

## INFORMATION SHEET

Waste Discharge Requirements Order No. R5 – 2008 – XXXX  
Greenwood Dairy  
Glenn County

### INTRODUCTION

Daniel Vander Dussen has proposed to expand the herd at his dairy in Glenn County, south of the city of Orland. The maximum herd size at the dairy after herd size expansion will be 4,100 total head: 3,500 milking cows, 550 dry cows, 50 spring heifers. With the expansion the dairy will include a milking parlor, freestall barns, shade structures, a Saudi-style barn, hay barns, a feed barn, a pole barn, a maternity barn, a shop, an office, a concrete-lined process pit, a mechanical separator, five wastewater storage lagoons, and one emergency detention basin. Wastewater is land-applied to 680 of the 890 acres for agricultural production. With the proposed expansion, dried manure not used for bedding will be sold offsite, as the nutrient requirements of the onsite crops will be met with process water application.

A Mitigated Negative Declaration and a Conditional Use permit were approved by Glenn County Department of Planning and Public Works on December 19, 2007.

As part of its development of a General Order for existing milk cow dairies, the Central Valley Regional Board required all existing dairies to file a Report of Waste Discharge (ROWD) by 17 October 2005 to document conditions at each dairy as of that date, including the number of mature dairy cows. The ROWD also requested the maximum number of mature dairy cows at each dairy within the preceding 12 months period. The maximum number of mature dairy cows that can be at an existing dairy is limited to 115% of the larger of these two numbers for the dairy to qualify for coverage under the General Order. Dairies in existence as of October 2005 that want to increase beyond this number must get Individual Waste Discharge Requirements.

Under the General Order the herd size of mature cows at the dairy is limited to the number given in the 2005 ROWD plus 15%, or 3,000 plus 450, for a total of 3,450 mature cows. These Waste Discharge Requirements will allow the Greenwood Dairy to increase its herd size to 4,100, the number allowed under the Mitigated Negative Declaration approved by Glenn County. This includes 3,500 milk cows, 550 dry cows, and 50 spring heifers. The facilities constructed at the dairy are all sized to house the number of animals allowed under the Conditional Use Permit and Mitigated Negative Declaration.

A Report of Waste Discharge dated August 2007 has been submitted for the expanded dairy. Additional information has been submitted to the Regional Board including a Nutrient Management Plan and Waste Management Plan.

## CURRENT CONDITIONS

The site of the dairy is zoned A-1 (General Agricultural) and has been historically used for growing crops (primarily alfalfa and forage crops). It has been in operation since May 2001. The dairy property is generally flat lying, and the soil is composed of Cortina very gravelly sandy loam that is very permeable. The cropland is comprised of Tehama Silt Loam, Tehama Gravelly Loam, Hillgate Clay Loam, Hillgate Loam and Arbuckle Gravelly Loam. All of the cropland soils are well drained with moderate to slow permeability.

## WASTE GENERATION AT FACILITY

Waste generated at the facility consists of manure, barn wash water, and rainfall and runoff that come into contact with manure or other waste. After the herd expansion, manure generation is estimated at 10,088 dry tons per year. Approximately 20 percent (2,018 tons per year) is retained for use as bedding.

Currently an estimated 432,000 gallons per day of clean water are used for the production area of the dairy. With the expansion, an estimated 589,210 gallons per day will be used.

The annual rainwater runoff and a 25-year, 24-hours storm event after evaporation will accumulate approximately 1,781,557 cubic feet, which will provide only a small percentage of the annual water needs for proposed crops.

The total amount of wastewater requiring storage over the 120-day maximum storage period, after removing losses due to evaporation and adding one 25-year 24-hour storm, is 4,294,389 cubic feet.

## WASTE MANAGEMENT AT FACILITY

Wastewater is passed through a concrete-lined process pit, mechanical solid separator, and then into five wastewater storage ponds. The solids and excess manure in corrals are stockpiled on the concrete slab at the solids separator and there a portion of the solids will be dried and used as animal bedding, the remainder will be sold and taken offsite.

