SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

FINAL DRAFT STAFF REPORT

PROPOSED RULE 4570 (CONFINED ANIMAL FACILITIES)

June 15, 2006

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I. SUMMARY

A. Reasons for Rule Development and Implementation

In terms of state and federal standards, the California Air Resources Board (ARB) and United States Environmental Protection Agency (EPA) classified the San Joaquin Valley Air Basin (SJVAB) as a non-attainment area for ozone. The District is classified as a serious non-attainment area for the federal 8-hour ozone National Ambient Air Quality Standards (NAAQS). It is anticipated that attainment of the eight-hour standard will require the control measures cited in the one-hour Extreme Ozone Attainment Plan (Ozone Plan), which include control measure 4570 (Confined Animal Facilities). Since Proposed Rule 4570 is a control measure in the District's Ozone Plan, it is subject to Federal Register, Clean Air Act (CAA), and California Health and Safety Code (CH&SC) requirements. Additionally, anti-backsliding provisions commit the District to develop all control measures listed in the Ozone Plan (Federal Register Volumes 69 and 70). These requirements are summarized in Table 1.

Table 1
Anti-backsliding and Ozone Plan Commitments

Subject	Reference	Requirement
Anti-backsliding	69 Federal Register 23955	Districts shall develop all control measures listed in the one-hour Ozone Plan until the District is designated as attainment for the 8-hr NAAQS.
BACM	Federal Register 8/18/94	Provisions in attainment plans should include the application of best available control measures (BACM) to existing major stationary sources.
BARCT	CH&SC 40919(a)(3) Ozone Plan	Ozone attainment plans should provide for best available retrofit technology (BARCT) for existing permitted sources. BARCT is specifically required for "large" Confined Animal Facilities (CAF).
Deadlines	Ozone Plan	Rule adoption by the 2nd quarter of 2006.
Feasible Controls	CH&SC 40914(a)(2)	Ozone attainment plans should include "all feasible control measures."
RACT	CAA 182(b)(2) and 182(f)	Ozone attainment plans shall assure that reasonable available control technology (RACT) for volatile organic compounds (VOC) is in use at sources and on source categories at or above the RACT threshold.
RACT Threshold	70 Federal Register 30592-30596	The applicable RACT threshold for control measures shall be the threshold in effect on June 15, 2004. The Districts threshold on June 15, 2004 was 10 tons per year (tpy) for VOC. Therefore, 10 tpy is the RACT threshold for Proposed Rule 4570.
Reductions	Ozone Plan	The rule shall reduce VOC emissions by at least 25% from the baseline by 2010. Twenty-five percent of the baseline used for the Ozone Plan (63.1 tpd) is 15.8 tpd.
Timeline	CAA Section 172(c)(1)	Ozone attainment plans shall implement control measures as expeditiously as practicable, and provide for attainment.

Proposed Rule 4570 is also intended to fulfill the following CH&SC requirements created by the passage of California's Senate Bill 700 (SB 700):

Table 2
SB700/California Health and Safety Code Requirements

Subject	CH&SC Sections	SB700 / CH&SC Requirements
Large Confined Animal Facility Definition (large CAF)	40724.6(a)	The District shall use the "large CAF" definition developed by the California Air Resources Board (ARB).
Deadline	40724.6(b)	By **July 1, 2006** the District shall adopt, implement, and submit for inclusion in the state implementation plan a rule requiring owners of "large" CAF to obtain a permit.
Degree of Mitigation Required	40724.6(d)(1)(B)	Best Available Retrofit Control Technology (BARCT) is the degree of mitigation required of large CAF.
Compliance Schedule	40724.6(d)(4)	Owner/operators shall implement control measures within **one year** of the permit issuance date.
Permit Requirements to be Included in the Rule	40724.6(d)	1. The permit shall include an emission mitigation plan that demonstrates use of BARCT, (Rule 4570 Section 5.0) 2. The District shall provide for a 30-day public noticing and commenting period for proposed permits, (Rule 4570 Section 6.1.6) 3. The District shall review and update permits at least once every three (3) years, (Rule 4570 Section 6.2) 4. The District shall act on completed permit applications within six (6) months of receipt, (Rule 4570 Section 6.3) 5. The permit shall include sufficient information to prepare an emission inventory of all regulated air pollutants emitted from the facility, and (Rule 4570 Sections 6.0 and 7.0) 6. The owner/operators of large CAF shall submit a permit application within six (6) months of Rule 4570 adoption. (Rule 4570 Section 8.1)
Impact Assessment	40724.6(d)	Prior to adopting a rule, the District shall analyze the following: 1. Category, number, and size of facilities affected, (Section II of the Staff Report) 2. Nature, quantity, and significance of emissions in adversely affecting public health, the environment, and attainment of air quality standards, (Section IB and Section II of the Staff Report) 3. Emission reduction potential, (Appendix B) 4. Costs, (Appendix C and D) 5. Impact on employment and the economy, (Appendix D) 6. Alternative controls, and (Section III of the Staff Report) 7. Technical and Practical Feasibility. (Section III of the Staff Report)

B. Scope of Proposed Rule 4570

Rule 4570 is properly limited to VOC regulation. Proposed Rule 4570 was developed pursuant to California Health and Safety Code (CH&SC) 40724.6, which applies only to the regulation of ozone and ozone precursors. This is confirmed by CH&SC 40724.6(d)(1)(B), which requires, amongst other things, the implementation of reasonably available control technology (RACT) in "moderate" and "serious" nonattainment areas, and best available retrofit control technology (BARCT) in "severe" and "extreme" nonattainment areas. "Severe" and "extreme", as used in these sections of the CH&SC, are legal terms that pertain only to ozone attainment status. Please see CH&SC 40724.6(d)(1)(B) for additional information. Due to the fact that the aforementioned sections only apply to ozone and ozone precursors, controlling emissions of other non-ozone related pollutants, such as ammonia, is not mandated or permitted.

Pursuant to CH&SC 40724.6(d)(4)(d)(2), the District analyzed the significance of emissions from CAFs and determined that the rule should focus on the control of volatile organic compounds ("VOCs") as ozone precursors.

Ammonia is not being targeted by this rule because ammonia is a particulate matter precursor and not an ozone precursor. Some commenters inaccurately stated that Proposed Rule 4570 must regulate ammonia because CH&SC 40724(a) requires BARCT controls for particulate matter (PM) precursors, and ammonia is a precursor for both PM10 and PM2.5. The District disagrees with this comment for several reasons. First, as discussed above, Rule 4570 is being adopted pursuant to CH&SC 40724.6, which authorizes the regulation of ozone, not particulate matter. The District complied with CH&SC 40724(a) when it adopted its Rule 4550 (Conservation Management Practices) in May and August 2004. To the extent that the commenters believe that ammonia should have been regulated under that rule, their comments are misplaced in this rule development process, as this is a separate district rulemaking activity. However, in an effort to respond to these comments, the District offers the following:

Ammonia was not targeted by Rule 4550 because, based on the District's PM-10 Plan; the preliminary results from the California Regional PM10/PM2.5 Air Quality Study (CRPAQS); and the Ninth Circuit decision in *Association of Irritated Residents vs. U.S. Environmental Protection Agency*, 423 F.3d 989 (9th Circuit 2005), reducing ammonia is not an effective method of achieving attainment for particulate matter. Oxides of nitrogen (NOx), not ammonia, are the limiting reagents in the formation of PM in the San Joaquin Valley. The District could reduce over half of the ammonia from CAFs and not affect particulate matter formation. Furthermore, CH&SC 40724(a) requires the District to regulate PM precursors "in a manner commensurate to other source categories." Since current District rules do not require any other source category to control ammonia, this rule cannot do so for confined animal facilities. In addition, the District did not regulate PM2.5 in Rule 4550 because CH&SC 40724(a) applies only to the regulation of PM in federal nonattainment areas designated as nonattainment for PM2.5 as of January 1, 2004. The San Joaquin Valley was not designated as nonattainment for PM2.5 until April 5, 2005, well after the January 2004 applicability date. Thus, CH&SC 40724(a) does not require regulation of PM2.5 precursors in the San Joaquin Valley.

Returning to the rule at issue here, Proposed Rule 4570, even if the District agreed that CH&SC 40724.6 applied to all "air contaminants" as commenters suggest, CH&SC 40724.6(b) requires that emissions from a facility be reduced "to the extent feasible." In order to be "feasible" emission reductions must have some relationship to the pollution problem being addressed. Since Proposed Rule 4570 seeks to reduce ozone pollution, it would be nonsensical to attempt to control ammonia, soot, odor, or other "air contaminants" that have no effect on ozone levels in the San Joaquin Valley. Such a regulation would not survive the required socioeconomic analysis because the money spent on controls would not result in an improvement in ozone levels in the San Joaquin Valley. Therefore, such controls would not be considered "feasible."

In addition, the District is prohibited from requiring controls in Proposed Rule 4570 that would duplicate controls required for particulate matter in Rule 4550. CH&SC 40724.6(h) states that "nothing in this section authorizes a district to adopt a rule or regulation that is duplicative of a rule or regulation adopted pursuant to CH&SC 40724 and 40724.5." As discussed above, Rule 4550 (Conservation Management Practices) was adopted pursuant to CH&SC 40724. Rule 4550 contains the required PM controls for agricultural sources, including confined animal facilities. As a result, the present ozone rule, Proposed Rule 4570, could not similarly regulate particulate matter pollution as that would be "duplicative" and thus in violation of CH&SC 40724.6(h).

Finally, CH&SC 40724.6(d)(4)(d) states that the District must consider the impacts of a rule adopted under the aforementioned section and assess, amongst other things, "the nature and quantity of emissions from the category and the significance of those emissions in … causing or contributing to the violation of a state or federal ambient air quality standard." As discussed above, the District performed this analysis for ammonia when it adopted it PM10 Plan in 2003 and again when it adopted an update to that Plan in 2006. This analysis determined that controlling ammonia is not an effective strategy for reducing particulate matter in the Valley. This analysis was affirmed by the Ninth Circuit in *Association of Irritated Residents vs. U.S. Environmental Protection Agency.* However, even though the District is not required to regulate ammonia with this rule, it is important to note that many of the mitigation measures required by the rule to reduce VOCs also reduce ammonia. As a result, this rule is expected to reduce ammonia from large CAFs by over 30%, as demonstrated in Appendix F.

The District also analyzed NOx pursuant to CH&SC 40724.6(d)(4)(d). Although NOx is an ozone and particulate matter precursor, Rule 4570 does not require NOx controls at CAFs. This is because animals and manure emit minimal quantities of NOx. Furthermore, the scope of this rule is limited to animal husbandry including manure disposal, not engines on these facilities. However, the District implemented BARCT for NOx emissions on CAFs from engines, boilers, and other sources in other District Rules including, but not limited to, District Rules 4301, 4304 through 4308, and 4701 through 4703.

Accordingly, because Rule 4570 as a measure for the District's Ozone Plan pursuant the authority set forth in H&SC section 40724.6, which authorizes the regulation of ozone and ozone precursors, this rule focuses on the regulation of VOCs, which are the pollutants that contribute to the District's non-attainment status for ozone.

C. Large CAF Definition

A CAF is defined in CH&SC 39011.5(a) and 39011.5(a)(1). Based on these sections of the CH&SC, a CAF is "a source of air pollution or a group of sources used in the...raising of fowl or animals located on contiguous property under common ownership or control...including, but not limited to, any structure, building, installation, barn, corral, coop, feed storage area, milking parlor, or system for the collection, storage, treatment, and distribution of liquid and solid manure, if domesticated animals are corralled, penned, or otherwise caused to remain in restricted areas for commercial purposes and feeding is by means other than grazing."

The California Air Resources Board (ARB) was required by CH&SC 40724.6 to "review all available scientific information, including, but not limited to, emission factors for confined animal facilities; the effect of those facilities on air quality in the basin; and other relevant scientific information and to develop a definition for a "large" confined animal facility. ARB's board adopted the following thresholds for a large CAF, based on air emissions from CAFs:

Table 3: ARB Large CAF Thresholds	
Livestock Category	**Number of Animals**
Dairy	*1,000 lactating cows*
Beef Feedlots	*3,500 beef cattle*
Other Cattle Operations	*7,500 calves, heifers, and other cattle*
Chickens-Broilers & Egg Layers	*650,000 head*
Turkeys	*100,000 head*
Swine	*3,000 head*
Sheep and Goats	*15,000 head*
Horses	*2,500 head*
Ducks	*650,000 head*
Other Livestock Not Previously Mentioned	*30,000 head*

Source: http://www.arb.ca.gov/regact/lcaf05/lcaf05.htm accessed 2/24/06

D. Permits Requirements

CH&SC 40724.6(c) provides the District with the authority to require permits on facilities with less than one half of any applicable emissions threshold, if they make certain findings, as quoted below:

> "A district may require a permit for a large confined animal facility with actual emissions that are less than one-half of any applicable emissions threshold for a major source in the district for any air contaminant, including, but not limited to, fugitive emissions in a manner similar to other source categories if, prior to imposing that requirement, the district makes both of the following determinations in a public hearing:
>
> (1) A permit is necessary to impose or enforce reductions in emissions of air pollutants that the district show cause or contribute to a violation of a state or federal ambient air quality standard and
>
> (2) The requirement for a source or category of sources to obtain a permit would not impose a burden on those sources that is significantly more burdensome than permits required for other similar sources of air pollution." (CH&SC 40724.6)

Staff believes that without a permit, determining compliance with Proposed Rule 4570 and ensuring compliance would not be feasible. A permit is the legal document through which we enforce the rule for permitted sources. Furthermore, since many of the affected sources already have permits and this rule would only require a modification to their existing permits, staff does not believe the permit requirement in Proposed Rule 4570 would impose a burden. The District will make these findings at a public hearing on June 15, 2006.

