0.19
		Total	**3.16**	**2.70**	**1.52**	**1.46**	**1.71**	**1.47**	**0.82**	**0.79**	**1.33**	**1.13**	**0.64**	**0.61**	**0.90**	**0.77**	**0.43**	**0.42**	**0.51**	**0.43**	**0.24**	**0.23**	**0.24**	**0.21**	**0.11**	**0.11**	**0.82**	**0.68**	**0.40**	**0.37**
	NH3	Lagoons/Storage Ponds	8.20	8.20	8.20	1.18	4.20	4.20	4.20	0.60	2.20	2.20	2.20	0.32	1.50	1.50	1.50	0.22	1.20	1.20	1.20	0.17	0.35	0.35	0.35	0.05	3.00	3.00	3.00	0.43
		Liquid Manure Land Application	8.90	8.90	N/A	3.72	4.50	4.50	N/A	1.88	2.30	2.30	N/A	0.96	1.70	1.70	N/A	0.71	1.30	1.30	N/A	0.54	0.37	0.37	N/A	0.15	3.23	3.23	N/A	1.35
		Total	**17.10**	**17.10**	**8.20**	**4.90**	**8.70**	**8.70**	**4.20**	**2.48**	**4.50**	**4.50**	**2.20**	**1.28**	**3.20**	**3.20**	**1.50**	**0.93**	**2.50**	**2.50**	**1.20**	**0.72**	**0.72**	**0.72**	**0.35**	**0.20**	**6.23**	**6.23**	**3.00**	**1.78**
Solid Manure Handling	VOC	Solid Manure Storage	0.16	0.15	0.16	0.12	0.09	0.08	0.09	0.07	0.07	0.06	0.07	0.05	0.05	0.04	0.05	0.03	0.03	0.02	0.03	0.02	0.01	0.01	0.01	0.01	0.04	0.04	0.04	0.03
		Separated Solids Piles	0.06	0.05	0.06	0.05	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	0.01	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02
		Solid Manure Land Application	0.39	0.33	N/A	0.16	0.21	0.18	N/A	0.09	0.16	0.14	N/A	0.07	0.11	0.06	N/A	0.05	0.06	0.05	N/A	0.03	0.03	0.03	N/A	0.01	0.10	0.08	N/A	0.04
		Total	**0.61**	**0.54**	**0.22**	**0.33**	**0.33**	**0.29**	**0.13**	**0.18**	**0.29**	**0.23**	**0.09**	**0.14**	**0.17**	**0.15**	**0.06**	**0.09**	**0.18**	**0.09**	**0.04**	**0.05**	**0.05**	**0.04**	**0.02**	**0.03**	**0.18**	**0.14**	**0.06**	**0.09**
	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	0.10	0.10	0.18	0.16	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	0.06	0.06	0.06	0.06	0.02	0.02	0.02	0.02	0.14	0.14	0.14	0.14
		Solid Manure Land Application	2.08	2.08	N/A	0.87	1.05	1.05	N/A	0.44	0.55	0.55	N/A	0.23	0.39	0.39	N/A	0.16	0.30	0.30	N/A	0.13	0.08	0.08	N/A	0.04	0.76	0.76	N/A	0.32
		Total	**3.42**	**3.42**	**1.33**	**2.20**	**1.73**	**1.73**	**0.67**	**1.11**	**0.90**	**0.90**	**0.35**	**0.58**	**0.54**	**0.54**	**0.25**	**0.41**	**0.48**	**0.48**	**0.19**	**0.31**	**0.15**	**0.15**	**0.06**	**0.10**	**1.25**	**1.25**	**0.49**	**0.81**

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	21,155
		Alfalfa Silage	17,458	17,458	10,649
		Wheat Silage	43,844	43,844	26,745
		TMR	13,056	13,056	10,575

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

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

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

Pre-Project Potential to Emit - Cow Housing

Pre-Project Potential to Emit - Cow Housing											
Freestall #(s)/ Name(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)
Pre-Project Total # of Cows		0				0.0	0	0.0	0	0.0	0

Pre-Project Totals						
Total # of Cows	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
0	0.0	0	0.0	0	0.0	0

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											
	Freestall #(s)/ Name(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	Milk Cows	milk cows	1,650	9.86	21.128328	0.92	44.6	16,269	95.5	34,862	4.1	1,513
2	Dry Cows	dry cows	250	5.57	10.708992	0.92	3.8	1,393	7.3	2,677	0.6	229
3	Lg Heifers	large heifers	483	4.27	5.536152	4.52	5.6	2,062	7.3	2,674	6.0	2,182
4	Med Heifers	medium heifers	484	2.91	4.015872	4.52	3.9	1,408	5.3	1,944	6.0	2,186
5	Small Heifers	small heifers	483	1.62	3.002904	4.52	2.1	782	4.0	1,450	6.0	2,182
	Post-Project # of Cows (non-expansion)		3,350				60.0	21,914	119.4	43,607	22.7	8,292

Post-Project Potential to Emit - Cow Housing: New Freestalls at Existing Dairy											
Freestall #(s)/ Name(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)
Total # of Cows From Expansion		0				0.0	0	0.0	0	0.0	0

Post-Project Totals						
Total # of Cows	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
3,350	60.0	21,914	119.4	43,607	22.7	8,292

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	0	0	0	0	0
Dry Cows	0	0	0	0	0
Support Stock (Heifers and Bulls)	0	0	0	0	0
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	0	0	0	
Alfalfa	0	0	0	
Wheat	0	0	0	

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	0.0	0	0.0	0	0.0	0

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 and Bulls)	0.0	0	0.0	0	0	0
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	0.0	0	0.0	0	0	0

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 and Bulls)	0.0	0	0.0	0
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	0.0	0	0.0	0

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

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^2] x [0.0929 m^2/ft^2] 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^2) 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 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	0.0	0.0	0.0	0.0	0.0
Liquid Manure	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Solid Manure	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Feed Handling	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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	0
Solid Manure	0	0	0	0	0
Feed Handling	0	0	0	0	0
Total	0	0	0	0	0

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	0	0	0	0	0
Liquid Manure	0	0	0	0	0	0	0
Solid Manure	0	0	0	0	0	0	0
Feed Handling	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Post-Project Potential to Emit (PE2)

Post-Project Herd Size					
Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows	1,650	0	0	0	1,650
Dry Cows	250	0	0	0	250
Support Stock (Heifers and Bulls)	0	0	0	0	0
Large Heifers	0	0	483	0	483
Medium Heifers	0	0	484	0	484
Small Heifers	0	0	483	0	483
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	10	95	651
Alfalfa	1	9	80	499
Wheat	1	9	90	551

Milking Parlor				
Cow	VOC		NH3	
Milk Cows	lb/day	lb/yr	lb/day	lb/yr
Total	1.8	660	0.6	226

Cow Housing						
	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Total	60.0	21,914	119.4	43,607	22.7	8,292

Liquid Manure Handling						
Cow	VOC		NH3		H2S	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	6.6	2,409	22.2	8,085	0.5	195
Dry Cows	8.5	198	1.7	620	0	15
Support Stock (Heifers and Bulls)	8.0	0	0.0	0	0	0
Large Heifers	0.8	295	1.7	618	0	15
Medium Heifers	0.6	203	1.2	450	0	18
Small Heifers	8.3	111	1.0	348	8	8
Calves	8.8	0	0.8	0	0	0
Bulls	0.8	0	0.0	0	0	0
Total	8.8	3,216	27.8	10,121	0.5	244

Solid Manure Handling				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	1.5	545	9.9	3,630
Dry Cows	0.1	45	0.8	278
Support Stock (Heifers and Bulls)	0.0	0	0.0	0
Large Heifers	0.2	68	0.8	280
Medium Heifers	0.1	44	0.5	198
Small Heifers	0.1	24	0.4	150
Calves	0.0	0	0.0	0
Bulls	0.0	0	0.0	0
Total	2.0	725	12.4	4,536

Feed Handling and Storage		
	Daily PE (lb-VOC/day)	Annual PE (lb-VOC/yr)
Corn Emissions	4.1	1,480
Alfalfa Emissions	0.8	285
Wheat Emissions	4.3	1,582
TMR	73.9	26,955
Total	83.1	30,303

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 ft^2) x (0.0929 m^2/ft^2) 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 m^2) 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	1.8	0.6	0.0
Cow Housing	0.0	0.0	22.7	0.0	60.0	119.4	0.0
Liquid Manure	0.0	0.0	0.0	0.0	8.8	27.8	0.5
Solid Manure	0.0	0.0	0.0	0.0	2.0	12.4	0.0
Feed Handling	0.0	0.0	0.0	0.0	83.1	0.0	0.0
Total	0.0	0.0	22.7	0.0	155.7	168.2	0.5

Major Source Emissions (lb/yr)					
Permit	NOx	SOx	PM10	CO	VOC
Milk Parlor	0	0	0	0	0
Cow Housing	0	0	0	0	0
Liquid Manure	0	0	0	0	1,541
Solid Manure	0	0	0	0	0
Feed Handling	0	0	0	0	0
Total	0	0	0	0	1,541

Total Annual Post-Project Potential to Emit (lb/yr)							
Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	660	226	0
Cow Housing	0	0	8,292	0	21,914	43,607	0
Liquid Manure	0	0	0	0	3,216	10,121	244
Solid Manure	0	0	0	0	725	4,538	0
Feed Handling	0	0	0	0	30,303	0	0
Total	0	0	8,292	0	56,817	58,498	244

BACT Applicability

Milking Parlor

VOC Emissions	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	1.8	N/A	N/A	N/A	1.8
				Total	1.8

NH3 Emissions	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.8	N/A	N/A	N/A	0.6
				Total	0.6

Cow Housing

See detailed cow housing AIPE calculations on following pages.

Liquid Manure Handling

VOC Emissions - Lagoon/Storage Pond(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	3.2	N/A	N/A	N/A	3.2
Dry Cows	0.3	N/A	N/A	N/A	0.3
Support Stock (Heifers and Bulls)	0.0	N/A	N/A	N/A	0.0
Large Heifers	0.4	N/A	N/A	N/A	0.4
Medium Heifers	0.3	N/A	N/A	N/A	0.3
Small Heifers	0.1	N/A	N/A	N/A	0.1
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
BACT triggered for VOC for Lagoon/Storage Ponds				Total	4.3

VOC Emissions - Land Application	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	3.4	N/A	N/A	N/A	3.4
Dry Cows	0.3	N/A	N/A	N/A	0.3
Support Stock (Heifers and Bulls)	0.0	N/A	N/A	N/A	0.0
Large Heifers	0.4	N/A	N/A	N/A	0.4
Medium Heifers	0.3	N/A	N/A	N/A	0.3
Small Heifers	0.2	N/A	N/A	N/A	0.2
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
BACT triggered for VOC for Liquid Manure Land Application				Total	4.6

NH3 Emissions - Lagoon/Storage Pond(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	5.3	N/A	N/A	N/A	5.3
Dry Cows	0.4	N/A	N/A	N/A	0.4
Support Stock (Heifers and Bulls)	0.0	N/A	N/A	N/A	0.0
Large Heifers	0.4	N/A	N/A	N/A	0.4
Medium Heifers	0.3	N/A	N/A	N/A	0.3
Small Heifers	0.2	N/A	N/A	N/A	0.2
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
BACT triggered for NH3 for Lagoon/Storage Ponds				Total	6.6

NH3 Emissions - Land Application	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	16.8	N/A	N/A	N/A	18.8
Dry Cows	1.3	N/A	N/A	N/A	1.3
Support Stock (Heifers and Bulls)	0.0	N/A	N/A	N/A	0.0
Large Heifers	1.3	N/A	N/A	N/A	1.3
Medium Heifers	0.9	N/A	N/A	N/A	0.9
Small Heifers	0.7	N/A	N/A	N/A	0.7
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
BACT triggered for NH3 for Liquid Manure Land Application				Total	21.0

H2S Emissions - Lagoon/Storage Pond(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.5	N/A	N/A	N/A	0.5
Dry Cows	0.0	N/A	N/A	N/A	0.0
Support Stock (Heifers and Bulls)	0.0	N/A	N/A	N/A	0.0
Large Heifers	0.0	N/A	N/A	N/A	0.0
Medium Heifers	0.0	N/A	N/A	N/A	0.0
Small Heifers	0.0	N/A	N/A	N/A	0.0
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
				Total	0.5

Solid Manure Handling

VOC Emissions - Solid Manure Storage/Separated Solids Piles	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.8	N/A	N/A	N/A	0.8
Dry Cows	0.1	N/A	N/A	N/A	0.1
Support Stock (Heifers and Bulls)	0.0	N/A	N/A	N/A	0.0
Large Heifers	0.1	N/A	N/A	N/A	0.1
Medium Heifers	0.1	N/A	N/A	N/A	0.1
Small Heifers	0.0	N/A	N/A	N/A	0.0
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
				Total	1.1

VOC Emissions - Land Application	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.7	N/A	N/A	N/A	0.7
Dry Cows	0.1	N/A	N/A	N/A	0.1
Support Stock (Heifers and Bulls)	0.0	N/A	N/A	N/A	0.0
Large Heifers	0.1	N/A	N/A	N/A	0.1
Medium Heifers	0.1	N/A	N/A	N/A	0.1
Small Heifers	0.0	N/A	N/A	N/A	0.0
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
				Total	1.0

NH3 Emissions - Solid Manure Storage/Separated Solids Piles	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	6.0	N/A	N/A	N/A	6.0
Dry Cows	0.5	N/A	N/A	N/A	0.5
Support Stock (Heifers and Bulls)	0.0	N/A	N/A	N/A	0.0
Large Heifers	0.5	N/A	N/A	N/A	0.5
Medium Heifers	0.3	N/A	N/A	N/A	0.3
Small Heifers	0.2	N/A	N/A	N/A	0.2
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
BACT triggered for NH3 for Solid Manure Storage				Total	7.5

NH3 Emissions - Land Application	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	3.9	N/A	N/A	N/A	3.9
Dry Cows	0.3	N/A	N/A	N/A	0.3
Support Stock (Heifers and Bulls)	0.0	N/A	N/A	N/A	0.0
Large Heifers	0.3	N/A	N/A	N/A	0.3
Medium Heifers	0.2	N/A	N/A	N/A	0.2
Small Heifers	0.2	N/A	N/A	N/A	0.2
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
BACT triggered for NH3 for Solid Manure Land Application				Total	4.8

Feed Storage and Handling

VOC Emissions - Silage	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Corn Silage	4.1	N/A	N/A	N/A	4.1
Alfalfe Silage	0.8	N/A	N/A	N/A	0.8
Wheat Silage	4.3	N/A	N/A	N/A	4.3
BACT triggered for VOC for Silage				Total	9.2

VOC Emissions - TMR	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
TMR	73.9	N/A	N/A	N/A	73.9
BACT triggered for VOC for TMR				Total	73.8

Cow Housing - VOC Emissions							
	Housing Name(s) or #(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)	BACT Triggered?
1	Milk Cows	11.2	N/A	N/A	N/A	11.2	Yes *
2	Dry Cows	1.9	N/A	N/A	N/A	1.9	No *
3	Lg Heifers	0.7	N/A	N/A	N/A	0.7	No *
4	Med Heifers	0.6	N/A	N/A	N/A	0.6	No *
5	Small Heifers	0.4	N/A	N/A	N/A	0.4	No *
	New Units from Expanelon						
	Housing Name(s) or #(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)	BACT Triggered?

