California Regional Water Quality Control Board
Santa Ana Region

Staff Report

August 28, 2009

Item: **10**

Subject: **Potential Repeal of Riverside County Prohibition on New Conventional Septic Systems in Cherry Valley Community of Interest** (Informational Item)

Introduction:
As discussed below, on July 17, 2007 Riverside County approved a prohibition on the use of on-site waste disposal systems in the Cherry Valley Community of Interest. Local residents, as the only voting members of a groundwater evaluation committee established by Riverside County Supervisor Ashley, have recently recommended that the prohibition be repealed, and in making this recommendation removed from the committee's final report technical recommendations to the contrary from Regional Board staff and other experts, effectively censoring technical evidence contrary to the wishes of the local residents.

Discussion:
Cherry Valley Community of Interest (Cherry Valley) is an unincorporated area located north of the City of Beaumont and southeast of the City of Calimesa. The community is not served by sanitary sewer systems, but relies on on-site waste disposal systems (OSWDS or septic systems). As of the US Census of 2000, there were 5,891 people, 2,434 households, and 1,740 families residing in Cherry Valley. Based on Riverside County 2005 parcel data, there are approximately 1,900 developed lots, all on septic systems. The area overlies the Beaumont Groundwater Management Zone (Beaumont GMZ) which serves as the only source of municipal water supply for Cherry Valley and the City of Beaumont (Figure 1). The Beaumont Cherry Valley Water District (BCVWD) is the major water supply agency serving the area and relies on the Beaumont GMZ as its primary source of water. In addition, there are also many private water supply wells. The beneficial uses of the Beaumont GMZ include Municipal and Domestic Supply, Agricultural Supply, Industrial Service Supply, and Industrial Process Supply. The water quality objectives specified to protect the beneficial uses of the Beaumont GMZ include total dissolved solids (TDS) of 330 mg/L (maximum benefit objective) and 230 mg/L (anti-degradation objective), and nitrate-nitrogen of 5 mg/L (maximum benefit objective) and 1.5 mg/L (anti-degradation objective). The antidegradation objectives are based on historic ambient quality of the Beaumont GMZ. The application of the maximum benefit water quality objectives is contingent on the implementation of certain projects and programs by the City of Beaumont, and the San Timoteo Watershed Management Authority

(STWMA[1]), as part of their maximum benefit demonstrations. Assimilative capacity created by these projects/programs is allocated to the parties responsible for implementing them.

Elevated nitrate levels have been observed in wells in Cherry Valley, and recently, nitrate concentrations in two groundwater production wells owned by BCVWD have approached the Maximum Contaminant Level (MCL) of 10 mg/L nitrate-nitrogen. In March of 2005, nitrate-nitrogen concentrations reached 9.0 mg/L at BCVWD Well 16 (Figure 2). In March 2006, nitrate-nitrogen concentrations reached 8.0 mg/L at BCVWD Well 21(Figure 2). Nitrate-nitrogen in drinking water in excess of the 10 mg/L MCL is of concern because, if ingested, these concentrations may cause methemoglobinemia, also known as blue-baby syndrome, in infants less than six months of age.

To determine the source of elevated nitrate in these wells, a committee consisting of the City of Beaumont, San Timoteo Watershed Management Authority (STWMA) and BCVWD, known as Project Committee No.1, contracted with Wildermuth Environmental, Inc. (WEI) to assess the current and future threat to groundwater quality from OSWDS in the Beaumont GMZ[2]. WEI completed a draft report in August 2006 and presented the draft report findings to the Regional Board on October 13, 2006. The final report was completed in March 2007. The WEI report concluded that the simultaneous occurrence of high nitrate concentrations, along with elevated levels of specific ions, and the presence of pharmaceutical compounds and nitrogen isotopes associated with OSWDS discharges, indicates that OSWDS are the source of nitrate contamination in the Beaumont GMZ. Modeling analysis performed by WEI also showed that nitrate-contaminated groundwater would eventually (projected for 2100) impact all production wells in the Beaumont GMZ. The modeling also suggested that, if left unmitigated, OSWDS discharges are sufficient to cause nitrate-nitrogen concentrations to exceed basin plan objectives and MCLs. WEI proposed that there was sufficient evidence to warrant a prohibition of OSWDS in Cherry Valley. A copy of the WEI final report is included in Appendix A.

Based on the conclusions of the WEI study report, the County of Riverside Board of Supervisors issued three Ordinances to ban new septic systems unless the systems are designed to remove 50% of the nitrogen in effluent. Ordinance No. 864, passed by the Board of Supervisors on October 16, 2006, specified a 90-day moratorium on the installation of conventional septic systems. Ordinance No. 864-1 extended that moratorium another 120 days. Finally, on July 17, 2007, the Board of Supervisors approved Ordinance 871, which made the moratorium a “Prohibition” without an expiration date. A copy of Ordinance 871 is included in Appendix B.

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[1] STWMA members include the Beaumont-Cherry Valley Water District (BCVWD), the City of Beaumont (Beaumont), the South Mesa Water Company, and the Yucaipa Valley Water District. The purpose of STWMA is to prepare and implement a water resources management program for the San Timoteo Watershed.

[2] Wildermuth Environmental. Inc. was the key technical consultant for the work leading to the development of the revised Nitrogen and TDS management strategy that was incorporated in the Basin Plan in 2004. This included the identification of groundwater management zones and appropriate TDS and nitrate-nitrogen objectives. WEI thus possesses significant expertise in considering conditions within the Beaumont GMZ, including factors that are leading or may lead to groundwater quality degradation.

On April 29, 2008, County of Riverside Supervisor Ashley established the Groundwater Quality Evaluation Committee for the Beaumont/Cherry Valley Area (Committee). The Committee members included interested local residents and technical experts in the field of water quality. The technical experts were non-voting members and provided only technical assistance to the local residents. The Committee was charged with reviewing technical data presented by Federal, State and regional experts and making recommendations to the Riverside County Board of Supervisors, the cities of Beaumont and Banning[3] and the Board of the BCVWD regarding the on-going concerns about groundwater quality in the Beaumont GMZ. Board staff served as a technical expert on the Committee. The Committee completed its Final Report and Recommendations on June 15, 2009. A copy of this report is included in Appendix C. It is imperative to emphasize that input from several technical experts, including Regional Board staff, was removed from the final report, evidently because these experts disagreed with the recommendations sought by the local residents. Some key findings and recommendations of the Report include the following:

Finding #2
"The conventional on-site wastewater disposal system prohibition instituted by Riverside County may have been premature."

The Committee recommends that the County repeal Ordinance 871 which prohibits the installation of new conventional on-site wastewater disposal systems until further information on the impact of groundwater quality is determined.

Finding #3
"Additional development has occurred in the unincorporated area of Cherry Valley that violates parcel size restrictions of nothing less than ½ acre. The California Regional Water Quality Control Board – Santa Ana Region has adopted this same minimum parcel size restriction of 1 OSWDS per ½ acre. The smaller parcel size may be a contributor to eventual groundwater contamination."

The recommendation is to continue parcel size restrictions of nothing less than 1 acre to limit density for development using OSWDS and to be consistent with existing land use parameters.

Finding #4
"Some active water wells, including ALL wells studied in the Wildermuth Report in the Cherry Valley area appear to be located within the 100' restrictive zone surrounding contamination sources."

[3] Even though the Beaumont GMZ boundary ends at Banning, the Beaumont storage unit does underlie the City of Banning. Therefore, the Committee was charged by Supervisor Ashley to also report to the City of Banning.

The committee recommendation is to encourage water purveyors within the Beaumont GMZ to retrofit water wells to have at least the minimum fifty foot sanitary seal, and to initiate the directives found in the State of California Drinking Water Source Assessment and Protection Program.

Board staff have reviewed the Committee's Final Report and the Findings. Staff agrees with Findings #3 and #4 of the Final Report that address the minimum lot size requirement and a minimum fifty foot sanitary seal requirement for water wells.

Staff strongly disagrees with Finding #2. All data assessed to date points clearly to significant water quality impacts to the Beaumont GMZ as a result of OSWDS. Repeal of the prohibition would be contrary to the protection of the quality of groundwater in the Beaumont GMZ and its use for domestic supply. Staff has sent two letters to Supervisor Ashley to express support for Ordinance 871, prohibiting the installation of new conventional OSWDS in Cherry Valley.

On July 10, 2009, the Riverside County Board of Supervisors accepted the Committee report and recommendations. The Board requested that interested regional agencies commission and obtain funding to conduct a new, more in-depth groundwater study within 180 days. If a new study is not commissioned within the 180 days, the County of Riverside would repeal Ordinance 871.

In light of the County's intended action, Board staff recommends the following course of action by Board staff and the Board itself to ensure the protection of water quality and beneficial uses in the Beaumont GMZ.

1. **CEQA Issues:** Request that the Board of Supervisors prepare an analysis of the potential environmental impacts of the repeal of Ordinance 871 pursuant to the California Environmental Quality Act (CEQA). Board staff has been informed that the County does not intend to conduct this review at the present time. If the County develops a CEQA document for the repeal in the future, Board staff will provide comments on the CEQA document.

2. **Work with the County and local agencies to identify (a) funding source(s) to support additional study**. Staff would explore funding availability through Supplemental Environmental Projects (SEP) or the Cleanup and Abatement Account and coordinate with the City of Beaumont, BCVWD, STWMA, and Supervisor Ashley's office for matching funds to better define the geographic extent of the Beaumont GMZ that has been impacted by septic systems, and to identify all septic systems in the Beaumont GMZ. In order to assure public participation in this endeavor, Board staff would support the formation of a task force similar to the Nitrogen/TDS Task Force to develop the specific scope of the new study, which would be conducted by qualified technical experts. The new study would be used to support the Basin Plan amendment discussed below.

3. **Restrict review of new septic systems by Riverside County Department of Environmental Health (CDEH).** At the present time, the CDEH, in accordance with a Memorandum of Understanding (MOU) with the Regional Board, reviews, approves and oversees the installation and maintenance of septic systems. CDEH requires additional review and approval by Board staff for the proposed use of alternative disposal systems that would meet a 50% reduction in nitrogen within Cherry Valley. If Ordinance 871 is repealed, Board staff would advise CDEH to suspend its review and approval of applications for new septic systems in Cherry Valley, and to forward such applications to Regional Board staff. Further, Board staff would advise the CDEH that Board staff intends to hold in abeyance all applications for new septic systems, pending (a) completion of the collection of data needed to fill data gaps in the WEI Report, and, (b) Regional Board consideration of the adoption of a Basin Plan amendment to incorporate an OSWDS prohibition for the Cherry Valley area (the specifics of the prohibition, including the areal extent, date for compliance, etc. would be delineated in the amendment).

4. **Amend the Basin Plan to establish a Waste Discharge Prohibition on discharges from OSWDS within Cherry Valley and the City of Beaumont.** The prohibition would address both existing and new OSWDS. The adoption of a Waste Discharge Prohibition would be considered through an extensive public participation process that entails extensive analysis, including economics, reasonably feasible methods of compliance, costs associated with methods of compliance, environmental analysis required pursuant to CEQA, and consideration of alternatives.

   In lieu of, or in addition to, establishing a Waste Discharge Prohibition, the Regional Board could consider the issuance of Waste Discharge Requirements to individual homeowners, requiring that wastewater discharged from OSWDS comply with the TDS and nitrate-nitrogen antidegradation objectives of the Beaumont GMZ. The Waste Discharge Requirements could include requirements for the collection of data that would support future consideration of a Prohibition.

5. **Cease and Desist Order**
   Once the Basin Plan amendment to incorporate the Prohibition becomes effective (i.e., once the amendment is approved by the Regional Board, the State Water Resources Control Board and the Office of Administrative Law), the Regional Board could issue a Cease and Desist Order, with a compliance schedule(s), to residents in Cherry Valley who dispose of wastewater to OSWDS. The Cease and Desist Order would compel compliance with the Prohibition.

   Enforcement orders could also be used to compel compliance with Waste Discharge Requirements adopted to regulate discharges from OSWDS.

Board staff will closely monitor the actions of Riverside County and other interested agencies to determine whether Regional Board/Board staff action, as described above, is necessary.

Appendices:

Appendix A: Wildermuth Environmental Inc., March 2007. Water Quality Impacts From On-Site Waste Disposal Systems In The Cherry Valley Community Of Interest. Final Report Prepared For San Timoteo Watershed Management Authority Project Committee No. 1

Appendix B: Riverside County Board of Supervisors, June 19, 2007. Ordinance No. 871 An Ordinance of the County of Riverside Prohibiting the Installation of Specified Septic Tank Systems in Cherry Valley.

Appendix C: Riverside County Board of Supervisors, July 10, 2009. Report from the Groundwater Quality Evaluation Committee for Beaumont/Cherry Valley Area

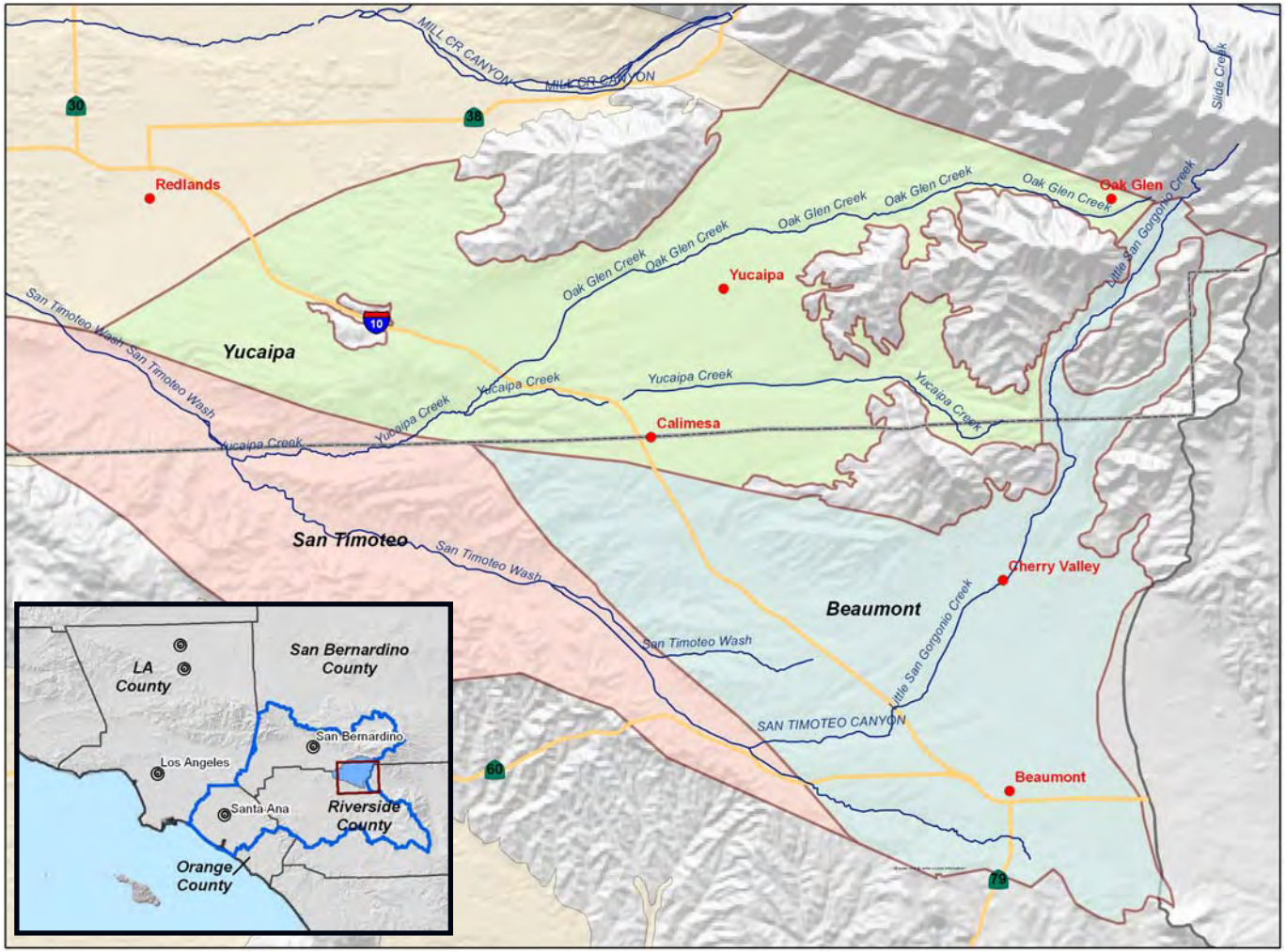
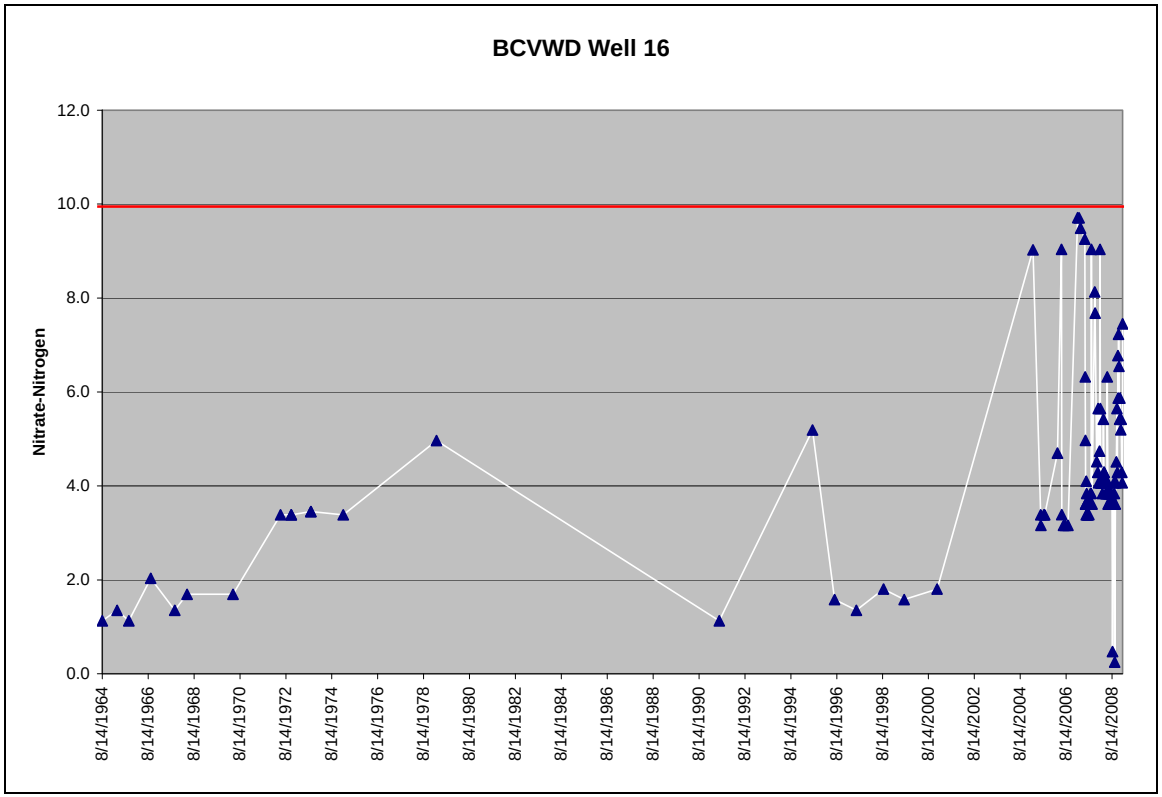


Figure 1. Location of Cherry Valley, neighboring cities and underlying Beaumont groundwater management zone


BCVWD Well 16
Nitrate-Nitrogen
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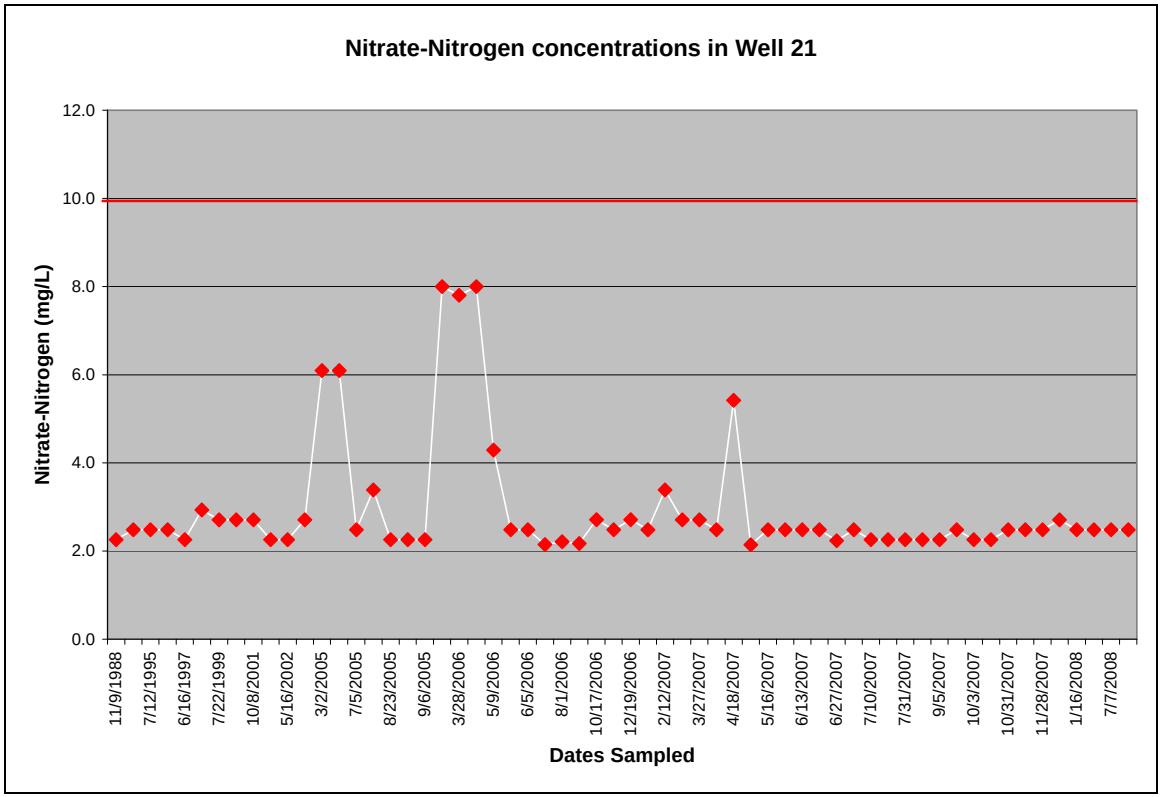
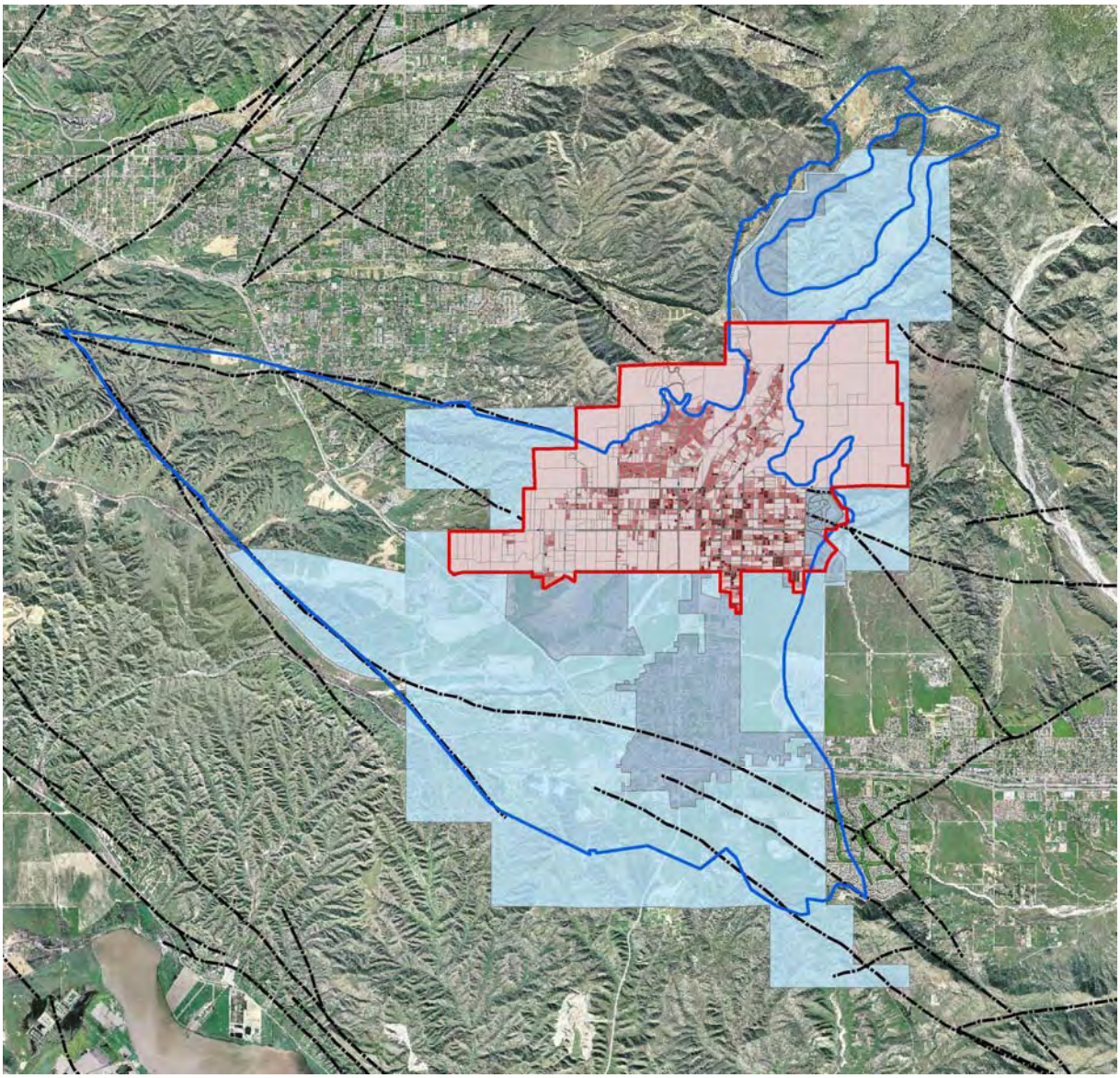


Figure 2. Nitrate-nitrogen concentrations in two production wells owned by BCVWD

Appendix A:

Wildermuth Environmental Inc., March 2007. Water Quality Impacts From On-Site Waste Disposal Systems In The Cherry Valley Community Of Interest. Final Report Prepared For San Timoteo Watershed Management Authority Project Committee No. 1

WATER QUALITY IMPACTS FROM ON-SITE WASTE DISPOSAL SYSTEMS IN THE CHERRY VALLEY COMMUNITY OF INTEREST



FINAL REPORT

PREPARED FOR

SAN TIMOTEO WATERSHED MANAGEMENT AUTHORITY PROJECT COMMITTEE NO. 1

PREPARED BY

WILDERMUTH™ ENVIRONMENTAL INC.

MARCH 2007

WILDERMUTH™
ENVIRONMENTAL INC.

March 21, 2007

San Timoteo Watershed Management Authority
Project Committee No. 1
Attention: J. Andrew Schlange
560 Magnolia Avenue
Beaumont, Ca 92223

Subject: Water Quality Impacts from On-Site Waste Disposal Systems (OSWDS) in the Cherry Valley Community of Interest (CVCOI) – Final Report

Dear Mr. Schlange,

Transmitted herewith is the final report for our investigation of the nitrogen impacts from the discharge of effluent from OSWDS in the CVCOI on groundwater in the Beaumont Management Zone. The inhabitants of the CVCOI use OSWDS to treat domestic wastewater and subsequently discharge the effluent to groundwater. Beaumont Cherry Valley Water District (BCVWD) and other water retailers in the CVCOI have experienced elevated nitrate concentrations in their wells. Wildermuth Environmental Inc. (WEI) developed a work plan to determine if the OSWDS are the source of elevated nitrate in water supply wells and to estimate the potential impacts in the future. As to the first question WEI used state of the art analytical techniques and four prestigious laboratories to identify the source of elevated nitrate concentrations. Our conclusions are as follows:

- Several production wells have been negatively impacted as nitrate concentrations are increasing at BCVWD and other retailers' wells in the CVCOI.
- Several water wells within and down gradient of the CVCOI have nitrate concentration that are close to or exceed the nitrate MCL of 10 mg/L.
- Water produced from wells high in nitrate in this area have a nitrogen isotopic signature that is consistent with discharge from OSWDS.
- Water produced from some of the wells high in nitrate in this area contain PPCPs that can only be explained by discharge from OSWDS.
- The simultaneous occurrence of high nitrate concentrations, elevated levels of specific ions, and PPCPs and nitrogen isotopes associated with OSWDS discharge can only be explained by discharge from OSWDS.
- If the CVCOI builds out to 4,900 lots, the impacts from OSWDS will significantly impact the local area and well-head treatment will be required in order to serve drinking water from the local production wells.
- If the CVCOI builds out to 8,800 lots, OSWDS will contribute enough nitrate to groundwater that in the fullness of time, the entire Beaumont Management Zone will be rendered non-potable.
- Left unmitigated, the magnitude of OSWDS discharges is sufficient to cause nitrate concentrations to exceed basin plan objectives.
- Based on a review of the law and the case histories of prohibitions on OSWDS in California, there is sufficient evidence of groundwater contamination by OSWDS to warrant the RWQCB to issue a prohibition on new OSWDS in the CVCOI.

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We recommend that the San Timoteo Watershed Management Authority (STWMA) Project Committee No. 1 (PC1) and the municipal pumpers in the Beaumont Management Zone carefully review this report and subsequently take immediate actions to eliminate this source of nitrate contamination in the Beaumont Management Zone. These actions should include:

- Work with the County and the RWQCB to establish a prohibition on all new OSWDS in the CVCOI.
- Work with the inhabitants of the CVCOI to sewer the existing developed areas within the CVCOI.

Even if these actions are taken, nitrate concentrations in wells that have already been impacted will continue to increase in the future. Currently unaffected wells will likely be impacted. BCVWD and the other impacted retailers should develop plans now to blend or treat high nitrate well water in the near future.

Please call Kristal Davis or me if you have any questions regarding this investigation. WEI thanks you for the opportunity to work on important water management issues and to serve the STWMA PC1 and the citizens in the STWMA service area.

Wildermuth Environmental, Inc.

Mark J. Wildermuth
President

WATER QUALITY IMPACTS FROM ON-SITE WASTE DISPOSAL SYSTEMS IN THE CHERRY VALLEY COMMUNITY OF INTEREST

Final Report

Prepared for

SAN TIMOTEO WATERSHED MANAGEMENT AUTHORITY PROJECT COMMITTEE NO. 1

Prepared by

WILDERMUTH™ ENVIRONMENTAL INC.

MARCH 2007

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ACRONYM AND ABBREVIATIONS LIST	
BCVWD	Beaumont-Cherry Valley Water District
BVMWC	Bonita Vista Mutual Water Company
CVCOI	Cherry Valley Community of Interest
CVMWC	Cherry Valley Mutual Water Company
CWA	Clean Water Act
CWC	California Water Code
DU	dwelling unit
DWR	Department of Water Resources
LLNL	Lawrence Livermore National Laboratories
MCL	Maximum Contaminant Level
µg/L	micrograms per liter
mg/L	milligrams per liter
MRL	minimum reporting limit
MWH	MWH Laboratories
N	nitrogen
NH_3-N	ammonia as nitrogen
NH_4-N	ammonium as nitrogen
ng/L	nanogram per liter
NO_3-N	nitrate as nitrogen
NO_2-N	nitrite as nitrogen
OSWDS	on-site waste disposal system
PC1	Project Committee No. 1
PPCPs	Pharmaceuticals and personal care products
RoWD	Report of Waste Discharge
RWQCB	Regional Water Quality Control Board
SAS	soil absorption system
STWMA	San Timoteo Watershed Management Authority
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen

ACRONYM AND ABBREVIATIONS LIST	
TIN	total inorganic nitrogen
TN	total nitrogen
TMDL	Total Maximum Daily Load
UCD	University of California at Davis
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WDR	Waste Discharge Requirement
WEI	Wildermuth Environmental, Inc.
WHOI	Woods Hole Oceanographic Institute

EXECUTIVE SUMMARY

The San Timoteo Watershed Management Authority (STWMA) was formed in January 2001 by the Beaumont-Cherry Valley Water District (BCVWD), the City of Beaumont (Beaumont), the South Mesa Water Company, and the Yucaipa Valley Water District. The purpose of STWMA is to prepare and implement a water resources management program for the San Timoteo Watershed. This program addresses: conservation of local water supplies, improvement of surface and groundwater quality and quantity, protection and enhancement of groundwater storage and recreational resources, preservation of open space, protection of wildlife habitat and wetlands, protection and enhancement of agriculture, and development and enhancement of the region's water resources for the benefit of the public. STWMA, concerned about the water quality of the region, formed Project Committee No. 1 (PC1), in part, to manage and improve water quality in the Beaumont Management Zone. In response to rising nitrate concentrations in the Beaumont Management Zone, PC1 initiated an investigation to determine the source of nitrates. This report presents the findings of that investigation.