E. RACT Requirements

Reasonably Available Control Technology (RACT) is required by CAA 182(b)(2) and 182(f) for any facility with at least ten (10) tons per year (tpy) of VOC emissions. The emissions factors for confined animal facilities are being revised; therefore, it is not possible to conclusively identify the number of animals of any species that would trigger RACT requirements. The development of this rule cannot be postponed until finalization of the emission factor due to the CH&SC 40724.6 requirements for rule adoption by July 1, 2006. Preliminary discussion with EPA staff suggest that, due to the current uncertainty of the emission factors, at this time EPA will consider the RACT and large CAF thresholds to be equivalent. Therefore, staff will address those facilities defined as "large CAF" by the ARB in Proposed Rule 4570 to be adopted on or before July 1, 2006. Later, after emission factors are more refined, staff may amend this rule to address CAFs below the large CAF definition, but at or above the ten (10) tpy emission threshold for RACT, if it is determined that such sources exist.

F. Scientific Background Review/Revision

Due to the relatively new status of CAFs as a regulated stationary source, the body of scientific knowledge that is useful in understanding its impact on air pollution is not as well established compared to other traditional stationary sources under the jurisdiction of the District. New scientific findings characterizing and quantifying dairy, poultry, and other animal emissions and possible control measures are being developed and completed. The District developed Proposed Rule 4570 using relevant findings from previous research efforts as they were finalized, published, and peer-reviewed. These include, but are not limited to:

- A study at UC Davis, led by Dr. Frank Mitloehner, which focused on emissions from cows housed in environmental chambers to evaluate the emissions produced directly from cows and their fresh manure.
- A study at two operating dairies in the San Joaquin Valley, led by Dr. Chuck Schmidt, in which measurements were made at various locations at the dairies, including the corrals and turnouts, bedding areas, lagoons, feed storage areas, flush lanes, and bunker feed.
- A study by Dr. Schmidt to validate the effectiveness and capture efficiency of using flux chambers that were used to quantify emissions in the dairy studies.

These studies have provided significant findings that provide an understanding of the emissions at CAFs. Due to the rule adoption date mandated by CH&SC 40724.6 and the presence of peer-reviewed and preliminary research data, staff will propose rule adoption no later than July 1, 2006.

Since control efficiencies for technologies and emission factors may change based on new research, staff structured the rule such that facilities may comply with rule requirements utilizing management practices and machinery that owners/operators already have access to onsite. This is intended to implement BARCT, while preventing owners/operators from being required to invest significant capital in a technology that is later found to control only a small portion of the emissions. Staff may amend this rule after July 1, 2006 when additional research is completed, which may require owners/operators to make capital investment beyond the mitigation measures currently being proposed in Rule 4570. At that time, the emissions from each area would be better quantified, and staff would be able to determine which VOC emission mitigation measures have the highest cost effectiveness values.

Since testing methods are being developed, staff left the testing requirements flexible to prevent owners/operators from being required to invest significant capital in testing that is later found to be ineffective or not the most cost effective method. Furthermore, the rule provides the flexibility for the APCO, ARB, and EPA to add additional test method options that they believe are appropriate. This concept acknowledges that, as research continues, new, more effective, and less expensive test methods may be developed and, if so, owner/operators should be allowed to use such methods.

While the studies by Dr. Schmidt and Dr. Mitloehner have provided valuable new information, they do not fully address air emissions from CAF. Additional work is needed to allow a comprehensive update to the emission factors currently being used for CAF. As additional research, such as that being undertaken by the California Air Resources Board, becomes finalized, this rule may be adjusted to incorporate that new information. Please see Appendix H for additional information on ongoing studies.

II. BACKGROUND

CAF are used for the raising of animals including, but not limited to, cattle, calves, chickens, ducks, goats, horses, sheep, swine, rabbits, and turkeys, which are corralled, penned, or otherwise caused to remain in restricted areas for commercial agricultural purposes and fed by a means other than grazing. (CH&SC 39011.5 (a)(1))

Due to the different methods of confinement and associated manure management, there is no typical CAF. The design and operation of a CAF varies depending on animal type, regional climatic conditions, business practices, and preferences of the owners/operators. This is why Proposed Rule 4570 provides a menu of options for the owners/operators. This acknowledges that not all facilities can implement the same options due to infrastructure, conditional use permits, water board permits, soil types, production contracts, and other limitations. It also enables the people that understand the particular operation best, the owners/operators, to choose the mitigation measures that make the best environmental and economic sense for the facility.

A. General Description of Poultry Operations

Poultry facilities operate either as layer ranches for egg production or as broiler ranches where birds are grown for the fresh meat market. Poultry facilities, called ranches in reference to their specialized operation, may consist of one or more farms on properties that may be several miles apart. Several barn-like houses may make up a farm. A chicken layer house may have over 100,000 layers; a typical chicken broiler house contains approximately 20,000-25,000 birds; and a typical turkey broiler house contains approximately 10,000 birds at any one time.

This typical practice of having no more than 650,000 birds on a single property or contiguous properties is for biosecurity purposes. Although the farms that make up a ranch may be operated as a single facility all using the same equipment, personnel, and operators and having a single owner, if the farms are not on contiguous properties they will each be considered a separate agricultural source based on the definition of a single agricultural source in CH&SC Sections 39011.5(a) and 39011.5(a)(1). Therefore, the majority of the existing poultry operations are expected to be below the thresholds established for control requirements.

In the United States, approximately 61% of the chicken layer houses and a majority of the breeder and broiler houses use power ventilation instead of natural ventilation. The most common type of power ventilation is tunnel ventilation. In tunnel-ventilated houses, all the fans are clustered at one end of the house and the fans push the air to the other end of the house. Curtains on the houses may be used on a non-routine basis for ventilation, particularly during colder weather.

Studies indicate that most chicken layer houses produce approximately two cubic yards of waste per week per five hundred chickens. Although a small amount of liquid waste may occur from egg washing operations located on the facility and a small amount of bedding may be collected as waste, poultry excretions account for a majority of the waste. Typically, hens are confined in a layer house that consists of many layer boxes positioned above the ground. On average, every seven (7) to nine (9) days workers remove waste from under the layer boxes, and every fourteen (14) to eighteen (18) weeks workers remove waste from the floor of the layer houses. However, many facilities list less frequent waste removal, ranging from one (1) to three (3) times per year (every 17-52 weeks) as a control technique used to comply with District Rule 4550 Conservation Management Plan (CMP). Several mitigation measures in Proposed Rule 4570 and Rule 4550 that the owners/operators could choose do not affect waste removal frequency. Therefore, owners/operators can comply with both Rule 4550 and 4570.

In broiler facilities, complete litter removal from the house occurs one (1) to four (4) times per year. Litter removal frequencies vary from every two (2) to seven (7) flocks (approximately 90-315 days); more commonly, it is removed every third flock. Before introducing a new flock, the house is left empty, typically for five (5) days. During this interlude, the operator adjusts the temperature and other ambient conditions in the house. In the broiler industry, the new flocks of birds are brought into the houses as chicks and are raised for approximately 45 days, until they reach the desired weight. Shortly thereafter, the grown birds are removed and the house is again left empty for approximately five (5) days to sanitize. This approximately 55-day cycle is the production period for one flock. Depending on management practices, litter production ranges from 0.5 to 0.7 pounds per pound of live bird weight. On average, for each pound of live weight gained, meat birds produced 0.52 pounds of litter during the production period.

Poultry excretions and bedding materials, such as rice hulls, are removed either by scraping or by flushing. In a scrape system, the litter is either swept or scraped from the house into a pile or piles outside the house. Typically, concerns about transmitting diseases among birds and flocks necessitate trucking the scraped litter offsite shortly after removal. The liquid handling system is similar to dairy flush systems, explained later in this report. However, less than 15% of the poultry operations in the San Joaquin Valley use liquid manure handling systems.

Based on current preliminary research data, litter and feed are the major sources of VOC emissions. These emission points are also sources of ammonia emissions. Since ammonia forms a significant health risk to the animals and decreases productivity, many facilities implement controls for ammonia. The humidity, litter additive, moisture, and ventilation controls widely used to control ammonia also constitute BARCT for VOC emissions. Based on industry comments, staff believes that the majority of poultry facilities in the SJVAB already implement BARCT for VOC emissions. Furthermore, the studies conducted to determine emissions factors for poultry were on poultry houses that had implemented BARCT, thus the baseline for poultry emissions includes BARCT.

B. Dairy Operations

For this description, dairy operations are defined as those operations producing milk or animals for facilities that produce milk. In order to produce milk, the cows must be bred and give birth. Typically, the gestation period for dairy cattle is nine (9) months and dairy cows are bred again approximately four (4) months after calving. Milk production typically peaks shortly after calving and then declines. Commonly a cow will produce milk for ten (10) to twelve (12) months and then be dry approximately two (2) months. Thus, a dairy operation may have several types of animal groups present including heifers, lactating cows, dry cows, calves, and bulls (for breeding purposes). Approximately 25% of a milking herd is replaced each year, but replacement levels can be as high as 40% for intensively managed herds (EPA 2001).

Calves are typically housed in individual pens or hutches. Older animals are typically housed in freestall barns, dry lots, tie stalls/stanchions, or any combination of the aforementioned. The freestall barn is the predominate type of housing system used on dairy farms for lactating cows. In a freestall barn, cows are housed in large pens with free access to feed bunks, waterers, and stalls for resting. Standard freestall barns have a feed alley in the center of the barn separating two feed bunks on each side. Animals stand on the corral side of the feed lane to eat; this is where the majority of the animal excretion occurs. In some cases, cows may be confined in or have access to drylots. Drylots are typically fenced in areas that may have shade. Drylot confinements are similar to beef feedlots described later in this report. Tie stalls/stanchions are not uncommon on smaller dairy farms and older facilities. In this type of housing system, cows are confined in a stall for feeding, but have access to a dry lot or pasture for exercise. A mechanically or manually cleaned gutter is located behind each row of stalls for manure collection and removal.

Feeding and watering practices vary for each animal type. In general, calves are nursed for four (4) to five (5) days after birth. Calves are then fed a milk replacement until weaning, which generally occurs at about eight (8) weeks of age. During this period, a feed grain based starter diet is introduced. This starter diet is fed to calves until they are approximately three (3) months old. At approximately three (3) months, calf rumen development allows a shift to a roughage-based diet.

Older cattle and calves being raised for milk production are commonly fed a roughage-based diet. The principal constituents of these diets are corn or grain sorghum silage and legume or grass and legume hays with feed grains and byproduct foodstuff added in varying amounts to satisfy energy, protein, and other nutrient requirements. The manure tends to be generated in a semi-solid state.

Manure with a total solid content of 10% or less can be handled as a liquid. In slurry or liquid systems, the manure is flushed from alleys or pits to a storage facility. Typically, effluent from the solid separation system or supernatant from a pond or an anaerobic lagoon is used as flush water in animal housing. The supernatant is the clear liquid in the lagoon that is overlying the solids that settle below. Dairy manure that is handled and stored as a slurry or liquid may be mixed with dry manure. Liquid systems are common in large dairies due to their lower labor costs and ease of use with automatic flushing systems. Manure handled as solids can be removed by mechanized scraping systems, a tractor, or a chain scraper. Typically, the solid manure scraped is stock piled and dried for disposal through land application.

C. General Description for Beef Cattle Feeding Operations

This animal sector includes adult beef cattle (heifers and steers). Beef may spend all, part, or none of their lives on a CAF. There are three types of operations in the beef industry: cow-calf operations, backgrounding operations, and finishing operations. These operations are typically conducted at separate locations that specialize in each phase of production, but may occur at a single location.

Cow-calf operations are a source of heifers and steers fed for slaughter. These animals are fed primarily hay with some grain and other foodstuff. Backgrounding or stocker operations prepare weaned calves for finishing. The backgrounding process is highly dependent on feed prices. Typically the animals are fed the lowest priced feed at the time, which may be forages or crop residues, with the objective of building muscle and bone mass at a low cost. The duration of the backgrounding process may be from thirty

(30) days to six (6) months old. Typically, high grain prices favor longer periods of backgrounding by reducing feed costs for finishing or fattening. After approximately 150 to180 days, animals in finishing operations will reach slaughter weights of 1,050 to 1,250 pounds. Although, some feedlots start with younger or older cattle and the finishing cycle may be less than 100 days or over 270 days. Accordingly, feedlots typically have between 1.5 to 3.5 cattle turnovers per year.

In any case, animals are typically segregated by production stage in pens with feed truck access. The animals are typically fed two (2) to three (3) times per day using feed bunks located along feed alleys that separate the individual pens.

For these types of operations, the manure is commonly handled as a solid. Solid manure is typically scraped or moved by tractors to stockpiles. Manure accumulates in areas around feed bunks and water troughs most rapidly, thus these areas may need to be cleaned during the finisher cycle. However, there is significant concern and risks associated with entering areas where beef cattle are housed.

D. General Description for Swine Operations

The production cycle for hogs has three (3) phases: farrowing, nursing, and finishing. The first phase begins with breeding and gestation over a 114-day period followed by farrowing (giving birth). After farrowing, the newly born pigs or piglets normally are nursed for a period of three (3) to four (4) weeks until they reach a weight of approximately ten (10) to fifteen (15) pounds. Typically, there are from nine (9) to eleven (11) pigs per litter. Sows can be bred again within a week after a litter is weaned. Sows normally produce five (5) to six (6) litters before they are sold for slaughter at a weight of 400 to 460 pounds.

Weaned pigs are fed a starter ration until they reach a weight of approximately fifty (50) to sixty (60) pounds. At this point, they are typically eight (8) to ten (10) weeks of age. Then the animals are fed a growing and finally a finishing ration until they are approximately 240 to 280 pounds at which point they are approximately 26 weeks of age and ready for slaughter. The diet varies, but it typically includes small grains such as wheat and barley, corn and soybean meal.

The animals are typically housed in confinement buildings that are either totally enclosed or open-sided with curtains. Totally enclosed facilities are mechanically ventilated throughout the year. Open-sided buildings are naturally ventilated the majority of the year, but may be mechanically ventilated when the curtains are closed due to weather conditions. Manure may be flushed from the floor of the housing or fall through slats in the floor to a pit underneath the floor. Manure in the pit may be flushed or scraped.

E. Land Application of Animal Waste

Liquid manure from flush systems stored in lagoons or solid manure scraped from facilities eventually may be land applied with or without prior treatment such as composting or anaerobic digestion. Typically, animal waste is applied to cropland at rates adequate to supply crop nutrient needs. Historically the determination of application rates has been based on crop nitrogen requirements due to concern about the impact of excess nitrogen on surface and ground water. In cases where treatment methods, such as aerobic digestion, increase the nitrogen content in the waste stream, the waste may need to be applied over a greater number of acres in order to comply with the Regional Water Quality Board's regulations.