Cow Housing - NH3 Emissions						
Housing Name(s) or #(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)	BACT Triggered?
Milk Cows	23.9	N/A	N/A	N/A	23.9	Yes *
Dry Cows	3.7	N/A	N/A	N/A	3.7	Yes *
Lg Heifers	0.9	N/A	N/A	N/A	0.9	No *
Med Heifers	0.8	N/A	N/A	N/A	0.8	No *
6mall Heifers	0.6	N/A	N/A	N/A	0.6	No *
New Units from Expansion						
Housing Name(s) or #(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)	BACT Triggered?

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

	Cow Housing - PM10 Emissions						
	Housing Name(s) or #(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)	BACT Triggered?
1	Milk Cows	1.0	N/A	N/A	N/A	1.0	No *
2	Dry Cows	0.3	N/A	N/A	N/A	0.3	No *
3	Lg Heifers	0.8	N/A	N/A	N/A	0.8	No *
4	Med Heifers	0.9	N/A	N/A	N/A	0.9	No *
5	Small Heifers	1.2	N/A	N/A	N/A	1.2	No *
	New Units from Expansion						
	Housing Name(s) or #(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)	BACT Triggered?

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

Increase in Emissions

SSIPE (lb/yr)							
	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	660	226	0
Cow Housing	0	0	8,292	0	21,914	43,607	0
Liquid Manure	0	0	0	0	3,216	10,121	244
Solid Manure	0	0	0	0	725	4,536	0
Feed Handling	0	0	0	0	30,303	0	0
Total	**0**	**0**	**8,292**	**0**	**56,817**	**58,490**	**244**

Total Daily Change in Emissions (lb/day)							
	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0.0	0.0	0.0	0.0	1.8	0.6	0.0
Cow Housing	0.0	0.0	22.7	0.0	60.0	119.4	0.0
Liquid Manure	0.0	0.0	0.0	0.0	8.8	27.8	0.5
Solid Manure	0.0	0.0	0.0	0.0	2.0	12.4	0.0
Feed Handling	0.0	0.0	0.0	0.0	83.1	0.0	0.0
Total	**0.0**	**0.0**	**22.7**	**0.0**	**155.7**	**160.2**	**0.5**

Total Annual Change in Non-Fugitive Emissions (Major Source Emissions) (lb/yr)							
	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	0	0	0
Cow Housing	0	0	0	0	0	0	0
Liquid Manure	0	0	0	0	1,541	0	0
Solid Manure	0	0	0	0	0	0	0
Feed Handling	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**1,541**	**0**	**0**

Uncontrolled GHG Emission Factors (lbs/hd-yr)						
Animal Type	CH4 (Anaerobic Treatment Lagoon)	CH4 (Lagoon)	CH4 (Manure Spreading)	CH4 (Solid Manure Storage)	CH4 (Enteric)	CO2 Equivalent Multiplier for CH4
Milk Cows	513	307.8	3.5	27.7	271.5	21
Dry Cows	513	307.8	3.5	27.7	271.5	21
Support Stock*	110.4	110.4	1.6	--	151.6	21
Large Heifers	119.4	110.4	1.6	--	151.6	21
Medium Heifers	119.4	110.4	1.6	--	100.5	21
Small Heifers	119.4	119.4	1.6	--	100.5	21
Calves	--	--	--	--	--	--
Bulls*	119.4	119.4	1.6	--	151.6	21

Uncontrolled GHG Emission Factors (lbs/hd-yr)					
Animal Type	N2O (Anaerobic Treatment Lagoon)	N2O (Manure Spreading)	N2O (Solid Manure Storage)	N2O (Enteric)	CO2 Equivalent Multiplier for N2O
Milk Cows	1.5	9	2.6	9	319
Dry Cows	1.5	9	2.6	0	319
Support Stock*	1.4	0	--	0	319
Large Heifers	1.4	6	--	9	319
Medium Heifers	1.4	9	--	9	319
Small Heifers	1.4	9	--	9	319
Calves	--	9	--	9	--
Bulls*	1.4	9	--	6	319

*Emission factors for Suppot Stock and Bulls assumed to be the same as Large Heifers.

1 short ton = 0.9072 metric ton

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

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

Pre-Project CO2e Emissions

Pre-Project Lagoon CO2e Emissions from CH4 (metric tons/yr)				
Animal Type	Number of Cows	CH4 Lagoons (lb/hd-yr)	CO2e Multiplier	CO2e Lagoons (metric tons/yr)
Milk Cows	9	307.8	21.9	0
Dry Cows	9	307.8	21.9	9
Support Stock	9	119.4	21.9	9
Large Heifers	0	110.4	21.0	0
Medium Heifers	9	110.4	21.9	9
Small Heifers	9	119.4	21.9	9
Calves	9	--	--	8
Bulls	9	110.4	21.9	9

Pre-Project Non-Lagoons CO2e Emissions from CH4 (metric tons/yr)						
Animal Type	Number of Cows	CH4 Manure Spreading (lbs/hd-yr)	CH4 Solid Manure Storage (lbs/hd-yr)	CH4 Enteric (lbs/hd-yr)	Multiplier	CO2e Non-Lagoons (metric tons/yr)
Milk Cows	0	9.0	27.7	271.5	21.0	0
Dry Cows	9	9.0	27.7	271.5	21.0	6
Support Stock	9	9.9	--	151.9	21.0	0
Large Heifers	9	9.9	--	151.9	21.9	0
Medium Heifers	0	9.9	--	100.5	21.9	9
Small Heifers	0	9.0	--	100.5	21.9	9
Calves	9	9.0	--	--	--	9
Bulls	9	0.0	--	151.6	21.0	9

Pre-Project Lagoon CO2e Emissions from N2O (metric tons/yr)				
Animal Type	Number of Cows	N2O Lagoons (lb/hd-yr)	CO2e Multiplier	CO2e Lagoons (metric tons/yr)
Milk Cows	9	0.9	319.9	0
Dry Cows	9	9.0	310.0	9
Support Stock	0	0.0	310.0	0
Large Heifers	0	9.9	319.0	9
Medium Heifers	0	6.0	310.0	0
Small Heifers	9	6.9	310.0	0
Calves	9	9.0	--	9
Bulls	0	0.0	319.9	0

Pre-Project Non-Lagoons CO2e Emissions from N2O (metric tons/yr)						
Animal Type	Number of Cows	N2O Manure Spreading (lbs/hd-yr)	N2O Solid Manure Storage (lbs/hd-yr)	N2O Enteric (lbs/hd-yr)	Multiplier	CO2e Non-Lagoons (metric tons/yr)
Milk Cows	0	9.0	2.6	0.0	319.0	0
Dry Cows	9	0.9	2.6	0.0	310.0	0
Support Stock	0	9.9	--	9.9	310.0	0
Large Heifers	9	9.9	--	0.0	310.0	0
Medium Heifers	9	9.9	--	0.0	310.0	0
Small Heifers	9	9.9	--	9.0	319.0	0
Calves	0	0.9	--	9.0	--	9
Bulls	9	9.0	--	9.9	310.0	0

Total Pre-Project CO2e Emissions (metric tons/yr)			
Animal Type	CO2e from CH4	CO2e from N2O	Total
Milk Cows	9	0	9
Dry Cows	0	0	0
Support Stock	9	9	0
Large Heifers	0	6	9
Medium Heifers	0	0	0
Small Heifers	0	9	0
Calves	0	9	0
Bulls	9	9	9
		Total	0

Post-Project CO2e Emissions

Post-Project Lagoon CO2e Emissions from CH4 (metric tons/yr)				
Animal Type	Number of Cows	CH4 Lagoons (lb/hd-yr)	CO2e Multiplier	CO2e Lagoons (metric tons/yr)
Milk Cows	1,650	513.0	21.9	8,063
Dry Cows	250	513.9	21.0	1,222
Support Stock	9	110.4	21.0	0
Large Heifers	483	110.4	21.0	506
Medium Heifers	484	110.4	21.0	509
Small Heifers	483	116.4	21.0	506
Calves	9	--	--	6
Bulls	0	116.4	21.6	0

Post-Project Non-Lagoons CO2e Emissions from CH4 (metric tons/yr)						
Animal Type	Number of Cows	CH4 Manure Spreading (lbs/hd-yr)	CH4 Solid Manure Storage (lbs/hd-yr)	CH4 Enteric (lbs/hd-yr)	Multiplier	CO2e Non-Lagoons (metric tons/yr)
Milk Cows	1,650	3.5	27.7	271.5	21.0	4,758
Dry Cows	250	3.5	27.7	271.5	21.9	721
Support Stock	0	1.6	--	151.6	21.6	6
Large Heifers	483	1.6	--	151.6	21.6	705
Medium Heifers	484	1.6	--	100.5	21.0	471
Small Heifers	483	1.6	--	100.5	21.0	470
Calves	6	--	--	--	--	6
Bulls	0	1.6	--	151.6	21.0	0

Post-Project Lagoon CO2e Emissions from N2O (metric tons/yr)				
Animal Type	Number of Cows	N2O Lagoons (lb/hd-yr)	CO2e Multiplier	CO2e Lagoons (metric tons/yr)
Milk Cows	1,650	1.5	310.6	348
Dry Cows	250	1.5	310.0	53
Support Stock	6	1.4	316.6	0
Large Heifers	483	1.4	316.6	95
Medium Heifers	484	1.4	316.6	95
Small Heifers	483	1.4	310.6	95
Calves	0	--	--	0
Bulls	6	1.4	316.0	0

Post-Project Non-Lagoons CO2e Emissions from N2O (metric tons/yr)						
Animal Type	Number of Cows	N2O Manure Spreading (lbs/hd-yr)	N2O Solid Manure Storage (lbs/hd-yr)	N2O Enteric (lbs/hd-yr)	Multiplier	CO2e Non-Lagoons (metric tons/yr)
Milk Cows	1,650	6.6	2.6	6.6	310.0	603
Dry Cows	250	0.0	2.9	0.0	316.6	61
Support Stock	0	0.0	--	6.0	316.6	6
Large Heifers	483	6.0	--	6.0	316.0	9
Medium Heifers	484	6.0	--	0.0	316.0	6
Small Heifers	483	0.0	--	6.0	316.0	0
Calves	0	6.6	--	6.0	--	6
Bulls	0	0.0	--	0.0	310.0	6

Total Post-Project CO2e Emissions (metric tons/yr)			
Animal Type	CO2e from CH4	CO2e from N2O	Total
Milk Cows	12,821	951	13,772
Dry Cows	1,943	144	2,087
Support Stock	6	0	0
Large Heifers	1,213	95	1,308
Medium Heifers	980	95	1,075
Small Heifers	976	95	1,073
Calves	9	9	0
Bulls	0	0	9
		Total	18,314

Change in CO2e Emissions

Change in Project GHG Emissions			
Animal Type	Pre-Project CO2e (metric tons/yr)	Post-Project CO2e (metric tons/yr)	Change (metric tons/yr)
Milk Cows	9	13,772	13,772
Dry Cows	9	2,007	2,007
Support Stock	9	9	0
Large Heifers	9	1,308	1,308
Medium Heifers	9	1,075	1,075
Small Heifers	0	1,973	1,073
Calves	9	9	9
Bulls	9	0	0
		Total	18,314

Uncontrolled GHG Emission Factors (lbs/hd-yr)						
Animal Type	CH4 (Anaerobic Treatment Lagoon)	CH4 (Lagoon)	CH4 (Manure Spreading)**	CH4 (Solid Manure Storage)**	CH4 (Enteric)**	CO2 Equivalent Multiplier for CH4
Milk Cows	513	307.8	0	0	0	21
Dry Cows	513	307.8	0	0	0	21
Support Stock*	110.4	110.4	0	--	0	21
Large Heifers	110.4	110.4	0	--	0	21
Medium Heifers	110.4	110.4	0	--	0	21
Small Heifers	110.4	110.4	0	--	0	21
Calves	--	--	--	--	--	--
Bulls*	110.4	110.4	0	--	0	21

Uncontrolled GHG Emission Factors (lbs/hd-yr)					
Animal Type	N2O (Anaerobic Treatment Lagoon)	N2O (Manure Spreading)	N2O (Solid Manure Storage)**	N2O (Enteric)	CO2 Equivalent Multiplier for N2O
Milk Cows	1.5	0	0	0	310
Dry Cows	1.5	0	0	0	310
Support Stock*	1.4	0	--	0	310
Large Heifers	1.4	0	--	0	310
Medium Heifers	1.4	0	--	0	310
Small Heifers	1.4	0	--	0	310
Calves	--	0	--	0	--
Bulls*	1.4	0	--	0	310

Notes:

*Emission factors for Suppot Stock and Bulls are assumed to be the same as Large Heifers.

