Goal DE ~~7~~ 6 and **Objective DE** ~~7.1~~ 6.1 would establish a Dairy Monitoring Program in the Kings County Planning Agency. **Policies DE** ~~7.1a~~ **6.1a.A** through ~~7.1c~~ **6.1a.C** establish procedures for, and requirement of, the ~~newly formed agency~~ Dairy Monitoring Program, including tracking individual dairies, problem resolution, and regular reporting to the Planning Commission. The Dairy Monitoring Program would be responsible for matters related to protection of water quality, as well as other issues.

~~**Goal DE 8** would establish the goal of bringing all existing non-permit holding dairies in Kings County into voluntary conformance with the provisions of the Element by the end of 2006. The objective (**Objective DE 8.1**) is to reduce the effect of the existing dairies on the environment (including impacts to water quality). **Policies DE 8.1a** and **8.1b** would implement a Dairy Conformance Program for existing dairies, promote cooperation with industry programs and dairy operators and work with the legislature to meet operating standards. **Policy DE 8.1c** states that the Element does not guarantee that a dairy that does not meet the specified standards will be able to come into conformance.~~

IMPACTS AND MITIGATION MEASURES

SIGNIFICANCE CRITERIA

The CEQA guidelines indicate that a project may have a significant effect on the environment, if it would:

- Violate any water quality standards or waste discharge requirements;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site;
- Create or contribute runoff water that would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff;
- Otherwise substantially degrade water quality;

- Place housing within a 100-year flood hazard area as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;

- Place within a 100-year flood hazard area structures that would impede or redirect flood flows;

- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam;

- Inundation by seiche, tsunami, or mudflow.

The discussion of potential impacts and mitigation measures presented below first addresses **construction-period** erosion/chemical releases and associated degradation of water quality (Impact 4.3-1). Potential **operation-period impacts to surface water hydrology and water quality** are discussed under Impacts 4.3-2 (drainage patterns), 4.3-3 (increase in impervious surfaces), 4.3-4 (flood hazards), and 4.3-5 (surface water quality). Potential **operation-period impacts to groundwater supply and quality** are discussed under Impacts 4.3-6 (water supply), 4.3-7 (pollutant loading of groundwater), 4.3-8 (poorly constructed wells), and 4.3-9 (cumulative impacts to groundwater quality).

Impact 4.3-1

Construction activities associated with new or remodeled dairies could result in degradation of water quality in receiving waters by reducing the quality of storm water runoff. This is a less-than-significant impact.

Construction and grading associated with new or remodeled dairies would require temporary disturbance of surface soils and may result in removal of existing soil cover. During the construction period, grading and excavation activities would result in exposure of soil to runoff and wind, potentially causing erosion. Soil stockpiles and excavated areas of the project site may be exposed to wind erosion and runoff and, if not managed properly, the eroded materials could increase sedimentation at and away from the site.

The potential for chemical releases is present at most construction sites. Once released, substances such as fuels, oils, paints, and solvents could be transported to ditches and/or groundwater in wash water and dust control water, potentially reducing the quality of the receiving waters. Any runoff from the project (expected to be limited, if occurring at all) would be collected in the ditches and process water ponds at the project site and would not be expected to discharge to surface water canals. Potential chemical releases at the construction sites that may result in water quality impacts are regulated by the NPDES permitting process.

Prior to the initiation of grading, the owner/operator of the proposed dairies would be required to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) designed to reduce potential impacts to water quality during construction of the project. The SWPPP would include:

- Specific and detailed BMPs designed to mitigate construction-related pollutants. These controls would include practices to minimize the contact of construction materials, equipment, and maintenance supplies (e.g., fuels, lubricants, paints, solvents, adhesives) with storm water. The SWPPP would specify properly designed centralized storage areas that keep these materials out of the rain and/or protected from the wind.

  Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel or asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching and sand fences can be employed for areas of occasional or no construction traffic. Preventive measures would include minimizing surface areas to be disturbed, limiting on-site vehicle traffic to 15 miles per hour, and controlling the number and activity of vehicles on a site at any given time.

  The SWPPP is required to specify a monitoring program to be implemented by the construction site supervisor. RWQCB personnel, who may make unannounced site inspections, are empowered to levy appropriate fines if it is determined that the SWPPP has not been properly prepared and implemented.

The Element does not specifically discuss potential impacts to surface water quality associated with construction activities. However, implementation of existing regulations (including the construction period SWPPP) would reduce this potential impact to a less than significant level without additional mitigation.

Mitigation Measure 4.3-1

None required.

Impact 4.3-2

Projects implemented under the Element could modify surface water drainage patterns, potentially causing localized off-site migration of runoff, erosion, and/or flooding. This is a less-than-significant impact.

The Element includes several policies that would reduce the potential impacts associated with alteration of drainage patterns. **Policy DE 1.2c** restricts dairy facilities to locations outside the 100-year flood hazard area, and therefore grading projects associated with construction of dairies and process water storage ponds would not be conducted in the 100-year flood plain. This policy would effectively minimize alteration of drainage patterns in areas subject to flooding. In addition, **Policy DE 1.2f** restricts dairies in the southwestern upland area (west of Interstate-5 and the California Aqueduct) where grading could create drainage and process water containment problems in areas of excessive slopes.

The area designated as acceptable for location of dairy facilities is relatively flat, and therefore minor changes in grade could alter the direction of surface water runoff. Grading associated with development or redevelopment could cause runoff to be directed away from a dairy site, toward an adjacent property, or into a surface water feature potentially affecting water quality. Site-specific drainage control is necessary to ensure that runoff is properly managed. **Policy DE 3.2c** establishes a minimum setback of 150 feet between manured areas and water wells or surface water bodies. **Policy DE 3.2d** requires that no process water be discharged to surface water features. To ensure that irrigated fields are properly drained, **Policy DE 4.1b.C** requires dairy operators to present an irrigation management program to the County Planning Department that ensures that irrigation water and runoff from fields at each dairy unit would not be allowed to migrate away from the site or into surface water bodies (i.e., features other than tailwater ponds).

Conformance with State Confined Animal Facility regulations and implementation of **Policies DE 1.2c, 1.2f, 3.2c, 3.2d, 4.1b, and 4.1c** would reduce impacts associated with runoff from dairy facilities to a less-than-significant level.

Mitigation Measure 4.3-2

None required.

Impact 4.3-3

Implementation of the proposed project would result in an increase in impervious surfaces, potentially increasing runoff volumes and velocities. This is a less-than-significant impact.

The construction of roofed structures (e.g., barns, support buildings, and residences) and pavement (e.g., roads, manure storage pad, parking lots) would result in an increase in impervious surfaces at each of the facilities developed under the Element. Impacts related to an increase in impervious surfaces generally relate to increases in runoff volume and velocity. However, in the case of confined animal facilities, there are also water quality implications (refer to Impact 4.3-5).

Under existing State regulations, confined animal facilities shall be designed and constructed to retain all facility wastewater generated, together with all precipitation on, and drainage through, manured areas during a 25-year, 24-hour storm event (CCR Title 27, Division 2, Subdivision 1, Chapter 7, Subchapter 2 Section 22562(a)). All precipitation and surface drainage outside of manured areas shall be diverted away from manured areas unless it would be fully retained (CCR Title 27, Division 2, Subdivision 1, Chapter 7, Subchapter 2, Section 22562~~(a)~~ (b)).

The runoff from increased impervious surfaces outside of manured areas may be substantial during intense storm events. However, the annual rainfall amount for the County is relatively low, and under normal circumstances, little runoff would be expected. Further, the County Public Works Department maintains minimum requirements for storm drainage facilities and would ensure that any project implemented under the Element would include an adequate drainage system.

Compliance with existing regulations and programs would reduce the impact to a less-than-significant level without additional mitigation.

Mitigation Measure 4.3-3

None required.

Impact 4.3-4

Dairies located in flood-prone areas could be damaged or rendered temporarily inoperable during a flood event. In addition, flood waters could inundate dairy facilities (manured areas and/or process water storage facilities) and fields where wet or dry manure had been recently applied causing impacts to surface water quality. This is a less-than-significant impact.