Surface application of manure waste may be done with a spreading device known as a box manure spreader. This is simply a rectangular box that is either tractor drawn or truck mounted with a spreading device at the rear end. During spreading, the manure moves to the rear of the box by either a belt or chain-and flight conveyor. Box type spreaders are typically loaded with tractor mounted front-end loaders. Manure handled as slurry or liquid may be spread with a tractor drawn or truck mounted tank known as a liquid manure spreader. The manure may be forced out of the tank under pressure against a distribution plate to create a spray pattern. Another option is to force the manure from the tank under pressure through a manifold with a series of hanging or trailing pipes to create parallel strips of manure on the soil surface. A second type of spreader for manure slurries is a flail spreader. This is a partially open tank with chains attached to a rotating shaft positioned parallel to the direction of travel. Manure is discharged perpendicular to the direction of travel by the momentum transferred from rotating chains.

Manure may be land applied and land incorporated through the use of a manure injection device, typically attached to a tractor; tilling surface applied manure under the soil; applying liquid manure at such a rate that is rapidly absorbed into the soil; or another method in which the manure is covered with soil.

Facilities choosing to use conservation tillage options will likely apply any liquid manure at a rate such that it is rapidly absorbed into the soil and apply any solid manure only after it has been treated with an anaerobic digestion process, treated with an aerobic digestion process, or dried to a moisture content of less than 50%. In any of these cases the animal waste land applied would not need to be tilled under the soil in order to comply with rule requirements. Similarly, such methods may be used when crop height prevents the owner/operator from tilling the land-applied waste.

F. Emission Characterization

Current research suggests that general sources of VOC on CAF may include: enteric (i.e. eructation and respiration), bedding, excreta, and feed. (Schmidt, 2004) In excreta, the majority of the non-methane volatile organic compounds (NMVOC) originate from the decomposition of undigested protein (Hobbs 2004). Sources of VOC from excreta include animal housing, yards, manure storage areas, land spreading, solid separator piles, and lagoons.

The District extensively reviewed current research in the APCO reports available at: http://www.valleyair.org/busind/pto/dpag/dpag_idx.htm

The District identified the following emission categories:

- Category 1- Feed and Enteric from an Environmental Chamber: Several VOC including aromatics and ethanol were not measured. Ethanol was the main VOC found in feed in Dr. Chuck Schmidt's study;

- Category 2- Ethylamines from Specific Dairy Processes: Does not include emissions from several processes, including feed storage, land application, and composting;

- Category 3- VOC from Miscellaneous Dairy Processes: Several VOC including methanol were not measured and several important processes including feed storage, land application, and composting were not included;

- Category 4- VOC from Lagoons and Storage Ponds: Several VOC including aromatics and ethanol were not measured;

- Category 5- Volatile Fatty Acids: Used low range estimates and minimums for several VFA calculations so it may underestimate the VFAs at dairies;

- Category 6- Phenols from Dairy Processes: Not included because no information regarding the relationship between phenol formation and diet and process conditions was provided to the APCO; and

- Category 7- Land Application, Feed Storage, Settling Basins, Composting, and Manure Disturbance: Not included due to limited data on the VOC emissions at these sources.

The emission categories listed above contribute to emissions in the following emission sources (locations) on a CAF are:

- Feed,
- Housing,
- Land Application (if applicable),
- Milking Center (if applicable),
- Liquid Waste Handling Systems (if applicable), and
- Solid Waste Handling Systems (if applicable).

Not every facility has all of the above emission sources due to differences in operating and farming practices.

G. Emission Factors

To calculate source emissions, reductions, and cost effectiveness of control measures, staff required emission factors. The emission reduction calculations are performed using the most recent emission factors accepted by the District at the time of the calculation.

Emission factors come from a variety of sources:

- The emission factor for swine, rabbits, horses, sheep, and goats are based on a metabolism study conducted in 1938 by Benedict and Ritzman. This study measured methane in animals including an elephant, a horse, seven (7) Holsteins, four (4) Jerseys, and a Hereford cow. This study and the subsequent research papers based on it remain the most currently published and reviewed source of emission factors for several species. Several most recent articles have reported different emissions from these operations and emission sources. However, those emission factors tend to be inconsistent, possibly due to variation between facilities, and are not complete. Staff was unable to locate comparable emission factor data that addressed all emission sources on these facilities. Therefore, the Ritzman study and Ritzman-based studies are currently considered the most complete, published, and peer reviewed source of emission factors for these facilities. Additionally they are the factors listed in the ARB October 2003 interim proposed report on emission factors.

- The remaining emission factors are those currently used by the District's Permit Services for permitting purposes. Those factors are based on the 2005 California Department of Food and Agriculture and Foster Farms source test of a chicken broiler facility; information from the Dairy Permitting Advisory Group (DPAG) (see www.valleyair.org/busind/pto/dpag/dpag_idx.htm for details); and ASAE manure production equivalents.

Table 4 details the emission factors, based on these sources, which will be used for calculation purposes. As noted previously, the emission factors may be revised in the permitting process to reflect the latest approved research information.

Table 4: Emission Factors (as of 4-26-06)

Animal Type	VOC Emission Factor (lb/hd-yr)
Milking Cow	19.3 to 21.7*
Dry Cow	11.9
Heifer (15-24 months)	8.3
Heifer (7-14 months)	7.2
Heifer (4-6 months)	6.6
Calf (under 4 months)	6.2
Feedlot Cattle	11.1
Laying Hens and Associated Birds	0.05
Broiler Chickens and Associated Birds	0.025
Turkeys and Associated Birds	0.10
Swine	4.6
Rabbits	0.19
Horses	6.7
Goats and Sheep	0.96

* The emission factor for lactating cows varies based on the type of housing. Cows in a complete flush dairy with no freestalls have an emission factor of 19.3 lb/hd-yr and cows in a complete flush dairy with freestalls have an emission factor of 21.7 lb/hd-yr. On the website the 21.0 lb/hd-yr value is listed because it is the weighted average of the number of animals in facilities with freestalls (71%) and the number of animals in facilities without freestalls (29%). Specifically, the calculation is: 21.7 x 71% + 19.3 x 29% = weighted emission factor = 21.0 lb/hd-yr.

H. Animal Inventory and Emissions

Staff utilized the 2002 USDA census, industry data, and California Air Resources Board documents to estimate the VOC's emitted by CAFs in the SJVAB. The methodology is further explained below; Table 5 summarizes the results.

Table 5: Total 2005 VOC Emissions from CAFs in the SJVAB				
	Total VOC Emitted by CAFs (lb/yr)	Total VOC Emitted by CAFs (tons/day)	Total VOC Emitted by Large CAFs (lb/yr)	Total VOC Emitted by Large CAFs (tons/day)
Milk Cows	37,432,525	51.28	26,951,418	36.92
Beef Cattle	2,042,955	2.80	1,940,807	2.66
Other Cattle	11,355,375	15.56	10,795,230	14.79
Poultry	2,583,221	3.54	1,574,625	2.16
Swine	729,266	1.00	414,000	0.57
Other Animals	296,383	0.00	0.00	0.00
Total Animals	54,439,725	74.57	41,676,080	57.09

Dairy

Staff utilized the California Department of Food and Ag (CDFA) report entitled "*California Agricultural Statistics 2004*." The numbers are shown in Table 6. These numbers only include milking and dry cows, not heifers that have not calved or calves.

Table 6: Number of Milk and Dry Cows (CDFA Data 2004)				
County	2002	2003	2004	Projected 2005*
Fresno	86,115	90,345	95,577	99,878
Kern	85,830	98,478	121,147	126,599
Kings	146,545	153,475	162,656	169,976
Madera	49,899	57,099	63,934	66,811
Merced	224,895	224,734	237,854	248,557
San Joaquin	99,828	106,162	103,619	108,282
Stanislaus	164,558	177,432	178,420	186,449
Tulare	424,643	437,476	442,853	462,781
Total	1,282,313	1,345,201	1,406,060	1,469,333

*The growth from 2002 to 2003 was approximately 4.9% and the growth from 2003 to 2004 was 4.5%. In order to be conservative, staff assumed a growth of 4.5% for 2004 to 2005.

In order to estimate the number of support stock at a dairy, ratios were developed using 216 dairy applications submitted to the District. Based on those applications the following ratios, listed in Table 7, were developed. These ratios represent the number of each type of animal.

Table 7: Ratio of Each Type of Dairy Cow to Milkers					
Support Animals to Milkers	Dry Cows to Milkers	Heifers (15-24 mo) to Milkers	Heifers (7-14 mo) to Milkers	Heifers (4-6 mo) to Milkers	Calf (<4 mo) to Milkers
107%	16%	34%	29%	16%	11%

Before the above ratios can be applied to the CDFA milk and dry cow numbers to estimate a total number of head, the number of dry cows needs to be subtracted from the milk and dry cow numbers. Based on the ratios above, 16% of cows are dry cows when compared to milk cows, therefore the calculations would be as shown in the example below:

1,469,333/1.16 = 1,266,666 milk cows
1,266,666 x 0.16= 202,667 dry cows
1,266,666 x 0.11 = 139,333 calves

Now we can use the ratios in Table 7 to estimate all the other types of cows at a dairy.

Staff assumed, based on the ARB's June 23, 2005 Staff Report for Confined Animal Facilities page iii, that 72% of the dairy cows would be included in this regulation.

Furthermore, since the APCO Report noted that the 19.3 lb/hd-yr factor did not consider all emission sources and that the majority of facilities have freestalls, in order to be conservative, Staff utilized the weighted emission factor of 21.0 lb/hd-yr listed on the District's web page for dairies.

Table 8: Total 2005 Dairy Animals in SJVAB						
	Total Animals	VOC Factor (lb/hd/yr) from Table 4	Total VOC Emissions (lb/yr)	Animal Included In Rule	VOC Factor (lb/hd/yr)	Total VOC from Animals Included in Rule (lb/yr)
Milk Cows	1,266,666	21.00	26,599,994	912,000	21.00	19,151,996
Dry Cows	202,667	11.90	2,411,733	145,920	11.90	1,736,448
Heifers (15-24)	430,667	8.30	3,574,533	310,080	8.30	2,573,663
Heifers (7-14)	367,333	7.20	2,644,799	264,480	7.20	1,904,256
Heifers (3-6)	202,667	6.60	1,337,600	145,920	6.60	963,072
Calves	139,333	6.20	863,866	100,320	6.20	621,984
Total Cows	2,609,333		37,432,525	1,878,720		26,951,418

Beef and Other Cattle

The following table includes other cattle facilities in the San Joaquin Valley, from a USDA California Agricultural Statistics 2004 Report and beef on feedlots from the California Farm Bureau Federation. Staff assumed, based on the ARB's June 23, 2005

Staff Report for Confined Animal Facilities page 8, that 95% of the beef cattle and other cattle would be included in this regulation. This is based on the assumption that a similar number of beef and other cattle would be included in this rule as feedlot cattle listed in the ARB Staff Report.

Furthermore, staff assumed that there were equal numbers of each type of heifers and calves at the other cattle facilities therefore, averaged the emission factors for heifers and calves in order to obtain the emission factor for other cattle. This was used to develop Table 9.

Table 9: Total 2005 Beef and Other Cattle

	Total Animals	VOC Factor (lb/hd/yr) from Table 4	Total VOC Emissions (lb/yr)	Animal Included In Rule	VOC Factor (lb/hd/yr)	Total VOC from Animals Included in Rule (lb/yr)
Total Beef	184,050	11.10	2,042,955	174,848	11.10	1,940,807
Total Other Cattle	1,605,000	7.08	11,355,375	1,524,750	7.08	10,795,230
Total	1,789,050		13,398,330	1,699,598		12,736,037

Poultry and Other Animals

Staff obtained an estimate of the number of layers in the SJVAB from the USDA census data. Since the ARB Proposed Emission Methodology assumed no significant growth for layers, staff assumed that the layer population has been relatively constant since 2002. Based on ARB June 23, 2005 Public Hearing to Consider the Adoption of a Regulation Establishing a Definition of BACT, staff assumed that 62% of the layers are housed in large CAFs.

Staff obtained estimates of the number of broilers and turkeys in the SJVAB from the California Poultry Federation. Based on this information, staff determined the number of turkeys and broilers housed in large CAFs.

Table 10: Total 2005 Poultry Animals

	Total Animals	VOC Factor (lb/hd/yr) from Table 4	Total VOC Emissions (lb/yr)	Animal Included In Rule	VOC Factor (lb/hd/yr)	Total VOC from Animals Included in Rule (lb/yr)
Layers	11,717,799	0.050	585,890	7,265,035	0.050	363,252
Broilers	47,608,059	0.025	1,190,201	29,540,054	0.025	738,501
Turkeys	8,071,297	0.100	807,130	4,728,720	0.100	472,872
Total	67,397,155		2,583,221	41,533,809		1,574,625

Staff obtained an estimate of the number of rabbits, goats, sheet, and swine in the SJVAB from the USDA census data. Since ARB Proposed Emission Methodology assumed no significant growth for non-cattle, staff assumed that the non-cattle population has been relatively constant since 2002. Based on the District's permit database, staff found that approximately 90,000 swine are housed in large CAFs and no rabbits, goats, or sheep in the SJVAB are housed in large CAFs. This is illustrated in Table 11.

Table 11: Total 2005 Other Animals						
	Total Animals	VOC Factor (lb/hd/yr) from Table 4	Total VOC Emissions (lb/yr)	Animal Included In Rule	VOC Factor (lb/hd/yr)	Total VOC from Animals Included in Rule (lb/yr)
Rabbits	3,903	0.190	742	-	0.190	-
Goats	34,160	0.960	32,794	-	0.960	-
Sheep	273,800	0.960	262,848	-	0.960	-
Swine	158,536	4.600	729,266	90,000	4.600	414,000
Total	470,399		1,025,649	90,000		414,000

I. Industry Description

The SCAQMD's dairy rule includes all facilities with 50 cows of any type, but the average dairy in SJVAB is over twice the size of dairies in the SCAQMD. Furthermore, the majority of the dairies in the SCAQMD are scrape dairies, many of which transport their manure off the dairy and into the SJVAB. In 2003, according to the Santa Anna Regional Water Quality Board, over 157,400 tons of manure was shipped from the Chino Basin to the SJVAB. Many of the SJVAB dairies use a flush waste control system instead of scrape waste removal system. Furthermore, dairies in the SJVAB do not typically ship manure out of the Valley but efficiently reuse their manure and flush water on adjacent or nearby crops. Therefore, staff does not believe the SCAQMD dairy operations are comparable to the SJVAB dairy operations.