Pond 1, constructed in 2001, is 350 by 600 feet in area and 13.5 feet deep. Pond 2, also constructed in 2001, is 225 by 290 feet in area and 14.5 feet deep. These two ponds are clay lined. The liners have a minimum permeability of  $1 \times 10^{-6}$  centimeters per second, with soils compacted to 92 percent relative compaction. Four new ponds were constructed in Spring 2006. Ponds 3, 4, 5, and 6 are lined with soil 12 inches thick compacted to a minimum permeability of  $1 \times 10^{-6}$  centimeters per second and 95 percent relative compaction. Ponds 3

and 4 are 164 feet by 809 feet and 796 feet, respectively and Pond 5 is 158 by 782 feet. The three ponds are 14 feet deep. Pond 6 is 6 feet deep and 917 feet by 568.5 feet.

#### LAND APPLICATION OF WASTEWATER TO CROPS

Wastewater and manure generated at the facility are currently applied to land owned and/or operated by the dairy at agronomic rates as described in the Nutrient Management Plan which is being updated.

All fields that receive liquid wastewater have tail water recovery via field drains and sumps. The wastewater piped from Pond 1 to the eastern and southern most fields is routed through a flow meter. Another flow meter is to be installed for water piped from Ponds 3 through 6.

The Order requires that wastewater samples be collected and analyzed, and the volume of wastewater applied to each field determined. This information will be used to refine the Nutrient Management Plan on an ongoing basis.

The dates and volume of each irrigation application (without wastewater) are recorded. These data are used to ensure that wastewater is not applied when the ground is at or above field moisture capacity, and to limit the flushing of nutrients below the root zone due to excessive application of irrigation water. In addition, samples of the irrigation water are tested to determine if there are nitrogen compounds present in the groundwater such that the Nutrient Management Plan should be amended to reflect nitrogen added from the irrigation water.

Soil monitoring and plant tissue monitoring are also required and the results used to further refine the Nutrient Management Plan.

#### GROUND WATER AND SURFACE WATER MONITORING PROVISIONS

There are five agricultural supply wells and two domestic wells on the property. Ten monitoring wells have been installed. These wells monitor upgradient groundwater quality (unaffected by dairy operations) and groundwater downgradient of the location of corrals, land application areas, and the wastewater storage lagoons. The Order requires sampling of these wells. Regional ground water flow is to the southeast and the depth to groundwater at the facility ranged from 34.95 to 46.10 feet below ground surface in December 2007.

Sampling of the older monitoring wells was conducted in December 2007. The four newly constructed wells were sampled in March 2008. The results indicate

some slight degradation of groundwater with respect to nitrate and sodium in the vicinity of the older ponds and down gradient of the corrals.

The domestic and agricultural wells at the facility are sampled semiannually for electrical conductivity and nitrate-nitrogen, and at least once for general minerals, ammonia-nitrogen, total dissolved solids, and fecal coliform. The monitoring wells will be sampled semiannually for electrical conductivity, pH, nitrate-nitrogen, ammonium-nitrogen, total dissolved solids, fecal coliform, phosphorous, and potassium; and annually for general minerals. Prior to any pre-sample purging, the depth of groundwater shall be measured from a surveyed reference point (anticipated to be the top of each well vault) to the nearest 0.01 foot in each well.

Because all fields receiving solid manure or liquid wastewater have tailwater recovery systems, it is not anticipated that there will be off-property discharges of waste, which would be in violation of the Water Code. It is expected that, if the Nutrient Management Plan and other conditions of the Order regarding waste application are followed, any discharges of storm water from fields receiving wastewater should not contain significant quantities of waste constituents. To verify this, representative samples of storm water will be collected from a portion of the fields each year to determine if waste constituents are present. Storm water monitoring will be adjusted based on the results from these samples

## REPORTING REQUIREMENTS

By January 15 of each year, the Discharger will submit an Annual Report containing the information on facility operations outlined in the Monitoring and Reporting Program and covering the period from 1 November through 31 October of the previous year. The initial annual report will cover the period between 1 January 2008 and 31 October 2008.

By 30 June 2008, and semiannually thereafter, the Discharger will submit the results of groundwater monitoring; and storm water monitoring conducted pursuant to the Monitoring and Reporting Program.