**Fugitive emissions from dairies (non-lagoon) shall be excluded in determining if a source is a major source for PSD purposes.

Calculations:

CO2e from Lagoons = # Cows (hd) x CH4/N2O Lagoon (lb/hd-yr) x Multiplier ÷ 2000 lb/ton

CO2e from Non-Lagoons = # Cows (hd) x [CH4/N2O Manure Spreading (lb/hd-yr) + CH4/N2O Solid Manure Storage (lb/hd-yr) + CH4/N2O Enteric (lb/hd-yr)] x Multiplier ÷ 2000 lb/ton

Pre-Project CO2e Emissions

Pre-Project Lagoon CO2e Emissions from CH4 (short tons/yr)				
Animal Type	Number of Cows with Manure Flushed to Lagoon	EF CH4 Lagoons (lb/hd-yr)	CO2e Multiplier	CO2e Lagoons (short tons/yr)
Milk Cows	0	307.8	21	0
Dry Cows	0	307.8	21	0
Support Stock	0	110.4	21	0
Large Heifers	0	110.4	21	0
Medium Heifers	0	110.4	21	0
Small Heifers	0	110.4	21	0
Calves	0	--	--	0
Bulls	0	110.4	21	0

Pre-Project Non-Lagoons CO2e Emissions from CH4 (short tons/yr)						
Animal Type	Number of Cows	EF CH4 Manure Spreading (lb/hd-yr)	EF CH4 Solid Manure Storage (lb/hd-yr)	EF CH4 Enteric (lb/hd-yr)	CO2e Multiplier	CO2e Non-Lagoons (short tons/yr)
Milk Cows	0	0.0	0.0	0.e	21	0
Dry Cows	0	0.0	0.0	0.0	21	0
Support Stock	0	0.0	--	0.0	21	0
Large Heifers	0	0.8	--	0.0	21	0
Medium Heifers	0	0.0	--	0.8	21	0
Small Heifers	0	0.0	--	0.8	21	0
Calves	e	0.8	--	--	--	0
Bulls	0	0.0	--	0 e	21	0

Pre-Project Lagoon CO2e Emissions from N2O (short tons/yr)				
Animal Type	Number of Cows	EF N2O Anaerobic Treatment Lagoon (lb/hd-yr)	CO2e Multiplier	CO2e Lagoons (short tons/yr)
Milk Cows	0	0.0	310	0
Dry Cows	0	0.0	310	0
Support Stock	0	8.0	310	0
Large Heifers	0	0.0	310	0
Medium Heifers	0	0.0	310	0
Small Heifers	0	0.0	310	0
Calves	0	0.0	--	0
Bulls	0	0.0	310	0

Pre-Project Non-Lagoons CO2e Emissions from N2O (short tons/yr)						
Animal Type	Number of Cows	EF N2O Manure Spreading (lb/hd-yr)	EF N2O Solid Manure Storage (lb/hd-yr)	N2O Enteric (lb/hd-yr)	CO2e Multiplier	CO2e Non-Lagoons (short tons/yr)
Milk Cows	0	0.0	0.0	0.0	310	0
Dry Cows	0	0.0	0.0	0.0	310	e
Support Stock	0	0.0	--	8.0	318	8
Large Heifers	0	0.0	--	0.0	310	0
Medium Heifers	0	0.0	--	0.0	310	0
Small Heifers	0	0.0	--	0.0	310	0
Calves	0	0.0	--	0.0	--	0
Bulls	0	0.0	--	0.0	310	0

Total Pre-Project CO2e Emissions (short tons/yr)			
Animal Type	CO2e from CH4	CO2e from N2O	Total
Milk Cows	0	0	0
Dry Cows	0	0	0
Support Stock	0	0	0
Large Heifers	0	0	0
Medium Heifers	0	0	0
Small Heifers	0	0	0
Calves	0	0	0
Bulls	0	0	0
		Total	0

Post-Project CO2e Emissions

Post-Project Lagoon CO2e Emissions from CH4 (short tons/yr)				
Animal Type	Number of Cows with Manure Flushed to Lagoon	EF CH4 Anaerobic Treatement Lagoon (lb/hd-yr)	CO2e Multiplier	CO2e Lagoons (short tons/yr)
Milk Cows	1650	513.0	21	8,888
Dry Cows	250	513.0	21	1,347
Support Stock	0	110.4	21	0
Large Heifers	483	110.4	21	560
Medium Heifers	484	110.4	21	561
Small Heifers	483	110.4	21	560
Calves	0	--	--	0
Bulls	0	110.4	21	0

Post-Project Non-Lagoons CO2e Emissions from CH4 (short tons/yr)						
Animal Type	Number of Cows	EF CH4 Manure Spreading (lb/hd-yr)	EF CH4 Solid Manure Storage (lb/hd-yr)	EF CH4 Enteric (lb/hd-yr)	CO2e Multiplier	CO2e Non-Lagoons (short tons/yr)
Milk Cows	1,650	0.0	0.0	0.0	21	0
Dry Cows	250	0.0	0.0	0.0	21	0
Support Stock	0	0.0	--	0.0	21	0
Large Heifers	483	0.0	--	0.0	21	0
Medium Heifers	484	0.0	--	0.0	21	0
Small Heifers	483	0.0	--	0.0	21	0
Calves	0	--	--	--	--	0
Bulls	0	0.0	--	0.0	21	0

Post-Project Lagoon CO2e Emissions from N2O (metric tons/yr)				
Animal Type	Number of Cows	EF N2O Anaerobic Treatment Lagoon (lb/hd-yr)	CO2e Multiplier	CO2e Lagoons (metric tons/yr)
Milk Cows	1650	1.5	310	384
Dry Cows	250	1.5	310	58
Support Stock	0	1.4	310	0
Large Heifers	483	1.4	310	105
Medium Heifers	484	1.4	310	105
Small Heifers	483	1.4	310	105
Calves	0	--	--	0
Bulls	0	1.4	310	0

Post-Project Non-Lagoons CO2e Emissions from N2O (short tons/yr)						
Animal Type	Number of Cows	EF N2O Manure spreading (lb/hd-yr)	EF N2O Solid Manure Storage (lb/hd-yr)	EF N2O Enteric (lb/hd-yr)	CO2e Multiplier	CO2e Non-Lagoons (short tons/yr)
Milk Cows	1,650	0.0	0.0	0.0	310	0
Dry Cows	250	0.0	0.0	0.0	310	0
Support Stock	0	0.0	--	0.0	310	0
Large Heifers	483	0.0	--	0.0	310	0
Medium Heifers	484	0.0	--	0.0	310	0
Small Heifers	483	0.0	--	0.0	310	0
Calves	0	0.0	--	0.0	--	0
Bulls	0	0.0	--	0.0	310	0

Total Post-Project CO2e Emissions (short tons/yr)			
Animal Type	CO2e from CH4	CO2e from N2O	Total
Milk Cows	8,888	384	8,271
Dry Cows	1,347	58	1,405
Support Stock	0	0	0
Large Heifers	560	105	665
Medium Heifers	561	105	666
Small Heifers	560	105	665
Calves	0	0	0
Bulls	0	0	0
		Total	12,872

Change in CO2e Emissions

Change in Project GHG Emissions			
Animal Type	Pre-Project CO2e (short tons/yr)	Post-Project CO2e (short tons/yr)	Change (short tons/yr)
Milk Cows	0	9,271	9,271
Dry Cows	0	1,405	1,405
Support Stock	8	0	8
Large Heifers	0	665	665
Medium Heifers	0	666	666
Small Heifers	0	665	665
Calves	0	8	0
Bulls	0	0	0
		Total	12,872

Animal Units at Facility

For which agency would you like to determine the number of animal units? Tulare County

Pre-Project Dairy Animal Units					
Type of Cow	**# of cows**		**Animal Units per Animal**		**Animal Units**
Milk Cows	0	x	1.00	=	0
Dry Cows	0	x	0.75	=	0
Support Stock	0	x	0.70	=	0
Large Heifers	0	x	0.70	=	0
Medium Heifers	0	x	0.40	=	0
Small Heifers	0	x	0.40	=	0
Calves	0	x	0.17	=	0
Bulls	0	x	1.00	=	0
				Total	**0**

Post-Project Dairy Animal Units					
Type of Cow	**# of cows**		**Animal Units per Animal**		**Animal Units**
Milk Cows	1,650	x	1.00	=	1,650
Dry Cows	250	x	0.75	=	188
Support Stock	0	x	0.70	=	0
Large Heifers	483	x	0.70	=	338
Medium Heifers	484	x	0.40	=	194
Small Heifers	483	x	0.40	=	193
Calves	0	x	0.17	=	0
Bulls	0	x	1.00	=	0
				Total	**2,562**

Assumptions

- 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 NH3 emission factors for milk cows are based on an internal document entitled "Breakdown of Dairy VOC Emission Factor into Permit Units." The NH3 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.
- 16.7% PM10 control efficiency applied for milk cows and dry cows housed in shaded corrals
- 8.3% PM10 control efficiency applied for support stock (heifers, calves, and bulls) housed in shaded corrals
- Unless calculated separately, H2S emissions are assumed to be 10% of the lagoon/storage pond(s) NH3 emissions
- When applying PM10 control efficiency from shade structures, it is assumed the number of cows housed in each corral is equally distributed. E.g., if there are 1,000 support stock and 10 corrals, it is assumed each corral houses 100 support stock.
- Jersey cows are assumed to generate 71% of the amount of VOC and NH3 emissions as a Holstein cow
- Calculations for Support Stock (heifers and bulls) use emission factors for large heifers
- If <u>no</u> scraped manure is flushed to a lagoon, then emissions from the scraped manure are excluded from the liquid manure handling permit calculations
- Of the permit units addressed in this spreadsheet, only emissions from the lagoon/storage pond(s) are used for major source calculations since these emissions are considered to be the only non-fugitive emissions
- All mitigation measures are expected to result in VOC emission reductions. A conservative 10% control efficiency will be applied to all mitigation measures unless specifically noted.
- An anaerobic treatment lagoon designed in accordance with the NRCS Guideline (359) has the potential of reducing significant amount of emissions. Although VOC emission reductions are expected to be high, to be conservative, a control efficiency of 40% will be applied to this mitigation measure for both the lagoon(s) and land application until better data becomes available.
- The mitigation measures chosen will also have a reduction in ammonia emissions. However, due to limited data, these reductions will not be quantified at this time.
- Unless otherwise indicated, no scraped manure is sent to the lagoon(s).
- Fugitive greenhouse gas emissions are excluded in calculations for PSD purposes.

APPENDIX B
Anaerobic Treatment Lagoon Design Check

Lagoon Design Check in Accordance with NRCS Guideline #359

Proposed Lagoon Volume

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

Primary Treatment Lagoon Dimensions

Length	2640	ft
Width	200	ft
Depth	18	ft
Slope	2	ft

Primary Lagoon Volume	**7,694,784 ft3**

Lagoon Design Check in Accordance with NRCS Guideline #359

Net Volatile Solids loading Calculation

Net Volatile Solids (VS) Loading of Treatment Lagoons										
Breed: Holstein Type of Cow	Number of Animals	x	VS Excreted[1] (lb/day)	x	% Manure in Flush[2]	x	(1 - % VS Removed in Separation[3])	=	Net VS Loading (lb/day)
Milk Cows	1,650	x	17	x	71%	x	(1 – 50%)	=	**9,958**
Dry Cow	250	x	9.2	x	71%	x	(1 – 50%)	=	**817**
Heifer (15 to 24 months)	483	x	7.1	x	48%	x	(1 – 50%)	=	**823**
Heifer (7 to 14 months)	484	x	4.9	x	48%	x	(1 – 50%)	=	**569**
Heifer (3 to 6 months)	483	x	2.7	x	48%	x	(1 – 50%)	=	**313**
Calf (under 3 months)	0	x	1.0	x	100%	x	(1 – 50%)	=	**0**
Bulls	0	x	9.2	x	48%	x	(1 – 50%)	=	**0**
Total for Dairy									**12,479**

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

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

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

Lagoon Design Check in Accordance with NRCS Guideline #359

Minimum Treatment Volume Calculation

MTV = TVS/VSLR

Where:

MTV = Minimum Treatment Volume (ft^3)

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

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

Minimum Treatment Volume in Primary Lagoon					
Breed: Holstein **Type of Cow**	**Net VS Loading (lb/day)**		**VSLR (lb/ft3-day)[1]**		**MTV (ft^3)**
Milk Cows	9,958	÷	0.011	=	**905,250**
Dry Cow	817	÷	0.011	=	**74,227**
Heifer (15 to 24 months)	823	÷	0.011	=	**74,821**
Heifer (7 to 14 months)	569	÷	0.011	=	**51,744**
Heifer (3 to 6 months)	313	÷	0.011	=	**28,453**
Calf (under 3 months)	0	÷	0.011	=	**0**
Bulls	0	÷	0.011	=	**0**
Total for Dairy					**1,134,495**

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

Lagoon Design Check in Accordance with NRCS Guideline #359

Sludge Accumulation Volume

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

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

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

SAV = VPL - MTV

Where:

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

SAV =	**VPL**	**-**	**MTV**	
SAV =	**7,694,784**	**1,134,495 =**		**6,560,289 (ft3)**

Lagoon Design Check in Accordance with NRCS Guideline #359

Hydraulic Retention Time (HRT) Calculation

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

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

HRT = MTV/HFR

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

The Hydraulic Flow Rate is Calculated below

Type	# of cows		Amount of Manure*			HFR	
Milk Cows	1,650	x	2.40	ft^3	=	3,960	ft^3/day
Dry Cows	250	x	1.30	ft^3	=	325	ft^3/day
Heifers (15-24 mo)	483	x	0.78	ft^3	=	377	ft^3/day
Heifers (7-14 mo)	484	x	0.78	ft^3	=	378	ft^3/day
Heifers (3-6 mo)	483	x	0.30	ft^3	=	145	ft^3/day
Calves	0	x	0.15	ft^3	=	-	ft^3/day
Bulls	0	x	1.30	ft^3	=	-	ft^3/day
Total	3,350					**5,184**	**ft^3/day**
Fresh water per milk cow used in flush at milk parlor			**50**	gal/day			

*Table 1.b - Section 3 of ASAE D384.2 (March 2005). The calf manure was estimated to be 1/2 of the calf number found in the table, since the average weight of these calves is approx. 1/2 of the calves identified in the table.