Wildermuth Environmental, Inc (WEI), under contract to PC1, conducted a study to assess the current and future threat to groundwater quality from on-site waste disposal systems (OSWDS) in the Beaumont Management Zone. The components of this study are:

1. A thorough review of the scientific literature.
2. A field study to estimate nitrogen concentrations in soil water below selected OSWDS.
3. A tracer study to confirm the presence of effluent from OSWDS in groundwater within the Beaumont Management Zone (this was conducted in addition to the original scope of work at the request of BCVWD).
4. An analysis of the locations and numbers of current and future OSWDS.
5. An estimation of current discharge from OSWDS to groundwater and projection of future discharge.
6. A planning level evaluation of basin-wide nitrogen impacts in the Beaumont Management Zone.
7. A review of the thresholds of evidence used in California to compel sewering when OSWDS contaminate or threaten to contaminate groundwater.

In the City of Beaumont and surrounding unincorporated areas, the only source of drinking water is groundwater, which is supplied by BCVWD. Rising nitrate levels have been observed in wells in the Cherry Valley Community of Interest (CVCOI), and recently nitrate concentrations in a couple of groundwater production wells owned by BCVWD have approached the Maximum Contaminant Level (MCL) of 10 mg/L nitrate-nitrogen. Two water companies in the CVCOI, Bonita Vista Mutual Water Company and Cherry Valley Mutual Water Company, have requested to be annexed into BCVWD's service area, in part, due to high nitrate concentrations in their wells. Nitrate in drinking water in excess of its MCL is of concern because, if ingested, it may cause methemoglobinemia, also known as blue-baby syndrome, in infants less than six months of age. In March of 2005, nitrate concentrations reached 9.0 mg/L at BCVWD Well 16 and 6.1 mg/L at BCVWD Well 21.

OSWDS, the preponderance of which are septic tank systems, have been identified as a possible source of nitrates in groundwater in the Beaumont Management Zone because of the density of households with OSWDS in the CVCOI and their proximity up-gradient and adjacent to water supply wells that have been impaired by nitrate. There is no sewer service in the CVCOI, and thus, residents rely exclusively on OSWDS for the treatment and disposal of their wastewater. OSWDS are the most frequently reported

cause of nitrate contamination in groundwater and their density is the most important factor influencing groundwater contamination. Beaumont and BCVWD are concerned about the potential nitrogen impacts on groundwater from OSWDS in the Beaumont Management Zone. In the future, BCVWD will have to mitigate the nitrate contamination in the CVCOI.

The United States Environmental Protection Agency (US EPA) designates areas with an OSWDS density greater than 1 per 16 acres as an area of potential groundwater contamination. The Santa Ana Regional Water Quality Control Board (RWQCB) requires a minimum lot size of one half acre per OSWDS. Numerous studies have looked at the potential impact to groundwater from OSWDS and have proposed different lot size requirements, ranging from 0.5 to 2.0 acres, to protect groundwater from contamination.

WEI obtained parcel and assessed property value information from the County of Riverside in digital format. Based on a review of these data, about 800 of the approximately 1,900 developed lots with OSWDS are on less than half acre size parcels, which violates the minimum half acre-parcel requirement of the RWQCB. There are about 1,400 developed lots that are less than 2.0 acre parcels. At build out, the total number of lots with OSWDS could reach about 8,800, depending on how CVCOI develops. Thus, there is ample reason for Beaumont and BCVWD to be concerned with OSWDS discharges to groundwater in the Beaumont Management Zone.

Given the high density of OSWDS, further investigation was conducted to confirm the presence of septic tank effluent in groundwater. Samples were collected and analyzed for several indicators of contamination from OSWDS. They included nitrogen isotopes and pharmaceutical and personal care products (PPCPs). Three research laboratories were contracted to analyze the nitrogen isotopic signature of nitrate: Lawrence Livermore National Laboratories, University of California at Davis, and Woods Hole Oceanographic Institute. PPCPs were analyzed by MWH Laboratories. Water produced from wells high in nitrate in the CVCOI had a nitrogen isotopic signature consistent with discharge from OSWDS and contained PPCPs that can only be explained by discharge from OSWDS. The simultaneous occurrence of high nitrate concentrations, elevated levels of specific ions, and pharmaceuticals and nitrogen isotopes associated with OSWDS discharge indicate that OSWDS are the source of nitrate contamination in the Beaumont Management Zone.

In order to assess basin wide nitrogen impacts from OSWDS to the Beaumont Management Zone, current OSWDS discharge and nitrogen loads were estimated. Subsequently, future OSWDS discharge and nitrogen loads were projected and a planning level estimate of nitrogen impacts in the Beaumont Management Zone was made.

In the long-term, the water quality of the upper saturated zone of an aquifer is comparable to the quality of the recharge waters. It is in this groundwater zone where the impacts from nitrate contamination are most prevalent. Impacts to groundwater from OSWDS over a defined geographical area can be estimated by a simplified mass balance approach. RWQCBs throughout California have used mass balance calculations as a means to assess the potential impacts from OSWDS. The average nitrate concentration in recharge water from precipitation and OSWDS discharge in the CVCOI was estimated to range from 22 to 33 mg/L. These nitrate concentrations exceed the MCL of 10 mg/L. Presently, OSWDS are discharging approximately 665 acre-ft/yr, which accounts for about 5 percent of the total recharge to the Beaumont Management Zone.

At build out there will be about 4,900 to 8,800 OSWDS, depending on how the CVCOI develops, discharging about 1,700 to 3,100 acre-ft/yr, respectively, to groundwater. This represents approximately 13 to 21 percent of the total recharge to the Beaumont Management Zone. If the CVCOI builds out to 4,900 lots, the impacts from OSWDS will significantly impact the local area and well-head treatment will be required in order to serve drinking water from the local production wells. If the CVCOI builds out to

8,800 lots, OSWDS will contribute enough nitrate to groundwater that in the fullness of time, the entire Beaumont Management Zone will be rendered non-potable.

Left unmitigated, the magnitude of OSWDS discharges is sufficient to cause nitrate concentrations to exceed basin plan objectives. Based on a review of the law and the case histories of prohibitions on OSWDS in California, there is sufficient evidence of groundwater contamination by OSWDS to warrant the RWQCB to issue a prohibition on new OSWDS in the CVCOI.

1. INTRODUCTION

The San Timoteo Watershed Management Authority (STWMA) was formed in January 2001 by the Beaumont Cherry Valley Water District (BCVWD), the City of Beaumont (Beaumont), the South Mesa Water Company, and the Yucaipa Valley Water District. The purpose of STWMA is to prepare and implement a water resources management program for the San Timoteo Watershed. This program addresses: conservation of local water supplies, improvement of surface and groundwater quality and quantity, protection and enhancement of groundwater storage and recreational resources, preservation of open space, protection of wildlife habitat and wetlands, protection and enhancement of agriculture, and development and enhancement of the region's water resources for the benefit of the public. STWMA, concerned about the water quality of the region, formed Project Committee No. 1 (PC1), in part, to manage and improve water quality in the Beaumont Management Zone. In response to rising nitrate concentrations in the Beaumont Management Zone, PC1 initiated an investigation to determine the source of nitrates. This report presents the findings of that investigation.

1.1 Background

The Beaumont Management Zone encompasses a majority of the Beaumont Basin and the streams that recharge the basin. The Beaumont Basin is an adjudicated basin and is the main source of drinking water to Beaumont, as well as an important source of drinking water to neighboring communities. The location of the Beaumont Management Zone and the Beaumont Basin are shown in Figure 1-1. Also shown in this figure are the maximum nitrate concentrations for the period of 2000-2006 and groundwater elevation contours for fall 2003. All nitrate concentrations stated herein are expressed as nitrate-nitrogen (NO_3-N). Nitrate concentrations are highest in the region known as the Cherry Valley Community of Interest (CVCOI). There is no sewer service in the CVCOI; hence, residents rely exclusively on on-site waste disposal systems (OSWDS) for the treatment and disposal of wastewater. There is a high density of OSWDS in the CVCOI and, thus, they have been identified as a possible source of nitrate in groundwater. This is a concern because groundwater flows from the northern portion of the CVCOI, across the Banning Fault and into the Beaumont Basin. The general direction of groundwater flow shown in Figure 1-1 demonstrates how nitrate contamination originating in the CVCOI has the potential to contaminate the entire Beaumont Basin.

Nitrate in drinking water in excess of its Maximum Contaminant Level (MCL) of 10 mg/L is of concern because if ingested, it may cause methemoglobinemia, also known as blue-baby syndrome, in infants less than six months of age. Research is also being conducted to confirm the relationship between the ingestion of nitrate in drinking water and hypertension (Malberg *et al.*, 1978; Seffner, 1995), diabetes (Kostraba *et al.*, 1992), increased infant mortality (Super *et al.*, 1981), central nervous system birth defects (Arbuckle *et al.*, 1988; Dorsch *et al.*, 1984), several types of cancer (Cantor, 1997; Eicholzer and Gutzwiller, 1990; Barret *et al.*, 1998), and non-Hodgkin's lymphoma (Weisenburger, 1993; Ward *et al.*, 1996).

In Beaumont and surrounding unincorporated areas, the only source of drinking water is groundwater, which is supplied by BCVWD. Rising nitrate levels have been observed in wells in the CVCOI, and recently nitrate concentrations in two groundwater production wells owned by BCVWD have approached the MCL. Two water companies in the CVCOI, Bonita Vista Mutual Water Company (BVMWC) and Cherry Valley Mutual Water Company (CVMWC), have requested to be annexed into BCVWD's service area, in part, due to high nitrate concentrations in their wells. Figure 1-2 shows nitrate concentrations over time at several wells in the BCVWD service area and Figure 1-3 shows the location of these wells.

In March of 2005, nitrate concentrations reached 9.0 mg/L at BCVWD Well 16 and 6.1 mg/L at BCVWD Well 21.

OSWDS, the preponderance of which are septic tank systems, have been identified as a possible source of nitrate in groundwater in the Beaumont Management Zone because of the density of households with OSWDS in the CVCOI and their proximity up-gradient and adjacent to water supply wells that have been impaired by nitrate. OSWDS are the most frequently reported cause of nitrate contamination in groundwater and their density is the most important factor that influences groundwater contamination (Yates, 1985; US EPA, 1977). Beaumont and BCVWD are concerned about the potential nitrate impacts to groundwater from OSWDS in the Beaumont Management Zone. In the future, BCVWD will have to mitigate the nitrate contamination in the CVCOI.

The United States Environmental Protection Agency (US EPA) designates areas with an OSWDS density greater than 1 per 16 acres as an area of potential groundwater contamination (US EPA, 1977). The Santa Ana Regional Water Quality Control Board (RWQCB) requires a minimum lot size of one-half acre per OSWDS. Numerous studies have looked at the potential impact to groundwater from OSWDS and have proposed different lot size requirements to protect groundwater from contamination (Holzer, 1975; Miller, 1972; Perkins, 1984; Reneau, 1979). These lot sizes range from 0.5 to 2.0 acres.

WEI obtained parcel and assessed property value information from the County of Riverside in digital format. Based on a review of these data, about 800 of the approximately 1,900 developed lots with OSWDS are on less than half-acre parcels, which violates the minimum half-acre parcel requirement of the RWQCB. There are about 1,400 developed lots that are less than 2.0 acres. The density of the existing OSWDS provides ample reason for Beaumont and BCVWD to be concerned with OSWDS discharges to groundwater in the Beaumont Management Zone and their possible contribution to rising nitrate levels.

1.2 Scope of Investigation

Wildermuth Environmental, Inc (WEI), under contract to PC1, conducted a study to assess the current and future threat to groundwater quality from OSWDS in the Beaumont Management Zone. The components of this study are:

1. A thorough review of the scientific literature.
2. A field study to estimate nitrogen concentrations in soil water below selected OSWDS.
3. A tracer study to confirm the presence of effluent from OSWDS in groundwater within the Beaumont Management Zone (this was conducted in addition to the original scope of work at the request of BCVWD).
4. An analysis of the locations and numbers of current and future OSWDS.
5. An estimation of current discharge from OSWDS to groundwater and projection of future discharge.
6. A planning level evaluation of basin-wide nitrogen impacts in the Beaumont Management Zone.
7. A review of the thresholds of evidence used in California to compel sewering when OSWDS contaminate or threaten to contaminate groundwater.

1.3 Organization of Report

Section 1 – Introduction

Section 2 – Literature Review of the Fate of Nitrogen from OSWDS

An extensive review of the scientific literature regarding OSWDS and their treatment of nitrogen in wastewater was conducted to assess the likelihood of groundwater contamination from OSWDS discharge and the concentration of nitrate in that discharge. Furthermore, a field study was performed to estimate the nitrate concentrations in the soil below OSWDS in the CVCOI. This section summarizes the results of the literature review and field study.

Section 3 – Sources of Nitrate in Groundwater Underlying the CVCOI

This section presents the findings of a tracer study conducted to determine the sources of nitrate in groundwater underlying the CVCOI.

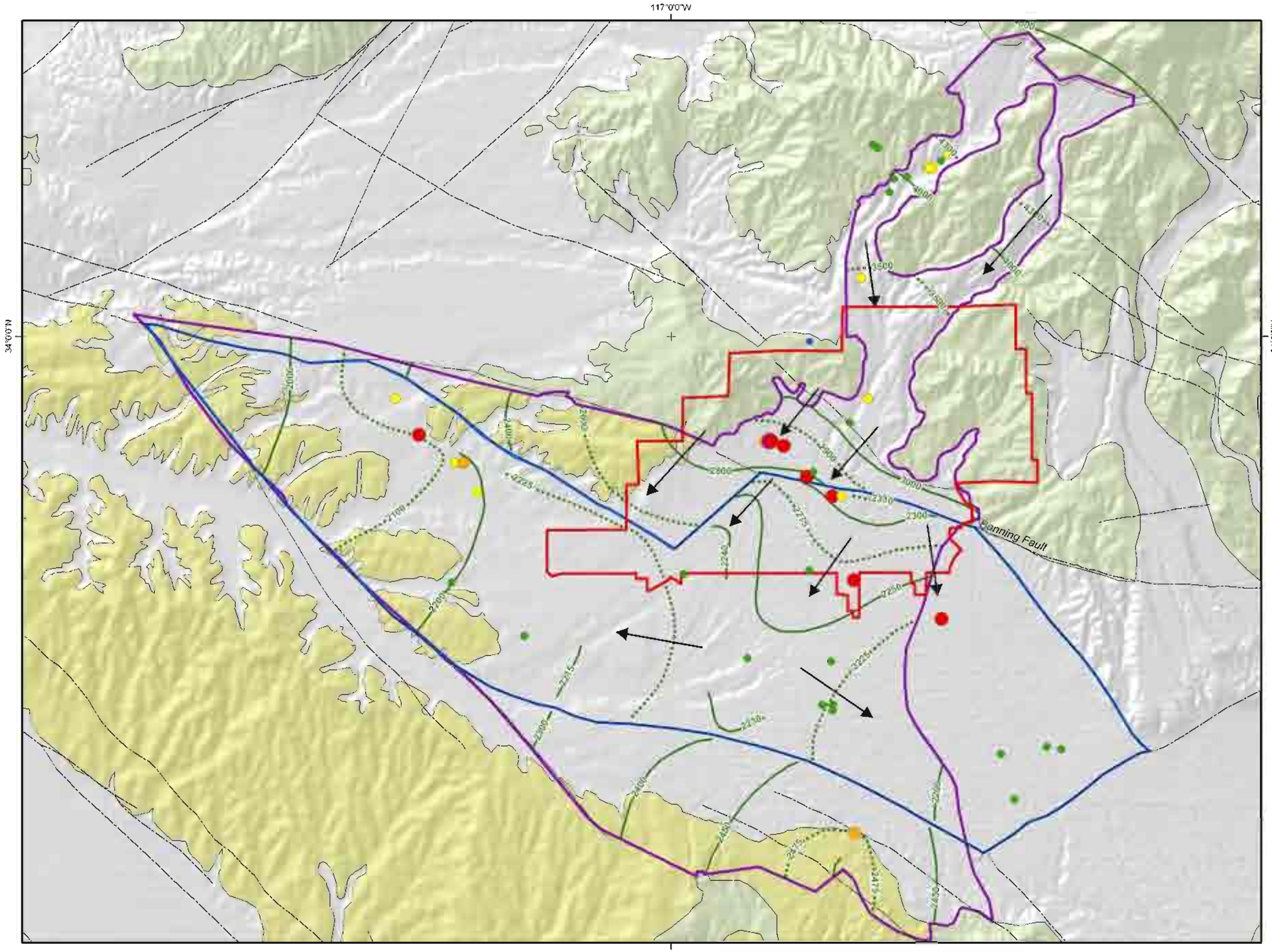
Section 4 – Current and Future OSWDS Discharge and Nitrogen Loads to the Beaumont Management Zone

In order to assess basin wide nitrogen impacts from OSWDS to the Beaumont Management Zone, current OSWDS discharge and nitrogen loads were estimated. Subsequently, future OSWDS discharge and nitrogen loads were projected and a planning level estimate of nitrogen impacts in the Beaumont Management Zone was made.

Section 5 – Thresholds of Evidence Used to Prohibit OSWDS

A thorough review of the law concerning the permitting of OSWDS and specific cases of OSWDS prohibitions in California was conducted. This section explains the regulation of OSWDS in California and evidence used to prohibit OSWDS throughout the state.

Section 6 – Conclusions



Main Features

Nitrate-Nitrogen
Max Conc. 2000-2006
(mg/L)

- ND
- <2.5
- 2.5 - 5
- 5 - 7.5
- 7.5 - 10
- >10

2000 / 2100 Groundwater Elevation Contours (feet above mean sea level)

General Direction of Groundwater Flow

Beaumont Basin

Beaumont Management Zone

Cherry Valley Community of Interest

Geology

Unconsolidated Sediments

Semi-Consolidated Sediments

Consolidated Sediments

Fault

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Author: KD
Date 20060614
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0 1 2 3 Miles
0 1 2 3 4 KM

San Timoteo Watershed Management Authority

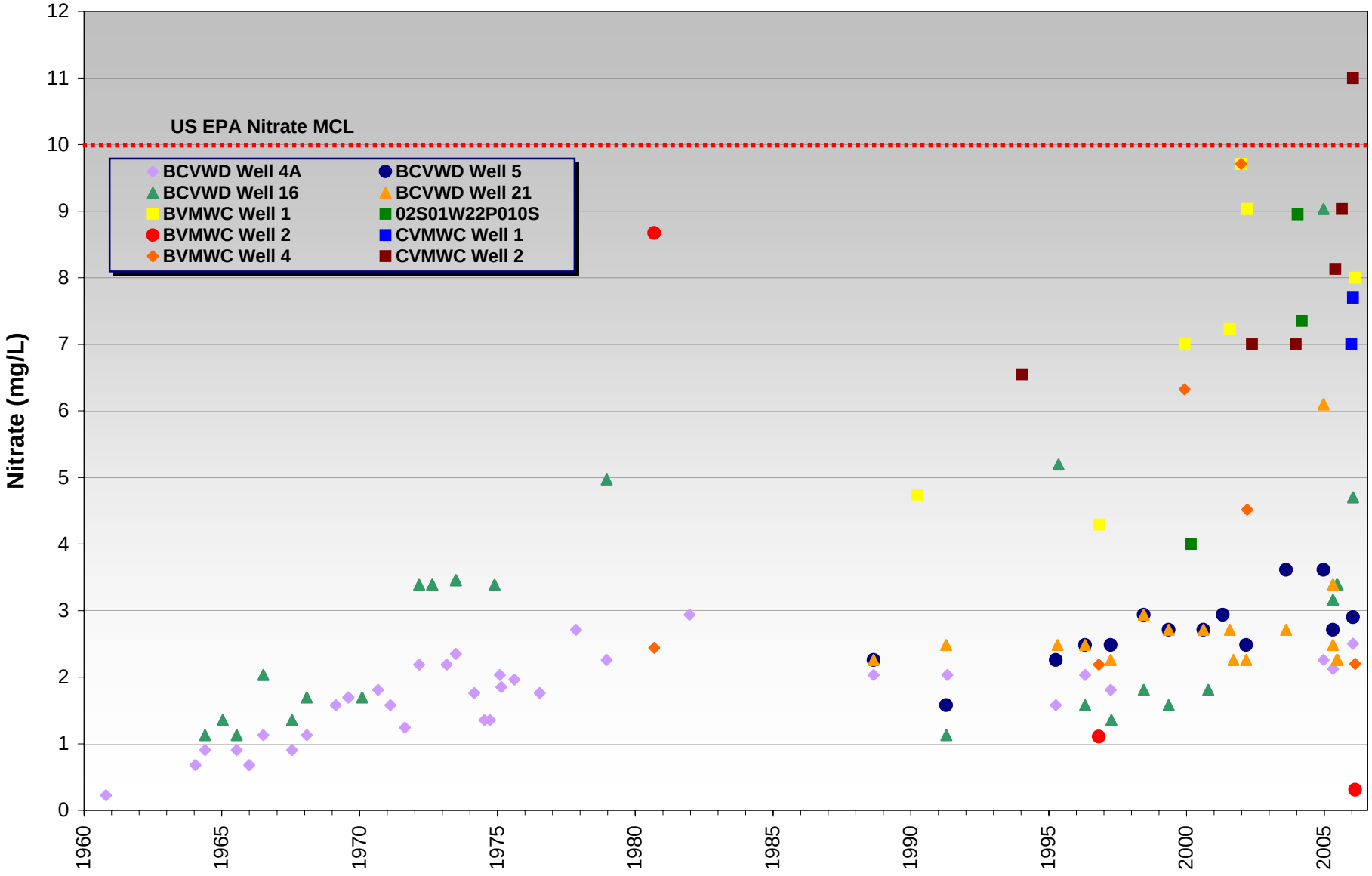
Project Committee 1
Task B - OSWDS Study

Location of Beaumont Management Zone

General Direction of Groundwater Flow

Figure 1-1

Figure 1-2
Nitrate Time History at Select Wells



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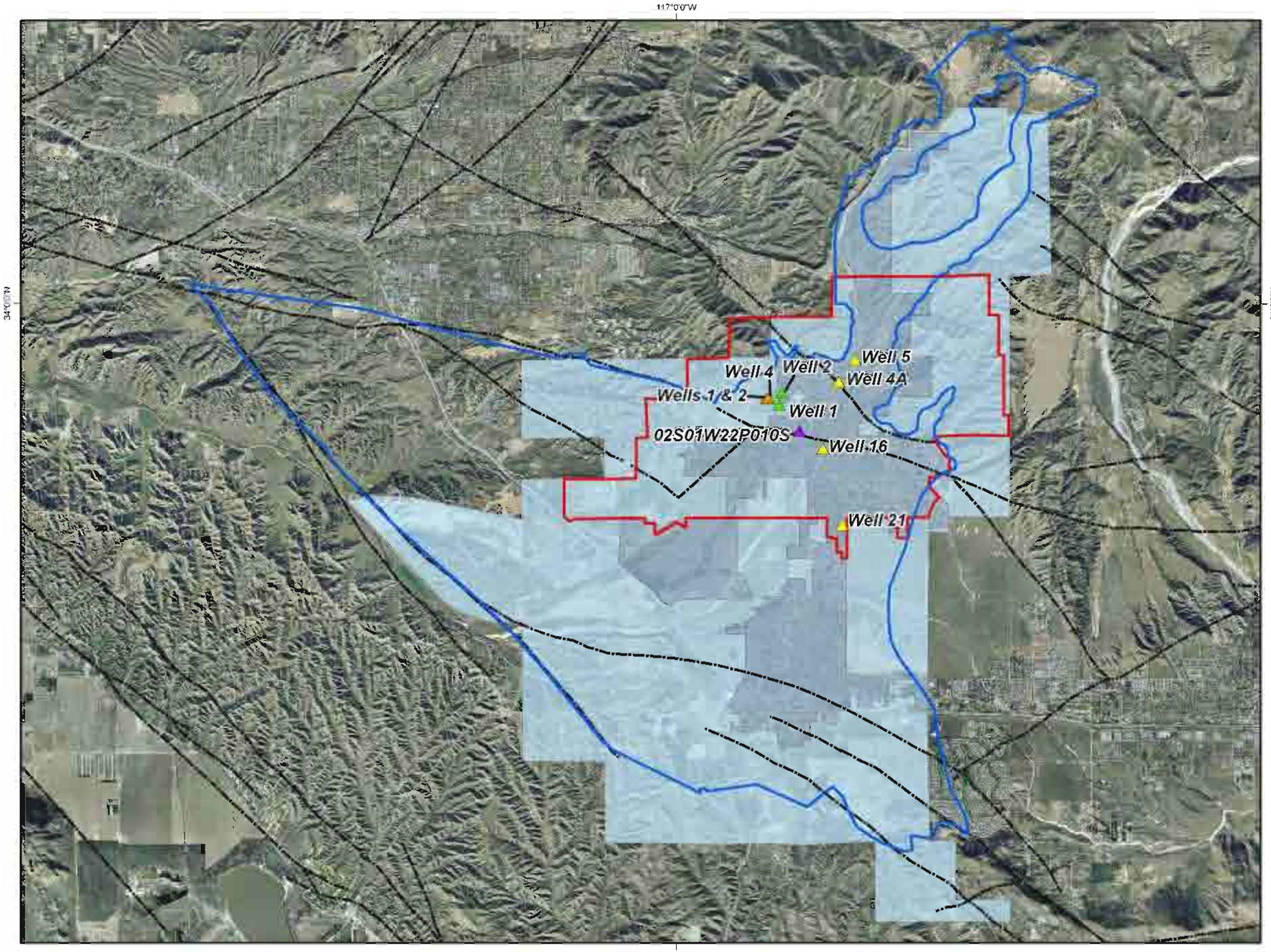

Main Features

- BCVWD Well
- BVMWC Well
- CVMWC Well
- USGS Monitoring Well
- Beaumont Management Zone
- Cherry Valley Community of Interest
- BCVWD Sphere of Influence
- BCVWD Service Area
- Fault

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0 1 2 3 4 Miles

0 2 4 6 KM

San Timoteo Watershed Management Authority

Project Committee 1

Task B - OSWDS Study

Location of Select Wells in the Cherry Valley Community of Interest

Figure 1-3

2. Literature Review of the Fate of Nitrogen from OSWDS

An extensive review of the scientific literature regarding OSWDS and their treatment of nitrogen in wastewater was conducted to assess the likelihood of groundwater contamination from OSWDS discharge and the concentration of nitrate in that discharge. Furthermore, a field study was performed to estimate the nitrate concentrations in the soil below several OSWDS in the CVCOI. This section summarizes the results of the literature review and field study.

2.1 Nitrogen Treatment in OSWDS

There are different technologies that constitute an OSWDS. These technologies can be divided into three basic categories: conventional, alternative, and innovative septic systems (Swann, 2001). The conventional septic system is composed of two main parts: a septic tank, designed to collect and hold household wastewater, and an absorption system, which disperses wastewater into the soil. The septic tank acts as a settling chamber and an anaerobic digester where solid matter is broken down and partially treated liquid waste passes through for disposal through the soil absorption system (SAS), also known as a leach field or drain field. A leach field consists of a series of perforated PVC or tile pipes. The wastewater undergoes additional treatment as it percolates through the soil. Typically, these systems rely upon gravity to carry the household waste to the septic tank and move the effluent from the septic tank to the SAS. A schematic of this system is shown in Figure 2-1. Conventional septic systems are primarily designed to remove solids from wastewater and reduce the organic carbon content. They have very low nitrogen removal capabilities. Overall, conventional septic systems only remove about 10 percent to 20 percent of the nitrogen entering the septic tank before disposal through the SAS (Swann, 2001). A survey conducted in 1993 found 97 percent of OSWDS permitted in the United States were conventional septic systems (NSFC, 1996).

Alternative septic systems are used in areas where conventional systems can not be used due to factors such as unsuitable soils or high water tables. The alternative systems use the same basic design of the conventional systems, but are modified to achieve greater separation from the water table or to disperse wastewater in low pressure doses. These systems typically provide no additional nitrogen removal and are only installed when conventional systems are not feasible at the site (Swann, 2001). Innovative septic systems are designed to increase the removal of nutrients and other pollutants. They are more effective at removing nitrogen, but are expensive and require much greater maintenance.

In the CVCOI, septic systems are permitted by the County of Riverside, Department of Environmental Health. The County reviews permits and site conditions and performs site inspections before the systems are constructed. Long-term septic system maintenance is the responsibility of the home owner. The typical design life of a septic system is 12 to 20 years and it is recommended that they be pumped out every three to five years (MOSDTF, 1999). Some studies have suggested that only about half of all septic system owners maintain their systems according to recommended guidelines (Swann, 1999; Gomez *et al.*, 1992). A survey conducted by the US EPA (2000) found that more than half of the existing systems are more than 30 years old and that at least 10 percent of all systems are failing at any given time.

Septic system failures can be placed into three general catagories: hydraulic failures, subsurface failures, and treatment failures (Swann, 2001). Hydraulic failures occur when the leachfield has become completely clogged, and sewage backs up in the house or breaks out on the ground surface. Subsurface failures result in plumes of partially treated sewage moving through soil macropores, cracks, or ditches. These plumes can eventually reach receiving waters causing contamination problems. Treatment failures mean that wastewater is adequately treated within the SAS, with the exception of nitrogen. This type of

failure results in untreated nitrogen, in the form of nitrate, reaching groundwater, coastal waters, or surface waters.

The condition of the septic systems in the CVCOI is not known; however, national surveys suggest that a noticeable level of septic system failure is likely. Septic system failure is exacerbated by hydraulic overloads, which are caused by a high density of septic systems. Even when septic systems are working properly, significant levels of nitrogen are not removed during the treatment process. Figure 2-2 shows the nitrogen cycle and treatment process that occurs in OSWDS.

Most of the nitrogen in wastewater that enters a septic system is in the form of organic nitrogen (Harrison *et al.*, 2000). The sources of nitrogen include human waste and cleaning products. In the septic tank most organic nitrogen is reduced to ammonium under anaerobic conditions. The effluent leaving the septic tank and flowing into the SAS is typically 75 percent ammonium and 25 percent organic nitrogen (Walker *et al.*, 1973a; Otis *et al.*, 1974). It has been estimated that the typical annual nitrogen contribution from a family of four is about 33 kilograms (Walker *et al.*, 1973a). On a residential lot size of 0.25 acres, this contribution is more than 200 times the amount of nitrogen that would be naturally introduced from the mineralization of soil organic nitrogen and precipitation (Hantzsche and Finnemore, 1992).

In the SAS most organic nitrogen is converted to ammonium; however, a portion the organic nitrogen will bind to the soil matrix and will accumulate in the soil beneath the leach field (Walker *et al.*, 1973a; Whelan and Barrow, 1984). Ammonium undergoes degradation by soil bacteria and some may be lost from the soil via volatilization of ammonia gas (Wilhelm *et al.*, 1994). Ammonium will also be adsorbed into the soil matrix (Lance and Whisler, 1972; Reneau, 1977) or removed by vegetation. However, the primary fate of ammonium is oxidation to nitrate in the presence of oxygen (Mote *et al.*, 1990; Postma *et al.*, 1992; Robertson *et al.*, 1991). Walker *et al.* (1973b) found almost complete nitrification of ammonium in the unsaturated zone in a well-aerated soil below a leach field.