A substantial portion of the County, particularly along the Kings and Tule rivers and Cross Creek, and in the Tulare Lake Bed area, is located in the 100-year flood hazard zone as mapped by FEMA (Figure 4.3-3). Dairy facilities located within flood hazard zones could be damaged by flood waters or be required to shut down for extended periods. Flood waters could mingle with wet or dry manure storage areas at the facilities, cause releases of process water from ponds, and/or come into contact with freshly applied manure on fields, impacting surface water quality.

Policy DE 1.2c of the Element restricts dairy facilities to locations outside the 100-year flood hazard area, and therefore effectively reduces potential flood-related impacts associated with new dairy facilities to a less-than-significant level.

~~Based on review of regional flood plain mapping, there are several existing dairy facilities along the Kings River and Cross Creek that are located within the 100-year flood hazard zone. A goal of the project is to bring all existing dairies into voluntary compliance with the policies of the Element (**Goal DE 8**). Existing dairies facilities located within the 100-year flood hazard zone could be considered out of compliance with the Element, and could represent a potentially significant impact.~~

Policy DE 3.2g is included in the Element to address this issue. Under the policy, existing dairies in the 100-year flood hazard zone would be allowed only if a site-specific hydraulic analysis (performed by a licensed engineer) demonstrates that the dairy facility is not in the 100-year flood zone (i.e., is at an elevation above the 100-year flood elevation at that location). Alternatively, the policy would allow dairies within the zone if 100-year flood protection is provided by constructing levees or other flood control structures.

The Element would allow application of wet and dry manure to fields (i.e., as a soil amendment/fertilizer) within the 100-year flood hazard zone if specific safeguards were to be established to prevent pollution (~~**Policy**~~ **Policies DE 1.2c** and **3.2d**), including:

- No spreading of manure or process water in flood plains during flooding or threat of flooding;
- Ensure that manure is worked into the soil immediately upon application.

Manure and process water applied to fields may contain substantial quantities of nutrients (i.e., nitrogen and phosphorus) and microorganisms, including pathogens (disease causing organisms). If these substances enter the surface or groundwater environments in sufficient concentrations, they could cause water quality degradation. Potential impacts to groundwater quality from excess nutrients and pathogens are described under Impact 4.3-7. Potential impacts to surface water quality associated with flooding of manure-fertilized agricultural fields would be mitigated by the Element and existing conditions as follows:

- The Element would require operational practices that would keep flood waters from coming into contact with recently applied manure or process water;
- A significant amount of adsorption to soil particles and inactivation of pathogenic organisms would be expected to occur in the fields prior to contact with any flood waters;
- Neither the flood water nor the receiving waters would be used as a drinking water source without prior treatment, and therefore any pollutants contained in the flood water would not be expected to be ingested by the public.
- During widespread regional flooding, all surface waters are expected to be degraded and precautions are already in place that minimize the likelihood of inadvertent

ingestion of pollutants by the public (i.e., public advisories to boil water before use, maintenance and disinfection of wells after flood waters recede).

Implementation of the pollution prevention actions required by the Element, including **Policies DE 1.2c, 3.2d,** and **3.2g**, would minimize the potential for degradation of water quality during flood events and reduce the impact to a less-than-significant level.

Mitigation Measure 4.3-4

None required.

Impact 4.3-5

Operation of existing and new dairies could result in releases of pollutants (including nutrients such as nitrogen and phosphorus), impacting the quality of surface waters. This is a less-than-significant impact.

Dairies must manage large volumes of manure and manure-laden process water (each milking cow excretes approximately 85 pounds of manure each day). Releases of process water to the environment and/or exposure of dry manure to uncontrolled rainfall and runoff could substantially impact the quality of receiving waters. Release of dairy process water or water that has come into contact with manure, feed, or dead animals could transport nutrients and other pollutants to receiving waters. Of particular concern, would be the release of substantial amounts of nitrogen and phosphorus into surface waters from dairy sites.

Excess nutrients (i.e., nitrogen and phosphorus) in surface waters have been associated with several environmental problems, including eutrophication and altering the productivity of natural ecosystems. While the effects of nitrogen (as nitrate) in drinking water is a human health concern (the U.S. EPA recommends the maximum concentration of 10 parts per million of nitrates in drinking water), phosphorus is not toxic[4] (Taylor, et al., 1980). The environmental problems related to nitrogen and phosphorus are mainly associated with the control of unwanted nutrient levels in surface waters. In nutrient-enriched surface waters, excessive plant growth may cause impacts. Plant growth in surface waters requires light, carbon dioxide, and nutrients (nitrogen and phosphorus, among others). Since light and carbon dioxide are readily available in plentiful quantities in shallow waters, it is typically the amount of nutrients available that limits plant growth.

It has been demonstrated that, in freshwater systems, phosphorus tends to be the limiting nutrient, while in marine systems nitrogen more often limits plant growth (Laws, 1993).

[4] Phosphorus may be toxic when present in certain pesticides.

This phenomena may be explained by the presence of cyanobacteria in freshwater systems that are capable of fixing nitrogen from the atmosphere. In freshwater systems, there is no such source for phosphorus. Conversely, nitrogen-fixing bacteria in marine systems are of relatively little importance (Laws, 1993). Based on this tendency, the County (which has no direct discharges to marine waters) should be particularly vigilant in controlling discharges of phosphorus to surface waters.

Regardless of the type of degradation (whether from phosphorus or nitrogen loading), for an impact to occur, the nutrients must reach the receiving waters. Several existing State regulations and numerous policies of the Element are designed to minimize potential impacts to surface water quality. Under existing State regulations, confined animal facilities shall be designed and constructed to retain all facility process water generated, together with all precipitation on, and drainage through, manured areas, feed storage areas, and dead animal storage areas during a 25-year, 24-hour storm event. All precipitation and surface drainage outside of manured areas shall be diverted away from these areas unless it would be fully retained (CCR Title 27, Division 2, Subdivision 1, 22562(a)). This State regulation is reiterated in the Element under **Policy DE 4.1a.B.3**.

The Element contains policies designed to minimize the potential impacts to surface water quality associated with existing and new dairies, including consideration of surface water quality when siting new dairies (**Policies DE 1.2f** and **DE 3.1a.A**) and construction methods and operational procedures designed to prevent leakage of pollutants (**Policy DE 4.1a.B.2**). **Policy DE 4.1b** would establish requirements for manure management, including maintenance of nutrient balance between land application and crops. Under **Policy DE 4.1c**, operators would be required to implement appropriate land management techniques to minimize the potential runoff of soil, nutrients, organic matter, and pathogens. In addition, **Policy DE 4.1d** would mandate appropriate management of dead animals to protect surface (and groundwater) quality. Implementation of existing State regulations and policies of the Element would adequately mitigate potential impacts associated with nutrients transported in surface water to a less-than-significant level.

Existing State regulations and policies of the Element do not directly address the potential for atmospheric fallout of nutrients to surface waters. It has been demonstrated that fallout of nitrogen compounds can affect surface water quality (National Atmospheric Deposition Program, 2000).[5] In addition to molecular nitrogen (which comprises 78 percent of the atmosphere), trace amounts of nitrogen oxides, nitric acid vapor, gaseous ammonia, and organic nitrogen circulate through the atmosphere. There are many human activities that represent sources of nitrogen compounds to the atmosphere. Motor vehicles, electric

[5] Phosphorus deposition is not further considered since investigators have found that it is a small contributor (David, et al., 2000).

utilities, and industrial boilers are the largest sources of nitrogen oxides and agriculture accounts for approximately 80 percent of the ammonia emissions in the United States (National Atmospheric Deposition Program, 2000).