In terms of size of facilities, a significant number of CAFs would be below the proposed Rule 4570 applicability thresholds. Information from the California Poultry Federation, District's permit database, and CDFA estimates and surveys was used to identify all other facilities that would likely be required to implement practices that they do not already utilize. Please note that a significant number of CAF already utilize enough mitigation options listed in the rule to comply with the rule requirements. Staff estimated the number of swine facilities affected by using 2002 USDA census data. By subtracting the maximum and minimum number of swine in facilities with fewer than 1,000 head from the total number of swine in each county, staff estimated the number of swine facilities that would be affected. This is summarized in Table 12.

Table 12
Estimated Number of Facilities Affected by the Rule

Animal Type	Number of Large CAFs	Number of Facilities That Will Likely Be Implementing New Practices
Dairy	430	233
Beef Feedlots	<16	6
Other Cattle Operations	<16	5
Swine	1 to 3	1 to 3
Poultry	<61	0

J. Source Growth

Overall, the livestock inventory in the SJVAB increased between 2 and 6% per year over the last 12 years. A significant portion of this growth is due to increases in the number of milk cattle. According to the USDA 2002 Census data and California Department of Food and Agriculture (CDFA) Statistics Annual from 1998 and 2002, the inventory of milk cattle in the SJVAB increased over 30% from 1997 to 2002. Local county agricultural reports show that the inventory of milk cows increased 2 to 4% between 2002 and 2003. In contrast, USDA census data indicate relatively stable or decreasing populations of beef cattle, hog, layer and broiler chicken, turkey, ducks, and geese from 1997 to 2002. Based on CEQA projects submitted to the District, the inventory of dairy cattle in the SJVAB would increase over 25% in the next three years, if all the proposed projects were completed. Although it should be noted that some of the CEQA projects may not be completed. Therefore, staff assumed a conservative 4.5% growth for the dairy industry based on historical data from CDFA.

III. EMISSION CONTROL TECHNOLOGY

This section summarizes the requirements for control and the possible control techniques for reducing air emissions from CAFs. The information assembled was obtained through a review of available literature and research. The goal of the literature review was to identify possible controls. Some of these controls do not appear in the rule as mitigation measures or on any list due to a lack of scientific data regarding VOC reductions. However, they are identified in this report to provide owners/operators with ideas of some mitigation measures that have been proposed as potential mitigation measures and, with further information, may be approved as alternative mitigation measures.

A. Technology Requirements

Best Available Control Technology (BACT) as a New Source Review Requirement

With the changes to the CH&SC and the resulting loss of exemption from permitting of agricultural sources of air pollution (CH&SC 39011.5 (b)), **new or expanded** CAFs may now be required to undergo the BACT process as a requirement under New Source Review (NSR). District Rule 2201 (New and Modified Stationary Source Review Rule) implements state and federal requirements under Title I, Part D and requires BACT for new sources or sources undergoing modification with emission increases that are above the de minimis value (two (2) pounds per day of VOC). BACT provisions would apply to sources which are subject to District permitting requirements and that emit or may emit one or more affected pollutant, either as a "major" source subject to Title V permitting or as a source with actual emissions which are 50% or more of any major source thresholds.

Beginning July 1, 2004, large CAFs, as defined by the ARB, and CAFs with emissions that reach or exceed 50% of the major source threshold were required to obtain permits. The existing sources that apply and receive permits are not reviewed as "new" sources, but rather as sources with a "loss of exemption." This means that BACT is not required, but the source may be subject to emission reduction requirements under other local prohibitory rules, which are local rules other than permitting rules.

Best Available Retrofit Control Technology (BARCT) Requirement for Large CAF

As mentioned previously, CAFs defined as "large" by the ARB will be required by Proposed Rule 4570 to submit emission mitigation plans. The level of mitigation required by the CH&SC is BARCT. This term characterizes a standard of emissions control for **existing**, traditional sources. Under federal air pollution programs for traditional sources, different levels of control are expected of new sources (best available) and existing sources (reasonably available), with the understanding that there are more options available at a more reasonable cost when a source is being designed, than there are after it is built, especially if it was built a long time ago. California law established an intermediate level of control that is the "best available" for "retrofit" to existing sources, recognizing that the state's air pollution problems may demand more effective pollution control than what is usually considered "reasonably available." Local air districts have adopted many rules to implement BARCT, including particulate control efficiency standards and limitations on exhaust pollutants and technology-based requirements that dictate the use of a particular control device or something that is equally effective.

BACT vs. BARCT
As discussed above, the purposes of BACT and BARCT are different. BACT is designed to **minimize the growth** in future stationary source emissions; BARCT is

designed to **reduce** current stationary source emissions. BACT is utilized in the permitting process on a case-by-case basis. BARCT is considered for application on an industry-wide basis in the rule development process.

B. Feed and Silage Mitigation Measures

Feed According to National Research Council Guidelines

Dietary manipulation of feed formulations, a practice commonly used to improve animal health and productivity, has been shown to reduce VOC emissions from cow flatulence (enteric) and manure. Emission reductions of at least 10% for ammonia, hydrogen sulfide, and VOC were found (Klaunser, 1998 J Prod Agric). However, studies regarding efficiency of dietary manipulation to reduce VOC conflict. This may be due to variations in feed formulations. Staff is considering the National Research Council's (NRC) recommendations regarding the nutrient requirement for different animals as an appropriate feed formulation to minimize VOC emissions from cow flatulence (enteric) and manure, while ensuring that animal health is not jeopardized. The National Research Council considered environmental, animal productivity, animal health, and energy concerns in developing their guidance for nutrient requirements for animals. The guidance is located in the following publications:

- *Nutrient Requirements of Beef Cattle, 2000;*
- *Nutrient Requirements of Dairy Cattle, 2001;*
- *Nutrient Requirements of Goats: Angora, Dairy, and Meat Goats in Temperate & Tropical Countries, 199*1;
- *Nutrient Requirements of Horses, 1989;*
- *Nutrient Requirements of Poultry, 1994;*
- *Nutrient Requirements of Rabbits, 1977;*
- *Nutrient Requirements of Sheep, 1985;* and
- *Nutrient Requirements of Swine, 1998.*

As of May 19, 2005 these documents were available for purchase through links at: http://www.nap.edu/category.html?id=ag

Feeding Corn

In the Proceeding of the Symposium on the State of the Science: Animal and Waste Management Jan. 2005 S.L. Archibeque et al presented a presentation titled "Feeding High Moisture Corn Instead of Dry Rolled Corn Reduces Odor Production in Finishing Beef Cattle Manure Without Sacrificing Performance". This study found that cattle fed high moisture corn instead of dry rolled corn excreted less starch in their manure (starch ferments to form volatile fatty acids which are a volatile organic compound) and less volatile fatty acids in their manure. Additionally, in the Journal of Dairy Science 87:2546-2553 article "The Effect of Steam Flaked or Dry Ground Corn and Supplemental Phytic Acid on Nitrogen Partitioning in Lactating Cows and Ammonia

Emissions from Manure" by Burkholder et al found less starch in the manure of cattle fed steam flaked corn than dry ground corn.

Feed Removal

Research conducted by Dr. Chuck Schmidt at dairies within the SJVAB suggested significant emissions from feed in the feed lane. Therefore, regular cleaning of feed from all areas of the facility are considered control measures. This is because by limiting the quantity of time that the feed is onsite, one limits the quantity of time that the feed may emit VOC. Additionally, it minimizes the amount of moisture that comes in contact with the feed. Since the microorganisms that breakdown feed in a manner that releases VOC require moisture, by minimizing the moisture one can minimize the microorganism's activity and thus VOC emissions.

Weatherproof Storage and Covers for Silage and Grain

Covering silage and grain may minimize the amount of area exposed to the environment, thus the amount of area from which VOC in the silage can enter the atmosphere. There are various options for covering silage and grain. These include, but are not limited to, silos, tarps, and bags. There are several benefits of utilizing bags to store silage. Because of the low storage height, there is less danger of falls from elevations. Additionally, there is reduced spoiling of silage. However, some of the disadvantages include added cost of approximately $10 per ton of silage based on information found at the following website: http://bse.wisc.edu/hfht/tipsheets_html/silagebag.htm accessed 2/16/06. Covering silage and venting it to a VOC control device is considered beyond BARCT because it has not been achieved in practice at facilities in the United States, although some venders and researchers contend it is feasible. It would be a transfer of technology from the composting industry and require significant capital investment (over $100,000 for materials and installation at a facility with 1,000 cows).

Leachate Management

Leachate from the silage contains water-soluble VOC. By collecting this and sending it to a treatment system, such as an anaerobic digestion lagoon, the owner/operator minimizes the opportunity for the water in the leachate to evaporate and the VOC to be emitted into the atmosphere.

Eliminate Silage

Since fermenting processes, such as the process used to produce silage, emit VOC, substituting fermented feed (silage) for unfermented feed (grain) would reduce VOC emissions. However, due to feed availability and cost, this is considered extremely difficult for facilities to implement. This is primarily due to the Regional Water Quality Board requirements for land application of animal waste in a manner that minimizes or prevents nitrates and nitrites from entering ground water. One common method to do this is planting silage crops, which take in significant quantities of nitrogen, such as corn. Therefore, staff believes that implementing this measure would result in significant increase in waste treatment costs (over $100,000 for a facility with 1,000 cows), such as installation of a denitrification system for animal waste; purchase of additional land; or transport of animal waste offsite.

Swine and Poultry Options

Research at the University of Mississippi State University and the International Journal of Poultry Science 2(5):313-317, 2003 article titled "Reduction of Broiler House Malodor by Direct Feeding of a Lactobacilli Containing Probiotic" by Chang et al suggested that feeding broilers lactobacilli containing probiotic reduced VOC emissions from the broiler house. The District's most recent BACT analysis for broiler facilities noted that feeding the poultry lactobacilli containing probiotics likely reduces VOC emissions from poultry. Addition of enzymes, such as those from yucca and soybeans also may reduce VOC emissions by increasing the animal's absorption or digestion of nutrients thereby reducing the quantity of protein and volatile fatty acids excreted in the manure and litter.

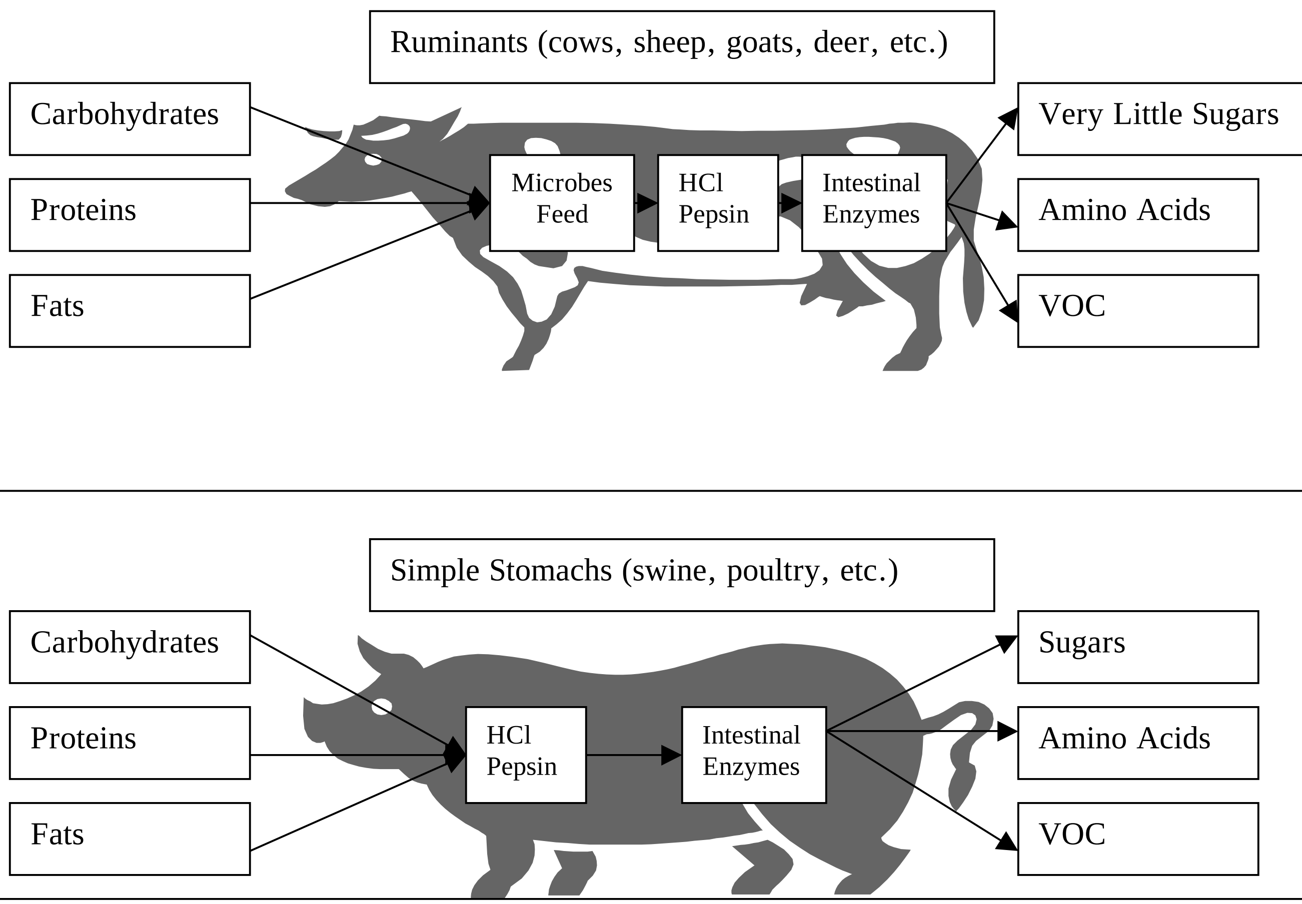
Information notes that poultry feed additives may be used to reduce the feed decomposition or oxidation in poultry feed, thus rate of VOC emissions.