Once nitrogen is in the form of nitrate, it is very mobile and travels with water as it percolates down to the water table. Nitrate is a highly soluble, negatively charged ion. Soil particles are typically negatively charged as well and, thus, very little adsorption of nitrate occurs and it is easily transported through the soil horizon with infiltrating rain water and wastewater. Nitrate may be immobilized by plants or through microbial uptake into biomass; however, these processes occur to a limited extent and are generally considered to be largely ineffective in reducing the amount of nitrate that is available for percolation to groundwater (Alexander, 1965; Lance, 1972). Additionally, nitrates may be retained by certain soil types such as clays; nevertheless, the adsorptive capacity of clay is used up as little as two years after a septic system is installed (Rogers, 1988).

The primary mechanism for reducing nitrate in the soil is denitrification; nevertheless, the microbes that facilitate this process generally require anaerobic conditions and organic carbon and because most of the organic carbon in effluent is typically removed as nitrate forms, there is not enough organic carbon present further down in the vadose zone where anaerobic conditions may occur (Wilhelm *et al.*, 1994; Harman *et al.*, 1996). Several studies have found that the natural organic carbon from overlying soils and solid organic matter in aquifers is inadequate for denitrification to occur (Wilhelm *et al.*, 1994; Starr, 1988; Stewart *et al.*, 1979; Harman *et al.*, 1996). Soils that are considered to be best suited for OSWDS, which are well-drained and permeable, are most likely to contribute to nitrate contamination of underlying groundwater (Reneau *et al.*, 1989).

Several studies have demonstrated that almost all of the ammonium in septic tank effluent converts to nitrate within 0.5 meter below the leach field (Walker *et al.*, 1973a; Whelan and Barrow, 1984). Bunnell

et al. (1999) found no decrease in total nitrogen at 1.5 meters below the leach field and 95 percent of the nitrogen present was in the form of nitrate. The degree of nitrogen reduction in a SAS varies depending on the organic carbon content, soil moisture, and particle size distribution of the soil. Many studies have been conducted in an attempt to quantify the mass of nitrate present in the soil-absorption field that may contaminate underlying aquifers. Table 2-1 presents the range of concentrations of nitrate and other forms of nitrogen found in soil-water at different depths below a leach field. The average nitrate concentration from 26 sites was 45 mg/L which is 4.5 times the drinking water MCL of 10 mg/L. Total nitrogen values of 40-60 mg/L have been used in mass-balance calculations as representative of the typical range of total nitrogen in OSWDS effluent (RWQCB, Santa Ana River Basin Region, 1989).

Once nitrate reaches the groundwater, it attenuates very slowly and can persist for decades. After contamination occurs, improving water quality becomes expensive or physically impossible (Nolan, 1996). One of the most significant long-term consequences of using OSWDS for the treatment of wastewater is the buildup of nitrate in groundwater.

2.2 Characterization of Nitrogen Immediately Below OSWDS

WEI attempted to quantify the concentration of nitrogen in the soil-water below leach fields in the CVCOI. Nine households volunteered to have the soil under their leach fields sampled as part of this investigation. The locations of these sites are shown in Figure 2-3. An initial assessment was conducted at each site prior to collecting samples. WEI staff met with the property owners and inquired about the location, design, and age of their OSWDS. Original OSWDS drawings were available at only one site. Additional information—such as OSWDS maintenance and the extent and type of vegetation—was also noted during the initial assessment.

The sites were sampled on December 15, 2005 and December 16, 2005. The first step at each site was to locate the leach field. Generally, leach lines are located a couple of feet below the ground surface and are surrounded by a six-inch to 12-inch gravel pack. Trenches were dug until the gravel pack or leach line was exposed. Two sites had seepage pits wherein wastewater is discharge directly to a pit several feet below the surface instead of a septic tank system. Samples were collected at the approximate depth of the leach line and in six-inch to 12-inch intervals below the leach line for several feet depending on site conditions. It was anticipated that soil recently wetted with effluent would be discovered. However, every soil sample collected was dry and did not have a distinguishable odor suggesting that there was no recent discharge from the leach line to soil. Samples were recovered at only five of the nine sites. At site B-7, the leach lines were not found. The top of the septic tank had been exposed by the owner and the direction of the leach lines leaving the septic tank was known. A trench six feet deep and six feet long was excavated perpendicular to the path of the leach lines, but the lines were never encountered. The exact location of the leach lines was unknown by the owner at sites B-6 and B-8 and it was neither practical nor within the scope of this investigation to excavate a large portion of their yard. At site B-9 the soil contained many small to large boulders, which made excavation to find the leach lines difficult; consequently a representative sample could not be obtained. In general, the soils in the CVCOI are rocky, which limited the areas that could be sampled at each site.

Soil samples were stored in a cooler with ice until transported to Applied P&CH Laboratories. The 1:5 extraction method was used to extract the soil water, which was then analyzed for ammonia as nitrogen (NH_3-N), NO_3-N, nitrite as nitrogen (NO_2-N), total kjeldahl nitrogen (TKN), and total nitrogen (TN). TKN is the sum of NH_3-N and organic nitrogen.

Table 2-2 shows the results of the sampling conducted on December 15, 2005 and December 16, 2005. NH_3-N concentrations ranged from 0.13 to 0.41 mg/L, with an average of 0.24 mg/L. Nitrate concentrations ranged from 1.0 to 7.2 mg/L and averaged 2.3 mg/L. NO_2-N was not detected in any of the samples. TKN concentrations were low and were comprised of about half NH_3-N and half organic nitrogen. Nitrate was approximately 82 percent of the total nitrogen on average. The highest nitrate concentrations were seen at site B-1b. This site also showed a steady decrease in NH_3-N and nitrate with depth.

The average nitrate concentrations in the samples from the CVCOI are much lower than those seen in other studies. There are several likely reasons for this. The moisture content of the samples and the analytical results of the samples suggest that a representative sample from the SAS was not obtained. The extremely wet winter of 2005-06 may have flushed the nitrogen well below the leach lines. Perforations in the leach lines can become clogged creating preferential flow to certain sections of the line or no discharge at all from an individual line. Biological clogging mats are also created in the leach field, which create preferential flow conditions as well (Canter and Knox, 1985; Reneau and Pettry, 1975; Reneau *et al.*, 1989). It is not possible to know where the preferential flow patterns are without excavating the entire leach field, which was not in the scope of this investigation.

The nitrogen concentrations of the samples collected suggest that the samples were more representative of soil not impacted by the OSWDS. The higher nitrate concentrations found at site B-1b are likely a combination of soil nitrate and residual nitrate from the OSWDS.

Table 2-1
Average Soil-Water Concentrations found below a Leachfield

NH_4-N (mg/L)	NO_3-N (mg/L)	Organic Nitrogen (mg/L)	TN (mg/L)	No. of Samples	Source
12	2.5	29	44	148	Harrison *et al*., 2000
0.1	19	4.7	24	162	Harrison *et al*., 2000
19	9.4	14	43	77	Harrison *et al*., 2000
1.0	6	1.2	8.2	77	Harrison *et al*., 2000
10	16	28	55	144	Harrison *et al*., 2000
0.1	21	2	23	104	Harrison *et al*., 2000
3.5	32		39		Andreoli *et al*., 1979
1.8	32		38		Andreoli *et al*., 1979
0.2	112			4	Harman *et al*., 1996
0.3	50			7	Harman *et al*., 1996
0.3	28			8	Harman *et al*., 1996
	21				Brown *et al*., 1984
	19				Brown *et al*., 1984
	18				Brown *et al*., 1984
	43				Walker *et al*., 1973a
	110				Walker *et al*., 1973a
	80				Walker *et al*., 1973a
	105				Walker *et al*., 1973a
	68				Gold *et al*., 1990
0.1	27		27	8	Wilhelm *et al*., 1994
5.1	33	3.1	42	115	Bunnell *et al*., 1999
0.7	32	1.2	34	115	Bunnell *et al*., 1999
47	106				Whelan and Barrow, 1984
3.0	78				Whelan and Barrow, 1984
1.5	37				Whelan and Barrow, 1984
4.0	65				Whelan and Barrow, 1984
----------*Average*----------					
6.1	*45.0*	*10.4*	*34.3*		

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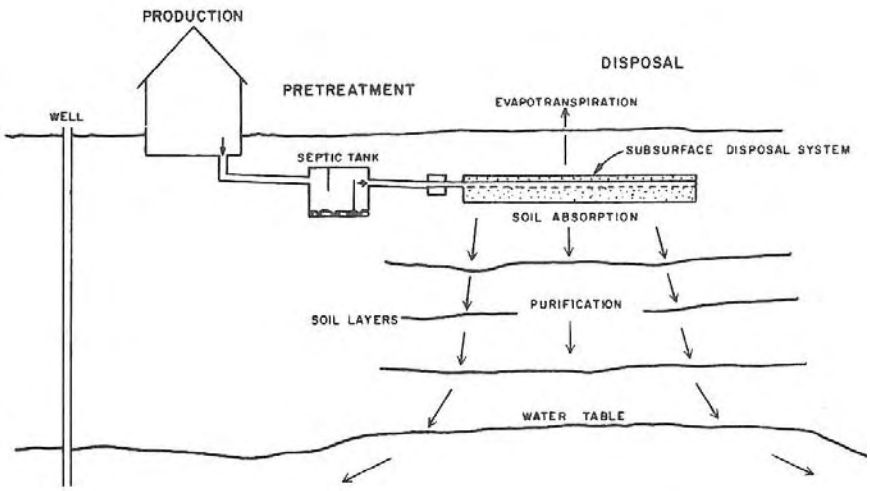
Table 2-2
Results for Field Samples

Sample Site	Depth (fbgs)	Date	NH3-N (mg/L)	NO3-N (mg/L)	NO2-N (mg/L)	TKN (mg/L)	Organic Nitrogen (mg/L)	TN (mg/L)
B-1	4.5	12/15/2005	0.20	2.2	ND	0.37	0.17	2.57
B-1	5.0	12/15/2005	0.24	2.1	ND	0.65	0.41	2.75
B-1	5.5	12/15/2005	0.16	2.2	ND	0.33	0.17	2.53
B-1	7.0	12/15/2005	0.14	2.0	ND	0.32	0.18	2.32
B-1b	4.5	12/15/2005	0.28	7.2	ND	0.45	0.17	7.65
B-1b	5.0	12/15/2005	0.19	4.9	ND	0.47	0.28	5.37
B-1b	5.5	12/15/2005	0.17	4.4	ND	0.44	0.27	4.84
B-1b	7.0	12/15/2005	0.13	4.0	ND	0.20	0.07	4.20
B-2	3.0	12/15/2005	0.23	2.8	ND	0.53	0.30	3.33
B-2	3.5	12/15/2005	0.35	2.4	ND	0.63	0.28	3.03
B-2	4.0	12/15/2005	0.20	1.9	ND	0.43	0.23	2.33
B-2	5.5	12/15/2005	0.18	2.0	ND	0.23	0.05	2.23
B-2b	3.0	12/15/2005	0.41	1.8	ND	0.44	0.03	2.24
B-2b	3.5	12/15/2005	0.18	2.0	ND	0.38	0.20	2.38
B-2b	4.0	12/15/2005	0.13	2.0	ND	0.36	0.23	2.36
B-2b	5.5	12/15/2005	0.30	2.2	ND	0.65	0.35	2.85
B-3	6.0	12/15/2005	0.32	1.6	ND	0.51	0.19	2.11
B-3	7.0	12/15/2005	0.27	1.4	ND	0.33	0.06	1.73
B-3	8.0	12/15/2005	0.36	1.0	ND	0.76	0.40	1.76
B-3	9.0	12/15/2005	0.24	1.3	ND	0.33	0.09	1.63
B-4	4.0	12/15/2005	0.22	1.5	ND	0.28	0.06	1.78
B-4	4.5	12/15/2005	0.30	1.4	ND	0.59	0.29	1.99
B-4	5.0	12/15/2005	0.40	1.4	ND	0.77	0.37	2.17
B-5	2.0	12/16/2005	0.21	1.7	ND	0.39	0.18	2.09
B-5	3.0	12/16/2005	0.20	1.6	ND	0.33	0.13	1.93
B-5	4.0	12/16/2005	0.16	1.6	ND	0.28	0.12	1.88
Average			*0.24*	*2.3*		*0.44*	*0.20*	*2.77*

Figure 2-1

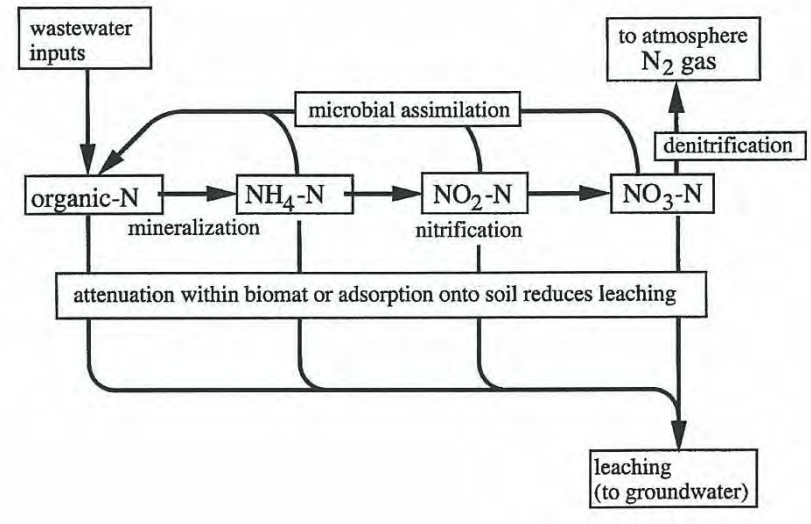
Typical On-Site Waste Disposal System Schematic



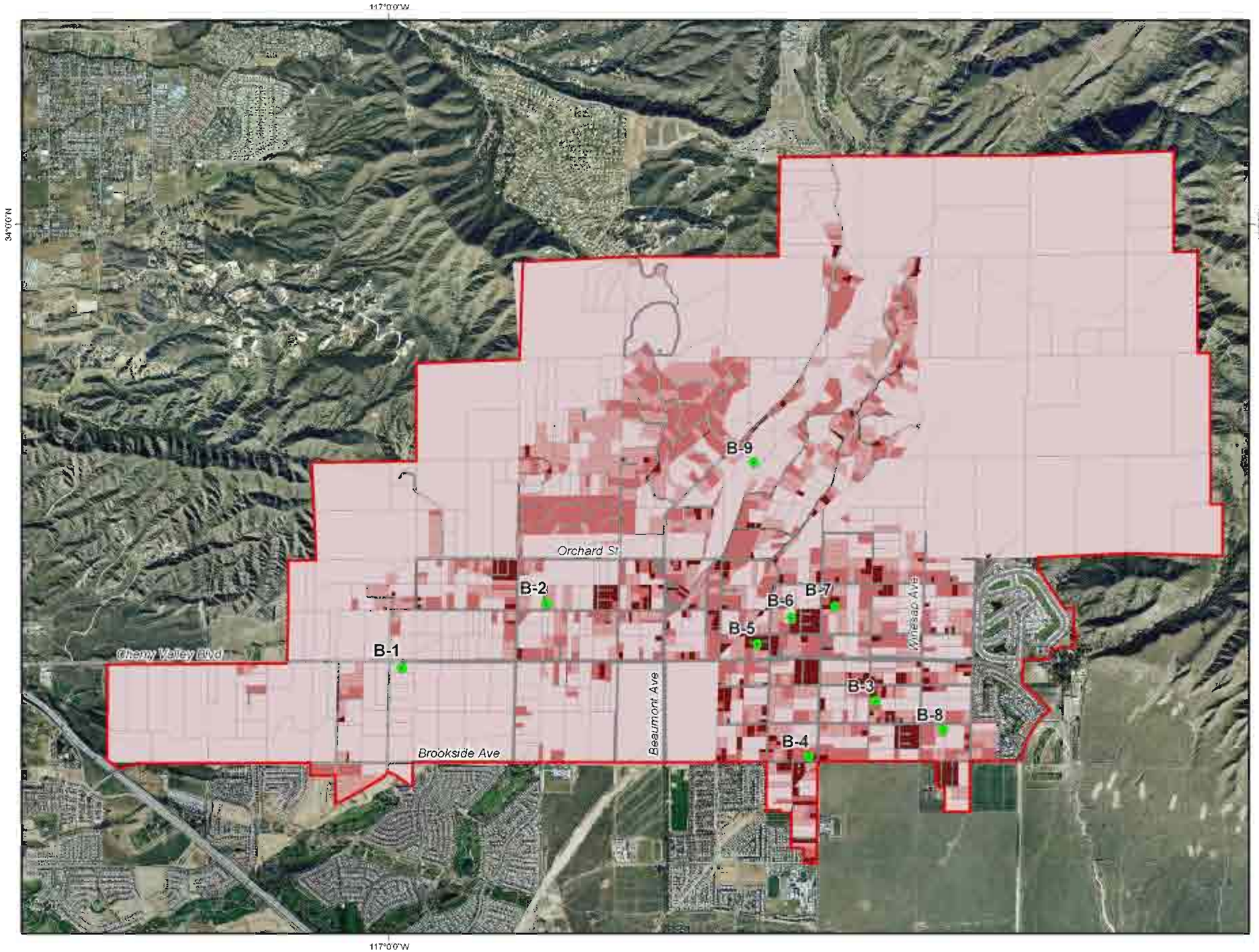
Source: Bouma *et al.*, (1972)

Figure 2-2

Nitrogen Transformations and Fate in an OSWDS



Source: Harrison *et al.* (2000)



Main Features

- Field Sample Site
- Cherry Valley Community of Interest

Parcel Size (acre)

- < 0.50
- 0.50 - 1.00
- 1.01 - 2.00
- > 2.0

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Date 20060206

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0 1 2 Miles

0 1 2 3 KM

San Timoteo Watershed Management Authority

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Task B - OSWDS Study

Location of Field Sample Sites

Figure 2-3

3. Sources of Nitrate in Groundwater Underlying the CVCOI

There are four possible sources of nitrate in the CVCOI, including OSWDS, naturally occurring soil nitrogen, waste from animal husbandry, and fertilizer from agriculture. Several egg ranches were operated in the CVCOI and a few small-scale horse ranches. Cherry tree orchards and other fruit trees exist throughout the CVCOI. A review of land use maps developed by the Department of Water Resources (DWR) showed agriculture decreased substantially between 1949 and 1963. Agriculture has continued to decrease as more land has been redeveloped for residential and commercial purposes.

Soil nitrogen, which is naturally present in the soil and may be converted to nitrate, was identified as possible source of nitrate in the CVCOI. As reported in Section 2, soil nitrate concentrations from twenty two samples not impacted by OSWDS in the CVCOI ranged from 1.0-2.8 mg/L and have an average concentration of 1.8 mg/L. These values are far less than the nitrate levels found in some production wells (8-11 mg/L) and are consistent with the nitrate levels found in groundwater south of the CVCOI (see Figure 1-1) where the community has a sewer system and does not rely on OSWDS for the treatment and disposal of their wastewater. Soil nitrogen contributes to background nitrate levels, but is not the source of the elevated nitrate levels in groundwater in the CVCOI.

There are several indicators that have been used to discern sources of nitrate in groundwater. They include nitrogen isotope ratios, specific ions, and pharmaceuticals and personal care products (PPCPs) (Aravena and Robertson, 1998; Harman *et al*., 1996; McQuillan, 2004; Fogg *et al*., 1998; Karr *et al*., 2001; Verstraeten *et al*., 2005; Lindsey and Koch, 2004; Miller and Meek; 2006; Glassmeyer *et al*., 2005). PPCPs are a diverse group of chemicals that include all human and veterinary drugs and consumer products, such as fragrances and sun-screen agents. This section presents the findings of a tracer study conducted to determine the sources of nitrate in groundwater underlying the CVCOI.

3.1 Tracer Study

3.1.1 Well Selection

Nine wells in the CVCOI that have elevated nitrate concentrations were selected for sampling: CVMWC Well 1, CVMWC Well 2, BCVWD Well 4A, BCVWD Well 5, BCVWD Well 16, BCVWD Well 21, BVMWC Well 1, BVMWC Well 2, and BVMWC Well 4. The locations of these wells are shown in Figure 1-3.

3.1.2 Well Sampling Procedure

Prior to sample collection, the wells were purged of water standing in the well casing in order to obtain a sample that represents groundwater in the geologic formation. Purge methods varied by well status. Operable production wells were fitted with sampling ports and then energized to obtain a sample. The pumps on these wells were operated for no less than 10-minutes to ensure that the groundwater samples were representative of the formation and not stagnant casing water. Samples were obtained from sample ports installed as close to the pump as possible and prior to chlorination or storage tanks.

For the wells that were classified as inactive, a submersible pump (Grundfos® Redi-Flo2) was used for purging and sampling. Well construction details such as total depth and screened intervals were not available for these wells, so the submersible pump was lowered to 100 feet in each well. As a precaution against sampling stagnant casing water, the submersible pump was run for a minimum of 45 minutes prior to sample collection.

After the wells were purged, samples were obtained from discharge tubing attached to either the sample port for production wells or the discharge tubing attached to the temporary submersible pump. New clean polyethylene tubing was used at each well.

The sample containers required for the specified analyses were provided by the laboratory or purchased from a laboratory supplier immediately prior to the sampling event. Preservatives were added to the containers by the laboratory prior to shipment as appropriate for the respective analysis.

To identify and manage samples obtained in the field, a sample label was affixed to each sample container. The samples were named with an alias for the site name so that the laboratories received blind samples. The sample labels included the following information:

- Project number
- Alias for site name
- Sample identification number
- Sampler's initials
- Date and time of collection
- Preservative (if any)

Following collection and labeling, samples were placed in a sample cooler for temporary storage. The protocol outlined below was followed for sample packaging:

1. The samples shipped were placed in coolers and packed with packaging materials to minimize the potential for disturbance and/or breakage of the sample containers.
2. Blue Ice packages were placed in leak-resistant plastic bags and included in the coolers to keep samples at a chilled temperature during transport to the analytical laboratory. The drain plugs of the coolers were secured with fiberglass tape.
3. For nitrate isotopic analysis, samples were frozen in I-Chem Series 300 500-ml high-density polyethylene plastic containers. The containers were packaged in padded coolers with dry ice and shipped to the respective laboratories.
4. Chain-of-custody forms were placed in water-resistant plastic bags and taped on the inside of the cooler lids.

Three research laboratories were contacted to analyze the nitrogen isotopic signature of nitrate in the samples collected from the selected wells: Lawrence Livermore National Laboratories (LLNL), University of California at Davis (UCD), and Woods Hole Oceanographic Institute (WHOI). LLNL and WHOI analyzed the samples using the Denitrifier Method described in Casciotti *et al.* (2002) and UCD used the Denitrifier Method described in Sigman *et al.* (2001). Each of these laboratories requested that field filtered samples be obtained for analysis. The sample ports were fitted with new braided poly tubing and a disposable 1.0 µm filter cartridge for sampling. In addition, the laboratories requested nitrate, nitrite, and sulfate concentrations to assist in their analysis.

Ten groundwater samples, including one field duplicate, were submitted to LLNL, UCD, and WHOI for the measurement of the nitrogen isotopic composition of nitrate. Seven samples were collected on March 28, one was collected on April 25, and two were collected April 27, 2006. Ten samples were submitted to MWH Laboratories (MWH) of Monrovia, California (NELAC 01114CA) for nitrate, nitrite, and sulfate analysis using EPA 300.0 method. Ten additional groundwater samples, including one field duplicate,

collected in similar fashion to those obtained for nitrate isotopic analysis were submitted to MWH for analysis of select PPCPs. Table 3-1 lists the compounds included in this analysis and a description of their general use.

3.2 Results of PPCPs Analysis

Of the fourteen PPCPs tested, six pharmaceuticals were detected: acetaminophen, ibuprofen, sulfamethoxazole, estradiol, progesterone, and testosterone. Acetaminophen is commonly known as Tylenol and is found in other pain relievers/fever reducers. Ibuprofen is found in Advil, Motrin, and other pharmaceuticals used for the management pain, fever, and inflammation. The only source of these pharmaceuticals in groundwater is discharge from OSWDS.

Sulfamethoxazole is an antibiotic that is registered for human and veterinary uses in the Unites States. It is primarily used to treat respiratory, skin, gastrointestinal, and urinary tract infections. In a study of PPCPs in the environment, sulfamethoxazole was one of the most commonly detected chemicals in wastewater treatment plant effluent and surface waters (Glassmeyer *et al.*, 2005). Sulfamethoxazole was the most frequently detected pharmaceutical in a region with a high density of OSWDS and has been indicative of septic system contamination (Verstraeten *et al.*, 2005; Miller and Meek, 2006).

Estradiol, progesterone, and testosterone are hormones naturally produced in mammals. They are also found in contraceptives (estradiol and progesterone) and hormone replacement therapy drugs. Testosterone is commonly used to build muscle mass. Human females excrete about 5 µg/day of naturally-produced estradiol and males excrete about 10 mg/day of androgens, which are primarily comprised of testosterone and androstenedione (Shore and Shemesh, 2003). In addition to the naturally produced estrogens, a substantial amount of estrogens are consumed as pharmaceuticals, about 100 kg/yr/5 million inhabitants (Stuer-Lauridsen *et al.*, 2000). Humans also consume hormones in their food. Zduncyk *et al.* (2001) found estradiol concentrations in milk and milk products to range from 10 to 84 picograms/mL. Average adult consumption of progesterone in food has been calculated to be 10 µg/day (Fritsche and Steinhart, 1999). Consequently, hormones have been detected in OSWDS discharge. Septic tank effluent from a population of about 7,000 inhabitants was found to contain 40-130 ng/L of estrogen (Shore *et al.*, 1995).

Table 3-2 presents the results of the PPCPs analysis. PPCPS were detected at six wells: BCVWD Wells 4A and 21; BVMWC Wells 1, 2, and 4; and CVMWC Well 2. The concentrations of some of these pharmaceuticals were within the range of concentrations found in previous studies on wastewater-impacted groundwater (Zwiener *et al*., 2001; Hinkle *et al*., 2005). The BVMWC wells and CVMWC Well 2 are located in the north-western portion of CVCOI and would not have been impacted by animal waste from egg ranches. The possible sources of the detected pharmaceuticals are OSWDS and animal waste.

Pharmaceuticals introduced to the environment at the ground surface are not detected in groundwater often, as they are subject to microbial degradation and can be adsorbed to the soil matrix (Verstraeten *et al.*, 2005). The mixing of OSWDS discharge and native groundwater can dilute pharmaceutical concentrations to below the detection limit. In addition to degradation, sorption and dilution, pharmaceutical loading may be temporally variable (Hinkle *et al*., 2005). This would explain why pharmaceuticals were not detected in all nine wells.

3.3 Results of Nitrogen Isotope Analysis

Stable isotopes are often utilized to discern the source of nitrate in groundwater. An isotope is a mass variation of a single element that naturally occurs in the environment. If an element has extra neutrons, its atomic mass will change, but the charge of the atom will not be affected. The atomic mass of nitrogen is normally 14. At this atomic mass nitrogen is referred to as ^{14}N, but when it contains an extra neutron it is referred to as ^{15}N. Isotopes that are naturally occurring and are not radioactive are termed stable isotopes.

Atmospheric nitrogen is comprised of 99.637 percent ^{14}N and 0.363 percent ^{15}N (Peterson and Fry, 1987). The ratio $^{15}N/^{14}N$ of atmospheric nitrogen is referred to as the atmospheric standard. Nitrogen isotopic compositions are expressed as $\delta^{15}N$, the relative difference in $^{15}N/^{14}N$ ratios between samples and atmospheric nitrogen, which is isotopically constant (Mariotti, 1983). The $\delta^{15}N$ values are given as a per mil (‰) difference from this atmospheric standard, where:

$$‰\ \delta^{15}N = [(^{15}N/^{14}N \text{ sample} - {}^{15}N/^{14}N \text{ standard})/\ ^{15}N/^{14}N \text{ standard}]*1000$$

The extent to which nitrogen sources can be identified in receiving waters depends upon the isotopic separation between various sources and the degree of isotopic fractionation that occurs from transformations of nitrogen during transport through the environment (Shearer and Kohl, 1993). Inorganic fertilizers are synthesized from atmospheric nitrogen and generally are within about ±4‰ of atmospheric nitrogen (Hübner, 1986; Freyer and Aly, 1974; Fogg *et al.*, 1998; McQuillan, 2004). However, fertilizer nitrogen is often enriched by several ‰ $\delta^{15}N$ due to processes such as ammonia volatilization, plant uptake and conversion to organic nitrogen, microbial remineralization, and denitrification (Black and Waring, 1977; Hübner, 1986). The resulting $\delta^{15}N$ of nitrate draining from fertilized fields can be similar to that of naturally occurring soil nitrate, which ranges from about -2 to +8‰ (Black and Waring, 1977; Bremner and Tabatabai, 1973; Freyer, 1978; Fogg *et al.*, 1998; Heaton, 1986; Komor and Anderson, 1993; Kreitler, 1975; Shearer *et al.*, 1978).

In contrast, nitrate from animal waste generally takes on a nitrogen isotopic signature greatly enriched in ^{15}N relative to other sources with a typical range of +10 to +27‰ (Fogg *et al.*, 1998; Wassenaar, 1995; Komor and Anderson, 1993; McQuillan, 2004). This distinction occurs when ammonia volatilization takes place during the application and storage of animal wastes, which preferentially removes ^{14}N and results in a large enrichment of the heavier ^{15}N isotope in the residual ammonium. This process also takes place in septic tanks, which fosters the enrichment of ^{15}N in human waste. The range of $\delta^{15}N$ in nitrates from OSWDS is +2 to +14‰ with mean values from +6 to +13‰ (Aravena, *et al.*, 1993; Fogg *et al.*, 1998; Komor and Anderson, 1993; McQuillan, 2004).

The results of the nitrogen isotope analysis from each laboratory are presented in Table 3-3 along with the mean of the results for each well sampled. The results shown are the reported value from each laboratory. Nitrogen isotope results from the three separate laboratories were in good agreement. With the exception of the BVMWC wells, results between the three laboratories were within ±0.2‰ of the mean. There was slightly more variability in the results from each laboratory for the BVMWC wells. At BVMWC Well 2, $\delta^{15}N$ results from the different laboratories were ±1.2‰ of the mean. On the whole, the $\delta^{15}N$ values ranged from +1.6 at to +13.3‰. The lowest $\delta^{15}N$ values were observed at BVMWC Well 4 and the highest at BVMWC Well 2. Figure 3-1 graphically shows the nitrogen isotope results and the typical range of nitrogen isotope values for different sources of nitrate. The $\delta^{15}N$ values for all wells fell within the range of $\delta^{15}N$ of nitrate from OSWDS effluent. The $\delta^{15}N$ values for several of these wells also fell within the range of soil nitrogen and inorganic fertilizer. However, as discussed previously, soil nitrogen is not the source of elevated nitrate levels in groundwater in the CVCOI. Samples collected at BVMWC

Well 2 had $\delta^{15}N$ values within the range of $\delta^{15}N$ of nitrate from OSWDS effluent and animal waste. To be clear, all the results fell within the range of $\delta^{15}N$ of nitrate from OSWDS effluent.

3.4 Other Indicators of OSWDS Discharge in Groundwater

Elevated concentrations of specific ions, such as, boron, chloride, potassium, and sodium, relative to background concentrations, have been used as indicators of OSWDS effluent in groundwater (Aravena and Robertson, 1998; Harman *et al*., 1996; McQuillan, 2004; Robertson *et al*., 1991; Wilhelm *et al*., 1994; Spruill *et al*., 2002). These constituents are found in detergents, human waste, and waste from the regeneration of water softeners and, consequently, OSWDS effluent. In OSWDS effluent they occur in higher concentrations than those found in groundwater influenced by other anthropogenic activities. High levels of chloride are also associated with dairies and evaporate deposits, but at significantly higher concentrations than those associated with OSWDS effluent. Chloride concentrations around 100 mg/L and boron concentrations above 200 µg/L are indicative of contamination from OSWDS (Bassett *et al*., 1995; Aravena and Robertson, 1998; McQuillan, 2004). The ratio of sodium to potassium has also been used to identify sources of nitrate in groundwater (Wilhelm *et al*., 1994; Spruill *et al*., 2002; Zublena *et al*., 1993a). Spruill *et al*. (2002) found this ratio to be the best discriminator of septic waste from other animal-derived nitrogen sources, as the ratio of sodium to potassium ratio is significantly higher in septic waste compared to animal waste. This may be due to the prevalence of sodium in the human diet. Several studies have demonstrated that the ratio of sodium to potassium for animal waste and common fertilizers is less than 0.5 (Zublena *et al*., 1991; Zublena *et al*., 1993a; Zublena *et al*., 1993b). Whereas, a sodium to potassium ratio above 8 is indicative of OSWDS effluent (Wilhelm *et al*., 1994; Spruill *et al*., 2002).