Once in the atmosphere, ammonia has three possible fates: 1) dry deposition, 2) wet deposition, or 3) movement into the upper atmosphere. Movement into the upper atmosphere represents a very small percentage of the total volatilized nitrogen (Elliot, et al., 1993) and would not have direct effect on surface water quality, so is not further discussed. Most volatilized ammonia is dissolved in water vapor in the lower atmosphere and washed to earth by rainfall (wet deposition). Wet deposition of ammonia could be viewed as another source of fertilizer for agricultural crops, but it can also be an unwanted input of fertilizer to sensitive ecosystems (National Atmospheric Deposition Program, 2000). Monitoring of the wet deposition of nitrogen from nitrate and ammonium indicates that the San Joaquin Valley receives a moderate amount of fallout at 3.0 to 4.0 kilograms per hectare (kg/ha) (0.027 to 0.036 pound/acre) annually. Alaska and some parts of Oregon receive less than 1.0 kg/ha (0.009 pound/acre), while several states in the Midwest receive more than 7.0 kg/ha (0.06 pound/acre) annually. The direct impacts to surface water quality from atmospheric fallout associated with dairy operations in the County are difficult to measure, but would be related to the quantity of these compounds released to the air. The areas receiving the highest levels of fallout would be expected to be nearest to the dairy facilities and, in general, these areas would be in cultivated agriculture that may benefit from the nutrient input. Once the compounds enter the air column and move miles to tens of miles away from the source, they are more appropriately considered a potential air quality issue. The Air Quality section of the EIR includes mitigation measures designed to reduce emissions of nitrogen-containing compounds, and these measures would be expected to reduce potential indirect impacts to surface water quality of distant water bodies to a less-than-significant level.

Compliance with existing regulations and programs and **Policies DE 1.2f, 3.1a, 4.1a, 4.1b, 4.1c,** and **4.1d** proposed by the Element would reduce potential impacts to surface water quality to a less-than-significant level without additional mitigation.

Mitigation Measure 4.3-5

None required.

Impact 4.3-6

Implementation of the proposed project could result in depletion of water resources. This is a less-than-significant impact.

Overdraft (i.e., pumping in excess of recharge) of the groundwater resources has been a problem within the San Joaquin Valley, which includes most of the County. Overdraft has been of particular concern in some of the Coast Range valleys (e.g., the Kettleman Plain and Sunflower Valley) in the western portion of the County. Use of water at dairy facilities in the County could result in an increase in aquifer overdrafting. However, in a conjunctively managed basin, where surface water supplies are routinely used to recharge regional aquifers, the distinction between overuse of groundwater versus overuse of surface water is less meaningful. Supplemental surface water is used to recharge the aquifer for later recovery. In such a system, an impact to water supply may be interpreted to occur if a considerable increase in the quantity of water to be used relative to the existing condition were proposed, or water use was interpreted to be wasteful. The focus of this discussion is on efficient use of water, regardless of its source.

Water use associated with dairies can be divided into two main categories: 1) water used at the dairy facility (including milk cow washing, drinking, flushing, and residential uses) and 2) water used to irrigate support crops.

Dairy Facility Water Use

Some of the water used at a dairy facility is consumed (i.e., lost to evaporation or converted to milk by cows), but most of the water is recycled for use in flushing the facilities or applied to crops as irrigation water. The following relationships show the difference between total and actual dairy water demand.

Total dairy water demand = operations (to be reused) +
evaporation (consumed) + milk (consumed)

Actual water demand = evaporation (consumed) + milk (consumed)

It has been demonstrated that acre-for-acre, dairy facilities **consume** less water than irrigated cropland (Kern County Planning Department, 1999; Kings County Planning Agency, 1999). Impacts associated with water demand at the dairy facilities that currently maintain double-cropped acreage would be less than significant. However, new dairies in those areas that may not be able to sustainably and economically support selected crops (as defined in the Element) because of insufficient water supply (e.g., the Kettleman Plain and Sunflower Valley), may result in overdraft of local groundwater supplies; compliance with **Policy DE 3.2h** proposed by the Element would reduce potential impacts to the groundwater supplies to a less-than-significant level without additional mitigation.

Cropland Water Use

Most of the arable land within the County is under cultivation. Essentially all crops grown in the County are irrigated. The Element estimates that approximately 314,313 acres of cropland are available within the County for support of the dairy facilities. Based on current cropping patterns, 84 percent of the cropland is single-cropped (grows one crop per year) and 16 percent is double-cropped.

Dairy designs often consider the cropland acreage available to manage the wet and dry manure as a limiting factor for the size of the dairy herd. In general, the goal is to maximize the herd size to increase profitability. Since double-cropping increases the amount of nitrogen and salt uptake, more manure can be applied (at agronomic rates) to double cropped-lands than single-cropped lands. Consequently, double-cropping is often specified in a dairy design to manage the nutrients and salts generated by the herd. If a substantial increase in the amount of double-cropped lands were to occur within the County, water demand to irrigate the additional crops would be expected to increase, potentially resulting in a significant impact. However, the Element based the size of the maximum herd (for the entire County) on the amount of nitrogen[6] that could be managed on the land available **using existing cropping patterns.** Therefore, the methodology used by the Element to determine the maximum herd size for the County effectively mitigates any potential increase in water use since cropping patterns are assumed to remain similar to existing conditions (there would be no reason to increase double cropping since current cropping patterns and available land could accommodate the generated manure). This is a less-than-significant impact.

Mitigation Measure 4.3-6

None required.

Impact 4.3-7

Activities associated with dairy facilities and support cropland could result in an increase in the rate of salt and nitrogen loading, and the release of pathogens in the basin, degrading groundwater quality. This is a less-than-significant impact.

According to the EPA's National Water Quality Inventory, agriculture (including animal feeding operations) is the leading source of water quality impairment in rivers and lakes in the United States (U.S. EPA, 1999), and has been identified as a major contributor to groundwater quality degradation in the Central Valley (Bertoldi, et al., 1991). Dairy operations can cause environmental degradation of groundwater quality unless the manure generated is collected, stored, and used in an environmentally sound manner. Substances

[6] Nitrogen was found to be the limiting factor, not salt.

contained in animal manure that, if not properly managed, could become pollutants include nutrients (i.e., nitrogen and phosphorus), pathogens, and salts.[7] Although salt loading in the closed system of the Tulare Lake Basin is a natural phenomena, any introduction of additional sources of salts to the basin may increase salt loading rates, impacting groundwater quality (California RWQCB, 1995).

Essentially all the arable land in the County is under cultivation, and current agricultural practices in the County (and elsewhere) dictate that some sort of soil amendment/fertilizer be added to the land on a regular basis to provide plants with the nutrients and trace elements essential to growth. The typical soil amendment/fertilizer used is either a manufactured fertilizer or manure, which contains salts and nitrogen (commercial fertilizers would be expected to have a substantially lower pathogen content, if any). Each of these potential pollutants is considered below.

Salt

Implementation of the Element may introduce more salts to the County than introduced under existing conditions. Dairy manure contains a significant quantity of salts (generally more than manufactured fertilizers [California RWQCB, Santa Ana Region, 1990]). Import of irrigation water to the County, which contains dissolved salts, would represent an additional source of salt input (although it is assumed that this is a current source that would remain essentially unchanged). Significant outputs of salt associated with agriculture from the basin would include only the salts contained in those products that are transported out of the basin (e.g., milk, meat, and crops). Therefore, under existing conditions, salt loading is probably already occurring in the County. Since no proven method exists to allow ongoing human activity in the basin and maintain groundwater salinity at current levels, the RWQCB supports controlling the rate of increase by prudent practices and source control.

Nitrogen

Nitrogen is an essential nutrient for plant growth. The nitrogen contained in dairy cow manure is a valuable commodity and a benefit provided by the dairy industry, if managed properly. Nitrogen would be applied to the cultivated crops in the County by application of commercial fertilizer (or some other type of animal manure) if the dairy manure supply was not available. The leaching of nitrates into groundwater depends on the solubility of the nitrogen-based fertilizer or manure, the rate at which the nitrate-containing leachate percolates into the soil, and the depth to the groundwater table. Sandy soils tend to permit greater percolation while clay-based soils inhibit infiltration and leaching to groundwater.

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[7] The non-nitrogen salts of concern are typically the anions and cations of calcium, magnesium, sodium, potassium, chloride, sulfate, and phosphate (California RWQCB, Santa Ana Region, 1990).

Under most circumstances, the majority of the nitrates is taken up by the crops or resides in the root zone, since manufactured fertilizers and manures are a valuable commodity and overapplication would not be cost effective. However, elevated nitrate levels have been documented in groundwater underlying dairies, including dairies in the Central Valley (Davis, 1995).