Feed additives that improve digestion efficiency have been studied on swine and poultry already being fed according to NRC guidelines for protein and nitrogen. In swine, research at the University of Purdue demonstrated that the addition of 5% cellulose in feed formulation reduced VOC emissions by 11%. The study reported no adverse health effects from the addition of this quantity of cellulose (Sutton 1998). The study also noted reduction in VOC emissions with the addition of 10-ppm anthraquinone, and use of reduced protein diets with supplemented amino acids. In swine, the Journal of Animal Science 2003 Volume 81:1754-1763 article "Ammonia, volatile fatty acids, phenolics, and odor offensiveness in manure from growing pigs fed diets reduced in protein by Otto et. al; Purdue 1998 Swine Day Report titled "Addition of Carbohydrates to Low Crude Protein Pig Diets to Reduce Manure Nitrogen Excretion and Odors" by Sutton et al; and Purdue 2000 Swine Day Report titled "Reduction of Odorous Sulfide and Phenolic Compounds in Pig Manure Through Diet Modification" by Hankins et al found the following feed measures reduced volatile fatty acids in swine manure:

- Feeding probiotics;
- Feeding at least 5% cellulose in the diet;
- Feeding a casein based diet;
- Feeding an amino acid supplemented diet with 2% sucrose thermal oligosaccharide caramel;
- Feeding a diet with no more than 10% crude protein with supplemented lysine, threonine, tryptophan, and methionine; and
- Feeling animals 10 ppm anthraquinone.

Since swine and chickens have a different digestive system and nutrient requirements from cattle, poultry and other animals, staff was unable to determine whether or not these feeding strategies would reduce VOC emissions from other types of animals. See Figure 1 for a brief explanation of the difference between a ruminant (e.g. cow) stomach and a simple stomach (e.g. swine and chickens).

Figure 1: Ruminants versus Simple Stomach Animals



Source: Rumen Microbiology and Its Role in Ruminant Nutrition by Dr. James Russell.

However, owners/operators of non-swine operations may utilize these options for their operation if they satisfy the requirements for utilizing these as alternative mitigation measures.

Alternative Mitigation Measures

The following mitigation measures have been proposed and many are being researched as potential VOC mitigation measures. However, at the time of this report, there was insufficient data for staff to determine that the measures would result in volatile organic compound (VOC) emission reductions and not cause harm to animals. Stakeholders may utilize these methods to comply with rule requirements if they could demonstrate, to the satisfaction of the ARB, APCO, and EPA that the measure achieves VOC reductions that are equal to or exceed the reductions that would be achieved by other mitigation measures listed in the rule that the owner/operator could have chosen.

1. Manage silage piles in a manner that minimizes exposed surface area (this was removed from the list because staff was unable to locate appropriate standards for these practices);
2. Feeding high moisture or steam flaked corn instead of dry corn to swine;
3. Feeding high moisture feeds other than corn, instead of dry feed;
4. Feeding a diet containing probiotics to animals other than swine and poultry;
5. Feeding a diet supplemented with amino acids to animals other than swine and poultry;
6. Feeding a diet containing at least 5% cellulose to animals other than swine;
7. Feeding a casein based diet to animals other than swine;
8. Feeding an amino acid diet supplemented with sucrose thermal oligosaccharide caramel to animals other than swine;
9. Feeding a diet with no more than 10% crude protein to animals other than swine;
10. Feeding a diet containing 10 ppm anthraquinone to animals other than swine;
11. Feeding feed additives that reduce feed decomposition for animals other than poultry;
11. Feeding a diet containing liquid instead of solid feed;
12. Feeding a manure acidifier;
13. Feeding high moisture or steam flaked corn to swine;
14. Only feeding silage that has a particle size of 10 to 20 mm;
15. Feeding high moisture grain;
16. Feeding animals elephant grass (also known as Napier grass and Pennisetum) instead of alfalfa hay;
17. Feeding animals bicarbonate;
18. Feeding animals forage instead of grain;
19. Supplementing animal diet with ruminally undegradable fiber;
20. Feeding a diet containing canola meal;
21. Feeding a diet containing sunflower seed;
22. Using silage additives such as sodium diacetate;
23. Using AIV silage;
24. Feeding a non-fiber carbohydrate supply to animals; and
25. Feeding a diet containing supplemental fats.

C. Housing/Animal Waste Mitigation Measures

Rapid Drying, Rapid Removal of Manure, and Moisture Minimization

In housing (including freestalls, pens, corrals, milk parlors, etc) moist conditions lead to anaerobic decomposition of manure. Suppression of emissions of reduced gaseous compounds can be achieved by faster drying of animal waste, minimization of moisture, and increased removal frequency. Increased removal frequency reduces anaerobic decomposition by reducing the amount of manure not exposed to the surface and oxygen; minimizing the moisture in the manure and feed thus minimizes the moisture needed by the microbes that decompose the manure to form VOC; and moving manure and feed from areas with minimal controls to areas with significant controls (such as a treatment lagoon) reduces the quantity of uncontrolled manure and feed emissions.

Elimination of Liquid Manure Handling

Poultry excrete a white solid called uric acid. Ammonia and VOC are emitted as the uric acid breaks down. The microbes needed to degrade the protein in the uric acid require moisture; therefore, moisture reduction is a significant means of reducing uric acid breakdown and thus ammonia and VOC emissions. Hatfield noted that VOC emissions are negligible at poultry scrape facilities, but significant at facilities with liquid handling systems. Therefore, using a solid litter handling system exclusively is considered a control measure.

In most other animals, significant VOC are emitted when the urease in urine mixes with solid excretion. Moisture facilitates this mixing process. The microbes that break down the waste require moisture, thus drying the waste and employing moisture minimization processes minimize the activity of these microbes. Several studies have found that volatile fatty acid emissions from manure increase with moisture. Koziel et al stated in their paper, “Measurements of Volatile Fatty Acids Flux from Cattle Pens in Texas, "[m]easured flux was proportional to manure pH and moisture content" (Texas A&M University Paper #04-A-646-AWMAA). In the paper titled "Strategies to Reduce Manure Emissions," McGinn stated that "[a]dding more than 20 mm of water to manure increased volatile fatty acids emissions over a four-day period. Therefore, solely utilizing a solid manure handling method for housing would reduce VOC.

Non-manure Based Bedding

As mentioned previously, manure breaks down in the presence of moisture to emit VOC. Housing tends to have high humidity and moisture due to misters, animal urination, and animal respiration. By using non-manure based bedding you are minimizing the amount of manure products present in the housing that have the potential to emit VOC. Some types of non-manure based bedding are rice straw, almond hulls, cow waterbeds, and cow mats. Furthermore, you limit the size of separated solid stockpiles, which emit VOC, on the facilities since in non-manure based bedding only a minimal quantity of separated solids is necessary.

Housing Animals in Buildings

One alternative would be to enclose the animal housing and vent the exhausted air to a secondary control device such as a biofilter. Plastic "curtains" similar to those used in poultry houses, in addition to traditional wall material, have been used for enclosures vented to biofilters. Since all the animal waste and enteric emissions in the house would be controlled by venting the exhaust air through a biofilter, management practices requirements including, but not limited to, dietary manipulation, animal waste removal frequency, and animal waste additives may not be necessary to ensure VOC reductions. It may allow owner/operator more flexibility in managing their animals and their manure/litter. It may also result in fewer monitoring, recording, and testing requirements, since management practices inside the building may not be regulated. This option alone may achieve highest VOC reductions of all the management practices proposed combined.

Furthermore, enclosing animals in buildings and venting the buildings to a biofilter may have benefits beyond air emissions. Depending on the ventilation rate through the house animals may breathe fresher and cleaner air since air may be cycled through the enclosure at a faster rate than it would be in a free stall or other housing with minimal or no mechanical ventilation. Dr. Terry Smith at Mississippi State University housed lactating Holsteins in a tunnel ventilated barn with misters and evaporative coolers and found an 1.8-2.7 kg/hd/day increase in milk production and 81% decrease in heat stress occurrences compared to animals housed in free stalls with fans and misters. Additionally, Hauls Dairy in Montana, a 1,100 head facility, found that, by enclosing their milkers, they increased their milk production; decreased their calving interval by over a month; reduced the number of cattle with symptoms of heat stress; and reduced odor at the facility. However, Hauls did note that adequate ventilation is crucial to protecting animal health in the building.

Operations, such as poultry and swine, already typically house animals in enclosures with mechanical ventilation. Therefore, to utilize this control, such facilities would only need to install a VOC control system and increase ventilation rates. Nicolai Pork in Hector, Minnesota; University of Minnesota swine facility and University of North Carolina swine facilities used barn(s) vented to biofilters, which achieve capture and control efficiencies of approximately 80% (this is why an 80% capture and control efficiency was used in the VOC control options). SRC in Urbana-Champaign, Illinois vent their swine-finishing house to a wet scrubber to reduce dust and VOC.

The University of Minnesota Extension publication number BAEU-18 dated March 2004 provides guidance for ventilation rates for dairy cows, chickens, turkeys, and swine housed in buildings. Additionally, it provides guidance for venting the building to a biofilter and configuring the biofilter. Cornell University Dairy Facilities Engineering

Program has an interactive program to assist in designing and estimating the cost of a tunnel ventilated dairy barn. Please refer to the following website for further information: www.prodairyfacilities.cornell.edu/TunnelVent/Final_Report.aspx

However, this would be considered beyond BACT due to the high cost and the fact that it has not been achieve in practices at facilities similar in size to those defined as large CAFs by the ARB.

Thymol

Thymol is plant oil derived from thyme. This compound was tested by Vincent Varel of the United States Department of Agriculture, Agricultural Research Service. This was applied to the ground at cattle feedlots and swine housing. In multiple studies, thymol showed a reduction in volatile fatty acid (VFA) emissions from manure. Thymol causes the pH of the manure to drop more rapidly, further inhibiting microbial activity and air emissions. In addition to reducing VFA emissions over 50%, it also reduced fecal coliform content in the waste. However, these results were from studies conducted for short period (less than a month) therefore additional data is required to determine the long-term effects of these oils.

Due to the fact it has not been used at facilities similar in size to that defined as large CAFs by the ARB and is very expensive, staff considered this mitigation measure beyond BARCT.

Lime

Lime has been used by several facilities to minimize moisture. However, it is extremely costly and in many cases not feasible due to soil quality and water quality issues. Therefore, it is considered beyond BARCT.

Vacuum Animal Waste and Apply Directly to the Land

While this would minimize emissions by minimizing the moisture in manure and the time that it is stored in an uncontrolled manner, it is considered beyond BARCT due to the high capital costs of vacuum trucks.

Use Shade Structures Designed to NRCS Standards

This would minimize moisture, thus anaerobic decomposition of manure under the shade structures. It would also minimize animal movement, thus the surface area over which manure is excreted and VOC emitted. However, this option is extremely costly, thus considered beyond BARCT.

Alternative Mitigation Measures

The following mitigation measures have been proposed and many are being researched as potential VOC mitigation measures. However, at the time of this report, there was insufficient data for staff to determine that the measures would result in volatile organic compound (VOC) emission reductions and not cause harm to animals. Stakeholders may utilize these methods to comply with rule requirements if they demonstrate, to the satisfaction of the ARB, APCO, and EPA, that the measure achieves VOC reductions that are equal to or exceed the reductions that would be achieved by other mitigation measures listed in the rule that the owner/operator could have chosen.

1. Acidification of manure;
2. Use of manure additives not listed in Proposed Rule 4570;
3. Use of potassium permanganate in manure piles or corral;
4. Use fresh water to clean the freestalls;
5. Use low biochemical oxygen demand water to clean the freestalls;
6. Use environmentally safe cleaning on degreasing products on dairy manure;
7. Pave feedlanes at least 8 feet on the corral side of the fence; and
8. Use of eugenol (may have water quality issues).

D. Solid Manure Handling

Cover or Eliminate Solid Manure Piles During the Wet Season

As noted above, wet manure promotes anaerobic decomposition, which emits significant VOC. Therefore, practices, such as covering piles that minimize exposure to moisture also minimize VOC emissions.

Compost

Current research suggests that aerated static piles (ASPs), in-vessel technology, and within vessel technology (i.e. Ag Bag) with the captured air vented to a secondary control may reduce VOC emissions from the pile by 23-95%. Preliminary data from Schmidt/Card's 2004 ARB Research Symposium presentation suggests that solid storage may account for approximately three (3) percent on the emissions at a facility. Based on this estimate ASPs, in-vessel, and within vessel technologies may reduce emission on a facility by approximately 0.69%-2.85%.

In ASP composting, manure is mixed with other material and formed into piles that are mechanically aerated. There are two common methods of aeration- either the compost pile is formed over a concrete floor with built-in vents to force air through the compost or the pile is formed around pipes attached to a blower that forces air through the pile. Both in-vessel and within vessel systems enclose the compost mix in a bag, vessel, or structure and mechanically aerates the mixture. In all the systems, the captured air is vented to a secondary control device, a device to further reduce VOC emissions, such as a biofilter.

It should be noted that the California Integrated Waste Management Board regulations, including but not limited to California Code of Regulations (CCR) Title 14, Division 7, Chapter 3.1, Articles 1-4, may limit the materials that may be use for composting and/or place additional requirements on the facility depending on the type of material used in composting; origin of material used in composting, quantity of material used; and quantity of compost given away or sold annually.

This is extremely costly and not achieved in practice at large CAFs, thus considered beyond BARCT.

Solid Waste Digesters

Anaerobic digestion has been used on swine and dairy operations for solid and liquid waste handling. Limited preliminary research suggests that when the gas is captured and vented to a secondary control, up to 90% control efficiency of VOC emissions from the waste can be achieved from these technologies. However, these are extremely costly and producers note that they require significant technical skill to operate, thus considered beyond BARCT.