A review of the limited historical water quality data available for the CVCOI revealed a well monitored by the United States Geological Survey (USGS) to have nitrate concentrations near the MCL and elevated levels of other ions on March 25, 2004. The water quality results are shown in Table 3-4. On that day, nitrate concentrations reached 8.95 mg/L, and potassium, sodium, and chloride levels were an order of magnitude higher than background levels found in the area. The ratio of sodium to potassium was 12. Moreover, concentrations of chloride and boron were 185 mg/L and 658 µg/L, respectively. These results indicate that OSWDS effluent was intercepted in the well on the date sampling occurred.

3.5 Conclusions

The following conclusions can be made regarding the occurrence of high nitrate concentrations in wells in the CVCOI:

- Several groundwater production wells within and down gradient of the CVCOI have nitrate concentrations that are close to or exceed the nitrate MCL of 10 mg/L.
- Water produced from wells high in nitrate in this area have a nitrogen isotopic signature that is consistent with nitrate discharge from OSWDS.
- Water produced from some of the wells high in nitrate in this area contain PPCPs that can only be explained by discharge from OSWDS.
- The simultaneous occurrence of high nitrate concentrations, elevated levels of specific ions, and pharmaceuticals and nitrogen isotopes associated with OSWDS discharge indicate that OSWDS are the source of nitrate contamination in the Beaumont Management Zone.

Table 3-1
PPCPs Included in Analysis

Compound	Description
Acetaminophen	Analgesic
Caffeine	An alkaloid found in coffee and tea
Cotinine	Metabolite of nicotine
Estradiol	Estrogenic hormone
Fluoxentine	Antidepressant drug (trade name Prozac)
Gemfibrozil	Medication (trade name Lopid) used to lower the levels of triglyceride in the blood
Ibuprofen	Analgesic
Iopromide	Nonionic radiopaque contrast agent
Progesterone	Female steroid hormone
Sulfamethoxazole	Antibacterial
Testosterone	Male steroid hormone
Triclosan	Antibacterial
Trimethoprim	Antibacterial

Table 3-2
Results of PPCPs Analysis

Chemical	Unit	MRL	BCVWD Well 4A	BCVWD Well 21	BVMWC Well 1	BVMWC Well 2	BVMWC Well 4	CVMWC Well 2
Acetaminophen	ng/L	1.0	--	--	--	1.5	--	--
Ibuprofen	ng/L	1.0	--	--	17	148	7.6	--
Sulfamethoxazole	ng/L	1.0	--	--	51	--	4.2	26
Estradial	ng/L	1.0	1.8	1.4	--	--	--	--
Progesterone	ng/L	1.0	--	--	--	--	--	1.5
Testosterone	ng/L	1.0	--	--	4.4	--	--	--

MRL is the minimum reporting level for a chemical
"--" indicates pharmaceuticals were not detected

Table 3-3
Results of Nitrogen Isotope Analysis

			δ15N ‰			
Owner	**Local Name**	**Lab ID**	**LLNL**	**UCD**	**WHOI**	**Mean**
Cherry Valley Mutual Water Company	Well 1	A	3.4	3.3	3.5	3.4
Cherry Valley Mutual Water Company	Well 2	B	4.2	4.2	4.2	4.2
Beaumont-Cherry Valley Water District	Well 4A	C	3.5	3.5	3.6	3.6
Beaumont-Cherry Valley Water District	Well 5	D	4.1	3.8	4.0	4.0
Beaumont-Cherry Valley Water District	Well 16	E	6.5	6.6	6.6	6.6
Beaumont-Cherry Valley Water District	Well 21	F	5.9	6.0	6.1	6.0
Beaumont-Cherry Valley Water District	Well 21	G	6.0	5.8	6.0	5.9
Bonita Vista Mutual Water Company	Well 1	H	5.8	5.3	4.7	5.3
Bonita Vista Mutual Water Company	Well 4	I	1.6	2.3	2.2	2.0
Bonita Vista Mutual Water Company	Well 2	J	11.0	13.3	12.1	12.1

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Table 3-4
Results for USGS Monitoring Well 002S001W22P01S on March 25, 2004

Parameter	Units	Result
Aluminum	µg/L	21
Ammonia as nitrogen	mg/L	0.03
Ammonia as nitrogen plus organic nitrogen	mg/L	0.95
Arsenic	µg/L	7.7
Barium	µg/L	4.9
Boron	µg/L	658
Calcium	mg/L	23
Chloride	mg/L	185
Deuterium/Protium ratio	‰	-61.8
Field pH	unit	6.7
Fluoride	mg/L	0.8
Iron	µg/L	11
Laboratory pH	unit	8.2
Laboratory Specific Conductance	µS/cm at 25ºC	1120
Lithium	µg/L	39
Magnesium	mg/L	26
Manganese	µg/L	15.5
Nitrite as nitrogen	mg/L	0.021
Nitrite plus nitrate as nitrogen	mg/L	8.97
Orthophosphate as phosphorus	mg/L	0.21
Oxygen-18/Oxygen-16 ratio	‰	-9.02
Phosphorus	mg/L	0.26
Potassium	mg/L	16.2
Silica	mg/L	17.9
Sodium	mg/L	194
Specific conductance	µS/cm at 25ºC	1240
Strontium	µg/L	205
Sulfate	mg/L	69.8
Uranium (natural)	µg/L	2.7
Vanadium	µg/L	202

Figure 3-1
Results of Nitrogen Isotope Analysis

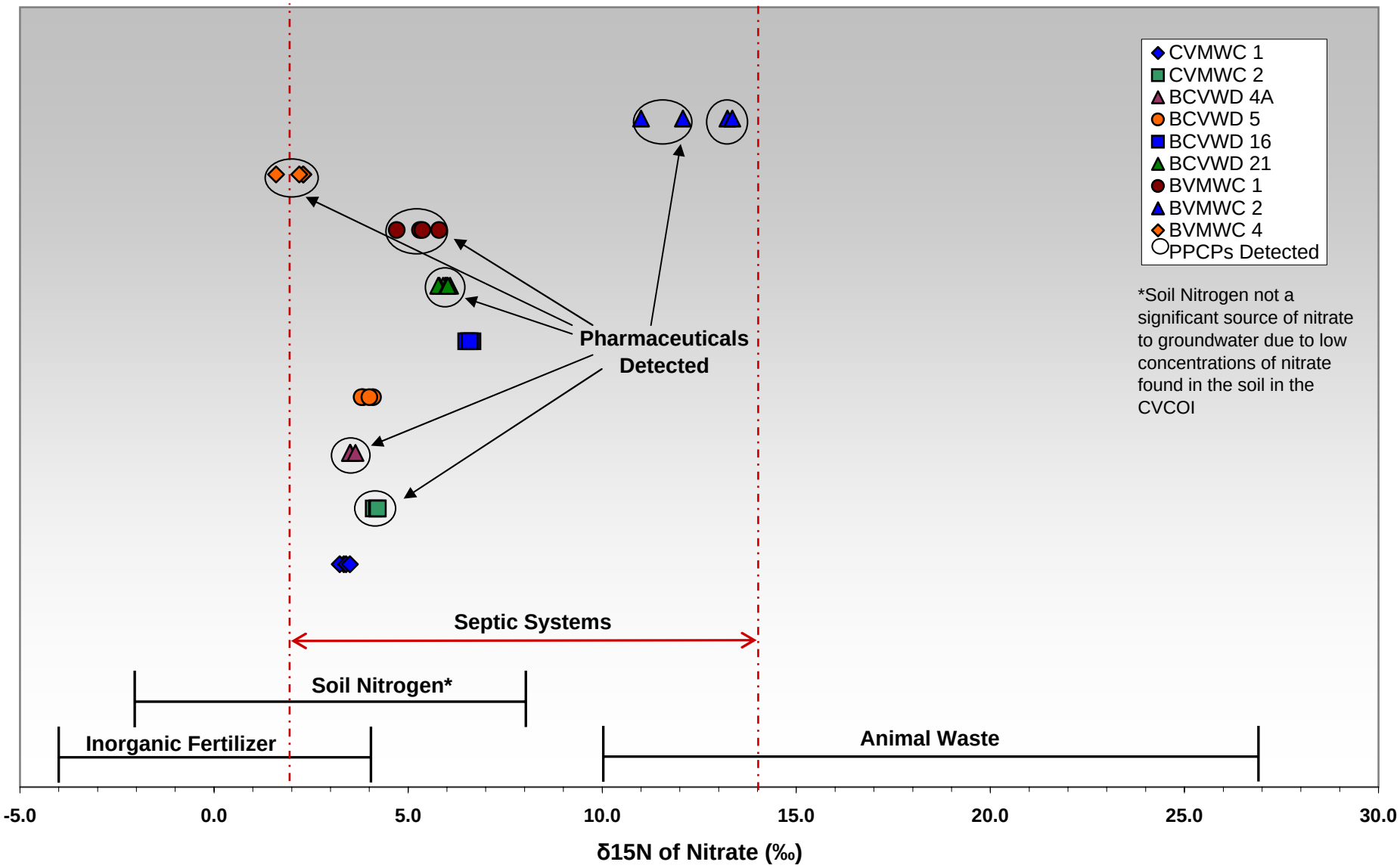

Figure_3-1.xls

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4. Current and Future OSWDS Discharge and Nitrogen Loads to the Beaumont Management Zone

In order to assess basin wide nitrogen impacts from OSWDS to the Beaumont Management Zone, current OSWDS discharge and nitrogen loads were estimated. Subsequently, future OSWDS discharge and nitrogen loads were projected and a planning level estimate of nitrogen impacts in the Beaumont Management Zone was made.

4.1 Current and Future Discharge to Groundwater from OSWDS

The annual discharge volume from OSWDS in the CVCOI was determined by a review and analysis of water sales data provided by BCVWD for the CVCOI. Water used by single-family residential homes on parcels less than 0.5 acre during the month of January was considered representative of indoor water use. It was assumed that consumptive use of water used indoors is negligible and all water used indoors is eventually discharged from an OSWDS. An analysis of the water sales data for the period of 2000 to 2005 suggests that the average annual discharge volume for each OSWDS is about 0.35 acre-ft/yr.

In order to estimate total discharge to groundwater from OSWDS the number of OSWDS in the CVCOI was evaluated. WEI obtained parcel and assessed property value information for 2005 from the County of Riverside in digital format. The County of Riverside considers parcels with a structure having an assessed value greater than $5,000 of being developed. If the assessed value of the structure is less than $5,000, the parcel is considered vacant.

Figure 4-1 shows the size distribution of parcels in the CVCOI. There are two mobile home parks in the CVCOI that are not apparent in Figure 4-1. The first mobile home park is located on the NE corner of Cherry Valley Boulevard and Mountain View Avenue and contains approximately 110 mobile homes on two parcels that total about 10.7 acres in size. The second mobile home park is located on the SE corner of Vineland Street and Beaumont Avenue and contains approximately 175 mobile homes on three parcels that total about 17 acres in size. For the purposes of this analysis, each mobile home was considered to be an individual lot. There is a densely developed area in the CVCOI located just east of Bellflower Avenue and north of Brookside Ave that is connected to the City of Beaumont's sewer system, which consequently, was not included in this analysis.

Based on the 2005 parcel and assessed property value data, there are approximately 1,900 developed lots. If the currently undeveloped parcels in the CVCOI were to develop out to 0.5 acre size lots, the total number of lots with OSWDS could reach about 7,800 at build-out. If these parcels were to develop out to 1.0 acre size lots, the total number of lots with OSWDS could reach about 4,900. Additionally, if the currently developed parcels larger than 10 acres were to be subdivided to 0.5 acre lots or 1.0 acre lots, the total number of lots with OSWDS could reach about 8,800 or 5,400, respectively, at build-out.

Presently, OSWDS are discharging approximately 665 acre-ft/yr. The total recharge to the Beaumont Management Zone is currently about 12,000 acre-ft/yr (STWMA letter to Santa Ana RWQCB, November 11, 2003). At build out, there will be about 4,900 to 8,800 OSWDS, depending on how the CVCOI develops, that discharge about 1,700 to 3,100 acre-ft/yr to groundwater, respectively. This discharge amounts to about 13 to 21 percent of the total recharge to the Beaumont Management Zone.

4.2 Current Nitrogen Loads

The water quality of the upper saturated zone is comparable to the quality of the recharge waters. It is in the upper saturated zone where the impacts from nitrate contamination are most prevalent. Impacts to groundwater from OSWDS over a defined geographical area can be estimated by a simplified mass balance approach. RWQCBs throughout California have used mass balance calculations as a means of assessing the potential impacts from OSWDS (RWQCB, North Coast Basin, 1996; RWQCB, Colorado River Basin Region, 2002). The mass balance constructed by Hantzsche and Finnemore (1992) considers only the inputs from wastewater and recharge of precipitation and losses due to denitrification in the vadose zone and the upper portion of the aquifer.

The resulting average concentration (n_r) of nitrate in recharge water is estimated by the following equation:

$$n_r = \frac{In_w(1-d) + Rn_b}{(I+R)} \tag{1}$$

Wherein I is the volume of OSWDS discharge to soil averaged over the gross developed area in inches/year, n_w is the total nitrogen concentration of the OSWDS discharge in mg/L, d is the fraction of nitrate loss due to denitrification in the soil, R is the average recharge rate of rainfall in inches/year, and n_b is the background nitrate concentration of rainfall recharge at the water table in mg/L.

Equation 1 assumes there is a uniform and complete mixing of OSWDS discharge and percolating precipitation at the upper part of the saturated zone. This equation also assumes that nitrogen is completely converted to nitrate. The result of this mass balance approach is a conservative approximation of long-term effects on groundwater quality from OSWDS.

Equation 1 can be rearranged to calculate the critical minimum gross acreage per developed lot (A) that would result in a value of n_r equal to 10 mg/L:

$$A = \frac{0.01344W[n_w - dn_w - 10]}{R(10 - n_b)} \tag{2}$$

Wherein A is expressed in terms of gross acres per dwelling unit (DU), W is the average daily OSWDS discharge per dwelling unit in gallons, and 0.01344 is a conversion factor with units of acre inch day DU year^{-1} gallon^{-1}.

Through equation 1, n_r was calculated for two different nitrogen concentrations in OSWDS discharge: 40 and 60 mg/L. These values represent the typical range of total nitrogen in OSWDS effluent (RWQCB, Santa Ana River Basin Region, 1989). The results of this calculation are shown in Table 4-1. The fraction of nitrate loss to denitrification was assumed to be 10 percent, which is consistent with the rate of denitrification used by the USGS in a study of sources of nitrate in groundwater (Cox and Kahle, 1998). The average recharge of precipitation in the CVCOI was estimated using a groundwater flow and nitrate transport model for the Beaumont Basin region that was developed by WEI. The groundwater flow and nitrate transport model report will be completed in 2007. The background nitrate concentration of rainfall

recharge at the water table was assumed to be 1.0 mg/L, which was based on a study conducted by the USGS (Nolan and Hitt, 2003).

The average nitrate concentrations in recharge water with total nitrogen inputs from OSWDS discharge of 40 and 60 mg/L were estimated to be 22 and 33 mg/L, respectively. These nitrate concentrations exceed the MCL of 10 mg/L. The total recharge to the Beaumont Management Zone is currently about 12,000 acre-ft/yr and the sum of percolating precipitation and OSWDS discharge represents approximately 17 percent of the total recharge.

The critical minimum gross acreage (A) per developed lot needed to maintain the concentration of nitrate in recharge waters at the MCL was calculated and is shown in Table 4-1. Assuming total nitrogen inputs from OSWDS discharge of 40 and 60 mg/L, A was estimated to be 5.4 and 9.2 acres, respectively. Currently, 97 percent of the developed lots in the CVCOI are less than 5.4 acres in size. Given the density of existing OSWDS, it is not possible to reduce the nitrate concentration of the combined recharge water from OSWDS and precipitation to below the drinking water MCL of 10 mg/L.

4.3 Projection of Future Nitrogen Loads and Expected Impacts to the Beaumont Management Zone

Future discharge from OSWDS is projected to be about 13 to 21 percent of the total recharge to the Beaumont Management Zone at build out. This equates to about 185,000 to 500,000 pounds of nitrogen a year from OSWDS entering the groundwater.

Groundwater nitrate concentrations over time were simulated using the groundwater flow and nitrate transport model for the Beaumont Basin region. The results of this simulation are presented in Figures 4-2 and 4-3, which show nitrate concentrations in years 2030 and 2100, respectively. In this simulation it was assumed that the CVCOI builds out to 7,800 lots. The extent of the model does not include the entire Beaumont Management Zone; however, water quality impacts in the Beaumont Basin can be evaluated. Over time, the nitrate concentration in groundwater will increase up to about 25 mg/L in the northeast portion of the Beaumont Basin due to discharge from OSWDS. In September of 2005, the BCVWD began recharging State Water Project (SWP) water at the BCVWD Recharge Facility, which is also shown in Figures 4-2 and 4-3. The thirty-year average nitrate concentration of SWP water is less than 1 mg/L. The BCVWD plans to continue to recharge SWP water at their recharge facility and additional supplemental water, including recycled water and stormwater, will be recharged at the BCVWD Recharge Facility to maintain the safe yield of the Beaumont Basin. This recharge will raise groundwater levels and deflect the high-nitrate groundwater to the west and east of the recharge facility. In 2030, the nitrate concentration at BCVWD well 16 will exceed 20 mg/L and well-head treatment will be required for the well to be utilized as a drinking water source. Well-head treatment will be required when the nitrate concentrations reach about 8 mg/L, which will occur well before 2030. Through 2100, high nitrate concentrations in excess of the drinking water MCL will have spread even further, and many private well owners who rely on their wells for drinking water and irrigation will be affected. The City of Banning, the South Mesa Water Company, and the Yucaipa Valley Water District wells will also be affected.

The water quality impacts to the Beaumont Basin from OSWDS discharge will be significant and the impacts to the Beaumont Management Zone will be even greater. Groundwater in the Beaumont Management Zone will be impacted by OSWDS discharge from the entire CVCOI. The travel time for nitrate to reach the groundwater may be on the order of years or decades depending upon the depth to groundwater and the hydraulic conductivity of the subsurface material. Hence, nitrate contamination may

not be observed at wells for many years after a septic system is installed (Rogers, 1988). The vadose zone in the CVCOI is fairly deep, with depths to the water table ranging from approximately 100 feet below ground surface at BCVWD Well 5 to 550 feet below ground surface at BCVWD Well 21, which is south of the Banning Fault. The travel time for nitrate to reach groundwater at a depth of 100 feet is approximately two to six years. At a depth of 500 feet, nitrate will reach groundwater in approximately fifteen years. In CVCOI elevated nitrate levels near the MCL were detected in 1980 at BVMWC Well 2, were the depth to water is about 100 feet. Nitrate from OSWDS have been building up in the vadose zone for decades and the impacts from OSWDS are just now being realized at groundwater production wells in the deeper portion of the CVCOI. Depending on how the CVCOI develops the following impacts are expected:

- If the CVCOI builds out to 4,900 lots, the impacts from OSWDS will significantly impact the local area and well-head treatment will be required in order to serve drinking water from the local production wells.
- If the CVCOI builds out to 8,800 lots, OSWDS will contribute enough nitrate to groundwater that in the fullness of time, the entire Beaumont Management Zone will be rendered non-potable.

Table 4-1
Calculation of Nitrate Concentration in Recharge Waters and Critical Minimum Gross Acreage

	(n_w) TN of OSWDS Discharge (mg/L)	Average Annual OSWDS Discharge (acre-ft/yr)	Acreage of Developed Area in CVCOI (acres)	(I) Volume of OSWDS Discharge over Developed Area (inches/yr)	(d) Fraction of Nitrate Loss due to Denitrification (%)	(R) Average Recharge Rate of Rainfall (inches/yr)	(n_b) Background Nitrate from Rainfall (mg/L)	(n_r) Nitrate of Recharge Water (mg/L)	(A) Critical Minimum Gross Acreage (acres)
Scenario 1	40	673	2463	3.28	10	2.2	1.0	22	5.4
Scenario 2	60	673	2463	3.28	10	2.2	1.0	33	9.2

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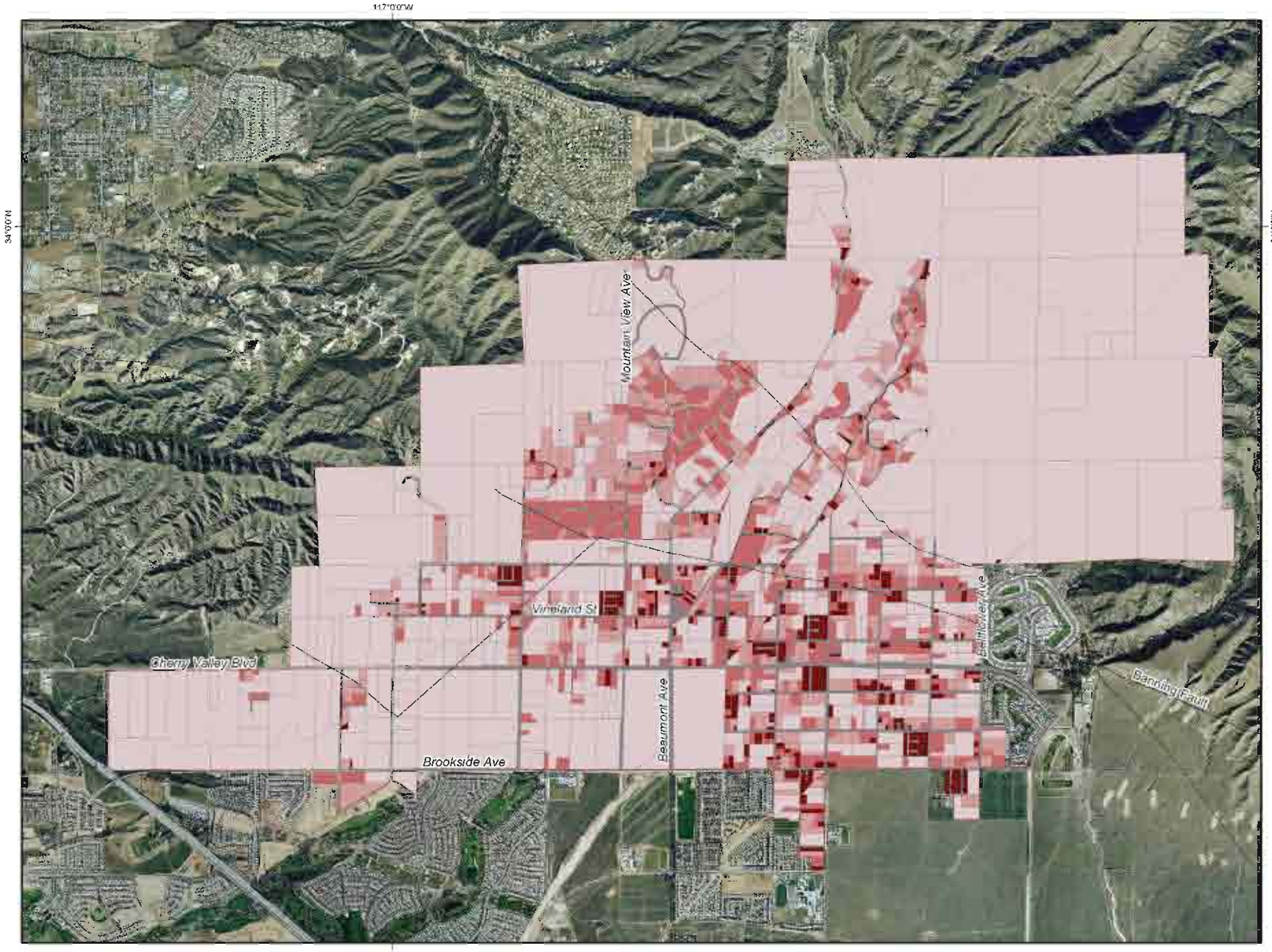

Main Features

Parcel Size (acre)

- < 0.50
- 0.50 - 1.00
- 1.01 - 2.00
- > 2.0

Cherry Valley Community of Interest

Fault

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File Figure_4-1.mxd

0 1 2 Miles

0 1 2 3 KM

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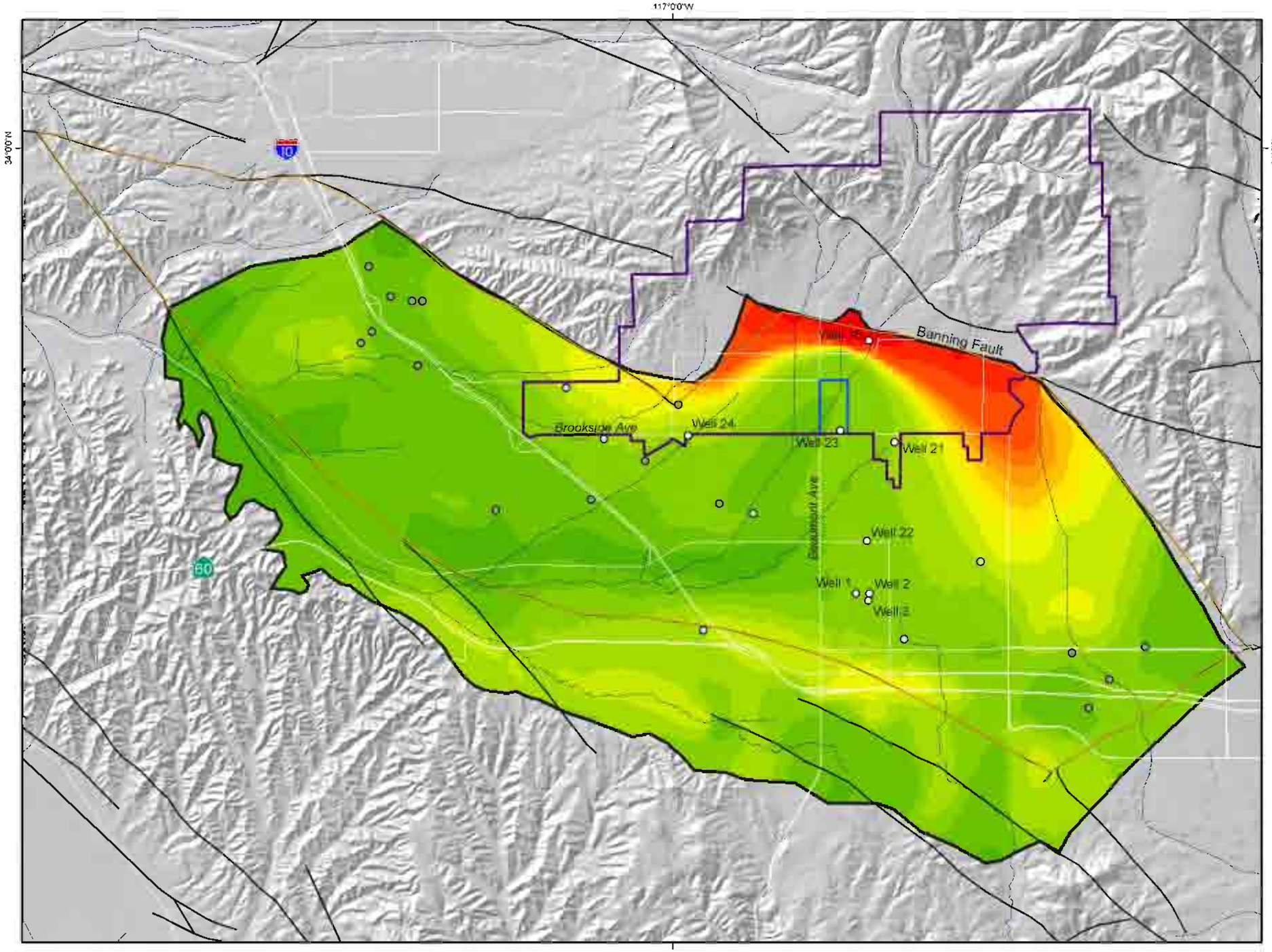
Task B - OSWDS Study

Size Distribution of Parcels in the Cherry Valley Community of Interest

Figure 4-1



Main Features

Nitrate Concentration (mg/l)

- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9
- 9 - 10
- 10 - 15
- 15 - 20
- >20

Active Wells Used in Model

- Existing BCVWD Production Well
- Planned BCVWD Production Well
- Other Production or Private Well
- Beaumont Basin
- BCVWD Recharge Facility
- Cherry Valley Community of Interest
- Model Domain
- Stream or River
- Fault

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0 1 2 Miles
0 1 2 3 KM

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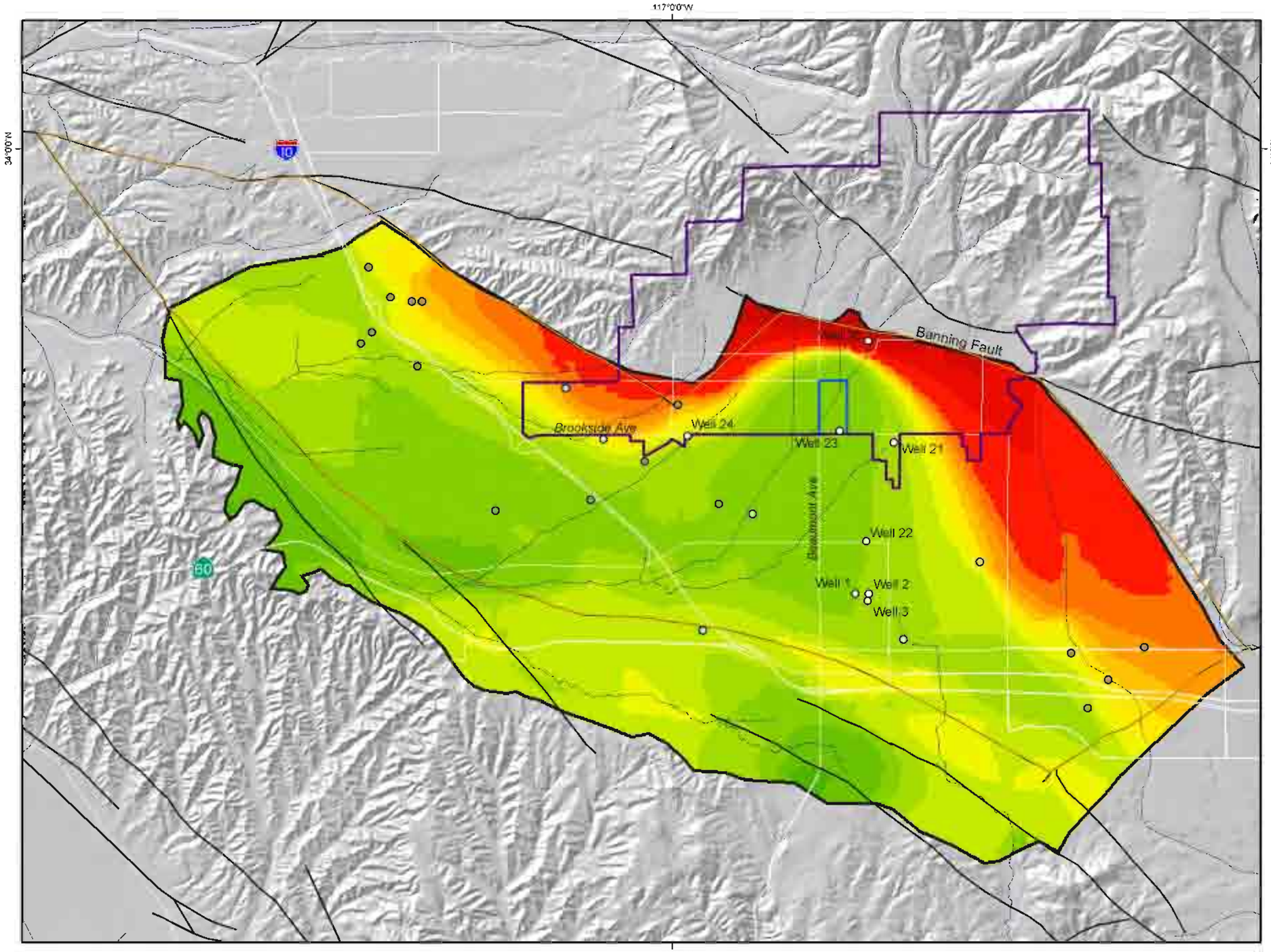
Task B - OSWDS Study

Groundwater Nitrate Concentrations in 2030

Figure 4-2



Main Features

Nitrate Concentration (mg/l)

- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9
- 9 - 10
- 10 - 15
- 15 - 20
- >20

Active Wells Used in Model

- Existing BCVWD Production Well
- Planned BCVWD Production Well
- Other Production or Private Well
- Beaumont Basin
- BCVWD Recharge Facility
- Cherry Valley Community of Interest
- Model Domain
- Stream or River
- Fault

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0 1 2 Miles
0 1 2 3 KM

San Timoteo Watershed Management Authority

Project Committee 1
Task B - OSWDS Study

Groundwater Nitrate Concentrations in 2100

Figure 4-3

5. Thresholds of Evidence Used to Prohibit OSWDS

5.1 Applicable Laws and Regulations

The regulation of OSWDS in California starts with RWQCBs through Water Quality Control Plans (Basin Plans). The Basin Plans include water quality objectives that protect the beneficial uses of each region's ground and surface waters and implementation plans for achieving these objectives.