Pathogens

When infected with disease, dairy cattle, like other animals, can shed infective organisms or pathogens in their manure. However, four steps need to occur for waterborne transmission of pathogens from dairy cows to humans (Atwill, 1997). First, the cow must shed the pathogens. Second, the pathogen must reach the water supply by the animal defecating into surface water, overland flow of tainted water to a surface water supply, or by infiltration to groundwater supplies. Third, the pathogen must remain active (infective) during transport in the environment. Fourth, upon ingestion by a human, an adequate concentration of infective organisms must be present to initiate an infection. Potential impacts to surface water quality from pathogens were discussed under Impacts 4.3-5 and 4.3-6. This analysis focuses on the infiltration to groundwater transmission pathway.

In general, the types of measures that limit the migration of one potential pollutant tend to limit the migration of others. For example, siting a dairy facility in an area underlain by clayey soils would tend to restrict the infiltration of salts, nitrogen compounds, and pathogens (hereafter referred to as pollutants). Adequate mitigation of pollutant loading should consider each of the following:

- Facility siting (i.e., favor siting dairies in areas where hydrogeologic conditions tend to limit or reduce pollutant migration and persistence);
- Source control (i.e., limiting the production and release of pollutants to levels that can be assimilated by the system without violating water quality objectives);
- Monitoring (i.e., monitoring of dairy operations to ensure that practices are maintained that minimize pollution potential and implementing a soil and groundwater quality monitoring program that provides feedback on the effectiveness of mitigation);
- Data evaluation (i.e., monitoring data must be evaluated in a way that allows early identification of potential impacts); and
- Response action (i.e., when data indicate an impact has occurred, a mechanism must be available to implement an appropriate response to eliminate the impact).

The Element is largely organized to address the items presented above.

Dairy Siting

Section III of the Element establishes general areas suitable for the location of dairies. Several of the criteria are based on the hydrogeology of the County and the goal to protect water quality.

- **Policy DE 1.2c** states that dairy facilities, including manure and dairy process water storage areas, shall not be located in Special Flood Hazard Areas (as designated by FEMA). However, dairy manure and process water could be transported into the flood hazard areas and applied to land if appropriate safeguards are implemented.

  Specific safeguards identified in ~~the policy~~ **Policy DE 3.2d** include avoiding spreading manure and process water during periods of flooding and immediate incorporation of manure into soil. **Policy DE 3.2g** requires existing dairies that propose to expand within the 100-year flood zone to demonstrate that the dairy facility is not actually in the flood hazard zone or to provide 100-year flood protection. These policies minimize the potential for water quality impacts related to inundation of flood-prone dairy facilities. **Policy DE 1.2f** prohibits dairy development in areas of excessive slope, reducing the potential for dairy runoff into surface water and ultimate infiltration to groundwater.

  Policy DE 1.2d restricts the development of dairies within areas underlain by shallow (perched) groundwater. The policy requires that minimum vertical separation of five feet between the bottom of dairy process water ponds or corral surfaces and the highest groundwater level. Proposed dairy facilities not meeting these criteria must present demonstrated site-specific mitigation measures that are approved by the RWQCB before an SPR approval can be considered. A minimum separation of five feet between groundwater and waste has been applied for storage or disposal of wastes that present a potential threat to groundwater (e.g., septic system design). However, the exclusion of dairies from areas with a separation between manured areas and storage ponds does not ensure that the potential for groundwater quality degradation would be reduced to a less-than-significant level. Pollutant migration toward the groundwater is controlled not only by the vertical distance that the pollutants must travel but also the hydraulic conductivity and chemistry of the media through which they must travel (i.e., soil and sediment) and the hydraulic gradient.

  Addressing this point, **Policy DE 3.1a** requires that ground and surface water quality and quantity must be considered by the County when reviewing and evaluating proposals for new and expanded dairies. This policy is supported by **Policy DE 3.2a**, which requires that specific information regarding hydrogeologic conditions (i.e., depth to first groundwater and groundwater usable for human consumption) must be provided to determine any constraints on dairy development related to water quality. **Policy DE 3.2b** addresses the suitability of a proposed dairy site with respect to use of nutrients in manure and process water as fertilizer and irrigation. The policy requires evaluation of the capacity of the soils at the site for assimilating nutrients and the crop production requirements for the applied nutrients to ensure that excess nutrients are not released. Other policies of the Element that address the control of pollutant migration from dairy facilities are evaluated under the discussion of source control in the following section.

- **Policy DE 3.2h** further addresses the potential impact of infiltrating pollutants on shallow groundwater quality. The policy requires that a qualified professional (certified hydrogeologist or professional engineer) conduct a Hydrogeologic Sensitivity Assessment (HSA) for new or modified dairies in areas where drinking water wells are screened in shallow groundwater areas, specifically, in areas where wells are screened above the E-clay (described in the Setting section above) or where the E-clay is not present and therefore does not provide a barrier to pollutant migration (e.g., the Kettleman Plain and Sunflower Valley). For a proposed dairy project to be approved, the HSA is required to prove that adequate hydrogeologic barriers are present to prevent migration of pathogens or nitrates to drinking water supplies. The measure further specifies that the HSA be conducted in conformance with the principles contained in the U.S. EPA's Ground Water Rule (as proposed or most current version). A report of the findings of the HSA, including conclusions and recommendations, would be submitted to the County for review and approval prior to issuance of permits to construct the proposed dairy. Therefore, site-specific hydrogeologic analysis of pollutant migration is required for all dairy facilities proposed in areas of relatively shallow groundwater.

Each of these siting criteria provide additional protection of groundwater quality.

Source Control

Section II of the Element calculates the maximum theoretical herd size that the County can accommodate based on the assimilative capacity of the system to process the nitrogen and salt load and maintain water quality objectives. The assumption is that, if the manure generated from the theoretical herd is properly managed, impacts to groundwater quality can be avoided. The Element concludes that nitrogen loading would be the limiting factor for the herd size (based on factors included in Fact Sheet No. 4 [RWQCB, 2000]), and that associated salt loading would be expected to be well below recommended guidelines.[8] The

[8] The RWQCB has, based on historic best management practices, established recommended maximum application rates of 2,000 pounds of salt per acre per year (lb/acre/yr) for single-cropped lands and 3,000 lb/acre/yr for double-cropped lands for areas where salts have not impaired groundwater (Wass, 2000)

calculations accurately incorporate the guidelines provided by the RWQCB for sizing dairies.

An additional important component of source control is proper management of the manure and process water generated at each dairy. The manure and process water generated at the dairy facilities would represent a potential pollutant source. Degradation of groundwater quality (in the form of nitrogen, salt, or pathogen loading) can occur if the source is released into the environment at a rate greater than the assimilative capacity of the system. Pollutant loading associated with dairies can occur at the dairy facilities or at the support croplands where manure is applied as a soil amendment. Following is a discussion of existing regulations and policies of the Element that would act to limit pollutant loading to groundwater.

Source Control at the Dairy Project Cropland

Some nitrogen and salt are essential to plant growth, and therefore the support crops associated with the dairies have the capacity to process at least a portion of these substances contained in the manure generated at the dairy facilities. However, if the amount of nitrogen and salts applied to the crops exceeds crop uptake potential, infiltration of nitrogen and salt below the root zone (perhaps eventually reaching groundwater) could occur, causing degradation of groundwater quality. The Element, which addresses salt and nitrogen loading at the support croplands, is further described below.