Alternative Mitigation Measures

The following mitigation measures have been proposed and many are being researched as potential VOC mitigation measures. However, at the time of this report, there was insufficient data for staff to determine that the measures would result in volatile organic compound (VOC) emission reductions and not cause harm to animals. Stakeholders may utilize these methods to comply with rule requirements if they demonstrate, to the satisfaction of the ARB, APCO, and EPA, that the measure achieves VOC reductions that are equal to or exceed the reductions that would be achieved by other mitigation measures listed in the rule that the owner/operator could have chosen.

1. Thermal Conversion (Including Combustion and Gasification
   Technologies that burn waste to produce energy or treat waste to produce fuels are classified as "thermal conversion": and include direct combustion (burning with excess air to produce heat), pyrolysis (thermal treatment in the absence of air, resulting in the production of pyrolysis oil and low BTU gas), gasification (thermal treatment at higher temperatures in an oxygen-restricted environment to produce a low to medium BTU gas), and hydrothermal liquefaction (thermal conversion of solids in a liquid stream to oils and char for separation and use as fuel). Many existing thermal conversion technologies are not suitable for raw dairy manure due to the high-energy costs to dry the manure to an acceptable moisture level. Additionally thermal conversion has the potential to create air

emissions, although there are methods of controlling these air emissions. The University of Southern Illinois is testing this potential control option.

2. Windrow Composting with Management Practices
Some stakeholders have suggesting management practices such as controlling the moisture content, carbon to nitrogen content, and porosity of compost piles to minimize VOC emissions from compost piles. As of the date of this report staff was not able to find significant information specifying the appropriate parameters for these measures and demonstrating that these measures would result in VOC emission reductions

E. Solid Separators

Solid separators may be used to reduce loading of the lagoon, extract separated solids for composting and/or bedding, and serve other purposes on the facility. There are two categories of solid separation systems-- source separation systems and delayed separation systems. While solid separation can occur at any point during manure handling and treatment processes, the separation methods used closest to the point of origin (source separation systems) are significantly different than the methods used after the manure has been diluted or stored.

Belt separation is one the most common types of source separation. Conveyor belts are placed beneath the animals, typically under a slatted floor. The belt is concave or positioned at an angle allowing the urine to flow into a gutter and away from the solids dropping onto the belt. The liquids flow down the gutter by gravity and into a collection tank. The manure solids are scraped off the belt and into a separation collection area. Belt systems have been used in poultry operations for about 30 years (van Kempen, 2003), have a life expectancy of eight to ten years, and require minimal maintenance. They have also been used routinely in swine facilities.

The alternative to source separation is delayed separation, separation after the urine and fecal matter have been mixed or diluted with flush water. Gravity, mechanical, and chemical are the main types of solid separation.

Gravity separation, also called passive separation, uses the natural downward force of gravity to separate the liquid from the solids. Solids denser than the liquid settle to the bottom and solids lighter than the liquid form a crust on the top. Liquid is removed by pipes between these two regions or by overflow where the liquid, when it reaches a certain height, simply flows over a small dam into another basin. Gravity systems can be settling channels, settling basins, or settling ponds. All of these systems require additional storage for the separated liquid, as well as periodic removal of the settled solids. Current research suggests a solid removal efficiency of 7% to 65% depending on factors such as the initial quantity of solids in the waste and the retention time.

An alternative to gravity separation is mechanical separation. This relies on a combination of moving parts and gravity to separate manure solids from the waste stream, mostly utilizing the size of the solid particles to achieve separation. While mechanical processes can achieve separation faster than gravity processes, there are tradeoffs, for example, the expense of the power to drive the machinery and the maintenance required of moving gears.

Mechanical systems include sloping stationary screens, vibrating screens, screw presses, drag chain separators, roller presses, and centrifuges. A sloping stationary screen is the most common method of mechanical solid separation. The slurry is deposited at the top edge of the sloping fabric screen where the screen is virtually vertical. As the slurry moves down the slope, free liquid flows through the perforations. The relationship between efficiency and mesh size is inverse. Vibrating screen systems are the second most common mechanical method for solid separation. They are similar to the sloping screen, except they vibrate to keep the perforations clear and shake solids off the edge of the screen. A different mechanical system is the screw press. The slurry enters a hopper, and then the screw press, which consists of a screw auger rotating inside of a cylindrical perforated screen. The slurry is put under pressure by the auger as it moves toward the discharge end. Adjusting a counterweight at the discharge end of the system can alter the efficiency of solid separation. Another system is the drag chain system. The slurry is applied to a perforated screen. Free liquid flows through the perforations and into a collection basin. Chains equipped with paddles pass over the surface of the screen. Variations in solid content affect the efficiency of this method. The roller press system consists of a roller press containing a rotating perforated drum and one or more rollers. First, the slurry enters the drum where free liquids pass through the perforations, and the slurry moves to the end of the drum. As the slurry moves under the rollers, more liquid is squeezed out. Solids are scrapped off the drum and roller apparatus and into a storage container. Another method is a centrifuge where the centrifuge rapidly spins the slurry, pulling the liquids to the outside through perforations. The solids remain on the inside wall of the perforated drum.

There are varying opinions regarding the typical percent solid removal from different types of solid separators as shown in Table 13.

Table 13 Estimates of Solid Removal with Mechanical Separation Methods	
Percent Removal	**Source**
10%-98%	Separating Fact from Fiction, Alan Newport, Hay and Forage Grower, Sept. 2004.
15%-65%	Iowa State University, Selection and Performance of mechanical Solid-Liquid Separators, Robert T. Burns, rburns@iastate.edu.
17%-60%	University of Tenn., Performance Testing of Screw-Press Solid Separators, Robert Burns and Lara Moody, P.O Box 1071, Knoxville, TN 37901-1071.
30%-40%	University of Ill. at Urbana-Champaign, Swine Odor Waste Management Paper 4, 2005.
50%-70%	Miner 2002.

Several factors including the size of the separation screen (which typically range from 0.010-0.150 inch and may be as small as 0.007 inches or as large as 0.025 inches); and initial solid concentration of the manure can affect the solid removal efficiency

F. Liquid Manure Mitigation Measures

Volatile organic compounds (VOC) are formed as intermediate metabolites in the degradation of organic material in manure and litter. Under aerobic conditions, any VOC formed are rapidly oxidized to carbon dioxide and water. Under anaerobic conditions, complex organic compounds are degraded microbially to volatile organic acids and other volatile organic compounds, which in turn are converted to methane and carbon dioxide by methanogenic bacteria. When the activity of the methanogenic bacteria is not inhibited, virtually all of the VOC are metabolized to simpler compounds and the potential for VOC emissions is nominal. However, inhibition of methane formation results in a buildup of VOC in the manure and ultimate volatilization to the air. Loading more solids in the liquid storage system than the system can handle causes this. VOC emissions will be minimal from a properly designed and operated stabilization process such as anaerobic lagoons. However, VOC emissions will be higher from storage tanks, ponds, overloaded anaerobic lagoons, and land application sites. (EPA 2001)

<u>Minimize Animal Excretions in Lagoons (only stormwater, boiler blowdown, etc.)</u>

By limiting the lagoon to wastewater not from freestall flushing, the organic loading and thus VOC emissions from the lagoon will be less.

<u>Phototrophic Lagoon</u>

In Zahn et al's 2001 study, lagoons with Bacteriochlorophyll A concentrations above 40 nmol mL^{-1}, phototrophic lagoons, showed lower emissions of VOC than other swine management systems. Overall, a lagoon with a phototrophic lagoon had 80% to 90% less VOC emissions per head on the average than a lagoon that was not phototrophic (Zahn 2001). Reductions of 80% to 93% of VOC were also observed in phototrophic swine lagoons following a photosynthetic bloom according Do 2003.

Lagoons Designed In Accordance with USDA/NRCS Recommendations

The USDA NRCS Agricultural Waste Management Field Handbook offers guidance on building and designing anaerobic and aerobic lagoons. In general, lagoons that meet the guidance parameters are expected to have lower VOC emissions than lagoons with smaller dimensions, lower dissolved oxygen content, or higher loading. In general, aerobic lagoons are shallow, 2-5 feet deep and loaded so that the dissolved oxygen concentration is approximately double the biological oxygen demand. Anaerobic lagoons tend to be sized so that there is sufficient water to dilute the animal waste entering the lagoon such that there is no more than 11 pounds of volatile solids per 1,000 feet^3 per day entering the lagoon. If the lagoon does not have sufficient volume to accept all the waste sent to the lagoon and not exceed 11 pounds of volatile solids per 1,000 ft^3 per day limit, pretreatment of liquids entering the lagoon may be used. This pretreatment may be solid separation. The solids separated from the liquid would be handled similar to other solids on the facility and the liquid, with less volatile solids, would be sent to the lagoon.

Lagoon pH

The solubility of VOC is pH dependant, thus measures to maintain the pH within the range that maximizes VOC solubility would minimize VOC emissions.

Complete Aeration/Aerobic Lagoons

In this system, sufficient concentration of dissolved oxygen is maintained to enable aerobic digestion to occur. Aerobic digestion is the decomposition of organic compounds by microbes in an oxygen-rich environment. The microbes reduce the organic compounds in the waste to carbon dioxide, water, nitrates, sulfates, and biomass (sludge). According to Dr. Ruihong Zhang of UC Davis, complete aeration can be achieved with dissolved oxygen concentrations of greater than 2.0 mg/L. However, this has not been achieved in practice at CAFs in the SJVAB and consumes significant energy, thus is considered beyond BARCT.

Lagoon Loading

This measure would minimize VOC by promoting phototrophic conditions, however is considered beyond BARCT due to the fact CAFs typically do not measure these parameters, thus may need extensive training to understand and maintain these parameters.

Use Non-standard Equipment or Chemical Additives with the Solid Separator

This method requires extensive capital expense and is typically beyond what is utilized at CAFs, therefore considered beyond BARCT.

Covered Lagoon with Gas Vented to a Control Device

Covers may be used to capture the gas produced by reactions in the lagoon and send the gas to a secondary VOC control device, which includes, but is not limited to an anaerobic digester generating electricity. Storage covers need to be acceptable by local mosquito abatement district regulations. These vary from district to district, but in general, districts require that the cover not be liquid permeable and completely cover the lagoon with no gaps that would allow mosquito access to the liquid or be removable so that mosquito abatement personnel can treat the lagoon if needed. There are two main storage cover designs: bank-to-bank and balloon.

Bank-to-bank covers extend across the entire span of the storage facility. The edges are buried in trenches around the perimeter of the pond, pit, basin, channel, or lagoon. Bank-to-bank covers are continuous with the ground surface or extend only slightly above the ground. The design should include floatation devices to keep the cover from sinking into the manure. Water pumping equipment may be required to keep the cover free of standing water. This design can create an anaerobic environment, depending on the specific design and materials used.

A variation of the bank-to-bank cover design is the balloon cover. These are essentially fabric pulled over the surface of the storage facility and kept aloft with fans and blowers. The fans and blowers create air pressure to inflate the cover. Pre-cast concrete posts or stainless steel poles may be used as supports for the cover. A matrix of ropes placed on the manure may also be used to keep the cover from sinking into the manure in case of a power loss. These covers are typically not appropriate for creating anaerobic conditions since air is pumped into the headspace above the manure. Once again, the edges of the cover are buried in trenches around the perimeter of the lagoon. There are various materials that may be used for covers including, but not limited to hypalon 45, polyvinyl chloride (PVC), PVC coated with acrylic or hypalon, estane polyurethane, polyethylene, and others.

However, this requires capital expenses beyond what is considered BARCT.

Alternative Mitigation Measures:

The following mitigation measures have been proposed and many are being researched as potential VOC mitigation measures. However, at the time of this report, there was insufficient data for staff to determine that the measures would result in volatile organic compound (VOC) emission reductions and not cause harm to animals. Stakeholders may utilize these methods to comply with rule requirements if they demonstrate, to the satisfaction of the ARB, APCO, and EPA, that the measure achieves VOC reductions that are equal to or exceed the reductions that would be achieved by other mitigation measures listed in the rule that the owner/operator could choose.

1. Chemical Oxidation
   Chemical oxidants can be applied in liquid form to liquid manure systems to oxidize VOC. Agents such as potassium permanganate and hydrogen peroxide may be applied to the system, at the surface, to reduce emissions. However, a large amount of these types of additives is typically required due to the high organic matter content of animal manure. The emission reductions achieved by these additives also appears to be short term, requiring frequent applications to consistently reduce gaseous emissions. There are several venders of these chemical oxidants and these chemicals have been utilized on swine and dairy facilities, however, due to the cost and other concerns, their use is not widespread.

2. Ozonation
   Ozone has been used to reduce gaseous emissions from manure slurries by bubbling or diffusing it through dairy slurry. However, ozone must be produced on-site, which requires costly generation and application systems.

3. Microaerobic Biological Nutrient Management Practice
   In this system, waste products are collected and mixed with water. The mixture is pumped through a contact chamber and then a coarse solid separator. The clarified liquid fraction containing dissolved solids, suspended solids, and a suspension of microbial cells flows to the next unit process in the treatment systems, the bioreactor. The liquid then passes through anaerobic and anoxic zones. According to technology venders, the majority of the VOC and VOC precursors are metabolized and incorporated into microbial biomass. Based on the Final Dairy Permitting Advisory Groups (DPAG) Report this has a control efficiency of approximately 79% for the emissions from liquid manure handling and approximately 52% for emissions from land application. The District has reviewed the provided information about this technology and it appears that it has the potential of reducing VOC emissions. Additional information, such as that specified in the Final DPAG Report, will be required to fully evaluate such a system. CAF owners/operators would include the additional information should they wish to propose such systems as alternative mitigation measures under Section 5.0 of Rule 4570.

4. Microbial Lagoon Additives
   In this method a mixture of microbes and, in some cases, nutrients and/or media are added to the lagoons on a routine basis. Venders suggest that this technology reduces VOC emissions, manure sludge buildup, odors, preserves nutrients, reduces nitrates, reduces ammonia emissions, reduces flies, and many other things. It has been used at numerous dairy and poultry facilities, however

there is not sufficient data available to determine the effect of this technology on VOC emissions.