Section 13260 of the California Water Code (CWC) requires any person discharging waste or proposing to discharge waste that may affect the waters of the State, except to a community sewer system, to file a report of waste discharge (RoWD) with the local Board that has jurisdiction over the discharge. Section 13269 of the CWC authorizes a Board to waive the requirement for RoWDs or the need to issue Waste Discharge Requirements (WDRs) wherein the waiver is consistent with the applicable Basin Plans and in the public's interest. WDRs for single family residences with OSWDS and the associated reporting and monitoring requirements have been waived by the RWQCBs throughout the state in the past and the jurisdiction to regulate and permit OSWDS has been provisionally delegated to local entities such as cities, counties, water districts, or sanitation districts.

In 2000, AB 885 was passed by the legislature. It requires the State Water Resources Control Board (SWRCB) to establish statewide standards for the regulation of OSWDS. AB 885 was codified in Sections 13290 through 13291.7 of the CWC. Pursuant to AB 885, the statewide standards were to be developed by January 1, 2004. Discussion with Board staff indicates that although standards have not yet been established, the development process continues and should be completed in the near future. Subsequent to the passage of AB 885, the SWRCB legal counsel informed RWQCB staff that RoWD waivers for OSWDS could no longer be extended. The changes from AB 885 extended the existing waivers until June 30, 2004 and do not allow renewal or extension of the waivers beyond that time (RWQCB, San Francisco Bay Region, 2002).

5.2 Past Prohibitions

RWQCBs have established over 60 prohibitions of OSWDS throughout the State in the past. Table 5-1 lists the communities in California with OSWDS prohibitions and Figure 5-1 depicts the locations of these communities. Many of the prohibitions listed in Table 5-1 were established in the 1970s or 1980s and much of the material supporting these prohibitions is unavailable.

Past prohibitions of OSWDS have been established as a result of several different processes including direct amendments to Basin Plans, legislation (Cathedral City Cove), the development of TMDLs (Tomales Bay), and the development of nitrate or salt management plans. At least one prohibition was initially established through a TMDL process and was later rescinded when the final nitrate management plan was included in the Basin Plan (San Lorenzo River). Many prohibitions against new systems were implemented from the date the resolutions or orders were formally adopted and against existing systems as of some future date to allow for time to connect to or construct community systems. One prohibition that was first established in 1983 was contested and agreed upon; presently, this case is the subject of a new cease and desist order and an administrative civil liability action (Los Osos).

5.3 Evidence Presented to Prohibit OSWDS

Section 13280 of the CWC is included in all Basin Plans. It establishes the standard of evidence by which an RWQCB can prohibit the use of OSWDS as follows:

> "A determination that discharge of waste from existing or new individual disposal systems or from community collection and disposal systems which utilize subsurface disposal should not be permitted shall be supported by substantial evidence in the record that the discharge of waste from such disposal systems will result in violation of water quality objectives, will impair present or future beneficial uses of water, will cause pollution, nuisance, or contamination, or will unreasonably degrade the quality of any waters of the state."

Section 13280 implies that the substantial evidence can be presented for any of the impacts it cites. However, in cases other than for Cathedral City Cove, it does not appear that OSWDS were prohibited in the past solely based on a violation of water quality objectives or the contamination of groundwater. For example, it has been demonstrated that OSWDS are the third leading cause of groundwater contamination in the United States and that the effluent from OSWDS contaminates ground and surface waters with nutrients, heavy metals and human borne pathogens (RWQCB, Colorado River Basin Region, 2002). Even when armed with this knowledge, the most recent resolutions for adopting Basin Plan amendments that prohibit OSWDS discharges and the corresponding staff reports presented substantial evidence that all of the impacts cited in Section 13280 were occurring or that they would occur in the future.

The following attachments are included in the appendices:

1. CWC Section 13280 – 13286.9.
2. CWC Section 13290 – 13291.7.
3. Excerpts from the EPA's "Onsite Wastewater Treatment Systems Manual.":
    - Table 3-16. Typical wastewater pollutants of concern.
    - Table 3-17. Examples of soil infiltration system performance.
    - Table 3-18. Case study: septic tank effluent and soil water quality.
    - Table 3-19. Wastewater constituents of concern and representative concentrations in the effluent of various treatment units.
    - Table 4-1. Characteristics of domestic septic tank effluent.
4. Water Quality Control Plan, Colorado River Basin – Region 7, excerpt:
    - Chapter 4, Implementation, Section II. H. Septic Systems, pages 4-5, 4-6.
5. California Regional Water Quality Control Board, Colorado River Basin Region, Resolution No. R7-2002-0184 entitled "Prohibition of the Discharge of Subsurface Wastewater Disposal Systems in the Cove Area of Cathedral City".
6. California Regional Water Quality Control Board, Colorado River Basin Region, Staff Report in Support of a Basin Plan Amendment to Prohibit the Discharge of Wastewater into the Ground from Individual Subsurface Disposal Systems in the Cathedral City Cove, September 2002.
7. State Water Resources Control Board, Resolution 68-16, Statement of Policy with Respect to Maintaining High Quality of Waters in California.

Items 5 and 6 are the resolution and staff report for the Cathedral City Cove area prohibition included in Section 13286 of the CWC. A review of the resolution indicates that groundwater contamination was the primary reason for the prohibition. However, the staff report cites rising nitrate levels in groundwater, violations of water quality objectives, and adequate protection of beneficial uses as part of the findings made by the legislature. Also, on page 2, the report states that:

> "Discharges from subsurface wastewater disposal systems in Cathedral City Cove violate water quality objectives for groundwater, impair present and future beneficial uses, and cause nuisance through surface ponding and greywater discharge. Discharges from subsurface wastewater disposal systems have contaminated ground water with nitrates and human-borne pathogens, a direct violation of the State anti-degradation policy (SWRCB Resolution 68-16: Statement of Policy with Respect to Maintaining High Quality of Waters in California)."

Section 13283 of the CWC establishes the criteria by which the SWRCB reviews determinations that the discharge of waste from OSWDS should not be permitted as follows:

> "In reviewing any determination that discharge of waste from existing or new individual disposal systems should not be permitted, the state board shall include a preliminary review of possible alternatives necessary to achieve protection of water quality and present and future beneficial uses of water, and prevention of nuisance, pollution, and contamination, including, but not limited to, community collection systems, community collection and disposal systems which utilize subsurface disposal, and conventional treatment systems."

The 1996 Basin Plan for the North Coast region states the following regarding analysis of the cumulative effects of OSWDS:

> J. Cumulative Effects
>
> b. Nitrate Loading
>
> Analysis of nitrate loading effects shall be based, at a minimum, on an estimate of an annual chemical-water mass balance.
>
> Minimum values used for the total nitrogen concentration of septic tank effluent shall be: 40 mg/l as N (for average flow conditions) for residential wastewater, or as determined from sampling of comparable system(s) or from literature values.
>
> On-site systems shall not cause the groundwater nitrate concentration to exceed 10.0 mg/l as N at any source of drinking water on the property nor on any off-site potential drinking water source. (page 4-21).

Further, it states the following in regard to achieving water quality objectives:

> VIII. INDIVIDUAL SYSTEM PROHIBITIONS
>
> In order to achieve water quality objectives, protect present and future beneficial water uses, protect public health and prevent nuisance, discharge of waste from new individual disposal systems may be prohibited forthwith and discharge of waste from existing individual systems may be prohibited in defined areas (page 4-22).

Based on the language in Section 13291 (a) (4) of the CWC, any OSWDS that

> "…in the judgment of a regional board or authorized local agency, discharges waste that has the reasonable potential to cause a violation of water quality objectives, or to impair present or future beneficial uses of water, to cause pollution, nuisance, or contamination of the waters of the state."

will have to comply with the new statewide regulations or standards. Since all but the most isolated OSWDS have reasonable potential to cause at least one or more of these impacts, most OSWDS will be subject to the new regulations when they are adopted. It is not clear whether this new language changes the standard of evidence such that to prohibit OSWDS, regulators will be able to demonstrate that the "reasonable potential" for adverse impacts exists or whether they will still be required to provide "substantial evidence".

Table 5-2 provides a brief summary of the evidence used by Regional Boards to support prohibitions of OSWDS. In most cases, the evidence has indicated that the use of septic systems results in the violation of water quality objectives, impairment of present or future beneficial uses of water, pollution, nuisance, or contamination, and unreasonably degrades the quality of the waters of the state. Many of the conditions that exist in areas where OSWDS prohibitions have been established are present in the CVCOI. Table 5-3 lists the evidence present in the CVCOI to warrant a prohibition of OSWDS according to CWC 13280.

Table 5-1
Septic System Prohibition Areas in California[1]

RWQCB Region	Location / Area	County	Document	Action
1-North Coast				
	Geyserville	Sonoma	Order 77-124	Prohibition
	Jacoby Creek & Old Arcata Rd	Humboldt	Res 70-7	Waiver Prohibition
	Campbell Tract	Siskiyou	Res 80-20	Prohibition
	Curtis Heights & Community of Bayside	Humboldt	Res 81-13	Prohibition
	Larkfield Area	Sonoma	Res 83-3	Prohibition
	Willowside Estates	Sonoma	Res 86-73	Modify Prohibition
2-San Francisco				
	Stinson Beach	Marin	Res 73-13	Prohibition
	Glen Ellen	Sonoma	Res 73-14	Prohibition
	Emerald Lake Hills	San Mateo	Res 76-7	Prohibition
	Oak Knoll Manor	San Mateo	Res 76-7	Prohibition
	Tomales Bay	Marin County		Prohibition
3-Central Coast				
	City of Nipomo, Portions of	San Luis Obispo		Prohibition
	San Lorenzo River Valley, Portions of	Santa Cruz		Prohibition
	Los Osos/Baywood Park	San Luis Obispo	Res 83-13	Prohibition
4-Los Angeles				
	Oxnard Forebay	Ventura		Prohibition
5-Central Valley				
	Amador City	Amador	Res 73-129	Prohibition
	Martell Area	Amador	Res 73-129	Prohibition
	Shasta Dam Area PUD	Shasta	Res 73-129	Prohibition
	Vallecito Area	Calaveras	Res 73-129	Prohibition
	West Point area	Calaveras	Res 73-129	Prohibition
	Celeste Subdivision Area	Merced	Res 73-129	Prohibition
	Snelling Area	Merced	Res 73-129 & 74-126	Prohibition
	North San Juan	Nevada	Res 74-123	Prohibition
	Arnold Area	Calaveras	Res 74-124 & 75-180	Prohibition
	Contra Costa County CSD No 15	Contra Costa	Res 74-125	Prohibition
	Madera County Service Area No 3, Bass Lake	Madera	Res 74-127	Prohibition
	Madera County Service Area No 1, Parksdale	Madera	Res 74-128	Prohibition
	Coulterville County Service Area No 1	Mariposa	Res 75-070	Prohibition
	Midway CSD	Merced	Res 75-072	Prohibition
	Adin CSD	Modoc	Res 75-272	Prohibition
	Fall River Mills CSD	Shasta	Res 75-273	Prohibition
	Bell Road Community, incl Panorama & Pearl	Placer	Res 75-274	Prohibition
	Nice & Lucerne	Lake	Res 76-058	Prohibition
	Courtland Sanitation District	Sacramento	Res 76-059	Prohibition
	Six-Mile Village	Calaveras	Res 76-060	Prohibition
	Clearlake Highlands & Clearlake Park	Lake	Res 76-089	Prohibition

Table 5-1

Septic System Prohibition Areas in California[1]

RWQCB Region	Location / Area	County	Document	Action
5-Central Valley Continued				
	Taylorsville County Service Area	Plumas	Res 76-129	Prohibition
	South Lakeshore Assessment District Community	Lake	Res 76-215	Prohibition
	Anderson-Cottonwood Irrigation District, Cottonwood	Shasta	Res 76-230	Prohibition
	Daphnedale Area	Modoc	Res 76-231	Prohibition
	Chico Urban Area	Butte	Res 90-126	Prohibition
	Corcoran Fringe Area	Kings	Res 77-224	Prohibition
	East Porterville Area	Tulare	Res 75-069	Prohibition
	Home Garden CSD	Kings	Res 77-020	Prohibition
	Kettleman City County Service Area No.1	Kings	Res 75-071	Prohibition
	South Shafter Community	Kern	Res 2005-0083	Prohibition
6-Lahontan				
	Cady Springs	Lassen		Prohibition
	Spaulding Tract & Stone-Bengard Subdivisions	Lassen		Prohibition
	Truckee River Hydrologic Unit Above Boca River Confl	Placer		Prohibition
	Glenshire & Devonshire Subdivisions	Placer		Prohibition
	Rush Creek Above Grant Lake	Mono		Prohibition
	Mammoth Creek Watershed	Mono		Prohibition
	Assessment District No 1	Inyo		Prohibition
	Assessment District No 2	Inyo		Prohibition
	Rocking K Subdivision	Inyo		Prohibition
	Bishop	Inyo		Prohibition
	Hilton Creek/Crowley Lake Communities	Mono		Prohibition
	Silverwood Lake	San Bernardino		Prohibition
	Deep Creek & Grass Valley Creek watersheds above 3200 feet	San Bernardino		Prohibition
	Desert Knolls Community	San Bernardino		Prohibition
7-Colorado River				
	Cathedral City	Riverside		Prohibition after Jan 1, 2012
	Mission Ck or Desert Hot Springs Aquifers	Riverside		Prohibition after Jan 21, 2005 if sewer available
8-Santa Ana				
	Grand Terrace CSD 70, Improvement Zone H	San Bernardino	1973	Prohibition
	Yucaipa-Calimesa (YVWD)	San Bernardino	1973	Prohibition
	Lytle Creek above 2000 feet	San Bernardino	1973	Prohibition
	Mill Creek above 2600 feet	San Bernardino	1973	Prohibition
	Bear Valley	San Bernardino	1973	Prohibition
	Homeland-Green Acres	Riverside	1982	Prohibition
	Romoland	Riverside	1982	Prohibition
	Quail Valley	Riverside	Res 2006-0024	Prohibition

[1] Excerpted from each region's Basin Plan by Todd Thompson, San Francisco RWQCB

Table 5-2
Select OSWDS Prohibitions and Supporting Evidence

Prohibition	Date	Region	Substantial Evidence Used to Support Prohibition
Quail Valley Septic System Prohibition - Draft	January 12, 2006	Santa Ana	Poor soil conditions High groundwater levels High density of septic systems Nitrogen and bacterial levels cause of impairment of water quality and beneficial uses Ponded septic system effluent and surfacing of septic system effluent Significant number of septic system failures Annual nitrogen loading from existing residences in Quail Valley estimated at over 52,000 pounds
Resolution 2005-0083	June 24, 2005	Central Valley	South Shafter Community consists of 345 small lots with community water supply and utilizing on-site individual septic systems for wastewater treatment and disposal Over half of the septic systems have failed or are in threat of failure and need frequent pumping to minimize surface ponding of sewage 51% of households are running laundry greywater onto lawns to relieve septic systems, a violation of public health regulations Four of the fifteen domestic water supply wells had nitrate concentrations about 45 mg/L and eight of eleven other wells had nitrate levels between 23 and 45 mg/L May 10, 2005 Kern County Public Health Officer declared conditions create a potential pollution and public health problem
Resolution 2002-0184	November 13, 2002	Colorado River	High septic system density, ranging up to 8.3 tanks per acre Approximately 300,000 gallons of wastewater percolates into the ground from Cove area septic systems daily Ponded septic system effluent and surfacing of septic system effluent Elevated concentrations of nitrates and human pathogenic viruses in monitoring wells downgradient of area on septic systems Occurrence of groundwater contamination at the top of the aquifer near the septic tanks Absence of alternative nitrate sources
Resolution 99-13	August 12, 1999	Los Angeles	Existing septic systems are passive treatment systems that do not have the ability to remove nitrogen to levels that will meet drinking water standards Communities discharge septic system effluent to groundwater, which is also their source of drinking water Septic system effluent contains nitrogen and pathogens well in excess of water quality objectives; communities' drinking water also contains nitrate and pathogens at times in excess of water quality objectives Some local water supplies were taken offline by State Health Officials because of nitrate levels exceeded 45 mg/L Underlying soils are coarse and well-drained and are not suitable to attenuate the high volume of septic system discharges Location of septic systems in area that recharges aquifers in the Oxnard Forebay and Oxnard Plain
Resolution 83-13	September 16, 1983	Central Coast	Septic system contribute 91% of nitrogen to groundwater Nitrogen and bacterial water quality drinking standards violated Municipal well abandoned due to nitrate concentrations exceeding 45 mg/L Documented septic system failure and surfacing effluent Majority of lots too small to provide adequate dispersion of septic system effluent
Resolution 73-13	September 25, 1973	San Francisco Bay	Widespread failure of leaching and percolation systems Failing systems contaminated surface waters Poor soil conditions

Table 5-3
Evidence for Prohibition of OSWDS in the CVCOI

CWC Section		Evidence Needed	Present in the CVCOI	Description
13280: A determination that discharge of waste from existing or new individual disposal systems or from community collection and disposal systems which utilize subsurface disposal should not be permitted shall be supported by substantial evidence in the record that the discharge of waste from such disposal systems will result in:	1.	Violation of water quality objectives	Yes	The water quality objective for NO3-N in the Beaumont Management Zone is 5.0 mg/L. This objective will be violated if CVCOI continues to develop in a high-density manner.
	2.	Impair present or future beneficial uses of water	Yes	Municipal and domestic supply beneficial uses have been impaired. Two water company are no longer using their production wells due to high nitrate concentrations.
	3.	Cause pollution, nuisance, or contamination	Yes	Multiple tracer study indicates OSWDS are the source of nitrate contamination in groundwater underlying the CVCOI.
	4.	Unreasonably degrade the quality of any waters of the state	Yes	Groundwater in the CVCOI has been degraded to the level that the drinking water MCL for nitrate has been exceeded.

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Figure 5-1

Septic System Prohibition Areas in California

Source: RWQCB, Santa Ana River Basin Region, 2006

6. Conclusions and Recommendations

The results of this investigation clearly indicate that the OSWDS in the CVCOI are the source of nitrate contamination of groundwater in the part of the Beaumont Management Zone overlain by the CVCOI. The following conclusions can be made regarding the occurrence of high nitrate concentrations in wells within and immediately down gradient of the CVCOI:

- Several production wells have been negatively impacted as nitrate concentrations are increasing at BCVWD and other retailers' wells in the CVCOI.
- Several water wells within and down gradient of the CVCOI have nitrate concentration that are close to or exceed the nitrate MCL of 10 mg/L.
- Water produced from wells high in nitrate in this area have a nitrogen isotopic signature that is consistent with discharge from OSWDS.
- Water produced from some of the wells high in nitrate in this area contain PPCPs that can only be explained by discharge from OSWDS.
- The simultaneous occurrence of high nitrate concentrations, elevated levels of specific ions, and PPCPs and nitrogen isotopes associated with OSWDS discharge can only be explained by discharge from OSWDS.
- If the CVCOI builds out to 4,900 lots, the impacts from OSWDS will significantly impact the local area and well-head treatment will be required in order to serve drinking water from the local production wells.
- If the CVCOI builds out to 8,800 lots, OSWDS will contribute enough nitrate to groundwater that in the fullness of time, the entire Beaumont Management Zone will be rendered non-potable.
- Left unmitigated, the magnitude of OSWDS discharges is sufficient to cause nitrate concentrations to exceed basin plan objectives.
- Based on a review of the law and the case histories of prohibitions on OSWDS in California, there is sufficient evidence of groundwater contamination by OSWDS to warrant the RWQCB to issue a prohibition on new OSWDS in the CVCOI.

The San Timoteo Watershed Management Authority Project Committee No. 1 and the municipal pumpers in the Beaumont Management Zone should carefully review this report and subsequently take immediate actions to eliminate this source of nitrate contamination in the Beaumont Management Zone. These actions should include:

- Work with the County and the Regional Water Quality Control Board to establish a prohibition on all new OSWDS in the CVCOI.
- Work with the inhabitants of the CVCOI to sewer the existing developed areas within the CVCOI.

Even if these actions are taken, nitrate concentrations in wells that have already been impacted will continue to increase in the future. Currently unaffected wells will likely be impacted. BCVWD and the other impacted retailers should develop plans now to blend or treat high nitrate well water in the near future.

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APPENDIX 1

CA Codes (wat: 13280-13286.9)WATER CODE
SECTION 13280-13286.9
Note: Emphasis & Format Added

13280. A determination that discharge of waste from existing or new individual disposal systems or from community collection and disposal systems which utilize subsurface disposal should not be permitted shall be supported by substantial evidence in the record that discharge of waste from such disposal systems will result in:

- Violation of water quality objectives,
- Will impair present or future beneficial uses of water,
- Will cause pollution, nuisance, or contamination, or
- Will unreasonably degrade the quality of any waters of the state.

13281. (a) In making a determination pursuant to Section 13280, except as specified in subdivision (b), the regional board shall consider all relevant evidence related to the discharge, including, but not limited to,

- Those factors set forth in Section 13241,
- Information provided pursuant to Section 117435 of the Health and Safety Code,
- Possible adverse impacts if the discharge is permitted,
- Failure rates of any existing individual disposal systems whether due to:
  - inadequate design,
  - construction,
  - maintenance, or
  - unsuitable hydrogeologic conditions,
- Evidence of any existing, prior, or potential contamination,
- Existing and planned land use,
- Dwelling density,
- Historical population growth, and
- Any other criteria as may be established pursuant to guidelines, regulations, or policies adopted by the state board.

(b) (1) To the extent that resources are available for that purpose, the regional board shall prohibit the discharge of waste from existing or new individual disposal systems on parcels of less than one-half acre that overlie the Mission Creek Aquifer or the Desert Hot Springs Aquifer in Riverside County, if a sewer system is available.

(2) For parcels of one-half acre or greater that overlie the aquifers described in paragraph (1), the maximum number of equivalent dwelling units with individual disposal systems shall be two per acre. For the purpose of this paragraph, the term "equivalent dwelling unit" means a single family dwelling as defined in Section 221.0 of the 1997 edition of the Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials.

(3) For the purposes of this subdivision, a sewer system is available if a sewer system, or a building connected to a sewer system, is within 200 feet of the existing or proposed dwelling unit, in accordance with Section 713.4 of the 1997 edition of the Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials.

(4) To the extent that resources are available for the purposes of this subdivision, the regional board shall achieve compliance with this subdivision on or before January 1, 2004.

13282. (a) If it appears that:

- Adequate protection of water quality,
- Protection of beneficial uses of water, and
- Prevention of nuisance, pollution, and contamination can be attained by appropriate:
  - design,
  - location,
  - sizing,
  - spacing,
  - construction, and
  - maintenance

  of individual disposal systems in lieu of elimination of discharges from systems, and
- If an authorized public agency provides satisfactory assurance to the regional board that the systems will be appropriately designed, located, sized, spaced, constructed, and maintained, the discharges shall be permitted so long as the systems are adequately designed, located, sized, spaced, constructed, and maintained.

(b) An authorized public agency shall notify the regional board if the systems are not adequately designed, located, sized, spaced, constructed, and maintained.

(c) For purposes of this section, "authorized public agency" means a public agency authorized by a water quality control board and having authority to ensure that systems are adequately designed, located, sized, spaced, constructed, and maintained.

13283. In <u>reviewing any determination that discharge of waste from existing or new individual disposal systems should not be permitted</u>, the state board shall include:

- A preliminary review of possible alternatives necessary to achieve protection of water quality and
- Present and future beneficial uses of water, and
- Prevention of nuisance, pollution, and contamination, including, but not limited to, community collection and waste disposal systems which utilize subsurface disposal, and possible combinations of individual disposal systems, community collection and disposal systems which utilize subsurface disposal, and conventional treatment systems.

13284. The state board may adopt guidelines, regulations, or policies necessary to implement the provisions of this article.

13285. (a) Any discharge from a storage tank, pipeline, or other container of methyl tertiary-butyl ether (MTBE), or of any pollutant that contains MTBE, that poses a threat to drinking water, or to groundwater or surface water that may reasonably be used for drinking water, or to coastal waters shall be cleaned up to a level consistent with subdivisions (a) and (b) of Section 25296.10 of the Health and Safety Code.

(b) (1) No public water system, or its customers, shall be responsible for remediation or treatment costs associated with MTBE, or a product that contains MTBE. However, the public water system may, as necessary, incur MTBE remediation and treatment costs and

include those costs in its customer rates and charges that are necessary to comply with drinking water standards or directives of the State Department of Health Services or other lawful authority. Any public water system that incurs MTBE remediation or treatment costs may seek recovery of those costs from parties responsible for the MTBE contamination, or from other available alternative sources of funds.

(2) If the public water system has included the costs of MTBE treatment and remediation in its customer rates and charges, and subsequently recovers all, or a portion of, its MTBE treatment and remediation costs from responsible parties or other available alternative sources of funds, it shall make an adjustment to its schedule of rates and charges to reflect the amount of funding received from responsible parties or other available alternative sources of funds for MTBE treatment or remediation.

(3) Paragraph (1) shall not prevent the imposition of liability on any person for the discharge of MTBE if that liability is due to the conduct or status of that person independently of whether the person happens to be a customer of the public water system.

13286. (a) On and after January 1, 2012, the appropriate regional board shall prohibit the discharge of wastewater into the ground through the use of individual subsurface disposal systems in the **Cove area of Cathedral City** in Riverside County for the purposes of protecting the health and safety of the residents consuming the groundwater of the Upper Coachella Valley Groundwater Basin and achieving the applicable water quality objectives.

(b) The appropriate regional board shall revise its water quality control plan to reflect the prohibition set forth in subdivision (a).

(c) Notwithstanding subdivisions (a) and (b), the appropriate regional board, prior to January 1, 2012, may prohibit the discharge of wastewater through the use of individual subsurface disposal systems in the Cove area of Cathedral City in Riverside County, and if so prohibited, that board shall revise its water quality control plan to reflect the prohibition.

(d) To ensure that the purposes of this section are fulfilled, the state board, using existing resources, shall assist Cathedral City to identify and obtain state and federal funds to establish a sanitary public domestic and commercial wastewater disposal system.

13286.9. On and after the date determined by the Santa Ana Regional Water Quality Control Board, or January 1, 2013, whichever is earlier, all wastewater discharged by the Orange County Sanitation District into the Pacific Ocean shall be subject to at least secondary treatment requirements pursuant to subparagraph (B) of paragraph (1) of subsection (b) of Section 301 of the Clean Water Act (33 U.S.C. Sec. 1311(b)(1)(B)), and any more stringent requirements determined to be appropriate by the state board or that regional board.

APPENDIX 2

CA Codes (wat:13290-13291.7)WATER CODE
SECTION 13290-13291.7
Note: Emphasis and Format Added

13290. For the purposes of this chapter:
(a) "Local agency" means any of the following entities:
(1) A city, county, or city and county.
(2) A special district formed pursuant to general law or special act for the local performance of functions regarding onsite sewage treatment systems within limited boundaries.
(b) "Onsite sewage treatment systems" includes individual disposal systems, community collection and disposal systems, and alternative collection and disposal systems that use subsurface disposal.

13291. (a) On or before January 1, 2004, the state board, in consultation with the State Department of Health Services, the California Coastal Commission, the California Conference of Directors of Environmental Health, counties, cities, and other interested parties, shall adopt regulations or standards for the permitting and operation of all of the following onsite sewage treatment systems in the state and shall apply those regulations or standards commencing six months after their adoptions:
(1) Any system that is constructed or replaced.
(2) Any system that is subject to a major repair.
(3) Any system that pools or discharges to the surface.
(4) Any system that, in the judgment of a regional board or authorized local agency, discharges waste that has the reasonable potential to cause a violation of water quality objectives, or to impair present or future beneficial uses of water, to cause pollution, nuisance, or contamination of the waters of the state.
(b) Regulations or standards adopted pursuant to subdivision (a), shall include, but shall not be limited to, all of the following:
(1) Minimum operating requirements that may include siting, construction, and performance requirements.
(2) Requirements for onsite sewage treatment systems adjacent to impaired waters identified pursuant to subdivision (d) of Section 303 of the Clean Water Act (33 U.S.C. Sec. 1313(d)).
(3) Requirements authorizing a qualified local agency to implement those requirements adopted under this chapter within its jurisdiction if that local agency requests that authorization.
(4) Requirements for corrective action when onsite sewage treatment systems fail to meet the requirements or standards.
(5) Minimum requirements for monitoring used to determine system or systems performance, if applicable.
(6) Exemption criteria to be established by regional boards.
(7) Requirements for determining a system that is subject to a major repair, as provided in paragraph (2) of subdivision (a).
(c) This chapter does not diminish or otherwise affect the authority of a local agency to carry out laws, other than this chapter, that relate to onsite sewage treatment systems.
(d) This chapter does not preempt any regional board or local agency from adopting or retaining standards for onsite sewage treatment systems that are more protective of the public health or the environment than this chapter.
(e) Each regional board shall incorporate the regulations or standards adopted pursuant to subdivisions (a) and (b) into the appropriate regional water quality control plans.

13291.5 It is the intent of the Legislature to assist private property owners with existing systems who incur costs as a result of the implementation of the regulations established under this section by encouraging the state board to make loans under Chapter 6.5 (commencing with Section 13475) to local agencies to assist private property owners whose cost of compliance with these regulations exceeds one-half of one percent of the current assessed value of the property on which the onsite sewage system is located.

13291.7. Nothing in this chapter shall be construed to limit the land use authority of any city, county, or city and county.

APPENDIX 3

Table 3-16. Typical wastewater pollutants of concern

Pollutant	Reason for concern
Total suspended solids (TSS) and turbidity (NTU)	In surface waters, suspended solids can result in the development of sludge deposits that smother benthic macroinvertebrates and fish eggs and can contribute to benthic enrichment, toxicity, and sediment oxygen demand. Excessive turbidity (colloidal solids that interfere with light penetration) can block sunlight, harm aquatic life (e.g., by blocking sunlight needed by plants), and lower the ability of aquatic plants to increase dissolved oxygen in the water column. In drinking water, turbidity is aesthetically displeasing and interferes with disinfection.
Biodegradable organics (BOD)	Biological stabilization of organics in the water column can deplete dissolved oxygen in surface waters, creating anoxic conditions harmful to aquatic life. Oxygen-reducing conditions can also result in taste and odor problems in drinking water.
Pathogens	Parasites, bacteria, and viruses can cause communicable diseases through direct/indirect body contact or ingestion of contaminated water or shellfish. A particular threat occurs when partially treated sewage pools on ground surfaces or migrates to recreational waters. Transport distances of some pathogens (e.g., viruses and bacteria) in ground water or surface waters can be significant.
Nitrogen	Nitrogen is an aquatic plant nutrient that can contribute to eutrophication and dissolved oxygen loss in surface waters, especially in lakes, estuaries, and coastal embayments. Algae and aquatic weeds can contribute trihalomethane (THM) precursors to the water column that may generate carcinogenic THMs in chlorinated drinking water. Excessive nitrate-nitrogen in drinking water can cause methemoglobinemia in infants and pregnancy complications for women. Livestock can also suffer health impacts from drinking water high in nitrogen.
Phosphorus	Phosphorus is an aquatic plant nutrient that can contribute to eutrophication of inland and coastal surface waters and reduction of dissolved oxygen.
Toxic organics	Toxic organic compounds present in household chemicals and cleaning agents can interfere with certain biological processes in alternative OWTSs. They can be persistent in ground water and contaminate downgradient sources of drinking water. They can also cause damage to surface water ecosystems and human health through ingestion of contaminated aquatic organisms (e.g., fish, shellfish).
Heavy metals	Heavy metals like lead and mercury in drinking water can cause human health problems. In the aquatic ecosystem, they can also be toxic to aquatic life and accumulate in fish and shellfish that might be consumed by humans.
Dissolved inorganics	Chloride and sulfide can cause taste and odor problems in drinking water. Boron, sodium, chlorides, sulfate, and other solutes may limit treated wastewater reuse options (e.g., irrigation). Sodium and to a lesser extent potassium can be deleterious to soil structure and SWIS performance.