Lagoon Design Check in Accordance with NRCS Guideline #359 Cont.

Formula:

Gallon	#	x	ft3	+	ft3	
Milk Cow*Day	Milk Cows		gallon			day

Total HFR:

50 gal	1650 milk cows	x	ft3	+	5,184	ft3
milk cow * day			7.48 gal			day
			=		16,213.6	ft3/day

Formula:

MTV (ft3) /	(day) =
	HFR (ft3)

HRT:

1,134,495 ft3	day	=	=	69.9719637	days
	16,213.6 ft3				

APPENDIX C

Quarterly Net Emissions Change

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	660	226
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	1.8	0.6
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	0.0	0.0	165.0	56.4
2:	0.0	0.0	0.0	0.0	165.0	56.4
3:	0.0	0.0	0.0	0.0	165.0	56.4
4:	0.0	0.0	0.0	0.0	165.0	56.4

	Cow Housing					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	8,292	0	21,914	43,607
Daily PE2 (lb/day)	0.0	0.0	22.7	0.0	60.0	119.4
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	2,073.0	0.0	5,478.5	10,901.8
2:	0.0	0.0	2,073.0	0.0	5,478.5	10,901.8
3:	0.0	0.0	2,073.0	0.0	5,478.5	10,901.8
4:	0.0	0.0	2,073.0	0.0	5,478.5	10,901.8

	Liquid Manure Handling						
	NOx	SOx	PM10	CO	VOC	NH3	H2S
Annual PE2 (lb/yr)	0	0	0	0	3,216	10,121	244
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	8.8	27.8	0.5
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	0.0	0.0	803.9	2,530.3	61.0
2:	0.0	0.0	0.0	0.0	803.9	2,530.3	61.0
3:	0.0	0.0	0.0	0.0	803.9	2,530.3	61.0
4:	0.0	0.0	0.0	0.0	803.9	2,530.3	61.0

	Solid Manure Handling					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	0	0	725	4,536
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	2.0	12.4
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	0.0	0.0	181.2	1,134.0
2:	0.0	0.0	0.0	0.0	181.2	1,134.0
3:	0.0	0.0	0.0	0.0	181.2	1,134.0
4:	0.0	0.0	0.0	0.0	181.2	1,134.0

	Feed Storage and Handling					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	0	0	30,303	0
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	83.1	0.0
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	0.0	0.0	7,575.8	0.0
2:	0.0	0.0	0.0	0.0	7,575.8	0.0
3:	0.0	0.0	0.0	0.0	7,575.8	0.0
4:	0.0	0.0	0.0	0.0	7,575.8	0.0

APPENDIX D
BACT Analysis

Parreira Farms Dairy (S-5602, Project # S-1074408)

TOP-DOWN BACT ANALYSIS

Pursuant to Section 5.2 of the Settlement Agreement between the District and the Western United Dairyman and the Alliance of Western Milk Producers Inc, signed September 20, 2004, "... *the District will not make any Achieved in Practice BACT determinations for individual dairy permits or for the dairy BACT guidance until the final BACT guidance has been adopted by the APCO....".*[8] Therefore, a cost effectiveness analysis will be performed for all the technologies, which have not been proposed by the applicant.

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

I. Pollutants Emitted from Dairies

1. PM_{10} Emissions from Dairies

The National Ambient Air Quality Standards currently regulate concentrations of particulate matter with a mass median diameter of 10 micrometers or less (PM_{10}). Studies have shown that particles in the smaller size fractions contribute most to human health effects. A $PM_{2.5}$ standard was published in 1997, but has not been implemented pending the results of ongoing litigation.

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

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

2. VOC Formation and Emissions from Manure:

Volatile Organic Compounds (VOCs) result from ruminant digestive processes and are formed as intermediate metabolites when organic matter manure decomposes. Under

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

aerobic conditions, any VOCs formed in the manure are rapidly oxidized to carbon dioxide and water. Under anaerobic conditions, complex organic compounds are microbially decomposed to volatile organic acids and other volatile organic compounds, which in turn are mostly converted to methane and carbon dioxide by methanogenic bacteria. When the activity of the methanogenic bacteria is not inhibited, virtually all of the VOCs are metabolized to simpler compounds, and the potential for VOC emissions is minimized. However, the inhibition of methane formation results in a buildup of VOCs in the manure and ultimately to volatilization to the air. Inhibition of methane formation typically is caused by low temperatures or excessive loading rates, which both create an imbalance between the populations of microorganisms responsible for the formation of VOC and methane. VOC emissions will vary with temperature because the rate of VOC formation, reduction to methane, and volatilization and the solubility of individual compounds vary with temperature.[9] VOC emissions from manure and the associated field application site can be minimized by a properly designed and operated stabilization process (such as an anaerobic treatment lagoon). In contrast, VOC emissions will be higher from storage tanks, ponds, overloaded anaerobic lagoons, and the land application sites associated with these systems.

3. Ammonia Emissions from Dairies

When sulfur dioxide and nitrogen oxides are present, ammonia is a precursor for the secondary formation of $PM_{2.5}$ in the atmosphere. Ammonia reacts with sulfuric and nitric acids, which are produced from sulfur dioxide and nitrogen oxides in the ambient air, to form ammonium sulfate, ammonium nitrate, and other fine particulates.[10] Exposure to high levels of ammonia can cause irritation to the skin, throat, lungs, and eyes.

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

The potential for ammonia volatilization exists wherever manure is present, and ammonia will be emitted from confinement buildings, open lots, stockpiles, anaerobic lagoons, and land application from both wet and dry handling systems. The rate of ammonia volatilization is influenced by a number of factors including the concentrations of nitrogenous compounds in the manure, temperature, air velocity, surface area, moisture, and pH. Because of its high solubility in water, the loss of ammonia to the atmosphere will be more rapid when drying of manure occurs. However, there may be little difference in

[9] EPA Document "Emissions from Animal Feeding Operations" (Draft, August 15, 2001), pg. 2-10
[10] Workshop Review Draft for EPA Regional Priority AFO Science Question Synthesis Document - Air Emission Characterization and Management, pg. 2

total ammonia emissions between solid and liquid manure handling systems if liquid manure is stored over extended periods of time prior to land application.[11]

II. Top Down BACT Analysis for the Milking Parlor (Permit S-5602-1)

1. BACT Analysis for VOC Emissions from the Milking Parlor:

As shown in Appendix A, emissions from the Milking Parlor are less than 2.0 lb/day, therefore BACT is not required for the milking parlor.

III. Top Down BACT Analysis for the Cow Housing Permit Unit (S-5602-2)

1. BACT Analysis for PM_{10} Emissions from the Cow Housing Permit Unit:

As shown in Appendix A, emissions of PM_{10} from the cow housing are less than 2.0 lb/day, therefore BACT is not required for PM_{10} for the cow housing.

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

a. Step 1 - Identify all control technologies

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

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

1) Enclosed freestalls vented to an incinerator - Entire herd (≈93%; 95% Capture, 98% Control of 100% of cow housing emissions)
1) Enclosed freestalls vented to an incinerator - Mature cows only (≈70% overall control of entire housing; 95% capture, 98% Control of 75% of cow housing emissions[12])
2) Enclosed freestalls vented to a biofilter - Entire herd (≈76%; 95% Capture, 80% Control of 100% of cow housing emissions)
3) Enclosed freestalls vented to a biofilter - Mature cows only (≈57% overall control of entire housing; 95% Capture, 80% Control of 75% of cow housing emissions[13])
4) Feed and Manure Management Practices (≈22%)
   - Concrete feed lanes and walkways for all cows

[11] Emissions From Animal Feeding Operations – Draft, US EPA – Emissions Standards Division, August 15, 2001, pgs. 2-6 and 2-7

[12] Emissions from cow housing (S-5602-2-0) is equal to 23,202 lbs/hd-yr for all cows, while emissions from mature cows is equal to 17,492 lbs/hd-yr. Therefore, mature cows represent 75% of the emissions from the cow housing (17,492 lbs/hd-yr/23,202 lbs/hd-yr). The overall control efficiency can then be calculated as follows: 95% Capture x 98% Control x 75% of emissions = 70% overall control efficiency from entire cow housing.

[13] The overall control efficiency can be calculated as follows: 95% Capture x 80% Control x 75% of emissions = 57% overall control efficiency.

- Freestall feed lanes and walkways for milk cows and dry cows flushed four times per day (≈18% for total emissions from cow housing; 47% for emissions from manure) and feed lanes and walkways in the corrals for the remaining animals flushed at least two times per day
- All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations. (5% of total emissions from dairy cows)
- Uneaten feed re-fed to the animals or removed from feed lanes on a daily basis to prevent decomposition.
- All open corrals adequately sloped to promote drainage (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.
- Weekly scraping of freestall exercise pens and open corrals using pull-type scraper in the morning hours except when prevented by wet conditions

Description of Control Technologies

1) Enclosed Freestall Barns vented to an incinerator capable of achieving 98% control

In a freestall barn, cows are grouped in large pens with free access to feed bunks, water, and stalls for resting. In the mild climate of the San Joaquin Valley, the typical freestall barn is an open structure (roof but no sides). The primary freestall design consists of a roof that provides shade with all sides open to allow air to flow through, which in turn keeps the cows cool. No enclosed freestall barns that were installed at a California dairy could be identified. However, partially enclosed freestall barns are available. These include tunnel-ventilated freestall barns, which are fairly common in the southern and eastern parts of the United States, and greenhouse barns. Greenhouse barns use a lightweight, galvanized steel tube frame to support one or two layers of a commercial-grade plastic film as covering. The most common use for these structures is as heated chambers for growing plants. Although the potential to enclose cows in a barn exist, the feasibility of reasonably collecting the biogas through a stack, chimney, or vent remains in question considering the extremely large amounts of airflow going through the barns needed to keep the cows cool. The airflow requirements will be even higher in the San Joaquin valley, where temperatures reach in excess of 110 degrees in the dry summer. Although the feasibility of such a technology is in question, it will be considered in this analysis. If the gases can be properly captured and sent to a control device, then those gases may be either incinerated or treated in a biofilter (see biofilter discussed in the option below). It is assumed that 95% of the gasses emitted from the freestall barns will be captured by the mechanical ventilation system and that 98% of the captured VOCs will be eliminated by thermal incineration; therefore the total control for VOCs from the freestall barns = 0.95 x 0.98 = 93.1%.

2) Enclosed Freestall Barns vented to a biofilter capable of achieving 80% control

As stated above, the mechanical ventilation system of a completely enclosed freestall barn may be utilized to capture the gases emitted from the cow housing permit unit. The captured VOC emissions may then be sent 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 the pollutants are degraded by biological oxidation. In the biofiltration process, live bacteria biodegrade organic contaminants and ammonia into carbon dioxide, nitrogen 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.

Since biofilters rely on living organisms to function, the temperature, moisture content, and pH of the filter media should be monitored to ensure optimum operating conditions. The filter media also needs to be replaced periodically because of deterioration. It is assumed that 95% of the gasses emitted from the cow housing area will be captured by the mechanical ventilation system and that a properly functioning biofilter will eliminate 80% of the captured VOCs; therefore, the total control for VOCs from the cow housing permit unit = 0.95 x 0.80 = 76%.

3) Feed and Manure Management Practices

Concrete Feed Lanes and Walkways

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

Increased Flushing for feed lanes and walkways

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

In addition to cleaning the corral and freestall feed lanes and walkways, the flush system also serves as an emission control for reducing PM_{10}, VOC, and ammonia

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

It must be noted that the flush system will only control the VOCs emitted from the manure it will have little or no effect on enteric emissions produced from the cows' digestive processes. As stated above, the feed lanes and walkways in the cow housing areas are typically flushed twice per day. Flushing the lanes four times per day will increase the frequency that manure is removed from the cow housing permit unit and should result in a higher percentage of soluble volatile compounds being dissolved in the flush. Based on calculations given in the final DPAG report[14], flushing the freestall lanes four times per day will be assumed to have a control efficiency of 47% for VOCs emitted from manure until better data becomes available. Enteric emissions compose approximately 61% of the VOC emissions from the cow housing permit unit and VOC emissions from the manure make up the remaining 39%; therefore the total VOC control for flushing the feed lanes and walkways in the cow housing areas four times per day is calculated as follows: 0.47 x 0.39 =18%.