Under normal circumstances, when manure and process water are applied to a field, pathogens are expected to be adequately rendered harmless by natural processes (i.e., sorption or retention to soil particles, inactivation/degradation or "die-off"). Adsorption and retention of viruses (typically the smallest and longest-lived of the pathogens) in the soil column occur nearly instantaneously (Tim, et al., 1991). Those pathogens stranded in the soil column would pose no threat to groundwater quality. Only those pathogens that travel with the infiltration water (a significantly reduced quantity) would be of concern. Inactivation times for mobile pathogens in water are extremely variable (Yates, et al., 1995) and depend on the type of pathogen and the water chemistry and temperature. Many states establish setbacks (ranging from 50 to 500 feet) between pathogen sources and drinking water supply wells. However, "the complexity of the processes that govern virus and bacteria transport in groundwater and the variability of groundwater velocity in sensitive hydrogeologic settings make it difficult, if not impossible, for EPA to specify setback distance that will be protective of public health for all hydrogeologic settings. Thus, EPA concluded that there was insufficient scientific data to mandate national setback distances..." (U.S. EPA, 2000, page 30226). The EPA does recognize that site specific hydrogeologic conditions may be capable of effective pathogen inactivation, such as sufficient thickness of unsaturated materials (vadose zone), vertical and horizontal groundwater travel times sufficiently long to inactivate pathogens, and/or a confining layer isolating the drinking water resource (e.g., the E clay). Essentially all of the County where dairies could be located is underlain by E clay at a depth ranging from 250 to 900 feet below the surface (Page, 1986; Croft, 1972). The exception to this condition is the isolated valleys in the southwestern portion of the County (e.g., Kettleman Plains and Sunflower Valley) where the E-clay was not deposited.

If drinking water supply wells at, and within one-half mile of, a proposed dairy facility are (or would be) screened exclusively below the E clay, pathogen migration to drinking water would be considered a less-than-significant impact. However, if drinking water supply wells are located, or proposed to be located, above the E clay within one-half mile of a dairy facility, a potential impact to public health could occur.

Policy DE 3.2h addresses the potential of infiltrating pollutants on shallow groundwater quality. The policy requires that a qualified professional (certified hydrogeologist or professional engineer) conducts a Hydrogeologic Sensitivity Assessment (HSA) for new or modified dairies in areas where drinking water wells are screened in shallow groundwater areas (i.e., underlain by the E clay). The HSA is required to demonstrate that adequate hydrogeologic barriers are present to prevent pathogen or nitrate migration to drinking water supplies. The measure further specifies that the HSA be conducted in conformance with the principles presented in the U.S. EPA Ground Water Rule (as proposed or most recent version). A report of the findings of the HSA, including conclusions and recommendations, would be submitted to the County prior to the approval of SPRs for proposed dairy facilities. Therefore, site-specific hydrogeologic analysis is required by the Element for dairy facilities that present a potential impact to shallow drinking water sources. **Policy DE 3.2i** requires that all existing wells at dairy sites be inspected to ensure the appropriate well seals are in place to minimize the potential for vertical contaminant migration.

In addition to these policies, **Policy DE ~~6.1h~~ 6.2f** requires that each new and expanded dairy implement a groundwater monitoring program. The program would be developed on the basis of site-specific hydrogeologic conditions. A minimum of three monitoring wells, and possibly lysimeters would be required. All wells and lysimeters would be sampled prior to dairy operation and annually thereafter, and tested for total dissolved solids, electrical conductivity, general mineral content, nitrogen (as ammonia, nitrate, and nitrite), phosphorus, and coliform (or other indicators of biological contamination). The required testing parameters could be modified at the request of the RWQCB.

The confined animal facility regulations (CCR Title 27, Section 22563) and the General Waste Discharge Requirements for Milk Cow Dairies (Order No. 96-270) require that "application of manure and wastewater to disposal fields or cropland shall be at rates that are reasonable for the crop, soil, climate, special local situations, management system, and type of manure." The policy requires that nutrient management shall ensure that the application rate of nutrients does not exceed the capability of the soil and crops to assimilate the applied nutrients.

In addition, the Element includes several objectives and policies designed to provide additional protection to groundwater from excessive nitrogen and salt inputs (among other constituents).

- **Objective DE 4.1** would require that a ~~*Comprehensive*~~ *Manure Nutrient Management Plan* be submitted with each new or expanded dairy application. Careful application of manure and process water to fertilize and irrigate agricultural crops is necessary to prevent the potential for the infiltration or runoff of excess nutrients. **Policy DE 4.1b** of the Element sets guidance for the appropriate reuse of the manure and process water. The policy identifies the primary purpose of nutrient management as the need to balance the available nutrients in site soils, in manure and process water, and commercial fertilizer with the nutrient requirements of the crops to be grown. The policy states that nutrients must be applied at rates that ensure that excess nutrients are not released to surface water or groundwater. The policy further states that soils and manure must be sampled to accurately determine nutrient levels. The policy also requires that manure application equipment must be calibrated to ensure that the planned rates of application are achieved. The policy also requires that dairy owner/ operators submit an Irrigation Management Program which ensures that irrigation water and runoff from fields within dairy units is not allowed to migrate away from the project site. In addition, **Policy DE 4.2a** requires that each dairy develop and implement a Comprehensive Dairy Process Water ~~Disposal~~ Application Plan ~~if any process water is to be used on cropland away from the dairy facility~~.

Source Control at the Dairy Facilities

The potential for releases of nitrogen and salts (among other constituents) from dairies facilities is regulated by specific Federal and State legislation designed to protect water quality. Specific regulation of large dairy operations and other "Confined Animals Facilities" (CAF) is provided by Title 27, Division 2, Chapter 7, Subchapter 2, Article 1 ("Confined Animals Facilities") of the California Code of Regulations commencing with Section 22560. These regulations were promulgated by the State Water Resources Control Board in 1984 and are enforced in the County by the RWQCB. The regulations specify that certain minimum standards shall either be implemented in the Waste Discharge Requirements (WDRs) for a particular CAF or made a condition to the waiver of such requirements. The requirements of Subchapter 2, Article 1 ("Confined Animals Facilities") of the California Code of Regulations that relate to protection of water quality at the dairy facility include (when appropriate, Element policies that address the stated regulation are provided):

- *The discharger shall prevent animals at a confined animal facility from entering any surface water within the confined area. (22561)*

- *Confined animal facilities shall be designed and constructed to retain all facility process water generated, together with all precipitation on, and drainage through, manured areas during the 25-year, 24-hour design storm. (22562(a))*

The Element contains a policy (**Policy DE 4.1a.~~A.3~~B.3**) that is consistent with this regulation.

- *All precipitation and surface drainage outside of manured areas, including that collected from roofed areas, and runoff from tributary areas during the storm events described in (a), shall be diverted away from manured areas, unless such drainage is fully retained. (22562(b))*

The Element contains a policy (**Policy DE 4.1a.~~A.1~~B.1**) that is consistent with this regulation.

- *Retention ponds and manured areas at confined animal facilities in operation on or after November 27, 1984 shall be protected from inundation or washout by overflow from any stream channel during 20-year peak stream flows. (22562(c)(1))*

The Element contains a policy (**Policy DE 4.1a.~~A.3~~B.3**) that is more stringent than this regulation, requiring that dairy facilities be located outside the 100-year flood hazard zone and that manured areas be setback a minimum of 150 feet from surface waters, recharge basins, and flood plains (Policy DE 3.2c).

- *Retention ponds shall be lined with, or underlain by, soils which contain at least 10 percent clay and not more than 10 percent gravel or artificial materials of equivalent impermeability. (22562(d))*

The soil survey (U.S. Department of Agriculture, 1986) indicates that many of the soils in the County are well-drained and may not meet these criteria. In addition, based on studies and regulatory experience gained since these regulations were adopted, it appears that these criteria may not be adequately protective of groundwater quality. Pollutants (nitrates and salts) have been documented to migrate through retention ponds and from corral areas at dairies in Merced and Stanislaus counties (Davis, 1995).

The minimum standard requiring a soil lining composed of at least 10 percent clay (and not more than 10 percent gravel) may not be adequate to prevent significant infiltration of process water from storage ponds at all sites. A soil with 10 percent clay, 10 percent gravel, and 80 percent coarse sand could be moderately to highly permeable.