5. Aquatic Cropping
   In this option alga is grown in engineered ponds, raceways, or lagoons. Some suggest that the algae incorporate nitrogen, phosphorus, and VOC precursors into their biomass. The algae could then be harvested and used as a slow release fertilize; protein feed; component in make-up production; or other use.

6. Natural Crust Manure Storage Cover
   A manure crust typically forms if large amounts of solids are added to a liquid manure storage unit. Some believe that the crust serves as a biological cover that would reduce VOC emissions. Others believe that by increasing solid loading to form this crust one would increase VOC emissions.

7. Elimination of Processing Pit
   Some believe that the processing pit is an additional emission unit that causes increase VOC emissions. They note that the manure in this pit is not treated; the pit has solids levels above 1%; in some cases the pit is stirred; and the solids have a potential of settling and forming anaerobic conditions—all of which could lead to increased VOC emissions. Others believe that the processing pit is not an additional emission unit and explain it as simply an expanded use of the pump pit for the solid separator.

8. Wet Combustion System
   This process involves adding oxygen and bacteria. The technology introduces oxygen into pond systems with the intent of raising the oxygen levels. Bacterial is introduced on a daily basis.

9. Reciprocating Water Technology
   In this process, organic matter is oxidized and nitrogen is removed via biological nitrification and denitrification.

10. Rotating Biological Contactor
    In this process, a fixed film of microorganisms rotates, much like a water wheel, in and out of an effluent stream thereby exposing the attached biofilm to alternating aerobic and anaerobic conditions. Organic compounds are oxidized.

G. Crop Application

Land Application

Current research suggests that the majority of emissions emitted during land application of manure are emitted during the first 24 hours. Therefore, rapid land incorporation, whenever feasible is considered a control measure. This includes rapid incorporation of waste into the soil by tilling, injection, and other methods. This type control method, based on SCAQMD PR1127 Staff Report has a control efficiency of approximately 23%. Furthermore, by only applying waste with minimal biological activity, either waste that has already by treated or with low moisture content, VOC emitted by biological degradation of manure is minimized.

Land application at an agronomic rate can be a cost-effective and sustainable practice that can build soil tilth, increase the water holding capacity of the soil, and provide essential nutrients for plant growth. The land application options are designed to provide and ensure maximum rule flexibility and allow land application of animal waste. Nothing in the rule places minimal or maximum limits on the quantity of manure applied to the land. Furthermore, the owners/operators have the opportunity to choose when to land apply waste, either by timing of animal housing removal or only applying waste that has been treated or with dried.

It is understood that a balance between manure incorporation and conservation tilling must be struck-- incorporation disturbs the soil surface and reduces plant residue cover, which can lead to erosion. Therefore, tilling options may not be feasible for all facilities. It is further understood that these measures are not always feasible, for example once crops grow a certain height the use of injection equipment may cause crop damage-- therefore injection methods are not to be used at these times. Additionally, in wet weather the vehicles used to transport the manure could become stuck in the fields, thus at some times weather may cause this option to be infeasible. In such cases, farmers would likely choose the following mitigation measures:

- Only apply liquid manure at a rate that it is absorbed into the soil, thus no tilling would be required;
- Not apply liquid manure;
- Only apply solid manure with moisture content less than 50%, thus no tilling would be required; or
- Not apply solid manure.

Surface applied solid and slurry type manure may be incorporated into the soil by either disking or plowing. Liquid manure may also be injected using a mobile injection device attached to a tank. Incorporation is expected to reduce VOC emissions because the soil is expected to trap the VOC below the surface and act a biofilter scrubbing and absorbing a significant portion of the VOC before they are able to escape into the atmosphere.

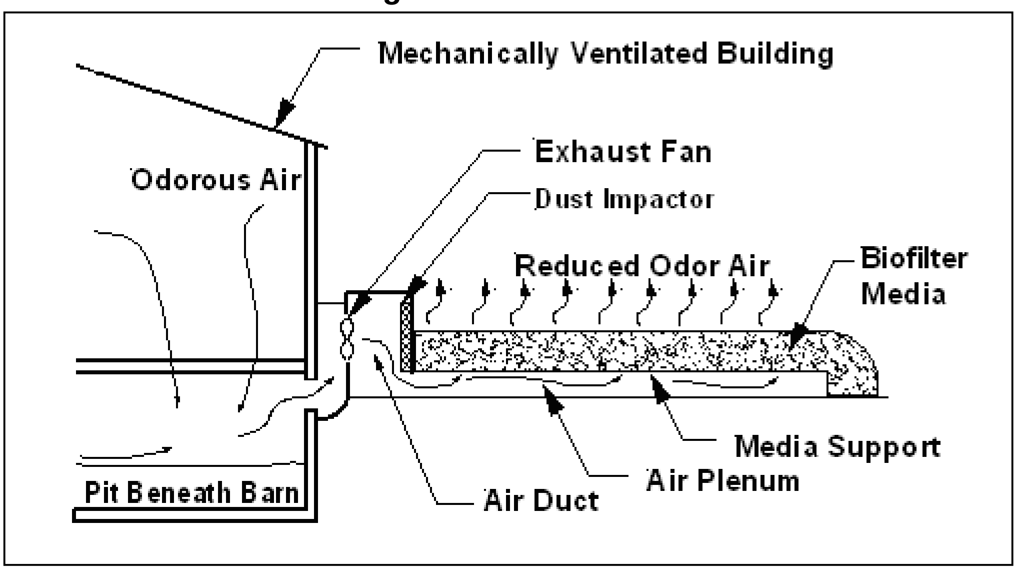
H. Secondary Controls

A secondary control is a device where air is exhausted to a control to further remove VOC from the air stream. Air from composting, digesters, enclosures, and covered lagoons, as discussed previously in this staff report, may be vented to a secondary control device including, but not limited to, biofilters and wet scrubbers. These systems have routinely been used in the swine industry and as well as some poultry and dairy facilities. Most of these biofilters were designed for ammonia or odor control rather than for VOC control.

Biofilter

A biofilter is a control technology that uses microorganisms to treat air emissions. They have been used at poultry, swine, and dairies (mostly in colder regions where the cows are housed in barns), to control air contaminants, however there may be negative animal health issues related to the use of biofilters. A biofilter is simply a layer of organic material, referred to as biofilter media, that supports a microbial population. Mechanical and/or natural ventilation pushes air through ducts into the air plenum; empty space underneath the biofilter. A fan then pushes the air up through the biofilter material. In the media, microbes convert VOC to carbon dioxide and water. Figure 2 below depicts an open-faced biofilter system for a swine house.

Figure 2 Biofilter



Biofilter designs are based on the volumetric flow rate of the air to be treated, air contaminants to be treated and the concentrations, media characteristics, biofilter size (area) constraints, moisture control, maintenance, and cost. These parameters all play a role in either the efficient cleaning of airstreams or in the economic operation of the biofilter. The ventilation rate required is dependent on temperature and the type, size, and number of animals in the building. Ventilation design procedures can be found in the University of Minnesota Extension Publication MWPS-32, Ventilation Systems for Livestock House. Some building ventilation rates are shown in Table 14.

Table 14
Typical Building Airflow Requirements

Facility Type	Airflow Requirements (cubic feet per minute per animal space for warm weather)
Swine Nursery	35
Swine Finishing	120
Swine Gestation	150
Swine Farrowing	500
Broiler or Layer (5 lb live weight)	5
Turkey (40 lb)	32
Dairy Cow (1,400 lb)	470
Covered Manure Storage (per square foot of surface area)	0.1

(Source: Schmidt 2004)

Biofilters treating air from a manure storage unit may treat a smaller volume of air than animal housing, but the air will have a higher concentration of odorous gases. Typical airflow rates from a covered manure storage unit are 0.01 cfm per square foot of surface area.

Media selection is another critical element because, for a biofilter to operate efficiently, the media must provide a suitable environment for microbial growth (including appropriate pH and temperature) and maintain a high porosity to allow air to flow easy. A proven organic media mixture for animal agriculture biofilters ranges from approximately 30:70 to 50:50 ratio by weight of compost and wood chips or wood shreds. The wood provides the porosity and structure while the compost provides microorganisms, nutrients, and moisture holding capacity.

The life of the media is typically at least three years and likely five years or longer. During this time, the media decomposes and becomes denser, which reduces the porosity (air space in the media) and increases the pressure or force needed to move the air through the biofilter media. This force is measured as the static pressure drop. A static pressure drop of over 50% of the design pressure, the pressure upon initial start-up, across the biofilter indicates the need to replace the media. (Schmidt 2004)

Ductwork and plenum construction are another critical component of a biofilter. Ducting must be constructed to move the air from the fans to the plenum of the biofilter. The ducts and plenum should be designed to keep the air velocity between 600 and 1,000 feet per minute. (Schmidt 2004)

Moisture control is also essential. Inadequate moisture can allow the media to dry out, deactivating the microbes and creating cracks and channeling of air, which results in a reduction of filter efficiency. Too much moisture can plug some of the pore in the media, causing channeling and limiting oxygen flow in saturated areas of the filter, thereby creating anaerobic zones in the biofilm. Recommended moisture content for biofilters range from 40-65% wet basis with optimum moisture content of 50% (Schmidt 2004.)

Finally, good weed prevention and rodent control are essential. Weed growth on the biofilter surface can reduce the treatment efficiency by causing air channeling and limiting oxygen exchange. Roots also contribute to plugging of biofilter pores inhibiting the flow of air through the media. Rodents, such as mice, rats, rabbits, woodchucks, and badgers, burrow through the warm media during the cold winter months causing channeling problems. Channeling, as previously mentioned, reduces the biofilter efficiency by providing a means of air escaping the biofilter without completely filtering through the media and being completely treated by the microbes.

Gas Absorption

In a gas absorber, building air is collected and passed though an enclosed (typically packed) tower with the absorption media flowing counter-current to the incoming air stream. Gases in the air stream diffuse into and are absorbed by the media. Although water is used as the scrubbing media in many applications, the absorption of gases can be enhanced using chemical reactions between target gases and the absorbing media, such as using caustic solution to remove acidic gases. Some negative impacts associated with this option are the emissions from the generation of the electricity needed to convey air to the scrubber and disposal of the absorbing media. It has been used in a study at the University of Minnesota, however staff was unable to find commercial CAFs utilizing this technology to reduce VOC.

Bioscrubber

The concept behind a bioscrubber is similar to that of biofiltration with the exception of the microorganisms, which are housed in an enclosed packed tower with water circulated counter-current to the incoming building air, instead of in a filter bed. As contaminated air is passed through the scrubber, water-soluble compounds are absorbed by the water and oxidized microbially. Some scrubber designs contain a vessel that is used as a biological reactor. Effluent from the scrubber is routed to the vessel where additional retention time is provided for microbial oxidation. No information was found in the literature review regarding the ultimate disposal of the effluent from bioscrubbers. However, it is likely that this effluent could be land applied. Periodically the filter media must be replaced due to decomposition and compaction. These have been utilized at swine operations with a reduction of over 80%, however they are not common at commercial operations.

IV. MONITORING AND MEASUREMENT REQUIREMENTS (MMR)

The monitoring and measurement requirements, which include minimum testing frequency, are designed to minimize the costs of testing for owners/operators while ensuring that adequate testing is conducted to demonstrate compliance with the appropriate mitigation measures and such measures are operating in a manner that optimizes the VOC reductions.

Monitoring Requirements

The CH&SC 40724.6 requires that the District obtain sufficient information to develop an emission inventory for all pollutants. Since the emission inventory is dependent on the number of animals in the SJVAB and typically other agencies do not collect and publish data in sufficient detail (e.g. number of animals of each type in each county) to accomplish this, staff is requiring producers to provide this information to the District, upon request. Please note that owners may use documents, such as Regional Water Quality Board Waste Nutrient Management Plans that list the numbers of animals in each production group (e.g. calves, heifers, milkers, and dry cows) to comply with this monitoring requirement. The rule will not require owners/operators to maintain a set of records exclusively for the use of the San Joaquin Valley Air District.

Other monitoring and testing requirements only apply to facilities that choose mitigation measures where such monitoring or testing would assist in demonstrating compliance. This is to acknowledge that, based on currently available information, these parameters are not necessary to determine an emission inventory, unless the mitigation measures chosen are affected by these parameters. An example is monitoring feed content. Table 15 below lists the feed mitigation measures for dairies.

Table 15 Feed Mitigation Measures for Dairies	
A.	Owners/operators shall incorporate at least four (4) of the following feed mitigation measures:
	Class One Mitigation Measures
1.	a. Feed according to National Research Council (NRC) guidelines.
2.	a. Feed animals high moisture corn or steam-flaked corn and not feed animals dry rolled corn.
3.	a. At least once every fourteen (14) days remove feed from the area where animals stand to eat feed.
4.	a. At least once every fourteen (14) days remove spilled feed from the area where equipment travels to place feed in the feed bunk.
5.	a. Remove uneaten wet feed from feed bunks within twenty-four (24) hours of a rain event.
6.	a. Feed or dispose of rations within forty-eight (48) hours of grinding and mixing rations.
7.	a. Store grain in a weatherproof storage structure from October through May.
8.	a. Implement an alternative mitigation measure(s), not listed above.

Facilities only choosing options A3, A4, A5, and A6 would not need to maintain records of feed content, formulation, or quantity of feed additives used in order to demonstrate rule compliance since these measures are not affected by this. However, a facility choosing option A1 may need to maintain the aforementioned records in order to demonstrate compliance.

Traditionally, the District has required testing of VOC control devices every twelve months to ensure that the device has not been damaged, degraded, or otherwise changed to the degree that it no longer achieved the desired reductions. More frequent testing is not required because it is a mechanical device with clearly defined operating parameters which are not expect to change significantly in time periods of less than a year. An example would be a biofilter. If the blowers are operating at a specific pressure, unless the biofilter media has been saturated, it has been well documented that specific VOC control efficiencies will be achieved. On the average, biofilter media becomes saturated to the point it is not effective for VOC control in one (1) to ten (10) years, depending on design. Therefore, testing more than once a year is not considered vital to ensure VOC control. Please note that a VOC control device, as defined in Proposed Rule 4570, are devices that capture air; reduce the VOC content in the air; and release the air into the environment. This would be a system such as an enclosure vented to a biofilter. It would not include control measures, such an increased cleaning, lagoon aerators, etc. where air is not captured by the control measure.