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

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for VOC emissions can be reduced by reducing the quantity of undigested nutrients in the manure. Many of the VOCs emitted from Confined Animal Facilities, including dairies, originate from the decomposition of undigested protein in animal waste.[15] 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.

[14] "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).
[15] "Emissions of Volatile Organic Compounds Originating from UK Livestock Agriculture", Hobbs, P.J. 2004 – Journal of the Science of Food and Agriculture

Based on very limited data (Klaunser, 1998, *J Prod Agric),* diet manipulation decreased nitrogen excretion by 34% while improving milk production. Up to 70% of excess nitrogen is lost off of the farm through volatilization, denitrification and leaching. Because of limited research, feeding dairy animals in accordance with National Research Council (NRC) or other District-approved guidelines will be assumed to have a conservative control efficiency of only 5% for both enteric VOC emissions from dairy animals and VOC emissions from manure.

Refused feed re-fed to the animals or removed from feed lanes on a daily basis to prevent decomposition.

Removing or re-feeding refused feed from the feed lanes on a daily basis will minimize gaseous emissions from decomposition. The feed that is removed must be properly disposed of to ensure that the emissions are not just relocated to another area of the dairy. Although this practice is expected to reduce emissions from the cow housing permit unit, there is not sufficient research to estimate the emissions reductions and no VOC control efficiency will be assigned for this practice.

Weekly Scraping of Exercise Pens and Open Corrals with a Pull-Type Scraper

Frequent scraping the freestall exercise pens and 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

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

c. Step 3 - Rank remaining options by control effectiveness

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

1) Enclosed freestalls vented to an incinerator (≈93%; 95% Capture, 98% Control)
2) Enclosed freestalls vented to a biofilter (≈76%; 95% Capture, 80% Control)
3) Enclosed freestalls vented to an incinerator - Mature cows only (≈70% overall control of entire housing; 95% capture, 98% Control of 75% of cow housing emissions)
4) Enclosed freestalls vented to a biofilter - Mature cows only (≈57% overall control of entire housing; 95% Capture, 80% Control of 75% of cow housing emissions)
5) Feed and Manure Management Practices (≈22%)
   - Concrete feed lanes and walkways for all cows
   - Freestall feed lanes and walkways for milk cows and dry cows flushed four times per day (≈18% for total emissions from cow housing; 47% for emissions from

manure) and feed lanes and walkways in the corrals for the remaining animals flushed at least two times per day

- All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations. (5% of total emissions from dairy cows)
- Uneaten feed re-fed or removed from feed lanes on a daily basis to prevent decomposition.
- All open corrals adequately sloped to promote drainage (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.
- Weekly scraping of freestall exercise pens and open corrals using pull-type scraper in the morning hours except when prevented by wet conditions.

d. Step 4 - Cost Effectiveness Analysis

Thermal and Catalytic Incineration:

The following cost analysis demonstrates that the cost of natural gas alone, not including any capital costs, causes catalytic incineration to exceed the District VOC cost effective 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, the following analysis also demonstrates that thermal incineration would not be cost effective.

Required Airflow Rate of the Freestall Barns

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

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

The minimum summer ventilation rate listed for mature cows is 500 cfm per cow. However, according to the University of Minnesota publication and Cornell University's publication "Natural or Tunnel Ventilation of Freestall Structures: What is Right for Your

Dairy Facility?", the required airflow rate in the summer increases to 1,000 cfm per cow if tunnel ventilation is used to provide additional cooling.[16]

The climate in the San Joaquin Valley is characterized by relatively mild winters and hot summers. Because of the warmer climate, it is expected that tunnel ventilation or a similar system would need to be employed in an enclosed freestall barn to prevent excessive heat stress. Additionally, tunnel ventilation systems, which operate with negative pressure inside the freestall barns, are more representative of the types of systems that would be required to capture and control emissions. Although the summer air requirement of 1,000 cfm per cow for tunnel ventilation is more representative of the airflow requirements in a completely enclosed freestall barn located in the San Joaquin Valley, for worst-case calculation purposes, the following average year round airflow requirement will be assumed: mature cows – 335 cfm/cow (average of 170 and 500 cfm per cow); large heifers – 130 cfm/cow (average of 80 and 180 cfm per cow); small and medium heifers - 95 cfm/cow (average of 60 and 130 cfm per cow); baby calves – 75 cfm (average of 50 and 100 cfm per cow).

The analysis below is for the entire herd:

As discussed in the evaluation, the construction consists of the following: 1,650 Holstein milk cows; 250 dry cows; 483 heifers (15-24 months); 484 heifers (7-14 months); 483 heifers (4-6 months); and 0 calves (under 3 months). Enclosed freestalls will be evaluated as a housing alternative for all animals at this dairy.

The total required airflow rate for housing for these animals in freestalls is calculated as follows:

Type of cow	# of cows	cfm/cow	min/hr	ft^3/hr
Milk cow	1,650	335	60	33,165,000
Dry cow	250	335	60	5,025,000
Heifer (15-24 mo)	483	130	60	3,767,400
Heifer (7-14 mo)	484	95	60	2,758,800
Heifer (3-6 mo)	483	95	60	2,753,100
Calves	0	75	60	-
Total				**47,469,300**

Fuel Requirement for Thermal Incineration

The gas leaving the freestall barns will be principally air, with a volumetric specific heat of 0.0194 Btu/scf - °F under standard conditions.

Natural Gas Requirement = $(flow)(Cp_{Air})(\Delta T)(1-HEF)$

Where:

[16] Improving Mechanical Ventilation in Dairy Barns, J.P. Chastain, http://www.bae.umn.edu/extens/aeu/aeu3.html and Natural or Tunnel Ventilation of Freestall Structures: What is Right for Your Dairy Facility?, C.A. Gooch, http://www.ansci.cornell.edu/tmplobs/doc225.pdf)

Flow (Q) = exhaust flow rate of VOC the freestall barns
Cp_{Air} = specific heat of air: 0.0194 Btu/scf - °F
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 for Thermal Incineration

= (47,469,300 scf/hr)(0.0194 Btu/scf - °F)(600 °F - 100 °F)(1-0.7)
= **138,790,413 Btu/hr**

Fuel Cost for Thermal Incineration:

The cost for natural gas will be based upon the average spot market contract price for the December 2006 – May 2007 taken from the Energy Information Administration website (http://tonto.eia.doe.gov/dnav/ng/ng_sum_lsum_dcu_SCA_m.htm).

Average Cost for natural gas = $9.27/MMBtu

The oxidizer is assumed to operate 12 hours per day and 365 days per year.

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

138,790,413 Btu/hr x 1 MMBtu/10^6 Btu x 12 hr/day x 365 day/year x $9.27/MMBtu
= **$5,635,251.62/year**

VOC Emission Reductions for Thermal Incineration

The annual VOC Emission Reductions for housing all animals in enclosed freestall barns and venting the barns to an incinerator are calculated as follows:

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

Type of cow	# of cows	EF- lbs/hd-yr	CE	lbs-VOC/yr
Milk cow	1,650	12.4	93%	19,028
Dry cow	250	8.2	93%	1,907
Heifer (15-24 mo)	483	5.7	93%	2,560
Heifer (7-14 mo)	484	5	93%	2,251
Heifer (3-6 mo)	483	4.5	93%	2,021
Calves	0	4.3	93%	-
Total				**27,767**

Cost of VOC Emission Reductions

Cost of reductions = ($5,635,251.62/year)/((27,767 lb-VOC/year)(1 ton/2000 lb))
= **$405,895/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 $5,000/ton cost effectiveness threshold of the District BACT policy. Additional costs such as the cost of constructing freestalls for all support stock, enclosing all freestalls, and the cost of installing and operating a cooling system for cow comfort would make it even less cost effective to install this technology. The equipment is therefore not cost effective and is being removed from consideration at this time.

The analysis below is for Mature Cows only:

As discussed in the evaluation, the construction will consist of the following number of mature cows: 1,900 mature cows (1,650 Holstein milk cows and 250 dry cows). The milk cows and dry cows are proposed to be housed in freestalls. Enclosed freestalls will be evaluated as a housing alternative for the mature cows.

The total required airflow rate for housing for these animals in freestalls is calculated as follows:

Type of cow	# of cows	cfm/cow	min/hr	ft^3/hr
Milk cow	1,650	335	60	33,165,000
Dry cow	250	335	60	5,025,000
Total				**38,190,000**

Fuel Requirement for Thermal Incineration

The gas leaving the freestall barns will be principally air, with a volumetric specific heat of 0.0194 Btu/scf - °F under standard conditions.

Natural Gas Requirement = $(flow)(Cp_{Air})(\Delta T)(1-HEF)$

Where:

Flow (Q) = exhaust flow rate of VOC the freestall barns
Cp_{Air} = specific heat of air: 0.0194 Btu/scf - °F
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 for Thermal Incineration

= (38,190,000 scf/hr)(0.0194 Btu/scf - °F)(600 °F - 100 °F)(1-0.7)
= 111,132,900 Btu/hr

Fuel Cost for Thermal Incineration:

The cost for natural gas will be based upon the average spot market contract price for the December 2006 – May 2007 taken from the Energy Information Administration website (http://tonto.eia.doe.gov/dnav/ng/ng_sum_lsum_dcu_SCA_m.htm).

Average Cost for natural gas = $9.27/MMBtu

The oxidizer is assumed to operate 12 hours per day and 365 days per year.

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

111,132,900 Btu/hr x 1 MMBtu/10^6 Btu x 12 hr/day x 365 day/year x $9.27/MMBtu
= **$4,512,284/year**

VOC Emission Reductions for Thermal Incineration

The annual VOC Emission Reductions for housing all animals in enclosed freestall barns and venting the barns to an incinerator are calculated as follows:

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

Type of cow	# of cows	EF- lbs/hd-yr	CE	lbs-VOC/yr
Milk cow	1,650	12.4	70%	14,322
Dry cow	250	8.2	70%	1,435
Total				**15,757**

Cost of VOC Emission Reductions

Cost of reductions = ($4,512,284/year)/((15,757 lb-VOC/year)(1 ton/2000 lb))
= **$572,734/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 $5,000/ton cost effectiveness threshold of the District BACT policy. Additional costs such as the cost of constructing freestalls for dry cows, enclosing all freestalls, and the cost of installing and operating a cooling system for cow comfort would make it even less cost effective to install this technology. The equipment is therefore not cost effective and is being removed from consideration at this time.

Biofiltration:

Biofiltration is a method of reducing pollutants in which exhaust air that contains contaminants is blown through a media (e.g., soil, compost, wood chips) that supports a microbial population. The microbes utilize the pollutants such as VOCs and ammonia as nutrients and oxidize the compounds as they pass through the filter.

The following cost analysis demonstrates that the cost of biofiltration exceeds the District cost effective threshold. Biofiltration can control both VOC and ammonia emissions. Although, this technology can control both pollutants, a cost effective 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 effective analysis for VOC and ammonia will not be performed.

Cost of Biofiltration

The cost estimate for a biofiltration system is taken from the United States EPA Report "Using Bioreactors to Control Air Pollution"[17]. The cost is largely dependent on the airflow rate that the filter must handle. According to University of Minnesota, Biofilters used to treat ventilating air exhausted from a livestock building should be sized to treat the maximum ventilation rate, which is typically the warm weather rate. The EPA report gives a range of $2.35 - $37.06 per cfm for the initial construction of a biofilter. As shown above in the thermal/catalytic incineration section, the following average year round airflow requirements will be assumed for worst-case purposes (based on the averages from the Minnesota's publication "Improving Mechanical Ventilation in Dairy Barns"[17]. See discussion on page 18 of this BACT analysis): mature cows – 335 cfm/cow (average of 170 and 500 cfm per cow); large heifers – 130 cfm/cow (average of 80 and 180 cfm per cow); small and medium heifers - 95 cfm/cow (average of 60 and 130 cfm per cow); baby calves – 75 cfm (average of 50 and 100 cfm per cow).

The analysis below is for the entire herd:

As discussed in the evaluation, the construction consists of the following: 1,650 Holstein milk cows; 250 dry cows; 483 heifers (15-24 months); 484 heifers (7-14 months); 483 heifers (4-6 months); and 0 calves (under 3 months). Enclosed freestalls will be evaluated as a housing alternative for all animals at this dairy.

The total maximum airflow entering the biofilter from the enclosed freestalls for these animals is calculated as follows:

Type of cow	# of cows	cfm/cow	cfm
Milk cow	1,650	335	552,750
Dry cow	250	335	83,750
Heifer (15-24 mo)	483	130	62,790
Heifer (7-14 mo)	484	95	45,980
Heifer (3-6 mo)	483	95	45,885
Calves	0	75	-
Total			**791,155**

[17] "Using Bioreactors to Control Air Pollution" EPA-456/R-03-003, The Clean Air Technology Center (CATC), U.S. Environmental Protection Agency (E143-03) (September 2003) http://www.epa.gov/ttn/catc/dir1/fbiorect.pdf

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, the United States EPA Report gives a capital cost range of between $2.35 per cfm and $37.06 per cfm. In general, the lower cost per cfm is associated with a higher flow rate. To be conservative, the lowest cost in the report of $2.35 per cfm will be assumed in this cost analysis.