The *Geotechnical, Design, and Construction Guidelines* published by the National Resource Conservation Service (NRCS) (1997) provide a more comprehensive approach to addressing potential impacts related to infiltration of process water from livestock process water management systems. Rather than set specific grain size requirements for soils surrounding process water storage facilities, the NRCS guidelines specifically address the ability of the soil to transmit water. The rate of flow through a porous medium (such as soil and sediment) is partially controlled by the hydraulic conductivity or permeability of the material. Flow rate is also affected by the hydraulic gradient. The NRCS Guidelines establish a maximum hydraulic conductivity (permeability) of 1×10^{-7} cm/s for soils lining retention ponds that would reduce infiltration to acceptable levels. From this hydraulic conductivity value, the NRCS Guidelines derive a standard for acceptable seepage losses (specific discharge) of 1×10^{-6} cm/s, which takes into account the thickness of the liner and the depth of water in the pond (hydraulic gradient), as well as the hydraulic conductivity of the liner. The NRCS Guidelines acknowledge that a certain amount of physical and chemical sealing of the pond sides and bottom occurs as the manure solids settle. One order of magnitude of hydraulic conductivity is credited to the manure solids sealing effect and, therefore, the pond liner must uniformly meet or exceed the standard of 1×10^{-5} cm/s (specific discharge) when installed, but in subsequent operation would be expected to quickly establish a specific discharge of 1×10^{-6} cm/s.

Significant infiltration of process water stored in the pits and ponds may occur. Ultimately, the infiltrating water would migrate downward to the shallow groundwater table. Although some pollutants in the water would be removed or geochemically treated as the water moves though the unsaturated zone, it is possible that the contaminants may reach the uppermost water-bearing zone. Therefore, mitigation to reduce infiltration is required to comply with Subchapter 2, Article 1 ("Confined Animals Facilities") of the California Code of Regulations, which states that:

- *Regulations are Minimum Standards - The RWQCB shall impose additional requirements, if such additional requirements are necessary to prevent degradation of water quality or impairment of beneficial uses of waters of the state. (22560(c))*

Calculations have been prepared to determine whether the dairy facilities (specifically the process water ponds within the facilities) would be expected to comply with the per-acre salt loading guidelines recommended by the RWQCB if the facilities were required to comply with the NRCS *Geotechnical, Design, and Construction Guidelines* for construction of the process water ponds. Results indicate that the salt loading rate at dairy facilities would be on the order of 500 to 1,000 pounds/acre/year, substantially lower than the RWQCB guidelines for manure application.[9] In addition, the fine-grained pond liners would provide an effective mitigation that would be expected to reduce or eliminate pathogen migration (depending on the mobility of the pathogen) into the subsurface. **Policy DE 4.1a** of the Element sets requirements for the ~~Comprehensive~~ Manure Nutrient Management Plan (~~C~~MNMP) required for all new and expanded dairies. These requirements include the following provisions (**Policy DE 4.1aB.2**.) which address the potential for infiltration of pollutants from process water ponds and manure separation pits:

- *All manure separation pits and process water ponds shall be constructed so that the bottoms of the pits and ponds are at least five feet above the highest expected groundwater levels.*

- *The pits and ponds shall be maintained so that ~~losses due to infiltration are minimized~~ the integrity of the liners is ensured.*

- *The specific discharge of process water through the ~~soils lining~~ bottom and sides of the manure separation pits and ~~ponds~~ lagoons shall not ~~exceed~~ be greater than 1 x ~~10^{-5} cm/s~~ 10^{-6} centimeters per second in compliance with the Geotechnical, Design, and Construction Guidelines published by the National Resource Conservation Service (1997).*

- *A qualified professional (i.e., Professional Engineer or Certified Engineering Geologist) shall certify that the ~~design and installation of the~~ liner system ~~shall be supervised by a qualified professional (i.e., professional engineer or certified engineering geologist)~~ of a lagoon or pit is installed according to the NRCS design standards.*

- *The soil sampling and permeability testing program shall be designed to be representative of all soils underlying all proposed pond areas.*

- *Construction of the ~~ponds~~ lagoons shall be inspected by a qualified professional to ensure that geologic heterogeneities (e.g., channel deposits and sandy lenses) are identified and properly mitigated to ensure integrity of the liner in compliance with the NRCS standards. The liner must be protected against damage during operation and maintenance activities.*

The corrals could be locations of significant manure accumulation. Leaching and infiltration may result in introduction of salts to the subsurface. However, since the hydraulic pressure of standing water (which would tend to drive nutrients into the

[9] Uptake of salts by plants would not occur under the ponds. However, the RWQCB estimates that salt uptake by crops, depending on the type of crop, is about 1,200 pounds/acre/year (Wass, 1994). Maximum application rates of 3,000 pounds/acre/year for double-cropped agricultural lands are recommended by the RWQCB, and therefore 1,800 pounds/acre/year would be considered the assimilative capacity of the subsurface. The loading rate of 500 to 1,000 pounds/acre/year at the dairy facilities is substantially less than the calculated assimilative capacity.

subsurface at the pond locations) would not occur in the corrals or storage areas and annual precipitation is very low, the risk to groundwater quality is reduced relative to infiltration at the ponds. Detailed studies on the fate and transport of nitrogen and salts in feedlots have been conducted by many investigators. It has been demonstrated that, in an active feedlot, a layer (typically two to four inches thick) of trampled manure/soil forms an "excellent moisture seal" (Sweeten, 1993). The sealing layer (typically dark brown to black, often resembling charcoal) is very thin, however, and essentially eliminated when the upper inch is removed (Lehman, et al., 1975). Continued disturbance of this layer, requiring that it be reformed often, may allow substantial infiltration of nutrients. Another study conducted at a level feedlot underlain by silty loam indicated that the feedlot contributed no more nitrate or ammonia to the shallow water table than the adjacent cropland (Elliot, et al., 1972). Soils underlying the areas of heaviest manure accumulation appear to be least impacted by leaching of nitrates, apparently explained by the creation of conditions unfavorable to nitrogen transformation to leachable forms (Chang, et al., 1973). The results of investigations indicate that, at properly managed dairies (particularly in arid environments where infiltration of precipitation is minimal), the corrals should not contribute any more nitrates or salts to the subsurface than the adjacent cropland. In addition, if vertical moisture migration is controlled at the corrals and manure storage areas, substantial vertical pathogen migration would be reduced or eliminated.

Policy DE 4.1a.B.2. of the Element provides measures to reduce the potential water quality impacts related to dairy cattle corrals. The following specific measures are included in the policy:

- *At the corrals, naturally-occurring or imported clayey (not less than 10% clay) soils shall underlie the corrals and dry manure storage areas. ~~Positive~~ Site drainage shall be included in the project design and construction of any manured area, including but not limited to, dairy surroundings, corrals, and ramps, pursuant to Title 3, Division 2, Chapter 1, Article 22, §646.1 of the California Code of Regulations to ensure that ~~excessive~~ ponding does not occur. ~~The design shall comply with Title 3, Division 2, Chapter 1, Article 22, §646.1 of the Food and Agriculture Code for construction and maintenance of dairy surroundings, corrals, and ramps, as described below~~.*

- *Regular maintenance of corrals and dry manure storage areas shall include filling of depressions. Care shall be taken not to disturb the seal layer in the corrals. Dairy personnel shall be taught ~~the~~ to correctly use ~~of~~ manure collection ~~machines (wheel loaders or elevating scrapers)~~ equipment.*

Monitoring

Monitoring is a critical requirement that must be included in any water quality mitigation program to provide the means of determining whether the siting and source control measures (described above) are effective in protecting groundwater quality. Section V of the Element describes the proposed monitoring program. **Goal DE 6** would implement a monitoring program to demonstrate the effectiveness of the provisions of the Element and associated mitigation measures, and would allow for adjustments in dairy operations, if deemed necessary, to protect the environment (**Objective DE ~~6.1~~ 6.2**). **Policies DE ~~6.1a~~ 6.2a ~~and 6.1b~~** would establish baseline environmental conditions, monitor the bovine carrying capacity of the county, and develop a database on dairy characteristics.