Source: Adapted in part from Tchobanoglous and Burton, 1991.

Table3-17. Examples of soil infiltration system performance

Parameter	Applied concentration in milligrams per liter	Percent removal	References
BOD_5	130–150	90–98	Siegrist et al., 1986 U. Wisconsin,1978
Total nitrogen	45–55	10–40	Reneau 1977 Sikora et al., 1976
Total phosphorus	8–12	85–95	Sikora et al., 1976
Fecal coliforms	NA[a]	99–99.99	Gerba, 1975

[a] Fecal coliforms are typically measured in other units, e.g., colony-forming units per 100 milliliters.

Source: Adapted from USEPA, 1992.

Table 3-18. Case study: septic tank effluent and soil water quality[a]

Parameter (units)	Statistics	Septic tank effluent quality	Soil water quality[b] at 0.6 meter	Soil water Quality[b] at 1.2 meters
BOD (mg/L)	Mean	93.5	<1	<1
	Range	46–156	<1	<1
	# samples	11	6	6
TOC (mg/L)	Mean	47.4	7.8	8.0
	Range	31–68	3.7–17.0	3.1–25.0
	# samples	11	34	33
TKN (mg/L)	Mean	44.2	0.77	0.77
	Range	19–53	0.40–1.40	0.25–2.10
	# samples	11	35	33
NO_3-N (mg/L)	Mean	0.04	21.6	13.0
	Range	0.01–0.16	1.7–39.0	2.0–29.0
	# samples	11	35	32
TP (mg/L)	Mean	8.6	0.40	0.18
	Range	7.2–17.0	0.01–3.8	0.02–1.80
	# samples	11	35	33
TDS (mg/L)	Mean	497	448	355
	Range	354–610	184–620	200–592
	# samples	11	34	32
Cl (mg/L)	Mean	70	41	29
	Range	37–110	9–65	9–49
	# samples	11	34	31
F. Coli (log # per 100 mL)	Mean	4.57	nd[c]	nd
	Range	3.6–5.4	<1	<1
	# samples	11	24	21
F. strep. (log # per 100 mL)	Mean	3.60	nd	nd
	Range	1.9–5.3	<1	<1
	# samples	11	23	20

[a] The soil matrix consisted of a fine sand; the wastewater loading rate was 3.1 cm per day over 9 months. TOC = total organic carbon; TKN = total Kjeldahl nitrogen; TDS = total dissolved solids; Cl = chlorides;
F. coli = fecal coliforms; F. strep = fecal streptococci.
[b] Soil water quality measured in pan lysimeters at unsaturated soil depths of 2 feet (0.6 meter) and 4 feet (1.2 meters).
[c] nd = none detected.

Source: Adapted from Anderson et al., 1994.

cause cloudiness in surface waters. TSS in direct discharges to surface waters can result in the development of sludge layers that can harm aquatic organisms (e.g., benthic macro invertebrates). Systems that fail to remove BOD and TSS and are located near surface waters or drinking water wells may present additional problems in the form of pathogens, toxic pollutants, and other pollutants.

Under proper site and operating conditions, however, OWTSs can achieve significant removal rates (i.e., greater than 95 percent) for biodegradable organic compounds and suspended solids. The risk of ground water contamination by BOD and TSS (and other pollutants associated with suspended solids) below a properly sited, designed, constructed, and maintained SWIS is slight (Anderson et al., 1994; University of Wisconsin, 1978). Most settleable and floatable solids are removed in the septic tank during pretreatment. Most particulate BOD remaining is effectively removed at the infiltrative surface and biomat. Colloidal and dissolved BOD that might pass through the biomat are removed through aerobic biological processes in the vadose zone, especially when uniform dosing and reoxygenation occur. If excessive concentrations of BOD and TSS migrate beyond the tank because of poor maintenance, the infiltrative

surface can clog and surface seepage of wastewater or plumbing fixture backup can occur.

Nitrogen

Nitrogen in raw wastewater is primarily in the form of organic matter and ammonia. After the septic tank, it is primarily (more than 85 percent) ammonia. After discharge of the effluent to the infiltrative surface, aerobic bacteria in the biomat and upper vadose zone convert the ammonia in the effluent almost entirely to nitrite and then to nitrate. Nitrogen in its nitrate form is a significant ground water pollutant. It has been detected in urban and rural ground water nationwide, sometimes at levels exceeding the USEPA drinking water standard of 10 mg/L (USGS, 1999). High concentrations of nitrate (greater than 10 mg/L) can cause methemoglobinemia or "blue baby syndrome," a disease in infants that reduces the blood's ability to carry oxygen, and problems during pregnancy. Nitrogen is also an important plant nutrient that can cause excessive algal growth in nitrogen-limited inland (fresh) waters and coastal waters, which are often limited in available nitrogen. High algal productivity can block sunlight, create nuisance or harmful algal blooms, and significantly alter aquatic ecosystems. As algae die, they are decomposed by bacteria, which can deplete available dissolved oxygen in surface waters and degrade habitat conditions.

Nitrogen contamination of ground water below infiltration fields has been documented by many investigators (Anderson et al., 1994; Andreoli et al., 1979; Ayres Associates, 1989, 1993b, c; Bouma et al., 1972; Carlile et al., 1981; Cogger and

Table 3-19. Wastewater constituents of concern and representative concentrations in the effluent of various treatment units

Constituents of concern	Example direct or indirect measures (Units)	Tank-based treatment unit effluent concentrations					SWIS percolate into ground water at 3 to 5 ft depth (% removal)
		Domestic STE[1]	Domestic STE with N-removal recycle[2]	Aerobic unit effluent	Sand filter effluent	Foam or textile filter effluent	
Oxygen demand	BOD_5 (mg/L)	140-200	80-120	5-50	2-15	5-15	>90%
Particulate solids	TSS (mg/L)	50-100	50-80	5-100	5-20	5-10	>90%
Nitrogen	Total N (mg N/L)	40-100	10-30	25-60	10-50	30-60	10-20%
Phosphorus	Total P (mg P/L)	5-15	5-15	4-10	<1-10[4]	5-15[4]	0-100%
Bacteria (e.g., *Clostridium perfringens, Salmonella, Shigella*)	Fecal coliform (organisms per 100 mL)	10^6-10^8	10^6-10^8	10^3-10^4	10^1-10^3	10^1-10^3	>99.99%
Virus (e.g., hepatitis, polio, echo, coxsackie, coliphage)	Specific virus (pfu/mL)	0-10^5 (episodically present at high levels)	0-10^5 (episodically present at high levels)	0-10^5 (episodically present at high levels)	0-10^5 (episodically present at high levels)	0-10^5 (episodically present at high levels)	>99.9%
Organic chemicals (e.g., solvents, petro-chemicals, pesticides)	Specific organics or totals (µg/L)	0 to trace levels (?)	0 to trace levels (?)	0 to trace levels (?)	0 to trace levels (?)	0 to trace levels (?)	>99%
Heavy metals (e.g., Pb, Cu, Ag, Hg)	Individual metals (µg/L)	0 to trace levels	0 to trace levels	0 to trace levels	0 to trace levels	0 to trace levels	>99%

[1] Septic tank effluent (STE) concentrations given are for domestic wastewater. However, restaurant STE is markedly higher particularly in BOD_5, COD, and suspended solids while concentrations in graywater STE are noticeably lower in total nitrogen.
[2] N-removal accomplished by recycling STE through a packed bed for nitrification with discharge into the influent end of the septic tank for denitrification.
[3] P-removal by adsorption/precipitation is highly dependent on media capacity, P loading, and system operation.

Source: Siegrist, 2001 (after Siegrist et al., 2000)

Source: Siegrist, 2001 (after Siegrist et al., 2000).

APPENDIX 4

Discharges of water softener regeneration brine are prohibited to facilities which ultimately discharge in areas where such wastes can percolate to ground water usable for domestic and municipal purposes. The Regional Board requests that local agencies adopt ordinances to prohibit discharges of these brines to ground waters, surface waters, or into community sewers.

H. SEPTIC SYSTEMS

Pursuant to Section 13224, Article 2, Chapter 4 of the California Water Code, the Colorado River Basin Region may issue policy statements relating to any water quality matter within its jurisdiction. Septic systems (all on-site wastewater treatment systems) have the potential to degrade the water within the Region's jurisdiction if improperly used. For this reason, the Regional Board has established guidelines and a general permit for such systems.

The 1979 "Guidelines for Sewage Disposal From Land Developments" (herein referred to as the guidelines) describe the appropriate use of septic tank systems. Also discussed is the role which the county governments have in the placement and allowance of these systems. The guidelines describe what types of discharges need Waste Discharge Requirements and what types of discharges qualify for a waiver under Water Code Sections 13260 and 13269, respectively. To eliminate confusion, systems which should adhere to the guidelines are also described. However, the bulk of the guidelines describe minimum design criteria where septic systems can be placed to protect groundwater quality.

The guidelines are reviewed and revised as necessary. At this time some local governments in the Region have prohibitions on septic systems.

Since January 1993, the Regional Board has required all new vehicle maintenance facilities which use septic systems as a wastewater disposal method to file for a general discharge permit. It has been shown that some septic systems for auto maintenance facilities have been contaminated with petroleum hydrocarbons. The general permit describes appropriate designs for septic systems used at vehicle maintenance shops and requires analysis, monitoring and reporting. By requiring these items, it is anticipated that pollution from these systems can be identified and stopped prior to extensive contamination.

Cathedral City Cove

On and after January 1, 2012, the discharge of wastewater into the ground through the use of individual subsurface disposal systems in the Cove area of Cathedral City in Riverside County is prohibited. Cathedral City Cove is that area of the city bound to the south by Cathedral City city limits as of January 1, 2012, to the east by the East Cathedral Canyon Channel, to the west by the West Cathedral Canyon Channel, and to the north east by the extension of the West Cathedral Canyon Channel, as depicted in the USGS Cathedral City Quad Map photorevised in 1981.

Cathedral City Cove - Reports

On October 17, 2002, the State Water Resources Control Board approved a $2,809,000.00 grant to the city of Cathedral City for Cove area septic system elimination. Pursuant to Section 13225 of the Water Code, by May 21, 2004 the City of Cathedral City shall submit to the Regional Board a report describing an implementation plan to comply with the January 1, 2012 prohibition date. Thereafter, the city shall submit annual reports to the Regional Board regarding any actions taken by the city of Cathedral City or any other person or entity in order to achieve compliance by January 1, 2012.

Mission Creek or Desert Hot Springs Aquifers

The following language implements Porter-Cologne Water Quality Control Act Section 13281.

Effective January 21, 2005:

(1) The discharge of waste from new or existing individual disposal systems on parcels of less than one-half acre that overlie the Mission Creek Aquifer or the Desert Hot Springs Aquifer in Riverside County is prohibited, if a sewer system is available.

(2) For parcels of one-half acre or greater that overlie the Mission Creek Aquifer or the Desert Hot Springs Aquifer in Riverside County, the maximum number of equivalent dwelling units

with individual disposal systems shall be two per acre, if a sewer system is available. The discharge of waste from additional new or existing individual disposal systems is prohibited, if a sewer system is available. The term “equivalent dwelling unit” means a building designed to be used as a home by the owner of such building, which shall be the only dwelling located on a parcel of ground with the usual accessory buildings. This definition is from Section 221.0 of the 1997 edition of the Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials, and any authority interpreting that section shall be relevant in interpreting this prohibition.

If a sewer system becomes available after January 21, 2005, Prohibitions (1) and (2) in the preceding paragraph shall apply to discharges of waste from all new or existing individual disposal systems on all parcels to which the sewer system becomes available.

A sewer system is “available” if a sewer system, or a building connected to a sewer system, is within 200 feet of the existing or proposed dwelling unit, in accordance with Section 713.4 of the 1997 edition of the Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials.

State Water Resources Control Board awarded two grants to Mission Springs Water District for a total of $2,800,000 for the elimination of disposal systems (septic tanks) on parcels less than one-half acre overlying the Desert Hot Springs and Mission Creek Aquifers if sewer is available. Pursuant to Section 13225 of the Water Code, by November 18, 2005, the Mission Springs Water District shall submit to the Regional Board a report describing actions taken to implement the subject prohibition.

III. NONPOINT SOURCE CONTROLS

Despite California's significant achievements in controlling point source discharges, such as wastewater from municipal treatment plants and industrial facilities, many of the State's valuable water resources continue to be polluted by nonpoint sources (NPS). NPS water pollution is generally caused by poor land use practices and the collective effects of individual behavior. It is distinguished from point sources which discharge wastewater of predictable concentrations and volumes. NPS pollution is diffuse throughout a watershed, variable in nature, and most significant in its cumulative effects. Management of NPS water pollution is also distinguished from point source management because it requires an array of control techniques customized to local watershed conditions, rather than relying exclusively on waste discharge requirements as with individual point source facilities. Land uses associated with NPS water pollution include agriculture, forestry, urban development, grazing, water development, inactive mines, and boating and marinas.

Impacts from land uses to California's water resources continue. Unless these uses are managed in a way which will minimize NPS impacts, the resource values will diminish, lowering land values and discouraging future use. The challenge of nonpoint source pollution management is to implement economically achievable protections which will preserve the resources upon which California's quality of life and economic vitality depend.

The Federal Clean Water Act, as amended in 1987, includes Section 319 titled "Nonpoint Source Management Programs". Section 319 requires the States to develop assessment reports and management programs describing the States' nonpoint source problems and setting forth a program to address the problems. The State Water Resources Control Board (State Board) adopted its "Nonpoint Source Management Plan" in November 1988. The Plan was updated in December 1999 with adoption of the "Plan For California’s Nonpoint Source Pollution Control Program," (hereafter referred to as "State NPS Program"), including "Volume I: Nonpoint Source Program Strategy and Implementation Plan for 1998-2013 (PROSIP)" and "Volume II: California Management Measures for Polluted Runoff (CAMMPR)" (adopted December 14, 1999, SWRCB Resolution No. 99-114). This Plan has an approach to NPS water quality control whereby the following are implemented as needed:

1. Self-determined implementation of Management Practices (MPs);

2. Regulatory-based encouragement of Management Practices; and

3. Effluent requirements.

Depending on water quality impacts and severity of NPS problem, the Regional Board may move directly to full regulatory and complementary

APPENDIX 5

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

RESOLUTION NO. R7-2002-0184

PROHIBITION OF THE DISCHARGE OF SUBSURFACE WASTEWATER DISPOSAL SYSTEMS IN THE COVE AREA OF CATHEDRAL CITY

WHEREAS, Article 3, Chapter 4 of Division 7 of the California Water Code directs each regional board to formulate and develop a water quality control plan to protect the beneficial uses and the prevention of nuisance of waters of the region.

WHEREAS, Section 13286 of the California Water Code requires the Regional Board to prohibit the discharge of wastewater into the ground through the use of individual subsurface disposal systems in the Cove area of Cathedral City on and after January 1, 2012.

WHEREAS, It is the intent of this Regional Board to encourage and support local governmental agencies, and to coordinate state and local efforts to develop water quality control measures in unsewered areas.

WHEREAS, The beneficial uses of the ground waters in the Coachella Hydrologic Subunit are:

a. Municipal supply
b. Industrial supply
c. Agricultural supply

WHEREAS, The California Department of Health Services specifies a maximum contaminant level of nitrate as 45 milligrams per liter for domestic water supply, Section 64435, Article 4, Chapter 15, Title 22 of the California Code of Regulations.

WHEREAS, A report done in May, 1986, by Camp, Dresser, and McKee addressing ground water contamination in Coachella Valley was submitted to the Desert Water Agency, Coachella Valley Water District, and this Regional Board, and states:

"The largest known area where septic tank use still prevails is in Cathedral City. The potential impact on local ground water quality includes increases in TDS, chlorides and nitrate…Data from five wells near Cathedral City …have nitrate and TDS levels above background levels in the Palm Springs Subarea."

WHEREAS, A report completed in February 1993, by the Desert Water Agency, indicated that the concentration of nitrate in several local water wells exceeded the maximum contaminant level for domestic water supply, with the most likely source being local subsurface wastewater disposal systems.

WHEREAS, A follow-up report completed in April, 2001, by Kreiger and Stewart Incorporated, presented evidence that further supported the source as local subsurface wastewater disposal systems

WHEREAS, Regional Board staff has reviewed relevant documents related to ground water contamination from subsurface disposal in the Cove.

WHEREAS, The Regional Board has found substantial evidence to indicate the source of ground water contamination in the Cove is from area subsurface wastewater disposal systems.

WHEREAS, The proposed amendment incorporates the language of the California Water Code Section 13286, as required by that section. In enacting the prohibition on subsurface disposal systems, the Regional Board cannot specify the design, location, type of construction or particular manner in which dischargers must comply with the proposed amendment, Section 13360, California Water Code. The proposed amendment is therefore a ministerial project exempt from the California Environmental Quality Act (CEQA) pursuant to Section 21080, subd. (b)(1) of the Public Resources Code.

WHEREAS, The basin plan amendment will prohibit the discharge of wastewater from individual subsurface disposal systems in the Cove area of Cathedral City, California as required by the California Water Code, Section 13286. The amendment also makes nonsubstantive language changes regarding the status of septic prohibitions within the Region, and requires the City of Cathedral City to submit annual reports pursuant to Section 13225 of the California Water Code.

WHEREAS, The Regional Board notified interested agencies and persons of its intent to revise Chapter 4, Implementation, part I, section "H. Septic Systems" of the Water Quality Control Plan.

WHEREAS, The Regional Board in a public meeting heard and considered all comments pertaining to the proposed amendment.

THEREFORE, BE IT

RESOLVED, that the California Regional Water Quality Control Board, Colorado River Basin Region, adopts the attached amendment to section "H. Septic Systems" of the Water Quality Control Plan, to prohibit the discharge of wastewater from individual subsurface disposal systems in the Cove area of Cathedral City on and after January 1, 2012.

RESOLVED, that the amendment shall become effective when approved by the State Water Resources Control Board, or, if submitted to the Office of Administrative Law (OAL), when approved by OAL.

RESOLVED, that the Regional Board Executive Officer is directed to submit the amendment to the State Board.

RESOLVED, that the Regional Board Executive Officer is directed to file a Notice of Exemption with the Office of Planning and Research.

RESOLVED, that if during the review or approval process the State Board or Office of Administrative Law determines that minor, nonsubstantive corrections to the language of the amendment are needed for clarity or consistency, the Executive Officer may make such changes, and shall inform the Board of any such changes.

I, PHIL GRUENBERG, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, Colorado River Basin Region, on November 13, 2002.

/s/
Executive Officer

Deleted: Wastewater into the Ground from

An Amendment to the Water Quality Control Plan for the Colorado River Basin Region to Prohibit the Discharge of Wastewater Into The Ground Through The Use of Individual Subsurface Disposal Systems in the Cathedral City Cove

AMENDMENT

(Proposed additions are denoted by underlined text, proposed deletions are denoted by ~~strikethrough~~ text)

Page 4-5, edit the third paragraph under "H. Septic Systems" as follows:

The guidelines are reviewed and revised as necessary. At this time ~~the Regional Board allows septic systems in all areas of the Region, although~~ some local governments in the Region ~~do~~ have prohibitions on septic systems. ~~Regional Board staff is working on Memorandum of Understandings (MOUs) with the counties of San Bernardino, Riverside, Imperial and San Diego. If these MOUs are adopted they will define the roles of all agencies involved in permitting and oversight of septic systems.~~

Page 4-5, after the fourth paragraph under "H. Septic Systems" add the following paragraphs:

Cathedral City Cove

On and after January 1, 2012, the discharge of wastewater into the ground through the use of individual subsurface disposal systems in the Cove area of Cathedral City in Riverside County is prohibited. Cathedral City Cove is that area of the city bound to the south by Cathedral City city limits as of January 1, 2012, to the east by the East Cathedral Canyon Channel, to the west by the West Cathedral Canyon Channel, and to the north east by the extension of the West Cathedral Canyon Channel, as depicted in the USGS Cathedral City Quad Map photorevised in 1981

Cathedral City Cove - Reports

On October 17, 2002, the State Water Resources Control Board approved a $2,809,000.00 grant to the city of Cathedral City for Cove area septic system elimination. Pursuant to Section 13225 of the Water Code, by **[1 year following State Board approval of this Basin Plan Amendment]** the City of Cathedral City shall submit to the Regional Board a report describing an implementation plan to comply with the January 1, 2012 prohibition date. Thereafter, the city shall submit annual reports to the Regional Board regarding any actions taken by the city of Cathedral City or any other person or entity in order to achieve compliance by January 1, 2012.

APPENDIX 6

California Regional Water Quality Control Board
United States Environmental Protection Agency

Prepared by

Regional Board Staff

California Regional Water Quality Control Board
Colorado River Basin Region
SEPTEMBER 2002

STAFF REPORT IN SUPPORT OF A BASIN PLAN AMENDMENT TO PROHIBIT THE DISCHARGE OF WASTEWATER INTO THE GROUND FROM INDIVIDUAL SUBSURFACE DISPOSAL SYSTEMS IN THE CATHEDRAL CITY COVE

INTRODUCTION

The California Regional Water Quality Control Board, Colorado River Basin Region (Regional Board; CRWQCB--CRBR) is charged by the California Water Code (CWC) with protecting the quality of ground and surface waters of the State within the region. Each Regional Board adopts regulations to carry out its powers and duties pursuant to guidelines established by the State Water Resources Control Board (SWRCB), CWC (§ 13222).

A Basin Plan is a regulatory instrument that designates beneficial uses for water bodies, and establishes water quality objectives and implementation plans to protect those beneficial uses. Regional Boards are empowered to develop and amend Basin Plans as necessary to protect the waters of the region (CWC §13225 and §13240).

The Basin Plan for the Colorado River Basin Region uses guidelines adopted in 1974 and revised in 1979 to establish regulations and construction requirements for subsurface wastewater disposal systems (Resolution No. 79-42: Guidelines for Sewage Disposal from Land Development). The guidelines identify: (a) types of systems that need discharge requirements, (b) setback distances, and (c) soil conditions (distance to water table, slope, and percolation rate). The guidelines do not restrict wastewater discharges from these systems in any part of the region. In 1993, the Regional Board approved a resolution to waive discharge requirements for individual subsurface disposal systems, provided they were permitted by the county, and complied with Basin Plan criteria and Regional Board guidelines (Resolution No. 93-004 Waiving Waste Discharge Requirements for Specific Types of Discharges).

An amendment to prohibit subsurface wastewater disposal systems in the Cathedral City Cove area is required by CWC § 13286. Section 13286 states that "[o]n and after January 1, 2012, the appropriate regional board shall prohibit the discharge of wastewater into the ground through the use of individual subsurface disposal systems in the Cove area of Cathedral City…for the purpose of protecting the health and safety of residents consuming the ground water of the Upper Coachella Valley Ground Water Basin and achieving the applicable water quality objectives."

In adopting Section 13286, the Legislature made the following findings:

1. The rising nitrate levels in the ground water of the Whitewater River Subbasin of the Upper Coachella Valley Ground Water Basin are caused by the continued use of individual residential and commercial subsurface disposal systems, which discharge more than one million gallons of wastewater daily into the ground within the Cove area of Cathedral City in Riverside County.

2. The continued use of individual residential and commercial subsurface disposal systems within the Cove area of Cathedral City will result in violations of water quality objectives, impair present and future beneficial uses of water, and cause pollution and contamination of the ground water of the Whitewater River Subbasin of the Upper Coachella Valley Ground Water Basin that is used as a water supply for much of the greater Coachella Valley.

3. Adequate protection of the quality and beneficial use of the ground water of the Whitewater River Subbasin of the Upper Coachella Valley Ground Water Basin and the prevention of pollution and contamination of that ground water caused by the use of individual residential and commercial subsurface disposal systems cannot be sufficiently achieved by redesign, relocation, alterations

to size and spacing, reconstruction, or increased maintenance of existing individual disposal systems.

4. The only viable alternative to the continued use of existing substandard individual disposal systems that utilize subsurface disposal within the Cove area of Cathedral City is the construction and installation of a sanitary public domestic and commercial wastewater disposal system in the Cove area and to prohibit the continued discharge of wastewater into the ground through the use of individual subsurface disposal systems.

5. Without the construction and installation of a sanitary public domestic and commercial wastewater disposal system in the Cove area, the city will be unable to meet the water quality objectives adopted by the regional water quality control board.

6. A wastewater disposal system is necessary to adequately meet the Coachella Valley's needs for present and probable future beneficial uses of water and to ensure the valley's quality of available water continues to meet or exceed minimum standards.

7. In the interest of achieving the applicable water quality objectives, it is necessary to protect present and future beneficial uses of the ground water of the Upper Coachella Valley Ground Water Basin and to prevent any further pollution and contamination of that ground water by immediately constructing and installing a sanitary public domestic and commercial wastewater disposal system in the Cove area of Cathedral City and prohibiting the discharge of wastewater into the ground through the use of individual subsurface disposal systems.

8. In order to protect the health and safety of the citizens currently consuming the ground water of the Upper Coachella Valley Ground Water Basin, a sanitary public domestic and commercial wastewater disposal system should be immediately constructed and installed in the Cove area of Cathedral City and the discharge of wastewater into the ground through the use of individual subsurface disposal systems should be prohibited.

(Stats. 2001, c. 700 (A.B. 358), §1.) Accordingly, CWC Sections 13280 and 13281 do not apply to this amendment. However, the following report addresses all of the factors set forth in Sections 13280 and 13281.

PROBLEM STATEMENT

Discharges from subsurface wastewater disposal systems in Cathedral City Cove violate water quality objectives for ground water, impair present and future beneficial uses, and cause nuisance through surface ponding and greywater discharge. Discharges from subsurface wastewater disposal systems have contaminated ground water with nitrates and human-borne pathogens, a direct violation of the State anti-degradation policy (SWRCB Resolution 68-18: Statement of Policy with Respect to Maintaining High Quality of Waters in California). Staff proposes that the Regional Board amend the Basin Plan as required by Section 13286 to prohibit wastewater discharge from individual subsurface wastewater disposal systems in Cathedral City Cove, to prevent further degradation of ground water. Residents and businesses will be required to discontinue usage of these systems by January 1, 2012 in accordance with Section 13286.

AREA CHARACTERISTICS

Location

Cathedral City is located in Coachella Valley approximately 100 miles east of Los Angeles, California (Figure 1 & 2). The city has 12,480 acres and approximately 44,500 residents. The climate is arid, with zero to five inches of precipitation annually. Seasonal temperatures fluctuate from 120 degrees Fahrenheit in summer, to near freezing temperatures in winter.

Cathedral City Cove is bound to the north by the Whitewater River, to the south by Cathedral City city limits, to the east by Date Palm Drive, and to the west by the Santa Rosa Mountains (Figure 2). Over 90% of the Cove is developed with Neighborhood Residential and Mixed Corridor zoning (i.e., mixed residential and commercial areas) (Krieger and Stewart, 1996). A 1990 census indicates that 28% of permanent Cathedral City residents (approximately 8,300 people) reside in the Cove on about 500 acres. Approximately 2,500 subsurface disposal systems are utilized by Cove residents and local industry (Desert Water Agency and Krieger and Stewart, 2001).

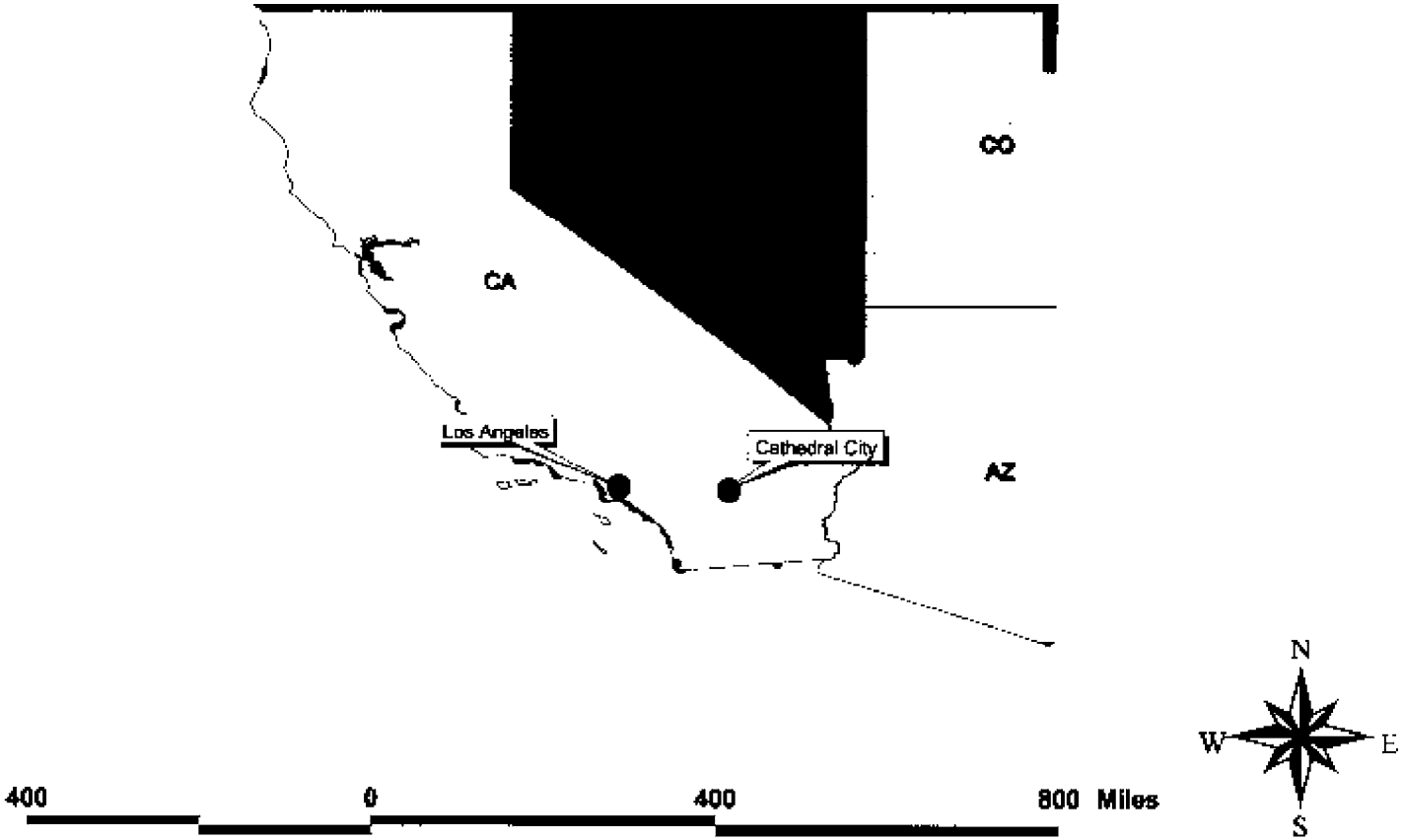
Geology

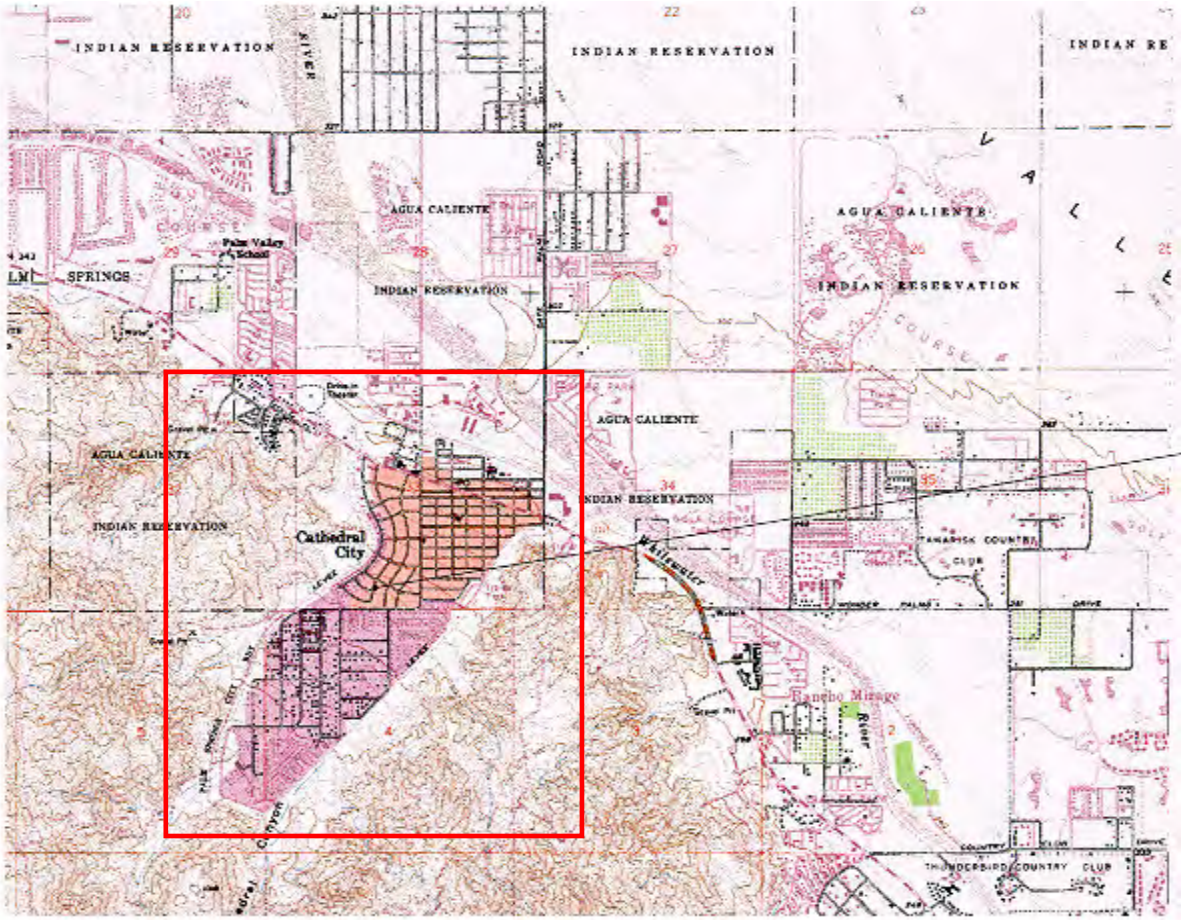
The Cove is situated on northeast-sloping alluvial fan deposits from the Santa Rosa Mountains (Figure 2). Borings drilled to 850 feet below ground surface indicate coarse textured, poorly consolidated, poorly sorted gravelly granitic alluvium with good to excellent drainage properties (U.S. Department of Agriculture Soil Conservation Service and University of California Agricultural Experiment Station, 1980). No extensive fine-grained layers to confine or restrict ground water or wastewater migration are observed. Clays and silts occur in minor amounts, mixed with coarser sediments or in thin lens (Desert Water Agency and Krieger and Stewart, 2001; Coachella Valley Water District, 2001).