In the event of any noncompliance with the requirements of the Order that endangers human health or the environment, or any noncompliance with the prohibitions in the Order as listed in the Noncompliance Reporting provisions of the Monitoring and Reporting Program, the Discharger shall notify the Board within 24 hours of becoming aware of the occurrence. Information about the situation shall be collected and submitted in accordance with the Priority Reporting of Significant Events requirements in the Monitoring and Reporting Program.

## APPLICABLE WATER QUALITY STANDARDS

The Central Valley Water Board has adopted a Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins (4<sup>th</sup> ed.). This Basin Plan designates the beneficial uses of groundwater and surface waters of the Region, specifies water quality objectives to protect those uses, and includes implementation programs for achieving water quality objectives. The Basin Plan also includes plans and policies of the State Water Board incorporated by reference, including State Water Board Resolution No. 68-16 (*Statement of Policy with Respect to Maintaining High Quality Waters in California*), State Water Board Resolution 88-63 (*Sources of Drinking Water Policy*), and State Water Board Resolution No. 92-49 (*Policies and Procedures for Investigation and Cleanup or Abatement of Discharges Under Water Code Section 13304*).

### *Beneficial Uses of Surface Water and Groundwater*

Pursuant to Chapter II of the Basin Plan, the beneficial uses of surface water may include: municipal and domestic supply; agricultural supply; agricultural stock watering; industrial process supply; industrial service supply; hydro-power generation; body contact water recreation; canoeing and rafting; other non-body contact water recreation; warm freshwater aquatic habitat; cold freshwater aquatic habitat; warm fish migration habitat; cold fish migration habitat; warm spawning habitat; cold spawning habitat; wildlife habitat; navigation; rare, threatened, and endangered species; groundwater recharge; freshwater replenishment; aquaculture; and preservation of biological habitats of special significance. The Basin Plan contains a Table that lists the surface water bodies and the beneficial uses and where not listed, the Basin Plan designates beneficial uses based on the waters to which they are tributary or applicable state or federal requirements. These beneficial uses are protected in this Order by, among other requirements, the prohibition of a direct or indirect discharge of waste and/or storm water from the production area to surface waters, the prohibition of discharge of wastewater to surface waters from cropland, the prohibition of any discharge of storm water to surface water from the land application areas unless the land application area has been managed consistent with a certified Nutrient Management Plan, and the prohibition of discharge of waste from existing milk cow dairies to surface waters which causes or contributes to an exceedance of any applicable water quality objective in the Basin Plan or any applicable state or federal water quality criteria, or a violation of any applicable state or federal policies or regulations.

Chapter II of the Sacramento River and San Joaquin River Basin Plan states: “*Unless otherwise designated by the Regional Water Board, all groundwaters in the Region are considered as suitable or potentially suitable, at a minimum, for municipal and domestic water supply, agricultural supply, industrial service supply, and industrial process supply.*” These beneficial uses are protected in this Order by, among other requirements, the specification that the discharge of

waste at an existing milk cow dairy shall not cause a violation of water quality objectives or cause pollution or nuisance.

Water Quality Objectives

Pursuant to the California Water Code Section 13263(a), WDRs must implement the Basin Plans, which require consideration of the beneficial uses of water, water quality objectives reasonably required to protect the beneficial uses, other waste discharges, the need to prevent nuisance conditions in the disposal area, and the receiving water. The water quality objectives are implemented in WDRs consistent with the Basin Plan's *Policy for Application of Water Quality Objectives*. The Basin Plan requires that WDRs apply the most stringent objective for each constituent to ensure that discharges do not cause adverse affects to any beneficial use.

Water quality objectives are the limits or levels of water quality constituents or characteristics that are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area. Water quality objectives apply to all waters within a surface water or groundwater resource for which beneficial uses have been designated. Water quality objectives are listed separately for surface water and groundwater in Chapter III of the Basin Plan and are either numeric or narrative.

The primary waste constituents of concern due to discharges of waste from dairies are ammonia, nitrates, phosphorus, chloride, boron, salts, pathogens, and organic matter. The discharge of waste from dairies must not cause surface water or groundwater to exceed the applicable water quality objectives for those constituents.