Policy DE ~~6.1h~~ 6.2f specifically addresses water quality monitoring. The policy requires that the Dairy Monitoring Program (established under **Objective DE ~~7.1~~ 6.1**) establish monitoring requirements for each dairy facility. The minimum requirements include:

- *Installation of groundwater monitoring wells at each dairy adequate to characterize the variations in depth to uppermost groundwater across the site and chemical quality of the uppermost groundwater zone. If non-continuous perched groundwater zones underlie the site, deeper aquifers may require monitoring. ~~When appropriate and as determined by the County, vadose~~ Vadose zone monitoring using lysimeters shall be required to monitor the quality of soil water, particularly in the vicinity of the ~~ponds~~ lagoons. The design and ~~I~~installation of water quality monitoring ~~wells~~ system shall be ~~conducted by~~ performed under the direction of a Registered Geologist or a Professional Engineer in accordance with California Well Standards.*

- *Groundwater and soil water samples shall be analyzed, at minimum, for TDS, electrical conductivity, general mineral content, nitrogen ~~(~~as nitrate and nitrite~~)~~, phosphorus, and coliform, ~~(~~or other appropriate indicator of biological contamination~~)~~.*[10] *This list of constituents to be analyzed may be modified at the request of the RWQCB. All samples should be analyzed by a State-certified analytical laboratory.*

- *Sampling of all wells and lysimeters shall be conducted~~, at a minimum,~~ prior to dairy operation to establish background levels and thereafter on an annual basis. In addition, the depth to water in each well shall be measured ~~(~~to within an accuracy of 0.1 foot~~)~~ twice each year, ~~(~~once in the spring and once in the fall~~)~~.*

- *Reporting requirements shall be according to the RWQCB and Policy DE 6.4d, below.*

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[10] The EPA is proposing *E. coli.*, coliphage, and enterococci as indicators closely related to fecal contamination in the draft Ground Water Rule [40CFR Sections 141 and 142].

These goals, objectives, and policies would establish the requirement for a monitoring program, and provide minimum standards for what should be included in the monitoring program (i.e., areas and constituents to be monitored, frequency of monitoring, organization of monitoring reports).

Data Evaluation

Appropriate evaluation of the monitoring data is critical to the success of the Element. A program that does not provide meaningful data evaluation would not ensure protection of groundwater quality.

TABLE 4.3-1: **Tulare Lake Basin, Groundwater Quality Objectives for Salinity**.

Subbasin	Maximum Average Increase in Electrical Conductivity (µmhos/cm)
Tulare Lake	3
Westside North	1
Kaweah River	3
Kings River	4

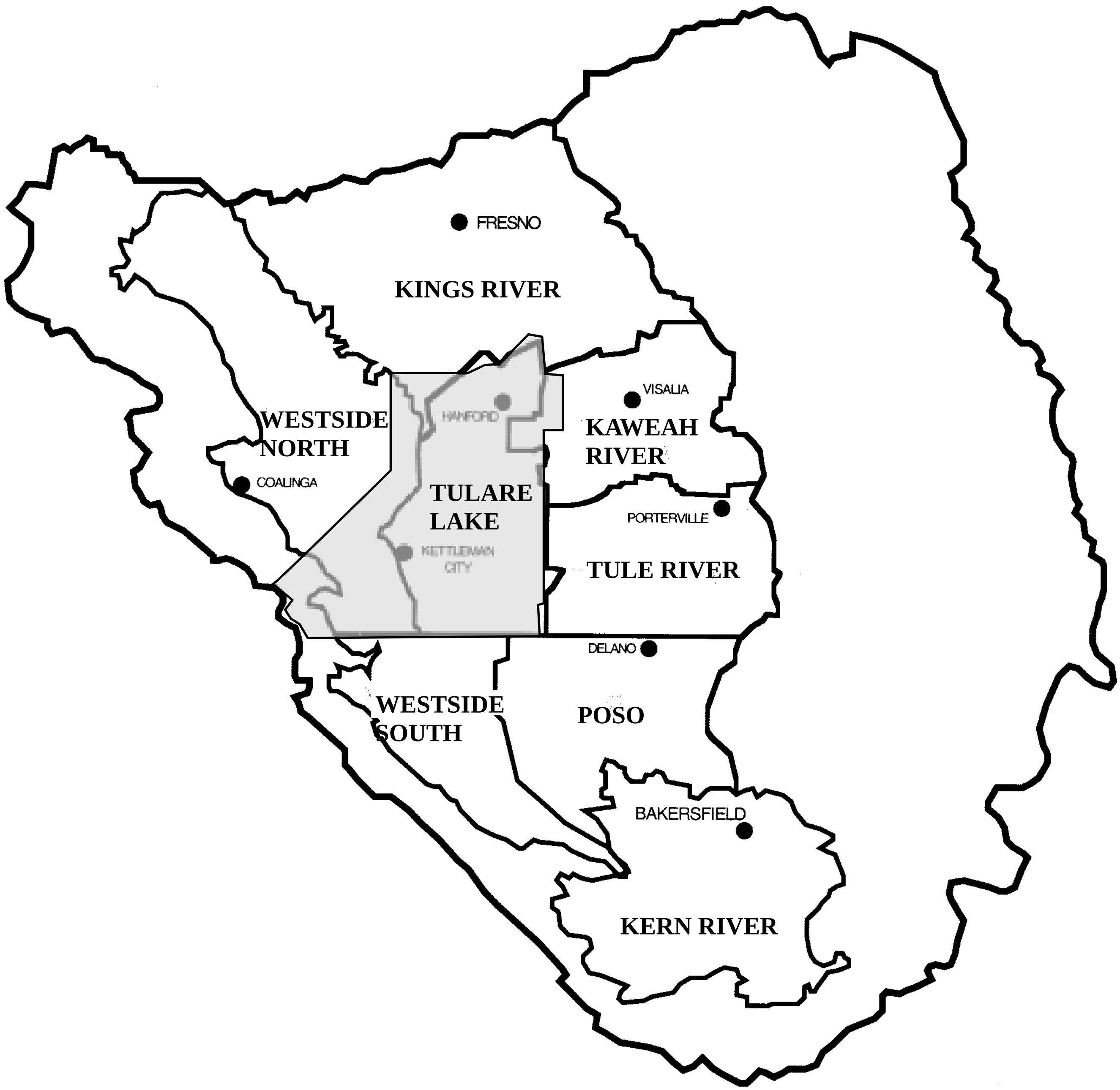
Source: Modified from California RWQCB, 1995.

The purpose of data evaluation would be to determine whether the potential contribution to nitrogen and salt loading that may occur under the Element represents a significant increase relative to existing conditions. There are two main quantitative considerations when determining significance of potential impacts to water quality: 1) toxicity, and 2) violation of water quality objectives, standards, and/or criteria. Clearly, minor to moderate increases in TDS or EC levels would not result in toxicity. There are no primary drinking water standards (which are designed to protect human health) for TDS or EC; only secondary standards that tend to address aesthetics of water (e.g., taste, odor) not health concerns. The only pertinent regulatory water quality objective available that addresses salt loading in the basin is found in the Basin Plan (California RWQCB, 1995), which provides numerical criteria for allowable increases in electrical conductivity (salinity) for each of the subbasins within the Tulare Lake Basin. The average annual increase would be determined from monitoring data by calculating a cumulative average annual increase over a 5-year period (California RWQCB, 1995). The limits of Kings County includes four subbasins within the Tulare Lake Basin, including Tulare Lake, Westside North, Kaweah River, and the Kings River subbasins (Figure 4.3-5). Table 4.3-1 summarizes the numerical criteria for each of the subbasins.

Therefore, the analysis of whether project-related salt loading is significant must determine whether operation of the dairies would be expected to result in violation of water quality objectives stated in Table 4.3-1.

The Element includes goals, objectives and policies concerning water quality data evaluation. **Goal DE ~~7~~ 6** and **Objective DE ~~7.1~~ 6.1** would establish a Dairy Monitoring

GROUNDWATER HYDROGRAPHIC UNITS Figure 4.3-5



Source: California RWQCB, 1995.