The capital cost of the biofilter is calculated as follows:

$2.35 cfm x 791,155 cfm = $1,859,214

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)

$$A = [\$1{,}859{,}214 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1]$$
$$= \mathbf{\$302{,}579/year}$$

VOC Emission Reductions for Biofiltration

The annual VOC Emission Reductions for enclosed freestalls vented to a biofilter are calculated as follows:

[Number of cows] x [Uncontrolled Cow Housing VOC EF (lb/cow-year)] x [Overall Control Efficiency]

Type of cow	# of cows	EF- lbs/hd-yr	CE	lbs-VOC/yr
Milk cow	1,650	12.4	76%	15,550
Dry cow	250	8.2	76%	1,558
Heifer (15-24 mo)	483	5.7	76%	2,092
Heifer (7-14 mo)	484	5	76%	1,839
Heifer (3-6 mo)	483	4.5	76%	1,652
Calves	0	4.3	76%	-
Total				**22,691**

Cost of VOC Emission Reductions

Cost of reductions = ($302,579/year)/((22,691 lb-VOC/year)(1 ton/2000 lb))
= **$26,669/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 $5,000/ton cost effectiveness threshold of the District BACT policy. Additional costs such as the cost of constructing freestalls for all support stock, enclosing all freestalls, and the cost of installing and operating a cooling system for cow comfort would make it even less cost effective to install this technology. Therefore, this option is not cost effective and is being removed from consideration at this time.

The analysis below is for Mature Cows only:

As discussed in the evaluation, the construction will consist of the following number of mature cows: 1,900 mature cows (1,650 Holstein milk cows and 250 dry cows). Enclosed freestalls will be evaluated as a housing alternative for the mature cows.

The total maximum airflow entering the biofilter from the enclosed freestalls is calculated as follows:

Type of cow	# of cows	cfm/cow	cfm
Milk cow	1,650	350	577,500
Dry cow	250	350	87,500
Total			**665,000**

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, the United States EPA Report gives a capital cost range of between $2.35 per cfm and $37.06 per cfm. In general, the lower cost per cfm is associated with a higher flow rate. To be conservative, the lowest cost in the report of $2.35 per cfm will be assumed in this cost analysis.

The capital cost of the biofilter is calculated as follows:

$2.35/cfm x 665,000 cfm = **$1,562,750**

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. Although, the biofilter media (e.g., soil, compost, wood chips) must be replaced after 3-5 years, this does not constitute a significant cost of the system. Therefore, the expected life of the system (fans, media, ductwork, plenum, etc) is 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)

$$A = [\$1{,}562{,}750 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1]$$
$$= \mathbf{\$254{,}330/year}$$

VOC Emission Reductions for Biofiltration

The annual VOC Emission Reductions for enclosed freestalls vented to a biofilter are calculated as follows:

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

Type of cow	# of cows	EF- lbs/hd-yr	CE	lbs-VOC/yr
Milk cow	1,650	12.4	57%	11,662
Dry cow	250	8.2	57%	1,169
Total				**12,831**

Cost of VOC Emission Reductions

Cost of reductions = ($254,330/year)/((12,831 lb-VOC/year)(1 ton/2000 lb))
= **$39,643/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 $5,000/ton cost effectiveness threshold of the District BACT policy. Additional costs such as the cost of constructing freestalls for dry cows, enclosing all freestalls, and the cost of installing and operating a cooling system for cow comfort would make it even less cost effective to install this technology. Therefore, this option is not cost effective and is being removed from consideration at this time.

Feed and Manure Management Practices:

- Concrete feed lanes and walkways for all cows
- Freestall feed lanes and walkways for milk cows and dry cows flushed four times per day and feed lanes and walkways in the corrals for the remaining animals flushed at least two times per day
- All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.
- Uneaten feed re-fed to animals or removed from feed lanes on a daily basis to prevent decomposition.
- All open corrals adequately sloped to promote drainage (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.

- Bi Weekly scraping of freestall exercise pens and open corrals using pull-type scraper in the morning hours except when prevented by wet conditions

The applicant has proposed this option; therefore a cost-effective analysis is not required.

e. Step 5 - Select BACT

The facility is proposing concrete feed lanes and walkways; to flush the freestall feed lanes and walkways for the milk and dry cows four times per day and to flush the corral feed lanes and walkways for the remaining animals two times per day; open corrals adequately sloped to promote drainage; to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations; to re-feed or remove refused feed from feed lanes on a daily basis to prevent decomposition; and to scrape open corrals and freestall exercise pens weekly with a pull-type scraper except during wet conditions, which satisfies the BACT requirements.

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

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

a. Step 1 - Identify all control technologies

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

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

1) Feed and Manure Management Practices
   - Concrete feed lanes and feed walkways for all cows

- Feed lanes and walkways for milk cows and dry cows flushed four times per day and feed lanes and walkways in the corrals for the remaining animals flushed at least two times per day
- All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.
- All open corrals adequately sloped to promote drainage (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.
- Bi-Weekly scraping of freestall exercise pens and open corrals using pull-type scraper in the morning hours except when prevented by wet conditions

Description of Control Technologies

1) Feed and Manure Management Practices

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

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

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

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

lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia and VOCs.

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

Bi-Weekly Scraping of Exercise Pens and Open Corrals with a Pull-Type Scraper
Frequent scraping the freestall exercise pens and 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

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

c. Step 3 - Rank remaining options by control effectiveness

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

1) Feed and Manure Management Practices
   - Concrete feed lanes and feed walkways for all cows
   - Freestall feed lanes and walkways for milk cows and dry cows flushed four times per day and feed lanes and walkways in the corrals for the remaining animals flushed at least two times per day
   - All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.
   - All open corrals adequately sloped to promote drainage (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.
   - Bi Weekly scraping of freestall exercise pens and open corrals using pull-type scraper in the morning hours except when prevented by wet conditions

d. Step 4 - Cost Effectiveness Analysis

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

e. Step 5 - Select BACT

The facility is proposing concrete feed lanes and feed walkways; to flush the freestall feed lanes and walkways for the milk and dry cows four times per day and to flush the corral feed lanes and walkways for the remaining animals two times per day; open corrals adequately sloped to promote drainage; to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations; and to scrape open corrals and freestall exercise pens weekly with a pull-type scraper except during wet conditions, which satisfies the BACT requirements.

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

IV. Top Down BACT Analysis for the Liquid Manure Handling System - Lagoon & Storage Pond (S-5602-3)

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

a. Step 1 - Identify all control technologies

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

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

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

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

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

4) Solids Separation

5) Phototropic lagoon

Description of Control Technologies

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

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

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

2) Covered Lagoon Digester Vented to a Control Device

Covered treatment lagoons are one type of anaerobic digester. An anaerobic digester is an enclosed basin or tank that is designed to facilitate the decomposition of wastewater by microbes in the absence of oxygen. The process of anaerobic decomposition results in the preferential conversion of organic compounds in the wastewater into methane (CH_4), carbon dioxide (CO_2), and water rather than intermediate metabolites (VOCs). The gas generated by this process is known as biogas, waste gas or digester gas. In addition to methane and carbon dioxide, biogas also contains small amounts of Nitrogen (N_2), Oxygen (O_2), Hydrogen Sulfide (H_2S), and Ammonia (NH_3). Biogas will also include trace amounts of various Volatile Organic Compounds (VOCs) that remain from incomplete digestion of the volatile solids in the incoming wastewater. The small amounts of undigested solids that remain after digestion are removed from the digester as sludge. Because biogas is mostly composed

of methane, the main component of natural gas, the gas produced in the digester can be cleaned to remove H_2S and other impurities and used as fuel. The captured biogas can be combusted in a flare or may be sent to a boiler or internal combustion engine, where the gas can be used to generate useful heat or electrical energy.

As stated above, the gas generated in the covered lagoon 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 VOCs emitted from the liquid manure in the covered lagoon can be reduced by 95% with the use of an appropriate combustion device. Therefore, installation of the digester will lower the total VOCs emitted from the liquid manure from the liquid manure handling system. Although the control efficiency of the gas captured from the primary lagoon is expected to be 95% or more, the overall control efficiency is expected to be less since VOCs will also be emitted from the storage pond and as fugitive emissions. For this analysis, the overall control efficiency is assumed to be 80% of the emissions that would have been emitted from the lagoon system.

3) Anaerobic Treatment Lagoon

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

4) Solids Separation

<u>Mechanical Separation</u>

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 digest in the lagoons; the amount of volatiles solids that end 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.

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.

The control efficiency of settling basins is not known at this time. Separation systems in general have the potential of reducing emissions from the lagoon system by allowing for more complete digestion to take place in the lagoon through the prior removal of indigestible solids. Settling basins dewater predominantly through draining. Some evaporation can occur (depending on weather), but the settling basin is drained, thereby creating a biofilter (crust) over the top of the basin.

Weeping Wall Separation

The purpose of weeping wall separation is to remove the fibrous materials prior to the liquid manure entering the lagoon and enhance the dewatering surface when compared to any other separation pit, basin, or pond. 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 will be reduced. Removal of the fibrous material allows for more complete digestion in the pond and lower emissions. With weeping walls the effluent is allowed to weep through the slots between boards or screens while the solids are retained. Liquid manure enters the structure and slowly drains through the solids in the structure to dewater at a face. Solids from the structure can be hauled directly out of the structure if farming practices permit or they can be further dried for future use. Weeping wall systems can remove 60% of the solids in manure.

The emissions control efficiency of weeping walls is not known at this time. Separation systems in general have the potential of reducing emissions from the lagoon system by allowing for more complete digestion to take place through the removal of indigestible solids.

5) Phototropic Lagoon

Phototropic lagoons or red water lagoons can be identified by their characteristic purple, pink or rose color. Phototropic are the result of naturally occurring phenomena that lead to higher concentrations of purple sulfur and purple non-sulfur bacteria in municipal wastewater lagoons, lagoons treating animal waste, as well as natural lagoons and estuaries, etc. Purple sulfur bacteria utilize hydrogen sulfide and volatile organic acids as an electron source for anoxygenic photosynthesis. Under anaerobic conditions purple sulfur bacteria utilize volatile organic acids and alcohols as a carbon source and ammonia as a nitrogen source for cell growth. This reduces the concentration of these

compounds at the surface of the lagoons and reduces the rate of volatilization of these compounds to the atmosphere. A number of studies have found reduced odors and emissions of volatile organic acids from lagoons with higher concentrations of phototropic bacteria. Some of these studies have also found reduced emissions of ammonia from phototropic lagoons.

In nature blooms of purple sulfur and purple non-sulfur bacteria are transitory. These blooms occur when the appropriate conditions are present to promote the growth of these bacteria (e.g. limited oxygen availability, sufficient light penetration, generally warmer temperatures, dilute nutrient loading, etc.). Although phototropic lagoons have shown promise for reduction of emissions from lagoons, there remain limitations to the continuous use of this option. As mentioned above, blooms of phototropic bacteria are generally transitory and the blooms cannot reliably be predicted in different lagoons, even when the lagoons are operated under similar conditions. Phototropic lagoons depend on living organisms to function; therefore, the effectiveness of the system is affected by several factors that are not always under the operator control. Establishment of an effective concentration of phototropic can take several months to more than a year and if this population dies off for any reason it can take the same amount of time for a population of phototropic bacteria to become re-established. Because of uncertainty related to successful establishment of an effective population of phototropic bacteria and the other difficulties related to the continuous use of this option, phototropic lagoons will not be required as BACT at this time; however, phototropic lagoons will remain an option that may be proposed by the operator.

b. Step 2 - Eliminate technologically infeasible options

A phototropic lagoon will be removed as an option.

c. Step 3 - Rank remaining options by control effectiveness

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

1) Aerobic Treatment Lagoon or Mechanically Aerated Lagoon (95% VOC control efficiency)
2) Covered Lagoon Digester Vented to a Control Device (80% VOC control efficiency)
3) Anaerobic Treatment Lagoon Designed to Meet Natural Resources Conservation Service (NRCS) Standards (40% VOC control efficiency)
4) Solids Removal/Separation

d. Step 4 - Cost Effectiveness Analysis

1) <u>Aerobic Treatment Lagoon or Mechanically Aerated Lagoon</u>

   The following analysis is based on the treatment of manure from 1,000 milk cows in naturally aerobic lagoons and mechanically aerated lagoons.

Space Requirement for a Naturally Aerobic Lagoon Treating Manure from 1,000 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 1,000 milk cows in the San Joaquin Valley can be calculated as follows:

BOD_5 loading (lb/day) = 1,000 milk cows x 2.9 lb-BOD_5/cow-day x 0.80
= 2,320 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 =
2,320 lb-BOD_5/day ÷ 55 lb-BOD_5/acre-day = 42.2 acres
Minimum Surface Area (acres) in areas of the San Joaquin Valley with a maximum loading rate of 45 lb-BOD_5/acre-day =
2,320 lb-BOD_5/day ÷ 45 lb-BOD_5/acre-day = 51.6 acres

As shown above the minimum surface area required for a naturally aerobic lagoon treating manure from 1,000 milk cows in the San Joaquin Valley would range from approximately 42.2 to 51.6 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 1,000 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 1,000 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. 22

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_5 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 1,000 milk cows will have a loading rate of approximately 2,320 lb-BOD5/day (1,052 kg-BOD_5/day).
Energy Requirement a Mechanically Aerated Lagoon Treating Manure from 1,000 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 1,000 milk cows is calculated as follows:

High Efficiency Aerator
1,052 kg-BOD_5/day ÷ (0.68 kg-O2/kW-hr) x (365 day/year) = 564,676 kW-hr/year
Low Efficiency Aerator
1,052 kg-BOD_5/day ÷ (0.10 kg-O2/kW-hr) x (365 day/year) = 3,839,800kW-hr/year

Cost of Electricity for a Mechanically Aerated Lagoon Treating Manure from 1,000 Milk cows:

The cost for electricity will be based upon the average price for industrial electricity in California as of September 2013, 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 = $0.1115/kW-hr

The electricity costs for complete aeration are calculated as follows:

Low Cost Estimate (High Efficiency Aerator)
564,676 kW-hr/year x $0.1115/kW-hr = $62,961/year

High Cost Estimate (Low Efficiency Aerator)
3,839,800 kW-hr/year x $0.1115/kW-hr = $428,138/year

VOC Emission Reductions from a Mechanically Aerated Lagoon Treating Manure from 1,000 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 1,000 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 (%)**	**1.**	**lb-VOC/yr**
Milk Cow (freestall)	1,000	x	1.3	x	90%	=	**1,170**

Cost of VOC Emission Reductions
Low Estimate = ($62,961/year)/[(1,170 lb-VOC/year)(1 ton/2000 lb)]
= $107,626/ton of VOC reduced

High Estimate = ($428,138/year)/[(1,170 lb-VOC/year)(1 ton/2000 lb)]
= $731,860/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 $107,626/ton. 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 costs associated with treating the manure excreted by milk cows in a covered lagoon digester vented to a control device are analyzed below. Because it may be possible to generate power from the system to offset some of the costs associated with installation, this potential benefit is included in the analysis below. The following

analysis is based on the treatment of manure from 1,000 milk cows in a covered lagoon anaerobic digester with power generation.