Water Quality Objectives and Federal Criteria for Surface Water<sup>1</sup>

Water quality objectives that apply to surface water include, but are not limited to, (1) the numeric objectives, including the bacteria objective, the chemical constituents objective (includes listed chemicals and state drinking water standards, i.e., maximum contaminant levels (MCLs) promulgated in Title 22 CCR Division 4, Chapter 15 Sections 64431 and 64444 that are applicable through the Basin Plan to waters designated as municipal and domestic supply), dissolved oxygen objectives, pH objectives, and the salinity objectives; and (2) the narrative objectives, including the biostimulatory substances objective, the chemical constituents objective, and the toxicity objective. The Basin Plan also contains numeric water quality objectives that apply to specifically identified

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<sup>1</sup> It is important to note that this Order prohibits the direct or indirect discharge of waste and/or storm water from the production area to surface waters, the discharge of wastewater to surface waters from cropland, and requires the monitoring of discharges of storm water to surface water from the land application areas where manure or process wastewater has been applied as well as implementation of a certified Nutrient Management Plan.

water bodies, including for example, electrical conductivity objectives for the Delta.

Federal water quality criteria that apply to surface water are contained in federal regulations referred to as the California Toxics Rule and the National Toxics Rule. See 40 CFR Sections 131.36 and 131.38.

#### Water Quality Objectives for Groundwater

Water quality objectives that apply to groundwater include, but are not limited to, (1) numeric objectives, including the bacteria objective and the chemical constituents objective (includes state MCLs promulgated in Title 22 CCR Division 4, Chapter 15 Section 64431 and 64444 and are applicable through the Basin Plan to municipal and domestic supply), and (2) narrative objectives including the chemical constituents, taste and odor, and toxicity objectives.

#### Implementation of Water Quality Objectives

The Basin Plan includes an implementation program for water quality objectives called the *Policy for Application of Water Quality Objectives*, which applies to implementation of both numeric and narrative water quality objectives. To evaluate compliance with narrative objectives, the Policy requires the Regional Board to consider, on a case-by-case basis, various factors and information, including direct evidence of beneficial use impacts (e.g., a fish kill), information submitted by the discharger and other interested parties (e.g., levels that constitute natural background or site-specific conditions, such as soil types), and “*relevant numerical criteria and guidelines developed and/or published by other agencies and organizations*”, such as the State Water Resources Control Board, California Department of Health Services, Department of Fish and Game, and the United States Environmental Protection Agency (USEPA). The Policy requires the Regional Board to consider this information and determine what specific numerical limit is “*relevant and appropriate*” to the situation at hand, and, therefore should be used in determining compliance with the narrative objective.

#### Narrative Water Quality Objectives

Some of the considerations of relevant numerical criteria and guidelines developed or published by other agencies and organizations include:

##### *Agriculture*

The Basin Plan contains a narrative chemical constituents objective for both groundwater and surface water that states that “[waters] shall not contain chemical constituents in concentrations that adversely affect beneficial uses.” This objective applies to the protection of agricultural beneficial uses. Relevant numerical criteria and guidelines for agricultural uses of groundwater are included in publications from the National Academy of Sciences, the University of California Cooperative Extension, and the Food and Agricultural Organization of the United Nations. This information is summarized in a 1985 publication *Water*

*Quality for Agriculture, Food and Agriculture Organization of the United Nations - Irrigation and Drainage Paper No. 29*, (hereafter U.N. Guidelines) and includes detailed information to evaluate the quality of irrigation water necessary to sustain various crops.

The major constituents used to assess the quality of water for beneficial uses of irrigated agriculture are salinity (expressed as total dissolved solids, or TDS), boron, chloride, and sodium. Salinity reduces crop growth by reducing the ability of plant roots to absorb water. Boron is an essential element in very low concentrations but can become toxic to plants when concentrations in water even slightly exceed the amount required for optimal growth. While boron sensitivity appears to affect a wide variety of crops, sodium and chloride toxicities are mostly limited to tree crops and woody perennials (e.g., citrus, stone-fruit, and vineyard). A predominance of sodium relative to other ions in irrigation water may also disperse soil aggregates, which in turn, affects virtually all crops by decreasing the permeability of the soil to water and air.