BASELINE

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Program in the Kings County Planning Agency which would be responsible for monitoring all aspects of dairy operation. **Policy DE** ~~**7.3d**~~ **6.4d** is included in the Element to specifically address the need to provide meaningful evaluation of groundwater data collected at Kings County dairies. The policy requires that each dairy operator performing required groundwater testing (**Policy DE** ~~**6.1h**~~ **6.2f**) retains a qualified professional (certified hydrogeologist or professional engineer) to compile and evaluate groundwater data collected as part of the water quality monitoring program. The professional would be required to compare the water quality data to applicable State water quality objectives (as defined in the Basin Plan) to whether violations of the objectives have occurred and mitigation is required. The policy specifies that evaluation of salinity testing results include statistical analysis of variations in concentration over time. An acceptable statistical methodology for determining trends in data (e.g., Mann-Kendall test) would be established by the Dairy Monitoring Office. In recognition that the performance of such a test of the data requires a set of data, the policy requires that the first trend analysis be performed after five years of data collection, and then each year thereafter. In recognition of evolving water quality criteria and objectives, the policy states that "when considering response action for identified violations, the Dairy Monitoring Office shall ensure that water quality criteria and Basin Plan objectives used in the evaluation of the site-specific data are appropriate and current and consult with the RWQCB to confirm that a violation has occurred and that remedial action is required." The data evaluation provided for in **Policy DE** ~~**7.3d**~~ **6.4d** appropriately addresses the need for professional analysis of water quality results.

Response Action

The purpose of data collection and evaluation is to determine whether ~~an impact~~ groundwater contamination may be occurring. Response action is required to mitigate any identified ~~impacts~~ problems. The Element includes policies that address impact resolution, including:

- **Policy DE 4.2d,** which provides the County with the authority to find a dairy operation in violation of its site plan review approval (and potentially revoke the approval) if a dairy operator fails to obtain approval for changes to process water and manure use agreements.
- **Policy DE** ~~**6.2a**~~ **6.3a**, which requires new and expanded dairies to ~~submit~~ conduct annual tests ~~results~~ to demonstrate that the facility is operating within established guidelines. If guidelines are exceeded, the operator would be required to ~~reduce the herd size or make other changes to balance nutrient management~~ bring the facility into compliance or face potential modification or revocation of his permit.
- **Policy DE** ~~**7.1b**~~ **6.1a.A**, which states that the dairy monitoring office would prepare specific reports, as necessary, on a case by case basis to address problems and work with dairy operators to solve problems in a timely manner.

- ~~**Policy DE 8.1c** which states that the Element does not guarantee that a dairy that does not meet the specified standards will be able to come into conformance, and that out of conformance dairies may be required to modify or cease their operations.~~
- **Policy DE 6.4d**, which requires the Dairy Monitoring Office to evaluate the data collected by dairy operators against applicable water quality standards and require corrective action in consultation with the RWQCB when necessary.

These policies indicate that the Kings County Planning Agency would be empowered and willing to modify or revoke the SPR approval or use permit of any and all dairies operating under the Element that do not meet the requirements established by the Element to protect groundwater quality. This appears to be an appropriate mechanism for enacting change if an impact is identified.

The discussion presented above demonstrates that the Element contains numerous specific policies that address protection of groundwater quality. The policies of the Element reflect the process under which the Element and this PEIR were developed in tandem. The policies reflect direct input from the PEIR team. The policies reflect concern regarding dairy siting (**Policies DE 1.2c, 1.2d, 1.2f, 3.1a, 3.2a, 3.2b, 3.2c, 3.2h,** and **3.2i**) as well as source control of pollution at dairy facilities (**Policies DE 4.1a.A** and **4.1a.B**) and in croplands irrigated and fertilized with process water and manure (**Policies DE 4.1b** and **4.1c**). The Element establishes policies to ensure monitoring of water quality at all new and expanded dairies (**Policy DE ~~6.1h~~ 6.2f**) and professional evaluation of collected monitoring data (**Policy DE ~~7.2d~~ 6.4d**). The policies are specific and conform with or exceed performance standards set by the responsible regulatory agencies. Implementation of these policies would minimize the potential for release of excess nutrients and pollutants and provide monitoring to ensure recognition of any water quality trends in the future. Therefore, the implementation of the policies identified above reduces localized and regional groundwater quality impacts to a less-than-significant level.

Mitigation Measure 4.3-7

None required.

Impact 4.3-8

Existing water supply wells may represent preferred pathways for pollutant migration to the subsurface. This is a less-than-significant impact.

Existing irrigation and water supply wells (either active or abandoned) that do not meet current wells standards of construction may act as conduits for pollutant migration to the subsurface. If any of the wells were not constructed with effective sanitary seals upon construction, or have been damaged since installation, or were to be damaged during grading and construction of the new or modified dairies, surface water may seep into the wells and the underlying aquifer, causing water quality degradation.

Two policies included in the Element address the specific issue of potential pollutant migration into wells. **Policy DE 3.2c** establishes a minimum setback of 150 feet between any manured areas and water wells. This setback exceeds the California Well Standards which require a minimum setback of 100 feet between water wells and an animal enclosure.

Policy DE 3.2i requires that all existing water supply wells at a proposed new or modified dairy site (including those located away from the dairy facilities in the cropland areas) shall be inspected by a qualified professional to ensure that each well is properly sealed at the surface to prevent infiltration of waterborne contaminants into the well casing or surrounding gravel pack. If any of the wells are found not to comply with the California Well Standards, the applicant or dairy operator shall retain a qualified well driller to install the required seal or functional equivalent certified by a licensed engineer or other qualified registered professional. Documentation of the inspections and seal installations, if any, shall be provided to the County Planning Department prior to commencement of dairy operations.

Mitigation Measure 4.3-8

None required.

Implementation of **Policies DE 3.2c** and **3.2i** would reduce the impacts associated with potential direct migration of pollutants into wells to a less-than-significant level.

Impact 4.3-9

Implementation of the proposed Element could result in cumulative impacts to water quality. This is a less-than-significant impact.

The area covered by the Element is located within the Tulare Lake Basin, a hydrologic basin that covers approximately 10.5 million acres (RWQCB, 1995). The Regional Water Quality Control Board designates beneficial uses within the basin and sets water quality objectives to protect those uses. The Water Quality Control Plan for the Tulare Lake Basin ("Basin Plan") describes water quality concerns identified for the basin. Increased salinity in groundwater is identified as the most significant problem within the basin. Considered a natural condition in a closed basin in an arid environment, elevated salinity is exacerbated by human activities that result in discharges of dissolved solids to the surface and subsurface.

Irrigated agriculture and confined animal facilities, land uses proposed under the Element, are recognized in the Basin Plan as significant potential contributing sources for salt loading within the basin. The Element specifically addresses the potential water quality impacts associated with implementation of the theoretical dairy herd. The theoretical herd size was determined on the basis of estimated capacity of croplands within the DDOZ and NSOZ to accommodate the nutrient loading associated with manure and process water generated by the herd. In addition, the theoretical herd estimate accounted for land required to accommodate the nutrient load from manure generated at existing nondairy confined animal facilities and approved biosolids disposal facilities (refer to Table No. 5A of the Element). Therefore, the basis of the Element accounts for cumulative impacts of nutrient loading associated with the use of dairy manure and process water in Kings County.

Potential surface water impacts are essentially eliminated by dairy design and provisions of the Element (**Policies DE 1.2c, 1.2f, 3.1a, 3.2c,** and **3.2g**). Cumulative water supply impacts would not be expected to occur since water use would be expected to be similar to existing conditions. Potential cumulative impacts to groundwater quality would be the only impact described above that would be expected to have the potential to result in a cumulative impact. However, the method used by the Element to size the theoretical herd is based on mitigating the potential cumulative impact to groundwater quality associated with nitrogen and salt loading, and ensures that, overall, the County would be in compliance with RWQCB estimates of assimilative capacity of the subsurface. Coupled with careful controls on siting of dairies (**Policies DE 1.2c, 1.2d,** and **3.2c**), required assessment of site-specific hydrologic conditions (**Policies DE 3.2.a, 3.2b,** and **3.2h**), management of the manure (**Policies DE 4.1a, 4.1b**, and **4.1c**), ~~and~~ ongoing monitoring and data evaluation (**Policy DE ~~6.1h~~ 6.2f** and **~~7.2d~~ 6.4d**), and adoption of compliance with water quality objectives of the Basin Plan as a threshold of significance for impacts of the Element to water quality (**Policy DE 4.4a**), the cumulative impact to groundwater quality is reduced to a less-than-significant level.

Mitigation Measure 4.3-9

None required.