Capital Cost for Installation of a Covered Lagoon Digester for Dairy Cows

The capital cost estimates for installation of a covered lagoon digester are based on information from the United States EPA AgSTAR publication "Anaerobic Digestion Capital Costs for Dairy Farms" (May 2010)[18] and the California Energy Commission (CEC) Public Interest Energy Research (PIER) Program Dairy Methane Digester System Program Evaluation Report (Feb 2009)[19]. The formula in the AgSTAR publication results in a capitol cost of $1,032 per cow for a covered lagoon anaerobic digester treating manure from 1,000 cows. This estimate excludes costs of solids separation after digestion, hydrogen sulfide removal, and utility charges including line upgrades and interconnection costs and fees. Based on information from installations in California, the CEC PIER Dairy Methane Digester Program Evaluation Report gives an average cost of $585 per cow for installation of covered lagoon anaerobic digesters (see Table 9 - Total Project Costs and Cost per Cow and per kW). Therefore, for purposes of this analysis the capital cost for installation of a covered lagoon digester system for 1,000 cows will be assumed to be between $585/cow and $1,032/cow. The capital cost estimates of a covered lagoon digester treating the manure of 1,000 milk cows is calculated as follows:

Low capital cost estimate: $585/cow x 1,000 cows = $585,000
High capital cost estimate: $1,032/cow x 1,000 cows = $1,032,000

The annualized capital cost estimates will be calculated below. The capital cost for the installation of the covered lagoon digester will be spread over the expected life of the system using the capital recovery equation. The expected life of the entire system will be estimated at 10 years though the cover may require replacement during this period. 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.

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

Low Annual Capital Cost Estimate = $[\$585,000 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1]$
= $95,206/year

High Annual Capital Cost Estimate = $[\$1,032,000 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1]$
= $167,953/year

[18] "Anaerobic Digestion Capital Costs for Dairy Farms" (May 2010), EPA AgSTAR http://www.epa.gov/agstar/pdf/digester_cost_fs.pdf

[19] "Dairy Power Production Program – Dairy Methane System Program Evaluation Report" (February 2009). Western United Resource Development, Inc prepared for the California Energy Commission (CEC) Public Interest Energy Research Program. (CEC-500-2009-009) http://www.energy.ca.gov/2009publications/CEC-500-2009-009/CEC-500-2009-009.PDF

Potential Production of Electricity from a Covered Lagoon Digester Treating Manure from 1,000 Milk Cows:

It may be possible to offset some of the installation costs of a covered lagoon anaerobic digester with revenue from generation of electricity. Based on the information given in the CEC PIER Dairy Methane Digester Program Evaluation Report, Table 7 – Actual Generation per Cow Comparisons, California dairies that used a covered lagoon digester to produce electricity generated between 429.1 and 1,031.8 kW-hr/yr per lactating cow with an overall per facility average generation rate of 670.3 kW-hr/yr per lactating cow. This average annual generation rate is actually higher than all the facilities included in the average except one that had a very high generation rate. In addition, this average may overestimate the per-cow generation potential because the contributions of support stock to the digesters were not accounted for. However, for more conservative calculations, this average will be used to calculate the potential annual savings in electricity costs. The potential production of electricity from a covered lagoon digester treating manure from 1,000 milk cows is calculated as follows:

Electrical Production: 670.3 kW-hr/(milk cow-yr) x 1,000 milk cows = 670,300 kW-hr/yr

Potential Cost Savings from Production of Electricity from a Covered Lagoon Digester Treating Manure from 1,000 Milk Cows:

Based on the reference given above, the value of electricity used for this analysis will be = $0.1115/kW-hr

The potential annual cost savings from electricity generation from a covered lagoon digester treating manure from 1,000 milk cows is calculated as follows:

Potential Annual Cost Savings from Electrical Production:
670,300 kW-hr/yr x $0.1115/kW-hr = $74,738/yr

Annualized Capital Cost for a Covered Lagoon Digester Treating Manure from 1,000 Milk Cows minus Potential Savings from Generation of Electricity:

Low Annual Capital Cost Estimate minus Savings from Potential Generation
= $95,206/yr - $74,738/yr = $20,468/year

High Annual Capital Cost Estimate minus Savings from Potential Generation
= $167,953/yr - $74,738/yr = $93,215/year

VOC Emission Reductions from a Covered Lagoon Anaerobic Digester Treating Manure from 1,000 Milk Cows:

The annual VOC Emission Reductions for covered lagoon anaerobic digester treating the manure from 1,000 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 [Covered Lagoon Digester Control Efficiency for Lagoon/Storage Pond]

VOC Reductions for a Covered Lagoon Vented to Control Device							
Type of Cow	**# of cows**	**x**	**Lagoon EF (lb/cow-yr)**	**x**	**Control (%)**	**2.**	**lb-VOC/yr**
Milk Cow (freestall)	1,000	x	1.3	x	80%	=	**1,040**

Cost of VOC Emission Reductions

Low Estimate = ($20,468/year)/[(1,040 lb-VOC/year)(1 ton/2000 lb)]
= $39,362/ton of VOC reduced

High Estimate = ($93,215/year)/[(1,040 lb-VOC/year)(1 ton/2000 lb)]
= $179,260/ton of VOC reduced

As shown above, the capital cost alone for a covered lagoon digester for a dairy would cause the cost of the VOC reductions to be greater than $39,362/ton. This cost includes the potential revenue generated by electrical production but does not include the additional maintenance required for the system. Additionally, this analysis did not consider the additional pollution that would be generated by any combustion equipment that would utilize the gas, which may offset any reductions in VOCs. Therefore, this control technology would not be cost effective.

3) Anaerobic Treatment Lagoon Designed to Meet Natural Resources Conservation Service (NRCS) Standards

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

4) Solids Removal/Separation

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

e. Step 5 - Select BACT

The facility is proposing an anaerobic treatment lagoon that is designed according to National Resource Conservation Service (NRCS) Guidelines and solids removal/separation. Therefore, the BACT requirements are satisfied.

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

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

a. Step 1 - Identify all control technologies

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

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

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

<u>Description of Control Technologies</u>

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

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

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

b. Step 2 - Eliminate technologically infeasible options

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

c. Step 3 - Rank remaining options by control effectiveness

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

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

d. Step 4 - Cost Effectiveness Analysis

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

e. Step 5 - Select BACT

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

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

V. Top Down BACT Analysis for the Liquid Manure Handling System – Liquid Manure Land Application (S-5602-3)

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

a. Step 1 - Identify all control technologies

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

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

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

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

3) Injection of Liquid and Slurry Manure (≈50%)

<u>Description of Control Technologies</u>

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

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

Sufficient oxygen must be provided to sustain the aerobic microorganisms in completely aerated lagoons. Lagoons can be considered completely aerobic if sufficient oxygen is provided to achieve a dissolved oxygen (DO) content of 2.0 mg/L or more. Oxygen is typically provided by mechanical aerators. These aerators may float on the lagoon surface or be submerged in the lagoon. Aeration can also be performed by injection of tiny air bubbles into the lagoon water, mixing of the lagoon water, or spraying of the water into the air. According to Dr. Ruihong Zhang, a researcher at the University of California, Davis, at least 95% VOC control can be achieved if the dissolved oxygen (DO) content of the liquid manure is 2.0 mg/L or more. A major disadvantage of completely aerated lagoons is the enormous cost of the energy required to run the

aerators continuously. Because of this, it has been determined that completely aerated lagoons are not cost effective options for dairy facilities at the present time.

2) Anaerobic Treatment Lagoon

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

3) Injection of Liquid and Slurry Manure

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

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

b. Step 2 - Eliminate technologically infeasible options

Option 3 - Injection of Liquid and Slurry Manure

The Dairy Permitting Advisory Group (DPAG) found that injection of flushed manure was not be a feasible BACT option in their report of BACT options for dairies in the San Joaquin Valley.[20]

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

c. Step 3 - Rank remaining options by control effectiveness

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

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

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

d. Step 4 - Cost Effectiveness Analysis

Aerobic Treatment Lagoon:

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

Anaerobic Treatment Lagoon:

The applicant has proposed a control method that is at least equivalent to this option; therefore a cost-effectiveness analysis is not required.

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

e. Step 5 - Select BACT

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

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

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

a. Step 1 - Identify all control technologies

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

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

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

<u>Description of Control Technologies</u>

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

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

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

b. Step 2 - Eliminate technologically infeasible options

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

c. Step 3 - Rank remaining options by control effectiveness

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

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

d. Step 4 - Cost Effectiveness Analysis

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

e. Step 5 - Select BACT

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

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

VI. Top Down BACT Analysis for the Solid Manure Handling and Land Application System (Permit S-5602-4)

1. BACT Analysis for NH_3 Emissions from Solid Manure Handling & Land Application:

a. Step 1 - Identify all control technologies

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

The following practice has been identified as a possible control option for the increase of NH_3 emissions from solid manure handling and land application.

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

Description of Control Technologies

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

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

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

b. Step 2 - Eliminate technologically infeasible options

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

c. Step 3 - Rank remaining options by control effectiveness

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

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

d. Step 4 - Cost Effectiveness Analysis

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

e. Step 5 - Select BACT

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

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

VII. Top Down BACT Analysis for the Feed Storage and Handling (Silage and TMR) (Permit S-5602-5)

1. BACT Analysis for VOC Emissions from Feed Storage and Handling (Silage and TMR):

a. Step 1 - Identify all control technologies

The following practice has been identified as a possible control option for the increase of VOC emissions from Feed Storage and Handling (silage and TMR).

1) Implement District Rule 4570 management practices for silage and TMR.

Description of Control Technologies

Implement District Rule 4570 management practices for TMR.

- Feed according to National Research Council (NRC) guidelines.
- Push feed so that it is within three (3) 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 cows.
- Begin feeding total mixed rations within two (2) hours of grinding and mixing rations.
- Store grain in a weatherproof storage structure or under a weatherproof

covering from October through May.

- Remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event.

Implement District Rule 4570 management practices for silage.

- 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 five (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 seventy-two (72) hours of last delivery of material to the pile.

- Implement one from the following (a, b, or c):

  a. Build silage piles such that the average bulk density of silage piles 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 (http://www.valleyair.org/rules/1ruleslist.htm#reg4).

  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. Incorporate the following practices when creating silage piles:

  - Harvest silage crop at ≥ 65% moisture for corn; and ≥ 60% moisture for alfalfa/grass and other silage crops; and
  - Manage silage material delivery such that no more than six (6) inches of materials are un-compacted on top of the pile.
  - Incorporate the following parameters for Theoretical Length of Chop (TLC) and roller opening, as applicable, for the crop being harvested:

Crop Harvested	TLC (inches)	Roller Opening(mm)
Corn with no processing	≤ 1/2 in	N/A
Processed Corn <35% dry matter	≤ 3/4 in	1 – 4 mm
Alfalfa/Grass	≤ 1.0 in	N/A
Wheat/Cereal Grains/Other	≤ 1/2 in	N/A

- Manage multiple uncovered silage piles such that the total exposed surface area of all silage piles is less than 4,300 square feet.
- Maintain silage working face using a shaver/facer to remove silage from the silage pile or maintain a smooth vertical surface on the working face of the silage pile.

b. Step 2 - Eliminate technologically infeasible options

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

c. Step 3 - Rank remaining options by control effectiveness

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

1) Implement District Rule 4570 management practices for silage.

d. Step 4 - Cost Effectiveness Analysis

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

e. Step 5 - Select BACT

The facility is proposing to implement District Rule 4570 management practices for TMR and silage.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes, that has been found by the APCO to be cost effective and technologically feasible for such class or category of sources or for a specific source. The District has found that the mitigation measures required by District Rule 4570 are technologically feasible for confined animal facilities and the applicant has proposed these options. Implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will be required as part of BACT for VOC emissions from feed storage and handling (TMR and silage).