Nitrogen in the form of nitrate and ammonium can also affect some nitrogen sensitive crops such as sugar beets, grapes, apricots, citrus, avocado, and some grain crops. Production of nitrogen sensitive crops may be affected at nitrogen concentrations above 5 mg/L nitrate (as nitrogen) or ammonium-nitrogen.

The U.N. Guidelines conclude that salt tolerance of crops and yield reductions can vary depending on various factors, such as irrigation management, the crop being grown, and the site conditions. The U.N. Guidelines recommend that a site-specific assessment be conducted to determine if water quality above or below the U.N. Guidelines would provide protection of irrigated agricultural uses. The U.N. Guidelines divide water quality characteristics as having “No Problem – Increasing Problems – Severe Problems” and show numerical criteria that protect a full range of crops and would likely be protective under all irrigated agricultural uses. The numerical criteria for agricultural irrigation use are:

<u>Problem and Related Constituent</u>	<u>No Problem</u>	<u>Increasing Problems</u>
Salinity of irrigation water (micromhos per centimeter (µmhos/cm))	< 700	700 – 3,000
Salinity of irrigation water (total dissolved solids (mg/L))	< 450	450 – 2,000
<b>Specific Ion Toxicity</b>		
From ROOT absorption		
Sodium (mg/L)	< 69	69 – 207
Chloride (mg/L)	< 142	142 – 355
Boron (mg/L)	< 0.7	0.7 – 3.0
From FOLIAR absorption		
Sodium (mg/L)	< 69	> 69
Chloride (mg/L)	< 106	> 106
<b>Miscellaneous</b>		
NH <sub>4</sub> -N (mg/L) (for sensitive crops)	< 5	5 – 30
NO <sub>3</sub> -N (mg/L) (for sensitive crops)	< 5	5 – 30
HCO <sub>3</sub> (mg/L) (only with overhead sprinklers)	< 90	90 – 520
pH	Normal range =	6.5 – 8.4

In determining the concentrations of the constituents listed above that will not result in adverse affects on agricultural beneficial uses in a given area, multiple criteria can apply. While the most stringent concentration becomes the constraining criterion, it is not necessarily the concentration that is required to protect all crops typically grown in the area. The U.N. Guidelines reflect the highest tolerable level of quality necessary to sustain the most sensitive crops but those crops may or may not be grown in the area. An evaluation of the existing crops grown in an area and crops that could be grown in that area is necessary to determine what the most stringent water quality criteria are that will protect all beneficial uses of water in that area. The highest water quality that is reasonable must be maintained.

*Animal Drinking Water*

As shown in the U.N. Guidelines, water quality needed to protect dairy animal drinking water uses are less sensitive than irrigated agriculture for all constituents shown above.

*Municipal and Domestic Supply*

With respect to water quality needed to protect municipal and domestic supply, the Basin Plan contains the narrative taste or odor objective that state in summary that waters shall not contain taste- or odor-producing substances in concentrations that cause nuisance, adversely affects any beneficial use, or impart undesirable tastes or odors in fish flesh or other edible products. Waste from a dairy contains organic nitrogen, a decomposition by-product of which is ammonia, a taste-producing substance that, if present in excessive concentrations, can adversely affect the beneficial use of groundwater for municipal and domestic supply. J.E. Amooore and E. Hautala have determined an

odor threshold for ammonia-nitrogen of 1.5 mg/L (*Odor as an Aid to Chemical Safety: Odor Thresholds Compared with Threshold Limit Values and Volatilities for 214 Industrial Chemicals in Air and Water Dilution*, Journal of Applied Toxicology, Vol. 3, No. 6 (1983)). While this numeric level is a value that is to be met at the point of use (i.e., the tap, rather than the receiving water), the Basin Plans state that “[w]ater quality objectives apply to all waters within a surface water or ground water resource for which beneficial uses have been designated, rather than at an intake, wellhead or other point of consumption.” In accordance with the *Policy on Application of Water Quality Objectives*, it is relevant, appropriate, and reasonable to use this numeric level of 1.5 mg/L ammonia-nitrogen to protect beneficial use of area groundwaters and surface waters for human consumption.