Hydrogeology

Cathedral City Cove is in the Whitewater River Hydrologic Subbasin, which is part of the Upper Coachella Valley Ground Water Basin. The Whitewater River Subbasin encompasses about 400 square miles and receives runoff and artificial recharge from the Colorado River (Coachella Valley Water District, 2001). The subbasin is currently in overdraft by an estimated 0.24% per year (Coachella Valley Water District, 2001). Ground water occurs at 150 to 180 feet below ground surface, and flows to the northeast following surface contours (Figure 2).

Figure 1. Cathedral City location relative to Los Angeles.





Cove area

0.6 0 0.6 1.2 Miles

N
W E
S

Figure 2. Cathedral City Cove area.

Beneficial Uses of Area Ground Water

The Coachella Valley Aquifer is the principle municipal water source utilized by the Desert Water Agency to service Cathedral City and surrounding communities (Desert Water Agency and Krieger and Stewart, 2001**;** CRWQCB--CRBR, 1994). Ground water in the Upper Coachella Valley generally is unconfined (Reichard and Meadows, 1992; CRWQCB--CRBR, 1994; Coachella Valley Water District, 2000). The amendment to prohibit subsurface disposal systems will protect current and future beneficial uses of Coachella Valley ground water. These include Municipal and Domestic Supply, Industrial Service Supply, and Agriculture Supply (Table 1).

Table 1. Beneficial Uses of Coachella Hydrologic Subunit Groundwater

Designated Beneficial Uses	Description
Municipal and Domestic Supply	Uses of water for community, military, or individual water supply systems including but not limited to drinking water supply.
Industrial Service Supply	Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well pressurization.
Agriculture Supply	Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Source: California Regional Water Quality Control Plan for the Colorado River Basin Region (CRWQCB--CRBR, 1994)

SUBSURFACE WASTEWATER DISPOSAL SYSTEMS

Description

Subsurface disposal systems treat wastewater by removing solid materials, and sustaining microorganisms that degrade residual solids and harmful contaminants (Figure 3). Subsurface disposal systems consist of two parts: a septic tank and soil absorption field. Wastewater first enters the septic tank where solids, greases, fats, and oils are removed in a process called clarification. Efficient clarification takes time because solids, greases, fats, and oils travel slowly in water and may require hours to float to the top, or settle to the bottom of the tank. A septic tank should retain wastewater for 24 to 48 hours for optimal effluent segregation and clarification (Noah, 2001). Anaerobic and facultative bacteria degrade residual solids. Biodegradation may require several hours to complete, with treatment efficiency again linked to detention time.

Clarified effluents migrate from the septic tank to the soil absorption field, constructed a few feet below ground surface (Figure 3). The soil absorption field consists of tile lines, or a seepage pit. Effluent may evaporate if the system is near the surface, or percolate through the soil to ground water. Soil will filter suspended solids in the effluent not removed by the septic tank, and filter or adsorb disease-causing bacteria. Microbes in soil near the absorption field also facilitate breakdown of residual solids (Kaplan, 1987).

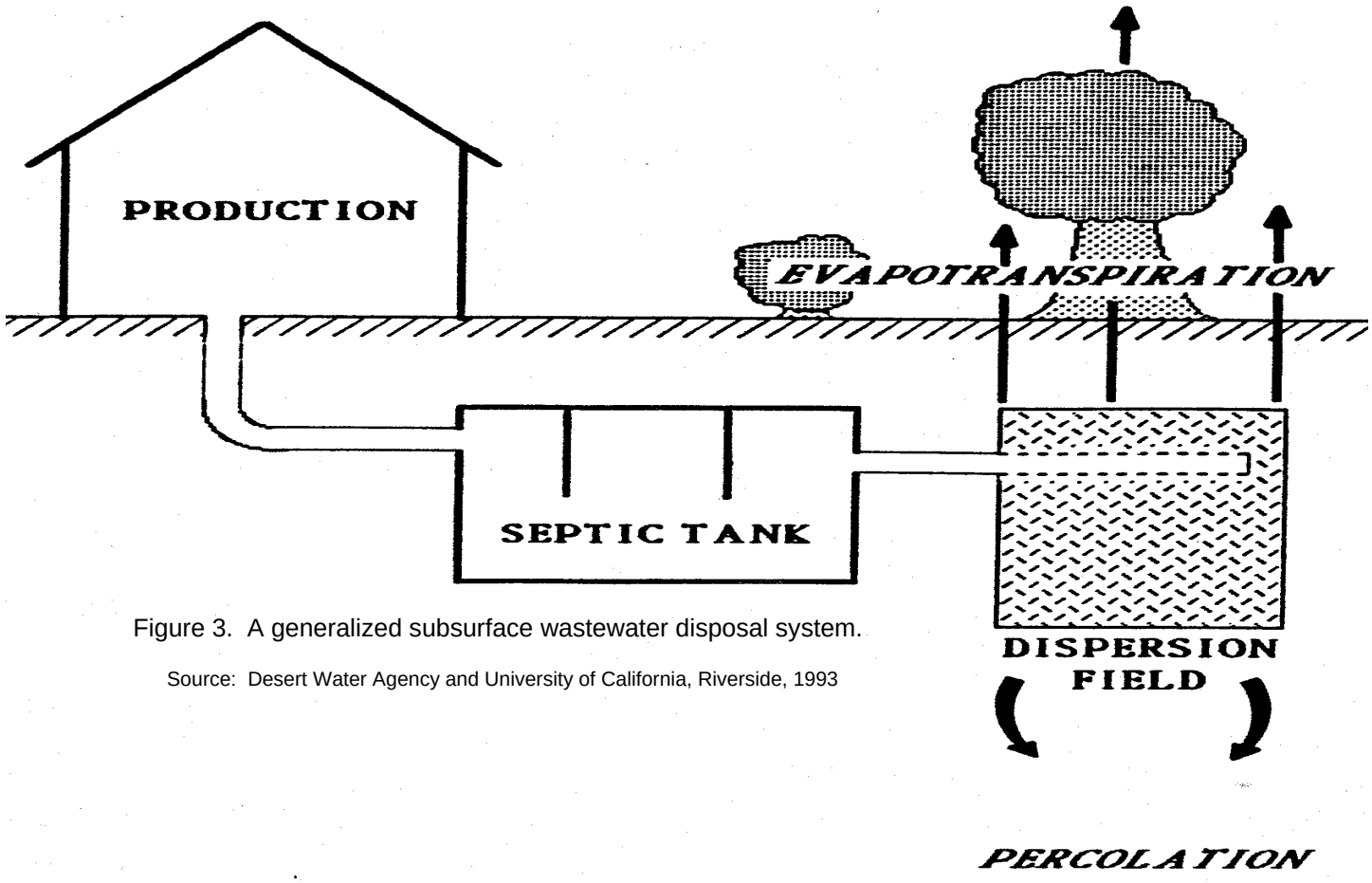


Figure 3. A generalized subsurface wastewater disposal system.

Source: Desert Water Agency and University of California, Riverside, 1993

Maintenance and Operations
Proper maintenance and operation of subsurface disposal systems involves not overwhelming the system with wastewater, and periodically pumping the tank to prevent accumulation of solids. Properly maintained and operated systems can treat wastewater effectively for 15 to 20 years. Improperly maintained systems become filled with solids, decreasing treatment efficiency and the life of the system (Falvey, 2000).

Excessive solids in the septic tank reduce treatment efficiency by decreasing wastewater detention time. This allows more solids to pass from the septic tank to the absorption field, leading to soil clogging (plugging of soil pores). Soil clogging reduces porosity, permeability, and the infiltration rate of the effluent. This can create a public health hazard and nuisance by allowing inadequately treated effluent to pond at the ground surface (Photo 1 & 2). Inadequately treated wastewater may contain high concentrations of total suspended solids, pathogens, and inorganic constituents (Kaplan, 1987).

Some Cove residents utilize inappropriate corrective measures, such as drain or septic tank cleaners, to treat failed subsurface disposal systems. These measures may compound the problem or create new ones. Drain and septic tank cleaners contain strong acids and toxic chemicals that kill microorganisms and degrade water quality in the process (Springer, 2001; U.S. Environmental Protection Agency, 1986). Some residents resort to reducing the amount of wastewater entering their systems by diverting greywater (domestic wastewater other than toilet water) to the ground surface (Photo 3). Greywater may contain human-borne pathogens that impact public health directly through contact or indirectly through rodent and insect vectors.

Sources of Ground water Contamination
Subsurface disposal systems are used in many rural areas where municipal wastewater disposal systems are impractical because of cost. More than 1.1 million subsurface disposal systems were in use in California in 1990 (U.S. Census Bureau, 1999). Treated wastewater discharges from septic tanks frequently contain pollutants harmful to human health or water quality that were not removed during treatment, or formed after treatment.

Subsurface disposal systems are the third leading cause of ground water contamination in the United States. Effluents from these systems contaminate ground and surface waters with heavy metals, eutrophication nutrients (nitrogen and phosphorus), and human-borne pathogens (U.S. Environmental Protection Agency, 2000; McKay, 1993; Brown, 1998; Scalf et al., 1977; Tomson et al., 1984; Waller et al., 1987; Falvey, 2001).

Contamination in Cathedral City
Cathedral City Cove residents and businesses utilize subsurface septic tanks rather than the city's municipal wastewater treatment facility for wastewater disposal. Septic system density is typically high, ranging up to 8.3 tanks per acre. This is considerably greater than the recommended 0.7 tanks per acre (Desert Water Agency and University of California, Riverside, 1993). Approximately 300,000 gallons of wastewater percolate into the ground from Cove area septic systems daily (Desert Water Agency and Krieger and Stewart, 2001). Many Cove systems are improperly maintained and operated, resulting in system failures and ponding of foul-smelling wastewater. A six-year study (1985-1991) by the Riverside County Health Department indicated that one in every one-hundred Cathedral City homes received a notice of violation due to wastewater overflow or surfacing (Desert Water Agency and University of California, Riverside, 1993). The number of violations increased to one in forty in densely populated areas (Desert Water Agency and Krieger and Stewart, 2001).

Photo 1. Wastewater ponding in Cathedral City.

Source: Desert Water Agency and University of California, Riverside, 1993

Photo 2. Wastewater ponding on groundsurface.

Source: Desert Water Agency and University of California, Riverside, 1993

Photo 3. Greywater on groundsurface.

Source: Desert Water Agency and University of California, Riverside, 1993

Desert Water Agency staff, in cooperation with the University of California, Riverside, published a report in February 1993 that assessed the effects of subsurface disposal systems on ground water quality in Cathedral City Cove (Desert Water Agency and University of California, Riverside, 1993). Ground water samples were evaluated for wastewater constituents from four monitoring wells located downgradient of the Cove. Elevated concentrations of nitrates and human pathogenic viruses occurred in all samples. Coliphage was detected in all monitoring wells, and provides conclusive evidence of warm-blooded animal waste impacts to ground water. (Coliphage viruses infect *E.coli* bacteria commonly found in fecal wastes of warm-blooded animals, and can be used to detect *E.coli* presence). Well samples also contained enteroviruses, which are specific to intestinal tracts of humans, monkeys, and apes. Their occurrence clearly indicates that human waste has impacted ground water. Coliphage and enteroviruses also were identified in water samples collected in 2001 (Desert Water Agency and Krieger and Stewart, 2001).

Table 2. Volume of wastewater produced in unsewered areas of Cathedral City. East Cove is the Cathedral City Cove.

Area	gal/ day
East Cove	289,959
West Cove	242,034
Dream Homes	201,485
Cree Ranch	63,755
Business Dist.	278,832
Total	**1,076,064**

(Adapted from Desert Water Agency and University of California, Riverside, 1993)

Evidence indicating subsurface disposal systems are the source of nitrates in Cathedral City Cove ground water include the: (a) high nitrate concentration, (b) presence of indicator viruses, (c) high density of subsurface disposal systems, (d) absence of alternative nitrate sources, (e) location of sampling wells downgradient of the Cove, and (f) occurrence of ground water contamination at the top of the aquifer near the septic tanks (Desert Water Agency and University of California, Riverside, 1993).

Nitrate is the primary contaminant of concern in Cathedral City ground water, given its high concentration. Nitrate levels in well samples are 2 to 6 times greater than the maximum contaminant limit for drinking water (45 mg NO_3^-/L), and 10 to 15 times greater than the Desert Water Agency's nearest productive well (Desert Water Agency and University of California, Riverside, 1993). Nitrate concentration in ground water near the top of the water table (less than 200 feet below ground surface) is consistently high (Table 3), and suggests that the contamination source is above the aquifer (Desert Water Agency and Krieger and Stewart, 2001; Eccles and Bradford, 1977).

Table 3. Measured concentration of nitrate (mg NO_3^-/L) in four sampling wells in the Cathedral City cove area.

Date	CCM-1[1]	CCM-2	CCM-3	CCM-4	Rainfall
JUN-91	304.4	229.2	228.0	37.9	0
JUL	-WELL DATA UNAVAILABLE -				1.51
AUG	261.5	232.4	224.5	42.9	0.7
SEP	214.0	201.5	195.5	37.6	0.05
OCT	188.5	192.5	203.5	42.6	0
NOV	229.8	215.1	218.4	45.1	0
DEC	225.5	192.0	192.5	57.4	0.99
JAN-92	219.5	207.0	210.0	82.3	0.64
FEB	222.5	213.5	215.5	90.8	3.58
MAR	222.8	200.1	225.2	110.6	1.97
APR	243.5	230.5	235.0	110.5	0.38
MAY	246.5	214.5	230.0	86.0	0
JUN	213.0	190.5	196.5	84.1	0
JUL	230.5	204.5	206.0	83.1	1.05
AUG	209.0	166.0	169.0	98.0	0.5
SEP	212.0	182.2	186.0	133.0	0
OCT	224.0	200.0	202.0	113.5	0.25
NOV	210.0	168.0	171.0	121.0	0
Average	228.06	202.32	206.39	80.95	(Adapted from Desert Water Agency and University of California, Riverside, 1993)

1 CCM- Cathedral City Monitoring well.

NITRATES

Health Concerns

Excessive nitrate consumption can lead to life-threatening conditions. Several studies show a positive correlation between nitrate consumption and cancer (Canter, 1997). Newborn infants ingesting water high in nitrates may develop methemoglobinemia (blue-baby syndrome), a condition that impairs the ability to assimilate and transport oxygen through the circulatory system (Canter, 1997).

Nitrate concentration in drinking water is regulated to protect public health. Primary Maximum Contaminant Levels (MCLs) for drinking water are based on the one-in-a-million incremental cancer risk for carcinogens, and threshold toxicity levels for non-carcinogens. They are adopted by the California Department of Health Services (DHS), and enforced by DHS, health departments, water supply systems, and regulatory agencies. The primary MCL for nitrate is 45 milligrams of nitrate per liter (mg NO_3^-/L), or 10 milligrams of nitrogen expressed as nitrogen per liter (mg N/L). Nitrate concentrations in ground water samples collected outside the Cove are low, approximating 1 to 3 mg NO_3^-/L (Desert Water Agency and Krieger and Stewart, 2001). In contrast, nitrate concentrations in the Cove average 200 mg NO_3^-/L (Table 3).

Chemistry

Nitrate is a naturally-occurring, stable form of nitrogen formed by the decomposition of nitrogen-rich organic matter in wastewater. Ammonia (NH_3) or ammonium (NH_4^+) derived from proteins and urea is the main source of nitrogen in wastewater (Canter, 1997). Microbial reactions occurring in septic tanks or near soil absorption fields break down organic wastes and release nitrogen (Table 4). Further microbial activity alters the nitrogen to nitrate (NO_3^-) (Scalf et al., 1977). Nitrates are highly soluble and can migrate with wastewater to contaminate ground or surface waters**.**

Table 4. Chemical equations that regulate nitrate production and loss in the subsurface environment. (Adapted from Canter, 1997)

[1] $$organic - N + microorganisms \xrightarrow{enzymes} NH_3 / NH_4^+ + products$$

[2] $$NH_3 + H_2O \rightarrow NH_4^+ + OH^-$$

[3] $$NH_3 + 2O_2 \rightarrow NO_3^- + H_2O + H^+$$

[4] $$NH_4^+ + 1.5O_2 \xrightarrow{Nitrosomonas} NO_2^- + 2H^+ + H_2O + energy$$

[5] $$NO_2^- + 0.5O_2 \xrightarrow{nitrobacter} NO_3^- + energy$$

[6] $$NO_3^- + organic - C \rightarrow NO_2^- + organic - C \rightarrow N_2 + CO_2 + H_2O$$

Table 4 shows chemical reactions for nitrate development from the breakdown of nitrogen-rich organic matter. Processes in nitrogen cycling are biologically facilitated. The first equation shows the liberation of nitrogen as ammonia from organic compounds, in a process known as mineralization. Equilibrium pH conditions regulate the phase of the released ammonia, to either ammonia or protonated ammonium ion [2]. Ammonia and ammonium is converted to nitrate via nitrification in equations [3], [4] and [5].

The nitrate can percolate through the ground, or convert to nitrogen gas via denitrification and escape to the atmosphere. Denitrification produces diatomic nitrogen gas (N_2) by reducing nitrate ions [6]. Because organisms participate in the nitrogen cycle, environmental conditions are important. Denitrification requires a suitable carbon source and oxygen deficiency. If oxygen is present, bacteria capable of using

nitrogen as the terminal electron acceptor will prefer oxygen to nitrogen. Remaining nitrates are highly soluble and either percolate to ground water or adsorb to soil, particularly clay**.**

Model

Mathematical equations can be used to model nitrate concentrations released from subsurface wastewater disposal systems (RAMLIT and Associates, 1982; California Regional Water Quality Control Board--Santa Ana Region, 1989). The amount of nitrate impacting ground water will depend on the physical and chemical environment, and wastewater characteristics. The mathematical model illustrates the effects of loading, denitrification, and wasteload application rate on nitrate concentrations in percolating wastewater (Angoli, 2000; Noah, 2001; Waller et al., 1987; Kaplan, 1987; Scalf et al., 1977), and predicts nitrate concentrations in wastewater impacting ground water in the Cove.

Mass loading rate is the daily amount of pollutant produced per person, and varies with an individual's physical characteristics and socio-economic level. The mass loading rate of nitrogen in wastewater usually ranges between 6 to 17 grams per person per day (U.S. Environmental Protection Agency, 1980). The mass loading rate of nitrogen in Cathedral City wastewater falls in this range**.** Fifteen percent of the total nitrogen in wastewater typically is lost to chemical processes in the septic tank (RAMLIT and Associates, 1982). Total nitrogen content of septic tank effluents can be calculated using the following equation:

Total Nitrogen Content of Septic Tank Effluents = Mass Loading Rate * 0.85
=17 grams N/person/day * 0.85
=14.45 grams N/person/day
(Assumes a mass loading rate of 17 grams N/person/day)

Denitrification is the conversion of inorganic aqueous phase nitrogen compounds to gaseous dinitrogen (N_2). Denitrification may occur in soil after wastewater leaves the subsurface disposal system. Little denitrification is expected in the unsaturated zone of sandy soils, given the scarcity of organic carbon and the presence of oxygen (California Regional Water Quality Control Board--Santa Ana Region, 1989). Denitrification may be significant in localized areas where suitable carbon sources and anaerobic conditions exist (Schroeder et al., 1993). Nitrogen content after denitrification can be calculated using the following equation:

Total Nitrogen Content after Denitrification = Corrected Nitrogen Content *(1-_%Denitrification)
15% Denitrification = 14.45 grams N/person/day*(1- 0.15)
=12.285 grams N/person/day
(14.45 grams N/ person/ day carries over from the previous calculation. Also assumes 15% Denitrification)

Nitrogen content in wastewater will depend on wastewater flow rate, or the daily amount of wastewater produced per person. The average Cathedral City individual produces about 90 gallons (340 liters) of wastewater daily (Desert Water Agency and Krieger and Stewart, 2001). Total nitrogen concentration in wastewater can be calculated using the following equation:

$$\text{Total Nitrogen Concentration in Wastewater} = \frac{\text{Total Nitrogen Content}}{\text{Wastewater Flow}}$$

$$= \frac{\text{12.285 grams N/person/day}}{\text{340 liter/person/day}}$$

=. 036 gram N/liter

= 36 mg N/liter

Total nitrogen and nitrate concentrations in wastewater were calculated for different mass loading rates, denitrification rates, and wastewater flow rates assuming total conversion of nitrogen to nitrates (Table 5). With a mass loading rate of 12 grams per person per day, a denitrification rate of 15%, and a wastewater flow rate of 90 gallons per person per day, the model predicts 29.94 milligrams of nitrogen in a liter of wastewater. This is significantly higher than the drinking water MCL for nitrate (10 mg N/L, or 45 mg NO_3^-/L). Comparing measured nitrate concentrations for Cathedral City in Table 3 with predicted nitrate concentrations in Table 5 supports the model's predictions.

Table 5. Predicted concentration of nitrogen and nitrate in wastewater.

Mass Loading (grams N/person/day	Denitrification (%)	Wastewater Flow[1] (gal/person/day)	Nitrogen in Wastewater (mg N/L)[2]	Nitrate in Wastewater (mg NO_3^-/L)[3]
6	0	30	52.83	233.98
		60	26.42	116.99
		90	17.61	77.99
6	0.15	30	44.91	198.88
		60	22.45	99.44
		90	14.97	66.29
12	0	30	105.67	467.96
		60	52.83	233.98
		90	35.22	155.99
12	0.15	30	89.82	397.77
		60	44.91	198.88
		90	29.94	132.59
17	0	30	149.70	662.95
		60	74.85	331.47
		90	49.90	220.98
17	0.15	30	127.24	563.51
		60	63.62	281.75
		90	42.41	187.84

[1] The Wastewater Flow from each person in Cathedral City is estimated at 90 gal/person/day.

[2] Concentration of Nitrogen in wastewater calculated as milligrams of nitrogen per liter.

[3] Concentration of Nitrates calculated by multiplying the Concentration of Nitrogen by 4.42, the ratio of molecular weight of nitrate to nitrogen

IMPLEMENTATION

The most likely municipal responses to the septic prohibition are to: (a) collect and transport wastewater to an existing sewage treatment facility or (b) construct a municipal wastewater collection system in the Cove. Several local communities with similar septic tank/ground water issues are implementing these approaches (Yucca, Desert Hot Springs, Rancho Mirage).

The Desert Water Agency has prepared an implementation plan (Krieger and Stewart, 1996) that outlines the type of construction and costs associated with installing a municipal wastewater collection system in the Cove and Town Center Precise areas. Municipal system construction will occur in phases. The

Desert Water Agency reports that the first phase (installing the pumping station, force main, and trunk piping for wastewater conveyance) is complete. Remaining tasks include; (a) lateral piping installation in Cove streets to allow user connection, and (b) removal, or "graveyarding," of subsurface disposal systems once the municipal system is available.

The statutory deadline for compliance is January 1, 2012, which allows sufficient time to complete construction of the municipal wastewater collection system. Regional Board staff is working closely with Cathedral City so that residents will be in compliance with the prohibition by the deadline. Events can be completed concurrently and include:

1. **Identify sources of funding.** The City will develop programs to secure funding from local sources, such as: (a) bonds, (b) special property taxes, (c) wastewater service charges, or (d) connection fee charges. The City has also applied for Proposition 13 Grant funding. In October 2003, the State Water Resource Control Board will consider final approval of a 2.809 million dollar grant for sewer installation in the Cove. The City can still apply for federal grants or other state funding programs to fund sewer construction. The U.S. Environmental Protection Agency funds the State Revolving Fund Loan Program, which provides low interest loans for financing the construction of wastewater treatment and reclamation facilities. Public involvement and support of City efforts will facilitate securing funds.

2. **Develop and produce engineering documents outlining construction.** The Desert Water Agency has prepared a facility plan that provides the materials and piping locations for a wastewater collection system in Cathedral City Cove. Specific piping locations and a construction plan are required to identify and mitigate possible difficulties.

3. **Prepare environmental documents.** The California Environmental Quality Act requires developers to: (a) evaluate environmental consequences of land-use decisions, (b) disclose significant environmental effects to the public and decision-makers, and (c) identify and implement mitigation measures to avoid or reduce the impact.

4. **Complete construction.** The City has adopted a phased approach toward sewerage system construction. These phases can be subdivided or combined, depending on funding.

5. **Connect residents and businesses and graveyard old systems.** Once construction is complete and residents and businesses are connected to the municipal collection system, the old systems can be graveyarded by: (a) pumping septic tanks and filling them with sand, or (b) removing septic tanks. The wastewater treatment facility that receives wastewater from the Cove should revise Waste Discharge Requirements to account for the additional load.

The City shall provide annual progress reports to the Regional Board, describing progress, difficulties encountered, and remedies to complete tasks.

CONSIDERATIONS

CWC § 12381 requires regional boards to consider, among other things, the factors set forth in CWC §13241 before prohibiting discharges from subsurface disposal systems. CWC §13281 does not apply to this project, since the legislature mandated the prohibition in Section 13286. Nevertheless, Regional Board staff has provided an analysis of the Section 13241 factors.

Section 13241, subdivision (d), requires the regional board to consider economics when preparing basin plan amendments. Regional Board staff contacted the Office of Statewide Initiatives Economics and Effectiveness Unit to analyze the economics of enacting a prohibition of discharge of wastewater into the ground from individual subsurface disposal systems in the Cove area. Regional Board staff provided relevant and requested documentation to Economics and Effectiveness Unit staff.

The Economic and Effectiveness Unit completed their analysis on June 5, 2002. Costs associated with constructing a wastewater collection system and graveyarding old systems were calculated, which is the method Cathedral City is planning to implement to meet prohibition requirements. The analysis indicates that costs may be a substantial burden to Cove residents. Cathedral City staff is investigating various finance options to construct a wastewater collection system.

CWC Section 13241, subdivision (e) and (f), requires the regional board to consider the need to develop housing, and to develop/use recycled water when preparing basin plan amendments. Greater than 90% of the Cove is developed (Krieger & Stewart Inc. 1996). Prohibiting the discharge of wastewater from individual subsurface disposal systems ensures new housing will not contribute ground water contamination from septic tanks after January 2012. Raw wastewater from individual subsurface disposal systems is not suitable for recycling. However, wastewater could be diverted to a wastewater collection system/water reclamation plant for treatment and possible reuse.

The factors set forth in CWC Section 13241, subdivisions (a), (b) and (c) are discussed throughout this report.

CONCLUDING STATEMENT

Subsurface wastewater disposal systems in Cathedral City Cove have degraded water quality in the Coachella Valley Aquifer, the area's primary drinking water source, with nitrates and bacteria. Nitrate concentrations in Cove ground water range up to 300 mg NO_3^-/L, significantly exceeding the primary MCL of 45 mg NO_3^-/L. Improper operation and maintenance of subsurface disposal systems cause wastewater ponding, thus creating a public nuisance and health concern from odor and human-borne pathogens. This degradation is significant and violates water quality objectives and impairs beneficial uses.

If no action is taken, further degradation to ground water in Cathedral City Cove may result, and deeper zones of the Coachella Valley Aquifer used for drinking water supply, may be impacted. The Desert Water Agency has three production wells downgradient of the Cove. Closure of these wells may be necessary if ground water contamination from septic tanks is allowed to continue in Cathedral City Cove. Regional Board staff recommends that the Regional Board amend the Basin Plan to prohibit the discharge of wastewater into the ground from individual subsurface disposal systems in the Cove area of Cathedral City. This prohibition satisfies the regional board requirement to prohibit the discharge of wastewater into the ground as described in CWC § 13286.

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APPENDIX 7

STATE WATER RESOURCES CONTROL BOARD

RESOLUTION NO. 68-16

STATEMENT OF POLICY WITH RESPECT TO
MAINTAINING HIGH QUALITY OF WATERS IN CALIFORNIA

WHEREAS the California Legislature has declared that it is the policy of the State that the granting of permits and licenses for unappropriated water and the disposal of wastes into the waters of the State shall be so regulated as to achieve highest water quality consistent with maximum benefit to the people of the State and shall be controlled so as to promote the peace, health, safety and welfare of the people of the State; and

WHEREAS water quality control policies have been and are being adopted for waters of the State; and

WHEREAS the quality of some waters of the State is higher than that established by the adopted policies and it is the intent and purpose of this Board that such higher quality shall be maintained to the maximum extent possible consistent with the declaration of the Legislature;

NOW, THEREFORE, BE IT RESOLVED:

1. Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.

2. Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

3. In implementing this policy, the Secretary of the Interior will be kept advised and will be provided with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act.

BE IT FURTHER RESOLVED that a copy of this resolution be forwarded to the Secretary of the Interior as part of California's water quality control policy submission.

CERTIFICATION

The undersigned, Executive Officer of the State Water Resources Control Board, does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on October 24, 1968.