Staff acknowledges that, at this time, there is not substantial information to determine what constitute minimum testing frequency to ensure compliance with the mitigation measures specified in the rule. However, staff believes that the minimum testing frequency for control devices, as was done for control devices in other District prohibitory rules is twelve (12) months. Also, as noted in the rule, more frequent testing may initially be necessary to confirm rule compliance. The need for more frequent testing would be determined by the APCO, ARB, and EPA and may only be temporary until the owner/operators has demonstrated that system tested (e.g. lagoon with a ph between 6.5 and 7.0) is stable.

V. POTENTIAL FUNDING SOURCES

As noted in the cost-effectiveness and socioeconomic analysis, some of these controls have significant costs. However, farms are eligible for numerous grants, which could pay for some or all of the costs of implementing mitigation measures. Some of these are listed below.

A. National Programs

<u>Environmental Quality Incentive Program (EQIP)</u>

This program provides financial and technical assistance to install or implement structural and management conservation practices. EQIP can be used for manure transport, composters, solid separators, land application of nutrients, and many other things. Approximately 60% of the total EQUIP funds are target to projects involving animal agriculture and air quality is one of the four national priorities for this program.

This funding can be used for up to approximately 75% of the cost of the project and has a maximum funding per project of approximately $450,000. For more information please contact your local or state Natural Resource Conservation (NRCS) office or check their website at http://www.nrcs.usda.gov/programs/eqip/index.html.

<u>EQIP Conservation Innovation Grants Program</u>

This program is intended to accelerate technology transfer and adoption of promising technologies and approaches to address some of the nation's most pressing natural resource concerns.

This funding can be used for up to approximately 50% of the cost of the project. For more information look for the announcement, which is usually released in early spring of each year, and the website at http://www.nrcs.usda.gov/programs/cig/.

Renewable Energy Systems and Energy Efficiency Improvement Program

This program establishes grant, loan, and loan guarantee programs to assist farmers, ranchers, and rural small businesses in purchasing renewable energy systems for making energy efficiency improvements.

The funding can be used for up to approximately 25% of the cost of the project. For more information look for the announcement or check their website at http://www.rurdev.usda.gov/rbs/farmbill/index.html.

Sustainable Agriculture Research and Education Grants Program

The purpose of this program is to advance farming systems that are profitable, environmentally sound, and good for communities.

For more information look for the announcement or check their website at http://www.sare.org/grants/index.htm.

B. State Programs

Please note some of these programs are only available to persons living in certain areas of the state.

Section 319 Grants

These may fund anaerobic digesters, manure vacuum devices, solid separators, compost devices and feed management practices. For more information please check their website at http://www.swrc.ca.gov/funding/319h.html

Self Generation Incentive Program

This may fund up anaerobic digesters. For more information check their website at http://www.sdenergy.org/ContentPage.asp?ContentID=35&SectionID=24.

Energy Efficiency Improvement Loan Fund

This may fund anaerobic digesters. For more information check their website at http://www.safe-bidco.com

VI. PROPOSED RULE 4570 (CONFINED ANIMAL FACILITIES)

The purpose of Proposed Rule 4570 is to limit VOC emissions from confined animal facilities (CAF). Preliminary analysis of the industries indicate that the cost and feasibility of control options will be highly variable due to existing infrastructure and current management practices at the facilities. To provide owner/operators flexibility in complying with the rule's control requirements, the rule includes several options for compliance and the option for owner/operators to develop their own control measures as appropriate.

A. Summary of Proposed Rule

Section 1.0 Purpose
The purpose is to limit volatile organic compound (VOC) emissions from confined animal facilities (CAF).

Section 2.0 Applicability
Indicates that the rule applies to any CAF located within the District.

Section 3.0 Definitions
Lists general definitions that pertain to the rule.

Section 4.0 Exemptions
The rule exempts facilities not exceeding any of the thresholds listed in Table 16 from all requirements except those requiring records be kept demonstrating that they qualify for the exemption.

Table 16: Exemption Thresholds

Livestock Category	Number of Animals
Dairy	1,000 lactating cows
Beef Feedlots	3,500 beef cattle
Other Cattle Operations	7,500 cows
Chickens	650,000
Ducks	650,000
Turkeys	100,000
Swine	3,000
Horses	2,500
Sheep, Goats, or any combination of the two	15,000
Any other livestock not listed above	30,000

Section 5.0 Requirements

- Operators of a CAF are to choose a specified number of VOC mitigation measures from the measures listed in the rule for each emission area on their facility. This cafeteria plan provides flexibility to facilities considering that CAF facilities vary from one another and not all controls are feasible for all facilities. Facilities that are unable to use the control options listed to meet the minimum required number of measures have the option of developing VOC mitigation measures that are more applicable to their facilities by demonstrating the efficiency of the measures.

Additionally, facilities have the option of submitting an emission mitigation plan that demonstrates a facility wide VOC reductions of at least 30% in lieu of implementing the minimum required number of measures in the applicable Tables 1 through 6 of the rule. The mitigation measures specified in Tables 1 through 6 of the rule are considered to have been approved by the APCO, ARB, and EPA through the rulemaking process, which provided avenues for such approving authorities to accept the appropriateness of the listed measures. Owners/operators would demonstrate, as part of the emission mitigation plan submission, the required facility wide emissions reduction by calculating the control efficiencies of their selected mitigation measures in accordance with the procedures/methods shown in Appendix B of the Final Draft Staff Report for Rule 4570. Any mitigation measure in the emission mitigation plan that is not specifically listed in the rule is considered an alternative mitigation measure. As such, it is subject to the requirements for alternative mitigation measures, as defined in Section 3.0 of the rule, including the requirement that the mitigation measure be approved by the ARB, APCO, and EPA. It is important to note that alternate mitigation measures are evaluated on a case-by-case basis and will only be approved by the APCO, ARB, and EPA if such alternate measures have been determined to achieve reductions that are equal to or greater than the reductions that would be achieved by those specific measures listed in the Tables 1 through 6 of the rule.

Additionally, Section 6.1.6 of the rule specifies that the permit application, including any emission mitigation plan, be publicly noticed with a commenting period of no less than thirty (30) days. During this time the ARB, EPA, and stakeholder will have the opportunity to view the emission mitigation plan, approve or disapprove of the plan, and recommend changes, as appropriate.

Table 17
Summary of the Minimum Number of VOC Mitigation Measures Per Animal Type and Area Compared to Total Number of Options

Area	Dairy	Beef	Other Cattle	Swine	Poultry
Feed	4 of 8	5 of 8	5 of 8	5 of 12	5 of 10
Silage	1 of 6	1 of 6	1 of 6	0 of 0	0 of 0
Milk Parlor	1of 3	0 of 0	0 of 0	0 of 0	0 of 0
Housing	8 of 26	7 of 15	7 of 23	5 of 10	4 of 17
Solid Manure	2 of 8	1 of 8	1 of 8	1 of 8	1 of 8
Liquid Manure	1 of 11	1 of 11	1 of 11	1 of 11	1 of 11
Land Application	2 of 7	2 of 7	2 of 7	2 of 7	0 of 0
TOTAL	**19 of 69**	**17 of 55**	**17 of 63**	**14 of 48**	**11 of 46**

- Suspension of Mitigation Measures
  This section allows mitigation measures to be suspended in order to promote molting; protect animal health; and address quarantine situations. In some limited cases all measures may need to be suspended, such as a case where

a quarantine prevents equipment, animal waste, nonessential personnel, etc. from entering or leaving the facility. However, the decision to suspend any or all mitigation measures must be approved on a case by case basis by the APCO, ARB, and EPA with input from the appropriate experts, such as licensed veterinarians, nutritionists, and government employees. Except for poultry molting, the exemption is designed to address atypical, non-periodic, and rare occurrences, not routine situations.

Furthermore, to minimize uncontrolled emissions, facility will have no more than 30 days to address the issue requiring the measures to be suspended or implement new mitigation measures to comply with rule requirements. This is designed to minimize the time that any VOC emissions occur in an uncontrolled manner.

Section 6.0 Permit Requirements

- Owner/operators would need to submit a permit application for each CAF within six (6) months of rule adoption.
- Permit application has to include:
    - Contact and legal information;
    - List of mitigation measures to be implemented;
    - Animal inventory; and
    - All information necessary for the District to prepare an emission inventory of all regulated air pollutants emitted from the facility.
- Owner/operators would need to submit an update to the permit application at least once every three (3) years.
- The District would need to act on the permit application within six (6) months of receipt.

Section 7.0 Administrative Requirements

- Recordkeeping
    - Indicates recordkeeping requirements
- Compliance testing
    - Control devices would need to be initially source tested upon start-up or modification, and thereafter at least once every 12 months
    - Facilities would need to conduct all laboratory testing required to determine compliance
- Test Methods
    - Indicates the applicable test methods to be used in determining compliance with the rule requirements.

Section 8.0 Compliance Schedule

- Owners/operators would need to comply with all requirements on and after one year from the permit issuance date.

VII. EMISSION REDUCTIONS

Emissions Reduction Analysis

The VOC reductions required by the Extreme Ozone Plan for Proposed Rule 4570 is 5,767 tons per year (15.8 tons per day) or 25% from the planning baseline of 23,031 tons of VOC per year (63.1 tons per day). District staff estimated that the VOC reduction from Proposed Rule 4570 is about 7,563 tons per year (21 tons per day) or 28 percent of the total CAF baseline emission of 27,000 tons per year. The VOC emission reduction analysis is included in Appendix B of the Final Draft Staff Report.

A concern was expressed as why the proposed rule targets VOC reductions but not ammonia emissions from CAFs. Ammonia is not a precursor to ozone formation and therefore not the pollutant targeted by the District's Ozone Plan. Although ammonia is not specifically regulated by Proposed Rule 4570, the VOC mitigation measures of the proposed rule actually have the added air quality benefit of reducing ammonia emissions. Staff estimated at least 100 tons per day of ammonia reductions could be achieved from the implementation the proposed VOC mitigation measures. The ammonia reduction analysis is included in Appendix F of the Final Draft Staff Report.

VIII. HEALTH EFFECTS

Respiratory diseases associated with agriculture were one of the first-recognized occupational hazards. According to the Institute for Agriculture and Trade Policy (Wallinga 2004), studies at beef, swine, and poultry facilities show increased occurrences of asthma, sinusitis, bronchitis, decreased lung function, and depression among workers at concentrated animal feeding operations. Of the 331 VOC and gaseous compounds found in odorous samples from North Carolina swine facilities, 157 are known airway irritants; chronic irritation can permanently scar lungs and lead to respiratory problems. (Wallinga 2004)

IX. RULE DEVELOPMENT PROCESS

As part of the rule development process, District staff conducted public scoping meetings in April 2005, public workshops and Socioeconomic Focus Group meeting in March 2006 in order to present, discuss, and solicit comments on Proposed Rule 4570. In addition to the workshops, staff met with representatives of the beef, dairy, poultry, swine industries, and control technology vendors to receive comments on the technical aspects and compliance costs of the proposed rule. The comments received from the public, affected sources, California Air Resources Board, and United States Environmental Protection Agency during the public workshop process and technical consultation meetings were incorporated into the proposed rule as appropriate.

Comments received and District responses are discussed in Appendix A of the Final Draft Staff Report.

Proposed Rule 4570 and the Final Draft Staff Report including the analyses mandated by CH&SC will be published prior to a public hearing on June 15, 2006 for the District Governing Board to consider the adoption of the proposed rule. The notice of the public hearing for this rule project was published in a general circulation newspaper in each of the eight San Joaquin Valley counties, and will be mailed to affected sources and interested parties. The public notice solicited written comments to be submitted by mail, and will identify the name and telephone numbers of the District staff that can answer questions and respond to comments. The June 15, 2006 adoption schedule will satisfy the requirement of the CH&SC for the District to adopt a regulation by July 1, 2006.

X. COST EFFECTIVENESS ANALYSIS

Pursuant to CH&SC 40920.6(a) a cost effectiveness analysis is required to be performed for rules that implement BARCT. For the purpose of calculating the compliance cost and associated cost-effectiveness of the proposed rule, staff took into consideration those mitigation measures already being implemented at facilities and assumed that owners/operators will likely choose the lowest cost mitigation measures. This was done to minimize overestimation of compliance costs. A detailed discussion of the analysis is shown in Appendix C of the Final Draft Staff Report. The estimated cost effectiveness is as follows:

- Dairies = $4,815 or less per ton of VOC reduced,
- Beef feedlots = $4,505 or less per ton of VOC reduced
- Other cattle facilities= $10,088 or less per ton of VOC reduced, and
- Swine = $3 or less per ton of VOC reduced.

A cost effective analysis was not done for poultry because, based on comments from industry and information in the District’s permit database, staff has determined that existing poultry facilities are already required to implement best available retrofit control technology. Therefore, the added cost would only be recordkeeping costs, which are considered minimal and typically not included in the cost effectiveness analysis.

XI. SOCIOECONOMIC ANALYSIS

Pursuant to CH&SC 40728.5, the District is required to perform a socioeconomic impact analysis prior to the adoption, amendment, or repeal of a rule that significantly affects air quality or strengthens an emission limitation. The socioeconomic analysis is presented in Appendix D of the Final Draft Staff Report.

XII. ENVIRONMENTAL IMPACTS

Proposed Rule 4570 underwent an environmental review in accordance with the requirements of the California Environmental Quality Act (CEQA). A proposed negative declaration has been issued by the District and made available for public review. The public commenting period ended on May 29, 2006. Staff received comments on the proposed negative declaration from the State Water Resources Control Board and addressed these comments in Appendix A. The initial study and proposed negative declaration are presented in Appendix G of the Final Draft Staff Report. District staff recommends that the District Governing Board approve the negative declaration.

XIII. RULE CONSISTENCY ANALYSIS

Pursuant to California Health & Safety Code Section 40727.2, District staff prepared a rule consistency analysis that compares the elements of Proposed Rule 4570 with the corresponding elements of other District rules, federal regulations and guidelines that apply to the same source category or type of equipment. The analysis is attached as Appendix E of the Final Draft Staff Report.

XIV. REFERENCES

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