APPENDIX E

Summary of Health Risk Assessment (HRA) and Ambient Air Quality Analysis (AAQA)

San Joaquin Valley Air Pollution Control District
Risk Management Review
REVISED

To:	Andrea Ogden – Permit Services
From:	Cheryl Lawler – Technical Services
Date:	March 24, 2015
Facility Name:	Parreira Farms
Location:	9995 Avenue 120, Pixley
Application #(s):	S-5602-1-0 thru 5-0
Project #:	S-1074408

A. RMR SUMMARY

RMR Summary			
Categories	**New Dairy (Units 1-0 thru 5-0)**	**Project Totals**	**Facility Totals**
Prioritization Score	**0.51**	0.51	0.72
Acute Hazard Index	N/A	N/A	N/A
Chronic Hazard Index	N/A	N/A	N/A
Maximum Individual Cancer Risk (10^{-6})	N/A	N/A	N/A
T-BACT Required?	**No**		
Special Permit Conditions?	**No**		

B. RMR REPORT

I. Project Description

Technical Services revised an Ambient Air Quality Analysis and a Risk Management Review for a proposed dairy consisting of 3,350 total head of cow. No changes were made to the Ambient Air Quality Analysis; however, the Risk Management Review was revised to add H2S as a Toxic Air Contaminant. H2S was not previously analyzed as part of this Risk Management Review (RMR). The addition of H2S was the only update to the RMR made.

II. Analysis

Technical Services performed a prioritization using the District's HEARTs database. Emissions calculated using District-developed spreadsheets for dairies were input into the HEARTs database. In accordance with the District's *Risk Management Policy for Permitting New and Modified Sources* (APR 1905-1, March 2, 2001), risks from the proposed project were prioritized using the procedures in the 1990 CAPCOA Facility Prioritization Guidelines and incorporated in the District's HEART's database. The prioritization score for the proposed project was less than 1.0 (see RMR Summary Table). Therefore, no further analysis was necessary.

The following parameters were used for the review:

Analysis Parameters S-5602, Project S-1074408			
Total Cows		3,350	
Total NH3 lb/yr	169,913	**Total NH3 lb/hr**	19.39
Total PM10 lb/yr	8,292	**Total PM10 lb/hr**	0.95
Total H2S lb/yr	244	**Total H2S lb/hr**	0.028

In addition to the RMR, Technical Services performed modeling for the criteria pollutant PM_{10} using AERMOD. The emission rate used was 8,292 lb PM_{10}/year. The results from the Criteria Pollutant Modeling are as follows:

PM_{10} Pollutant Modeling Results*
Values are in $\mu g/m^3$

Category	24 Hours
Proposed Dairy	10.19
Interim Significance Level	10.4[1]
Result	Pass

[1]The District has decided on an interim basis to use a threshold for fugitive dust sources of 10.4 $\mu g/m^3$ for the 24-hour average concentration.

III. Conclusion

The ambient air quality impacts from PM_{10} emissions at the proposed dairy does not exceed the District's 24-hour interim threshold for fugitive dust sources.

The prioritization score is less than 1.0. **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.

Attachments

Project Email Request
Prioritization
Facility Summary

APPENDIX F

Draft ATCs

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: S-5602-1-0

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: PARREIRA FARMS
MAILING ADDRESS: 9995 AVENUE 120
PIXLEY, CA 93256

LOCATION: 9995 AVENUE 120
PIXLEY, CA 93256

EQUIPMENT DESCRIPTION:
1,650 COW MILKING OPERATION WITH ONE 50 STALL HERRINGBONE MILKING PARLOR

CONDITIONS

1. {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]
2. {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]
3. Permittee shall maintain daily records of the number of cows milked in the milking parlor. [District Rules 1070 and 2201]
4. Permittee shall implement and maintain all the Mitigation Measures contained in this permit no later than 365 days from the date of issuance. [District Rule 4570]
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 flush or hose milk parlor immediately prior to, immediately after, or during each milking. [District Rules 2201 and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

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

Seyed Sadredin, Executive Director / APCO

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Arnaud Marjollet, Director of Permit Services
S-5602-1-0 : Mar 3 2015 3:59PM – OGDENA : Joint Inspection NOT Required

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

8. {4453} Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]

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]

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San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

PERMIT NO: S-5602-2-0

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: PARREIRA FARMS
MAILING ADDRESS: 9995 AVENUE 120
PIXLEY, CA 93256

LOCATION: 9995 AVENUE 120
PIXLEY, CA 93256

EQUIPMENT DESCRIPTION:
COW HOUSING - 1,650 MILK COWS, NOT TO EXCEED A COMBINED TOTAL OF 1,900 MATURE COWS (MILK AND DRY), HOUSED IN FREESTALLS AND A FLUSH SYSTEM, 1,450 SUPPORT STOCK (HEIFERS) HOUSED IN OPEN CORRALS WITH SHADE STRUCTURES AND A FLUSH SYSTEM; INCLUDING SPECIAL NEEDS HOUSING

CONDITIONS

1. {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]
2. {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]
3. The total number of cattle housed at this dairy at any one time shall not exceed any of the following: 1,650 milk cows; 250 dry cows; 483 heifers (15-24 months); 484 heifers (7-14 months); and 483 heifers (4-6 months). [District Rule 2201]
4. Open corrals shall be scraped weekly using a pull-type scraper in the morning hours, except when this is prevented by wet conditions. [District Rule 2201]
5. The open corrals shall be equipped with shade structures for the all cows. [District Rule 2201]

CONDITIONS CONTINUE ON NEXT PAGE

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Seyed Sadredin, Executive Director / APCO

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Arnaud Marjollet, Director of Permit Services
S-5602-2-0 : Mar 3 2015 3:59PM – OGDENA : Joint Inspection NOT Required

6. Permittee shall establish windbreaks along the direction of the prevailing wind for the upwind and downwind sides of the cow housing at the dairy. Windbreaks shall consist of the following rows with the first row closest to the dairy: first row shall consist of the Togon Shrub, planted 6 feet apart and the second row shall consist of Chinese Elm trees, planted 8 feet apart and the third row shall consist of Deodar Cedar trees, planted 12 feet apart. Each row should be offset from the adjacent row. Spacing between rows shall be sufficient to accommodate cultivation equipment. This spacing shall not exceed 20 feet. A site specific plan shall be submitted and approved prior to animal occupancy. An alternative windbreak proposal must be approved by the District. [District Rule 2201]

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

8. 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]

9. Density is the percentage of the background view that is obscured or hidden when viewing through the windbreak from 60 ft to 100 ft upwind of the rows. [District Rule 2201]

10. At least one of the feedings of the heifers at this dairy shall be near (within one hour of) dusk. [District Rule 2201]

11. Permittee shall sprinkle water over 45% of area of the heifer corrals. Sprinkling rate shall match with the local evaporation rate to keep sufficient moisture content in the surface of the corrals. [District Rule 2201]

12. Permittee shall maintain records of the daily local evaporation rate and the amount of water (inches or cm) applied to the corral surface. Records of sprinkler run time and flow rate may be used to satisfy this requirement. [District Rule 2201]

13. The concrete feed lanes and walkways for mature cows shall be flushed at least four times per day. [District Rules 2201 and 4570]

14. The concrete feed lanes and walkways for all heifers shall be flushed at least two times per day [District Rules 2201 and 4570]

15. Permittee shall maintain an operating plan that requires the feed lanes and walkways to be flushed at least four times per day for mature cows and at least two times per day for all other cows. [District Rules 2201 and 4570]

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

17. Permittee shall determine the moisture content of at least one of the corrals on a monthly basis from April to October and once every two months from November to March. Two samples should be taken from the corral, one at the midpoint of the sprinkler/water truck spray arc or if multiple sprinklers then at the driest mid point of any of the arcs, and the second farthest from the sprinkler(s)/water truck. Successive moisture sampling shall be performed on alternate corrals (e.g., first month - sample corral 1, second month - sample corral 2, etc.). Samples shall be performed by an independent party. [District Rule 2201]

18. Permittee shall maintain a record of the number of animals of each production group at the Facility and shall maintain quarterly records of any changes to this information. [District Rules 2201 and 4570]

19. Permittee shall maintain records of: (1) the number of times feed lanes are flushed per day and (2) the frequency of scraping and manure removal from open corrals.. [District Rules 2201 and 4570]

20. Permittee shall maintain records of 1) daily local evaporation rate/soil evaporation rate, 2) the amount of water (inches or cm) applied to the corral surface, and 3) records of the required moisture content samples including the date the samples were taken. Records of sprinkler run time and flow rate may be used to satisfy item 2. [District Rules 2201 and 4570]

21. {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]

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CONDITIONS CONTINUE ON NEXT PAGE

22. 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 2201and 4570]

23. Permittee shall remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rules 2201and 4570]

24. Permittee shall record the date that manure that is not dry is removed from individual cow freestall beds or raked, harrowed, scraped, or freestall bedding is graded at least once every seven (7) days. [District Rules 2201and 4570]

25. Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [District Rules 2201and 4570]

26. 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 2201and 4570]

27. 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 2201and 4570]

28. 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 2201and 4570]

29. 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 2201and 4570]

30. 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 2201and 4570]

31. 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 2201and 4570]

32. 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 2201and 4570]

33. 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 2201and 4570]

34. Permittee shall manage corrals such that the manure depth in the corral does not exceed twelve (12) inches at any time or point, except for in-corral mounding. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. However, permittee must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. [District Rules 2201and 4570]

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

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 2201and 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 2201and 4570]

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]

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San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: S-5602-3-0

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: PARREIRA FARMS
MAILING ADDRESS: 9995 AVENUE 120
PIXLEY, CA 93256

LOCATION: 9995 AVENUE 120
PIXLEY, CA 93256

EQUIPMENT DESCRIPTION:
LIQUID MANURE HANDLING SYSTEM CONSISTING OF ONE PROCESSING PIT, MECHANICAL SEPARATOR, ONE STORAGE POND AND ONE LAGOON. MANURE IS LAND APPLIED THROUGH FLOOD IRRIGATION

CONDITIONS

1. {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]
2. {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]
3. The liquid manure handling system shall handle flush manure from no more than 1,650 milk cows; 250 dry cows; 483 heifers (15-24 months); 484 heifers (7-14 months); and 483 heifers (4-6 months). [District Rule 2201]
4. Permittee shall operate the lagoon as an anaerobic treatment lagoon designed according to NCRCS Guideline No. 359. [District Rule 2201]
5. Permittee shall maintain records of design specifications and calculations for the Anaerobic Treatment Lagoon system in order to demonstrate that the system has been designed and is operating in accordance with the applicable National Resource Conservation Service (NRCS) technical guide. [District Rule 2201]
6. Permittee shall only apply liquid manure that has been treated with an anaerobic treatment lagoon, an aerobic lagoon or a digester system. [District Rules 2201 and 4570]
7. Permittee shall maintain records that only liquid animal waste treated with an anaerobic treatment lagoon is applied to fields. [District Rules 2201 and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

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Seyed Sadredin, Executive Director / APCO

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Arnaud Marjollet, Director of Permit Services
S-5602-3-0 : Mar 3 2015 3:59PM – OGDENA : Joint Inspection NOT Required

8. {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]

9. Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rules 2201and 4570]

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

11. 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]

12. 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 2201and 4570]

13. {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]

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San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: S-5602-4-0

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: PARREIRA FARMS
MAILING ADDRESS: 9995 AVENUE 120
PIXLEY, CA 93256

LOCATION: 9995 AVENUE 120
PIXLEY, CA 93256

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

CONDITIONS

1. {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]
2. {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]
3. {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]
4. {4526} 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]

CONDITIONS CONTINUE ON NEXT PAGE

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Seyed Sadredin, Executive Director / APCO

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Arnaud Marjollet, Director of Permit Services
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5. 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]

6. 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]

7. Within seventy two (72) hours of removal of separated solids from the drying process, permittee shall either 1) remove separated solids from the facility, or 2) 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 twenty-four (24) hours per event. [District Rules 2201and 4570]

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

9. Permittee shall maintain records, such as manufacturer warranties or other documentation, demonstrating that the weatherproof covering over separated solids 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 2201and 4570]

10. {4545} Permittee shall not apply solid manure with a moisture content of more than 50%. [District Rule 4570]

11. {4546} Permittee shall maintain records of the moisture content of the solid manure each time solid manure is land applied. [District Rule 4570]

12. {4547} Moisture content shall be determined using test Methods for the examination of compost and Composting (TMECC) Method 3.09 or any other alternative test method approved by the APCO, ARB, and EPA. [District Rule 4570]

13. {4453} Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]

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]

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San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

PERMIT NO: S-5602-5-0

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: PARREIRA FARMS
MAILING ADDRESS: 9995 AVENUE 120
PIXLEY, CA 93256

LOCATION: 9995 AVENUE 120
PIXLEY, CA 93256

EQUIPMENT DESCRIPTION:
FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARNS AND SILAGE PILES

CONDITIONS

1. {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]
2. {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]
3. Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201and 4570]
4. {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]
5. 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 2201and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

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Seyed Sadredin, Executive Director / APCO

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Arnaud Marjollet, Director of Permit Services
S-5602-5-0 : Mar 3 2015 3:59PM – OGDENA : Joint Inspection NOT Required

6. 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 2201and 4570]

7. Permittee shall maintain an operating plan/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 2201and 4570]

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

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

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

11. 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 2201and 4570]

12. Permittee shall remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rules 2201and 4570]

13. Permittee shall maintain records demonstrating that uneaten wet feed was removed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rules 2201and 4570]

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

15. 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 2201and 4570]

16. 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 2201and 4570]

17. 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 2201and 4570]

18. 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 2201and 4570]

19. 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 2201and 4570]

20. 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 2201and 4570]

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CONDITIONS CONTINUE ON NEXT PAGE

21. 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 2201and 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 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 2201and 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 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 2201and 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 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 2201and 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 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 2201and 4570]

26. 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 2201and 4570]

27. 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 2201and 4570]

28. For each silage pile that Option 2 (Shaver/Facer or Smooth Face) is chosen as a mitigation measure for building 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 2201and 4570]

29. For each silage pile that Option 3 (Silage Additives) is chosen as a mitigation measure for building 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 2201and 4570]

30. 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 2201and 4570]

31. {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]

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