Dated: October 28, 1968

Kerry W. Mulligan
Executive Officer
State Water Resources
Control Board

Appendix B:

Riverside County Board of Supervisors, June 19, 2007.
Ordinance No. 871
An Ordinance of the County of Riverside Prohibiting the Installation of Specified Septic Tank Systems in Cherry Valley.

SUBMITTAL TO THE BOARD OF SUPERVISORS
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

FROM: Marion Ashley, Supervisor, Fifth District

SUBMITTAL DATE: June 19, 2007

SUBJECT: Ordinance No. 871, an Ordinance of the County of Riverside Prohibiting the Installation of Specified Septic Tank Systems in Cherry Valley

RECOMMENDED MOTION:

1. That the Board introduce Ordinance No. 871 prohibiting the installation of specified septic systems in Cherry Valley.
2. That the Board declares this Ordinance to be an urgency measure and shall take effect immediately upon its adoption.
3. The Board adopt Riverside County Ordinance No. 871

BACKGROUND:

Ordinance No. 864 Establishing a 90 Day Moratorium for Septic Systems in Cherry Valley was adopted by the Board of Supervisors on October 16, 2006, in response to a study prepared by Wildermuth Environmental Inc. titled "Water Quality Impacts from On-Site Waste Disposal Systems in the Cherry Valley Community of Interest (Study) implicating septic systems in the deterioration of local groundwater supplies of the community.

(continued)

MA:DM

Marion Ashley, Supervisor, Fifth District

FINANCIAL DATA				
	Current F.Y. Total Cost:	$	In Current Year Budget:	N/A
	Current F.Y. Net County Cost:	$	Budget Adjustment:	N/A
	Annual Net County Cost:	$	For Fiscal Year:	

SOURCE OF FUNDS:

Positions To Be Deleted Per A-30 ☐

Requires 4/5 Vote ☐

C.E.O. RECOMMENDATION:

County Executive Office Signature

Dep't Recomm: ☒ Consent ☐ Policy

Per Exec. Ofc.: ☐ Consent ☐ Policy

Departmental Concurrence

Prev. Agn. Ref.: Feb. 27, 2007, 9.2 | **District:** 5 | **Agenda Number:**

A fixed term moratorium was requested to allow County staff to continue evaluating that study in conjunction with the Santa Ana Regional Water Quality Control Board and to investigate appropriate long term options to protect water quality in the area. That moratorium was extended by the Board for an additional 120 days with the approval of Ordinance No. 864.2 on February 27, 2007.

County staff and the Santa Ana Regional Water Quality Control Board staff have evaluated the Study and found no basis for challenging the conclusions. The property owner would still have the option to either install a new septic system that is designed to remove no less than fifty percent (50%) of the nitrogen released in the effluent (advanced treatment, denitrifying systems) or connect to a sewer system if available.

The Beaumont Cherry Valley Water District is in the process of providing sewer service to a major portion of this area in order to further protect the groundwater basin.

ORDINANCE NO. 871

AN ORDINANCE OF THE COUNTY OF RIVERSIDE PROHIBITING THE INSTALLATION OF SPECIFIED SEPTIC TANK SYSTEMS IN CHERRY VALLEY

The Board of Supervisors of the County of Riverside ordains as follows:

Section 1. FINDINGS. The Board of Supervisors hereby makes the following findings of fact:

a. The proper disposal of sewage waste as generated in homes and business isessential to protect the health and welfare of the residents and visitors to the County of Riverside.

b. High levels of nitrate in drinking water are implicated in a number of illnesses and health disorders. For that reason, both the USEPA and the State of California have established maximum contaminant levels (MCLs) that may not be exceeded in water provided to the public.

c. Rising nitrate levels have been observed in wells in the Cherry Valley Community of Interest (CVCOI) and recently nitrate concentrations in wells owned by the Beaumont Cherry Valley Water District (BCVWD) have approached the maximum contaminant level (MCL) for nitrates.

d. Two water companies in the CVCOI, Bonita Vista Mutual Water Company and Cherry Valley Mutual Water Company have been annexed into BCVWD's service area, due in part to the high nitrate concentrations in their wells.

e. On July 12, 2006, Wildermuth Environmental Inc. published a draft report entitled Water Quality Impacts from On-Site Waste Disposal Systems in the Cherry Valley Community of Interest (Report). The report was prepared for the San Timeteo Watershed Management Authority and provides compelling evidence that groundwater in the CVCOI is becoming degraded by elevated nitrates and that local septic systems are a primary contributor to that degradation.

f. In light of the above findings, a potential health hazard exists in the Cherry Valley area due to the effects of current wastewater treatment systems in the CVCOI.

g. It is appropriate that the County initiate reasonable and prudent actions to prevent this potential public health hazard from becoming a public health emergency.

h. The current technology for septic system design includes systems that can effectively reduce the nitrates in the effluent to levels that will not lead to further degradation of the groundwater.

i. Ordinance No. 864 was adopted on October 16, 2006 establishing a ninety (90) day moratorium on the installation of septic systems unless designed to remove fifty percent (50%) of the nitrogen in the wastewater. This was established to allow staff time to coordinate review of the relevant documents.

j. Ordinance No. 864.1 was adopted on February 27, 2007 extending the moratorium for an additional one hundred twenty (120) days to allow for further review by staff and coordination with the Regional Water Quality Control Board.

k. Pursuant to the review of the Report and supporting documentation, discussion with the Regional Board staff and limited field investigations, staff can find no basis for challenging the conclusions of the Report and recommend that the moratorium be revised to a non-expiring prohibition.

Section 2. DEFINITIONS. As used in this ordinance, the following terms shall have the following meanings:

a. Department. The Riverside County Department of Environmental Health.

b. Cherry Valley Community of Interest. The area generally located north of the City of Beaumont, east of the City of Calimesa, west of Bellflower Avenue and south of the San Bernardino County line, with the exception of the areas south and west of the Beaumont Avenue and Brookside Avenue intersection, and the area north of Sylvania Lane and east of Taiga Road.

Section 3. PROHIBITION.

a. No application for a new septic system shall be accepted for any lot or parcel within the CVCOI unless that system is designed to remove no less than fifty percent (50%) of the nitrogen released in the effluent (advanced treatment, denitrifying systems).

b. No existing system in the area shall be expanded or otherwise modified to accommodate new construction and/or additional wastewater generating fixtures or appliances.

Section 4. REPLACING OR REPAIRING EXISTING SYSTEM. In the event that an existing system requires replacement or repair, such replacement may be approved and installed, subject to the existing requirements of Riverside County Ordinance No. 650.

Section 5. REQUIREMENT OR COMPLIANCE. Non-compliance with this ordinance shall be deemed a violation of Riverside County Ordinance No. 650.

Section 6. SEVERABILITY. If any clause, provision, sentence, or paragraph of this ordinance or the application thereof, is deemed to be invalid as to any person, entity, establishment, or circumstance, such invalidity shall not affect the other provisions of the ordinance which shall remain in effect.

Section 7. EFFECTIVE DATE. This ordinance is hereby declared to be an urgency measure and shall take effect immediately upon its adoption. In accordance with the requirements of Government Code section 25123, subdivision (d), the Board of Supervisors hereby declares that the provisions contained herein are necessary for the immediate preservation of the public peace, health, or safety for the following reasons: 1) the County's moratorium on installing conventional septic systems designed to remove less than fifty (50) percent of nitrogen in wastewater is only for one hundred twenty (120) days and is set to expire; 2) upon expiration of the moratorium, escalation of nitrate levels in drinking water will continue; and 3) preventing further degradation of the groundwater is necessary to avoid a potential public health emergency in the CVCOI.

BOARD OF SUPERVISORS OF THE COUNTY
OF RIVERSIDE, STATE OF CALIFORNIA

By:_____
Chairman

ATTEST:

CLERK OF THE BOARD:

By:_____
Deputy

(SEAL)

PJW:ay
06/13/07
G:\Property\06-ORDINANCE\871\Ord 871.doc

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will continue; and 3) preventing further degradation of the groundwater is necessary to avoid a potential public health emergency in the CVCOI.

Adopted: 871 Item 3.3 of 07/31/2007 (Eff: Immediately)

Appendix C:

Riverside County Board of Supervisors, July 10, 2009.
Report from the Groundwater Quality Evaluation Committee for Beaumont/Cherry Valley Area

SUBMITTAL TO THE BOARD OF SUPERVISORS
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

FROM: Marion Ashley, Supervisor Fifth District

SUBMITTAL DATE:
July 10, 2009

SUBJECT: Report from the Groundwater Quality Evaluation Committee for the Beaumont/Cherry Valley Area

RECOMMENDED MOTION:
1) Accept the Committee Report and Recommendations
2) Request interested Regional Agencies to commission and obtains funding for a new more in-depth groundwater study acceptable to the Department of Environmental Health and other interested parties within the next 120 days.
3) Direct the County Executive Office to research and determine the availability of any grants funds that may assist in funding this new report.
4) Direct the Department of Environmental Health to prepare the necessary documents to repeal Ordinance 871 if the scope and funding for a new study has not been commissioned within the 120 days.

BACKGROUND:
The Riverside County Board of Supervisors established the Groundwater Evaluation Committee for

Continued on page 2

MA:JW

Marion Ashley, Supervisor Fifth District

FINANCIAL DATA				
	Current F.Y. Total Cost:	$ 0	In Current Year Budget:	N/A
	Current F.Y. Net County Cost:	$ 0	Budget Adjustment:	N/A
	Annual Net County Cost:	$ 0	For Fiscal Year:	09/10

SOURCE OF FUNDS:

Positions To Be Deleted Per A-30	☐
Requires 4/5 Vote	☐

C.E.O. RECOMMENDATION:

County Executive Office Signature

Departmental Concurrence

Dep't Recomm.: ☐ Consent
Per Exec. Ofc.: ☐ Consent ☒

2.24

Prev. Agn. Ref, 4/29/2009 **District:** 5 **Agenda Number:** 3.36

the Beaumont/Cherry Valley Area on April 29, 2008. The committee was directed to review technical data presented by regional experts and make recommendations to the Board of Supervisors and other interested. The committee consisted of 7 local residents and 7 non-voting technical experts. This committee typically met once per month starting in July 2008 through June 2009. There were a total of 13 meetings which were all held in the Beaumont/Cherry Valley Area. The committee heard from seven different speakers representing agencies with knowledge and expertise of groundwater quality in the Beaumont Basin. Two of the presenters discussed their own independent studies and the others reflected on those studies.

The speakers included representatives from the United States Geological Survey, State Department of Public Health, Regional Water Quality Control Board and Wildermuth Environmental.

The Department of Environmental Health (Department) provided a senior representative to the Technical Committee and assisted in facilitating the meeting. The Department also provided clerical support. Information about the committee activities including audio files of meetings, meeting minutes, and many documents are available on the Department website located at http://www.rivcoeh.org.

I would also like to thank each of the committee members for all the effort and hard work on this committee report.

FISCAL

No impact

Groundwater Quality Evaluation
Committee for the
Beaumont/Cherry Valley Area.

Final Report And Recommendations

June 15, 2009

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Executive Summary

The Ground Water Quality Evaluation Committee (Blue Ribbon Committee) was formed by the County of Riverside on April 29, 2008 to review the Wildermuth Environmental Report and all pertinent data. Water quality data included within the Wildermuth Environmental Inc. (WEI) report indicates that Beaumont Cherry Valley Water District's well #16 and #21 have had sporadic spikes of nitrate concentration levels reaching the Maximum Contaminant Level (MCL). Cherry Valley Water Company and Bonita Vista Mutual Water Company have encountered the same problems. Data provided to the Committee from the California Department of Public Health (CDPH) indicates that these levels were only a spike and NOT indicative of the regional aquifer. Also the WEI report states that the presence of on-site wastewater disposal systems (OSWDS) could be a "*possible source*". As you read on, the build out of potential OSWDS are inflated and also indicates that OSWDS "*are the source of nitrate contamination in the Beaumont Management Zone*" contradicting previous pages. And again on page 1.1, the report indicates the OSWDS as being a "*possible source.*" The report tends to discredit the effectiveness of septic systems leading the reader to assume the worst. United States Environmental Protection Agency (EPA) Fact sheet #932-F99-075 contradicts this discredit and clearly explains the functionality and operations of septic tanks including the parameters for failure. Maintained septic systems have an operational life exceeding 30+ years. Also, nitrogen removal was grossly understated and future nitrogen loading was over estimated.

Section 4 within the WEI report references future build out and potential nitrogen loading factors. Unfortunately, these factors are overstated due to inaccurate information with regard to potential build out projections. Furthermore, the Cherry Oaks and Hidden Meadows Tracts should have been included in these equations thus adding to the uncertainty of these projections. Figures 4-1, 4-2, 4-3 are a simulation in time to project the total impact of nitrogens. However with the data provided in this report to reflect future build-out/impacts, this data was part of the model calibration which should be deemed inaccurate. The report gives conclusions and recommendations on page 6-1 a total of 11:

1. According to CDPH water quality records, this is NOT accurate.
2. Again, this is NOT accurate, but over stated.
3. True.
4. This is true according to the report, however not noticed in Well 16.
5. High nitrate levels are sporadic at best, and there are NO high levels of specific ions according to CDPH.
6. Accurate under report conditions only.
7. Accurate under report conditions only.

8. Accurate under report conditions only.

9. This has NOT been proven in the Cherry Valley Community of Interest (CVCOI).

10. This should be left undetermined at this time.

11. This should be left undetermined at this time.

Despite efforts by local agencies involved in this report and /or those agencies that have deemed this report credible, it is apparent that the OSWDS within the CVCOI should be considered an effective treatment system until otherwise proven by future reports. It is also apparent that within the CVCOI there may be some locations that should be considered a "Point Source" based on their land use which would distinguish predictable concentrations and volumes. As noted, there have been geographical areas that should have been included in this report that were not.

At the County level, their efforts were deemed appropriate under the circumstances and information provided to them. Pursuant to the County of Riverside review and actions; the Board of Supervisors acted on April 29, 2008 to form this Committee evaluate groundwater quality in the CVCOI and make specific recommendations to County Board of Supervisors. However, after lengthy review of all reports, supporting documentation, the Committee would recommend that the County Board of Supervisors immediately repeal Ordinance 871 which prohibited conventional OSWDS until further investigations can be completed by an independent resource NOT associated with local agencies or influences. The potential effects of installing sanitary sewers within the CVCOI has not been determined that it will eliminate the degradation of local ground waters.

Measure "B" which was defeated by majority vote could have had a devastating effect on the CVCOI. The proposed cost to complete all infrastructures was estimated to be at $60 million amongst 2000 residents. This equates to $30,000 per resident and based on the final report by Wildermuth Environmental Inc. The tragedy to this would be if Measure "B" had passed, infrastructure built, and the problem NOT solved.

Introduction

Within the Beaumont Management Zone (BMZ) and surrounding areas, increasing nitrate levels were noticed in some production wells giving concern to local water agencies. Within this area, the main source of drinking water is groundwater extracted from the Beaumont Basin area. The San Timoteo Water Shed Management Authority (STWMA) was formed in 2001 by the following agencies: Beaumont/Cherry Valley Water District (BCVWD), the City of Beaumont, South Mesa Water Company and the Yucaipa Valley Water District (YVWD). BCVWD and City of Beaumont concerned with water quality issues formed Project Committee No.1 (PC1) to manage and improve water quality in the BMZ respectively. With ongoing concerns over potential nitrates issues; PC1 initiated an investigation to determine the source of nitrates within this area.

Consequently, Wildermuth Environmental, Inc. (WEI) was contracted to develop a report regarding water quality within the BMZ to help determine the source of nitrates and was finalized in March 2007. At the County level, Ordinance 864.1 was passed by the Board of Supervisors on October 16, 2006 in response to the Wildermuth "Draft Report" dated July 12, 2006 for a 90 day period. Subsequently on February 27, 2007 Ordinance 864.2 was passed leading to an extension of a 120 day moratorium. On June 19, 2007, Ordinance 871 was passed, prohibiting any additional OSWDS unless they can remove 50% nitrogen. The ordinance was then considered a "*Prohibition*" instead of a moratorium. All action was based on a draft and final report prepared by Wildermuth Environmental.

On September 25, 2007 the Beaumont Cherry Valley Water District held a Special Measure Election that could have empowered the District to activate its "Latent Powers". Through the Local Agency Formation Commission (LAFCO), the District would have filed an application under the Municipal Water District Act. During local town hall meetings organized by the District prior to the election, it was estimated that capital costs to sewer the Cherry Valley area was ranging between $50 to 60 million dollars. It was to be divided amongst 2000 residents with no additional funding secured. On September 26, 2007, Measure "B" failed to get the required votes for passage.

The Riverside County Board of Supervisors established the Groundwater Quality Evaluation Committee for the Beaumont/Cherry Valley Area on April 29, 2008. The Committee consists of interested local residents and technical experts in the field of water quality. The Committee membership is as follows:

Local Residents

Name	Area Represented	Number Attended
Joe Aceto	Beaumont	10
Bruce Cash[1]	San Timoteo Canyon	10
Brian DeForge	Beaumont	8
Sarah Eberhardt	Beaumont/Cherry Valley	1
Nancy Hall	Beaumont	10
Luwanna Ryan[2]	Cherry Valley	11
Carl Workman	Banning	6

[1]Appointed by the Committee as Chairperson
[2]Appointed by the Committee as Vice – Chairperson

One member, Sarah Eberhardt, only attended the first meeting. She did not participate in any of the discussions or vote on the approval of the Committee's final recommendations.

Technical Experts

Name	Job Title	Agency Represented	Number Attended
John Covington*	Water Resources Manager	Morongo Band of Mission Indians	11
Cindy Li, PhD, R.G.	Engineering Geologist	Regional Water Quality Control Board – Santa Ana Region	8
Hal Marlow, PhD	Assistant Professor	Loma Linda University School of Public Health	0
Behrooz Mortazavi, PhD, P.E.	Assistant General Manager Resource Development	Eastern Municipal Water District	6
Mark Norton, P.E.	Water Resources & Planning Manager	Santa Ana Watershed Project Authority (SAWPA)	7
John Watkins, M.P.H., R.E.H.S.	Deputy Director	Riverside County Department of Environmental Health	11
Joe Zoba	General Manager	Yucaipa Valley Water District	1

*Also a local resident of Cherry Valley

The technical experts are non-voting members of the Committee but provided significant technical assistance to the process of evaluating the many sources of information

The Committee was directed to review technical data presented by Federal, State and regional experts and make recommendations to the Riverside County Board of Supervisors, Cities of Beaumont and Banning and the Board of Beaumont Cherry Valley Water District regarding the on-going concerns of groundwater quality in the Beaumont Management Zone.

Scope of Investigation

Land Use: The area of investigation within the WEI report identifies the Cherry Valley Community of Interest (CVCOI). Directly up gradient of the Bonita Vista Mutual Water Company (BVMWC) and the Cherry Valley Water Company's (CVWC) wells are two large scale residential tracks of homes. The Cherry Oaks Tract includes 100 lots and the Hidden Meadows Tract includes 600 lots, unfortunately this should have been made a portion of this study as the impacts could be considerable. WEI indicates that the CVCOI has 1,900 developed lots, and under the assumption that future 1 acre lots would be reduced in size to .25 acre thus increasing the total number of OSWDS potentially to 8800. Currently, lots sizes are predominately 1 acre in size thus over inflating the potential OSWDS projections and future nitrogen loadings.

Scientific Literature: The WEI report consisted of many excerpts from previous studies that were related to OSWDS and the functionality and life expectancies. However, likewise there were many challenges to those references.

Nitrogen concentrations below OSWDS: The WEI report indicated that 9 sample locations where chosen for field examination and sampling. Samples were only recovered at 5 of 9 locations. Generally leach lines are located a few feet below ground surface and are usually surrounded by gravel. Every sample obtained was dry and did not have a distinguishing odor. It was also stated in the WEI report that *"the average nitrate concentrations in the samples from the CVCOI are much lower than seen in other studies". The moisture content of the samples and the analytical results of the samples suggest that a representative sample was NOT obtained. The nitrogen concentrations of the samples collected suggest that the samples were more representative of soil NOT impacted by OSWDS.* Based on sampling results, it would seem prudent to incorporate additional sample locations for verification which was not completed.

Tracer Study: Within the CVCOI, nine wells were selected for sampling. Out of the nine, only 4 wells were active producers. Inactive wells can be used, however they must be adequately cleansed/flushed prior to sampling. Within the WEI report, it was apparent to the Committee that inadequate flushing of the inactive wells may have occurred. A low-flow pump was used and the sampler had no well data on any of the nine wells to help determine the construction and the well casing volume to assure that appropriate cleansing had occurred. Within the CVCOI, there are over 40 active wells which could have been utilized other than inactive sites. Pharmaceuticals and personal care products (PPCP) were detected in 6 of nine wells. However, one of the nine wells with the highest "nitrate spike" had **NO** PPCP's found in the samples. Also within the report, it is stated that *"The possible source of detected pharmaceuticals are OSWDS and animal waste".*

As noted in Section 3.5, *"elevated concentrations of specific ions, such as boron, potassium, and sodium relative to OSWDS have been used as indicators of OWDS effluent"*. However, all water quality data submitted from the California Department of Public Health to the Committee shows very low levels of the above mentioned ions or completely non-detected.

Estimation of current/future discharge projections: Information regarding future build out was inflated due to the WEI report's assumptions that current undeveloped lots which are mostly 1 acre would be developed into .5 acres in size thus doubling the estimated OSWDS and their discharge amounts. Current and future nitrogen loads have also been overstated. There are numerous references that indicate that an average household of four persons will contribute 8-10 lbs. annually. WEI reports 18 lbs annually. It is also stated that OSWDS only remove between 10-20% of nitrogen. EPA treatment guidelines indicate that 10-20% is removed before the Soil Absorption System (SAS) and another 10-40% removed in the leach field equating to 20-60% removal rate.

Planning level of basin-wide nitrogen impacts: The report is based on potential build out, again assuming that lot sizes will become .5 acres or less and the total OSWDS will increase accordingly. This is shown to equate to 185,000 to 500,000 pounds of nitrogen a year which would only be possible under these assumptions. There are numerous assumptions into the Year 2100, which the following would have to occur:

- Water quality would have to be at a point of degradation with an average nitrate concentration of 8 mg/l. (n)
- CVCOI would have to completely build out all potential lots.
- CVCOI would have to decrease all lot sizes to .5 acres.

Thresholds to compel sewering: It is understood that the California Regional Water Quality Control Board (CRWQCB) has certain authority to compel sewering in areas determined to be negatively effecting groundwaters and exceeding basin water quality objectives. It is further understood that under the previous AB 885, it would have required the CRWQCB to further establish Statewide regulations for OSWDS. Since the immediate withdrawal of AB 885, it is presumed that this bill will be re-introduced in the near future. However, the CRWQCB has established over 60 prohibitions of OSWDS within the State based on some type of report indicating the degradation of local groundwater.

Water Resource Quality

As indicated in Figure 1-1 of the WEI report the groundwater flows directly from a northerly to a southern direction or in other words, from the Cherry Oaks Tract to the Beaumont Management Zone thus impacting the BVMWC and CVWC respectfully. Well locations that were selected for the "Tracer Study" appeared to be only wells that at some time had shown elevated levels of nitrate. Wells in surrounding areas of the Beaumont Management Zone were NOT part of this study, nor were any water quality data sampled or recorded to establish a benchmark. None of the wells except Well 21

(BCVWD) have a sanitary seal. Wells selected were not reviewed for construction data, which would have included: casing diameter, overall depth, screen intervals, sanitary seal, date of construction, mineral composites, drilling method, and estimated yield. Lack of this information whether it becomes part of a final report or just utilized for field study reference, is critical before determining sampling locations. It has been confirmed that most of the wells selected in this report are less than the required 100' distance between a domestic water well and an OSWDS. Furthermore, specific flood control channels, active commercial septic systems, and residential activity could have been the determining factor for the sporadic spikes in nitrates rather than a widespread aquifer problem with OSWDS. When reviewing the sampling procedures, it has been determined that 60% of all wells sampled were in-active. Not having the well construction data, the sampler has no idea if he/she has exchanged the stagnant waters with a representative sample amount of the surrounding aquifer. The pump used in the in-active wells is listed as a GrundFos Redi-Flo2 pump. The report indicates that the pump was lowered to 100' below ground surface (BGS) and pumped at a minimum of 45 minutes. The total flow equates to 338 gallons @ 7.5 gallons per minute at 100' of total dynamic head (TDH).

This is NOT an adequate exchange of casing volume as well as lacking velocity to help cleanse the casing in a stagnate state. Section 3 of the WEI report references specific ions that would be attributed to the presence of OSWDS. In reviewing water quality data received from the California Department of Public Health with regards to wells referenced in the study, it appears that there is at best a minimal detection of such ions in BCVWD wells #4a, 5, 16, and 21. These results are from 1996 to 2008. The results are summarized as follows:

Well Number	Chloride Level	Sodium Level	Total Dissolved Solids	Potassium	Nitrate
4a	20 to 21 mg/l *MCL 250 mg/l*	20-21 mg/l *MCL 250 mg/l*	300-350 mg/l *MCL 500 mg/l*	1-2 mg/l *MCL - None*	8-11 mg/l *MCL 45 mg/l*
5	10 - 11 mg/l *MCL 250 mg/l*	15 - 19 mg/l *MCL 250 mg/l*	290-370 mg/l *MCL 500 mg/l*	1.2 - 2 mg/l *MCL - None*	11-16 mg/l *MCL 45 mg/l*
16	13 – 16 mg/l *MCL 250 mg/l*	35-38 mg/l *MCL 250 mg/l*	310-360 mg/l *MCL 500 mg/l*	1 – 2 mg/l *MCL - None*	6 – 43 mg/l *MCL 45 mg/l*
21	11 – 13 mg/l *MCL 250 mg/l*	24 – 25 mg/l *MCL 250 mg/l*	270-300 mg/l *MCL 500 mg/l*	1.5 – 2 mg/l *MCL - None*	9.5 – 43 mg/l *MCL 45 mg/l*

Under State law, every water purveyor is required to submit to its consumers a Consumer Confidence Report (CCR) each calendar year prior to July. This report in detail should explain the following: (i) water quality constituents that have been detected within the year of the report, including previous year's data (ii) explanation of the related terms used in the report, (iii) contaminants that may be

present in the source water, (iii) and any additional information deemed necessary by the agency. This committee has received and reviewed the CCR's for the calendar years of 2006-2009 and has found the following levels of detected nitrates:

Range of Detections		Average Level Detected	
2006:	3.1-40 mg/l (NO3)	8.1 mg/l	MCL 45 mg/l
2007:	2.5-16 mg/l (NO3)	6.8 mg/l	MCL 45 mg/l
2008:	3.1-16 mg/l (NO3)	6.8 mg/l	MCL 45 mg/l

Committee Directives

The Riverside County Board of Supervisors directed the Committee to accomplish the following:

1. Conduct bi-monthly committee meetings.
2. Examine the overall water quality of the Beaumont/Cherry Valley region.
3. Review independent technical studies regarding the current and future status of the groundwater quality in the area.
4. Identify potential threats to the groundwater quality.
5. Identify possible mitigation measures and the cost effectiveness of each measure.
6. Present Committee's recommendations to the Board of Supervisors, Cities of Beaumont, Banning and Calimesa, the Board of Beaumont Cherry Valley Water District, 5th District Pass Area Municipal Advisory Committee, Regional Water Quality Control Board – Santa Ana Region, Riverside County Department of Environmental Health, San Gorgonio Pass Water Agency, San Timoteo Watershed Management Authority, Yucaipa Valley Water District, Morongo Band of Mission Indians and other interested entities.

Committee Activities

The Committee typically met once per month starting in July 2008 through June 2009. There were a total of 13 meetings which were all held in the Beaumont/Cherry Valley Area. The Committee heard from seven different speakers representing agencies with knowledge and expertise of groundwater quality in the Beaumont Basin. Two of the presenters discussed their own independent studies and the others reflected on those studies. The speakers included the following individuals:

Committee Presenters

Name	Agency Represented
Peter Martin, PhD	United States Geological Survey
Steve Williams, P.E.	State Department of Public Health – Drinking Water
Mark Wildermuth, M.S., P.E.	Wildermuth Environmental
Chuck Butcher	Beaumont Cherry Valley Water District
Jeff Davis, M.S., P.E.	San Gorgonio Pass Water Agency
Gerard Thibeault, P.E.	Regional Water Quality Control Board – Santa Ana
Andy Schlange	San Timoteo Watershed Mgmt. Authority and Watermaster

After each presentation the Committee and the audience were able to ask questions of the presenters for clarification and in some cases request additional information. The Committee met three additional times to review the presentations in their totality and evaluate their findings in reference to the charge of the Committee. These studies and presentations considered current conditions and sensible future growth for the area. (Charge #2, #3 & #4)

Committee Conclusions and Recommendations

The Committee makes the following findings and recommendations:

1. Findings: The Wildermuth report titled: *Water Quality Impacts from On-site Waste Disposal Systems in the Cherry Valley Community of Interest March 2007 Wildermuth Environmental Inc.* had parameters that were too narrowly focused; used well water sources located in close proximity to on-site wastewater disposal systems and used exaggerated build out approximations.

   Recommendation:

   - An independent third party study conducted by someone other than Wildermuth Environmental, who conducted the initial report, is needed to evaluate this perceived regional issue. The study should evaluate beyond those areas studied in the initial report, consider reasonable build-out projections and consider other possible sources of groundwater contamination such as septic systems in the Cherry Oaks Tract and beyond to the Hidden Meadows Tract area and the surrounding communities including the City of Beaumont. The cost of the new study would likely exceed $150,000 (based on the cost of Wildermuth Report). The information would be invaluable and assist in making sensible land use planning decisions in the area. (Board of Supervisors Committee Charge #3, #4 & #5)

2. Findings: The conventional on-site wastewater disposal system prohibition instituted by Riverside County may have been premature. It was based on a narrowly focused report prepared by Wildermuth Environmental and

commissioned by the San Timoteo Watershed Management Authority Project Committee 1. It was acknowledged that on-site wastewater disposal systems can negatively impact the groundwater but not as quickly or severely as specified in the Wildermuth Report.

Recommendation:

- Repeal Riverside County Ordinance 871 which prohibits the installation of new conventional on-site wastewater disposal systems until further information on the impact of groundwater quality is determined. This is under the assumption that stringent parcel size restrictions are in place and are enforced. The cost of the non-conventional or advanced treatment systems is estimated to be between $30,000 and 40,000 for each property owner and may not be necessary until more is known about the groundwater basin. (Board of Supervisors Committee Charge #4 & #5)

3. Findings: Additional development has occurred in the unincorporated area of Cherry Valley that violates parcel size restrictions of nothing less than ½ acre. The California Regional Water Quality Control Board – Santa Ana Region has adopted this same minimum parcel size restriction of 1 OSWDS per ½ acre. The smaller parcel size may be a contributor to eventual groundwater contamination.

   Recommendation:

   - Continue parcel size restrictions of nothing less than 1 acre to limit density for developments using on-site wastewater disposal systems and to be consistent with existing land use parameters. The cost of this recommendation would be borne by the developer and not existing residents. (Board of Supervisors Committee Charge #4 & #5)

4. Findings: Some active water wells, including ALL wells studied in the Wildermuth Report in the Cherry Valley area appear to be located within the 100' restrictive zone surrounding contamination sources.

   Recommendations:

   - Encourage water purveyors within the Beaumont Management Zone to retrofit water wells to have at least the minimum fifty foot sanitary seal.
   - Initiate the directives found in the State of California Drinking Water Source Assessment and Protection Program (DWSAP). (Board of Supervisors Committee Charge #4 & #5)

5. Findings: Potential and future development of parcels within the unincorporated area of Cherry Valley, and the possible action of future assembly bills for on-site wastewater disposal systems could be deemed undesirable both financially and operationally with respect to current and future landowners.

   Recommendations:

   - The County of Riverside should consider and convene an oversight committee comprised of the County Department of Environmental Health, representatives of local water agencies within the immediate geographical area and residents of the unincorporated area of Cherry Valley. This committee's tasks shall be but not limited to:
     - Prepare and initiate a future proposed study.
     - Review potential actions of future assembly bills
     - Seek source funding for future projects within the unincorporated area of Cherry Valley. (Board of Supervisors Committee Charge #4 & #5)