#### *Aquatic Life*

Ammonia is known to cause toxicity to aquatic organisms in surface waters. Waste from a dairy contains both ammonia and un-ionized ammonia, both of which can cause impact to aquatic life. The US EPA has established Ambient Water Quality Criteria for Ammonia for the protection of freshwater aquatic life. These criteria include an acute criterion (1-hour average) for total ammonia (including ionized and un-ionized ammonia) that is dependent on pH and fish species and a chronic criterion (30-day average) that is dependent on pH and temperature, and at temperatures less than 15 degrees centigrade (59° F) is also dependent on fish species. For freshwater aquatic life protection, the acute criterion for total ammonia-nitrogen ranges from 0.885 (at pH 9.0) to 32.6 (at pH 6.5) milligrams nitrogen per liter (mg N/L) when salmonids are present and from 1.32 (at pH 9.0) to 48.4 (at pH 6.5) mg N/L when salmonids are absent. The chronic criterion for total ammonia-nitrogen ranges from 0.179 (at pH 9.0) to 10.8 (at pH 6.5). These criteria are based on total (un-ionized plus ionized) ammonia.

The California Department of Fish and Game criteria to protect freshwater aquatic life is 0.02 mg/L un-ionized ammonia. The equilibrium between un-ionized and ionized ammonia is controlled by temperature and pH. The California Department of Fish and Game determines the concentration of un-ionized ammonia based on the known percentage of un-ionized ammonia in a concentration of total ammonia at a given temperature and pH.

#### *Numeric Water Quality Objectives*

##### *Maximum Contaminant Levels (Drinking Water Standards)*

The Basin Plan’s incorporation of MCLs by reference is prospective to incorporate changes to MCLs as changes in Title 22 CCR take effect. Should a change occur to an MCL and that MCL thereby becomes the most or more stringent objective, implementation of the changed objective would be affected through reopening of this Order.

*Water Quality Objectives for Bacteria*

The majority of waste collected at a dairy is fecal matter or manure. This waste contains pathogenic bacteria and can impact water quality if not properly handled. The Basin Plan contains numeric water quality objectives for bacteria in surface waters and in groundwater. For surface water, the Basin Plan specifies that “[i]n waters designated for contact recreation (REC-1), the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 ml, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400/100 ml.” For groundwater, the Basin Plan specifies that “[i]n ground waters used for domestic or municipal supply the most probable number of coliform organisms over any seven-day period shall be less than 2.2/100 ml.”

Receiving Water Limitations for Dairies

The numeric water quality objectives and numeric limits that are relevant and appropriate to implement narrative water quality objectives applicable to the primary waste constituents of concern in discharges of waste at dairy facilities that could affect groundwater and surface water are as follows: For groundwater, the most stringent limitations to implement narrative and numeric water quality objectives are for total coliform 2.2/100 milliliter (ml), for ammonia-nitrogen 1.5 mg/L, for boron 0.7 mg/L, for chloride 106 mg/L, for nitrate-nitrogen 5 mg/L, for EC 700 µmhos/cm, and for TDS 450 mg/L. For surface water, the most stringent limitations to implement narrative and numeric water quality objectives and criteria are for total coliform 2.2/100 ml, for chloride 106 mg/L, for nitrate-nitrogen 5 mg/L, for EC 700 umhos/cm, and for TDS 450 mg/L. For surface water, the appropriate limitation for ammonia is 0.02 mg/L un-ionized ammonia or a concentration of total ammonia determined by the pH and fish species, whichever is less. Less stringent limitations may apply to different areas but can only be determined through a site-specific assessment. The Discharger may propose the application of less stringent limitations for consideration in the Monitoring and Reporting Program. Dairy waste may include other waste constituents not mentioned here. This Order requires the discharge to comply with all water quality objectives and federal water quality criteria for surface waters applicable to the discharge.