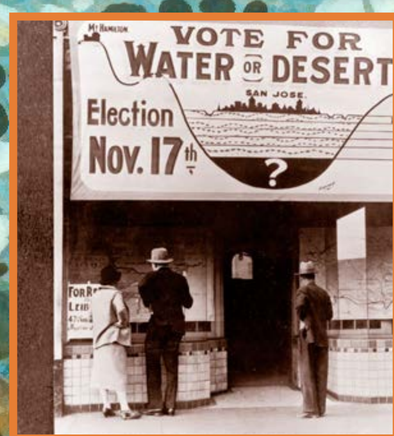
Appendix G: Supplemental Water Supply Information

- Santa Clara Valley Water District 2012 Groundwater Management Plan
- DWR Groundwater Bulletin 118

Santa Clara Valley Water District

2012

Groundwater Management Plan



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2012
Groundwater Management Plan

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Executive Summary

The Santa Clara Valley Water District (District) is the groundwater management agency for the Santa Clara and Llagas Subbasins in Santa Clara County. The District is also the primary water wholesaler, flood manager, and watershed steward for the county. Nearly half of the water used in the county is pumped from groundwater, with some communities relying solely on groundwater. The purpose of this 2012 Groundwater Management Plan (GWMP) is to describe basin management objectives, the strategies, programs and activities that support those objectives, and outcome measures to gauge performance.

DISTRICT OVERVIEW

The mission of the District is to provide for a healthy, safe, and enhanced quality of living in Santa Clara County through watershed stewardship and comprehensive management of water resources in a practical, cost-effective, and environmentally-sensitive manner for current and future generations.

Local communities have relied on groundwater since the 1850s, when the first wells were drilled to supply water to residents, agriculture, and businesses. By the 1920s, far more water was being pumped than nature could replenish, resulting in declining groundwater levels and permanent land subsidence. The District was formed in 1929 by an act of the California legislature through the Santa Clara Valley Water District Act[1] (District Act) for the purpose of providing comprehensive management for all beneficial uses and protection from flooding within Santa Clara County.

Per Sections 4 and 5 of the District Act, the District's objectives and authority related to groundwater management are to recharge groundwater basins, conserve, manage and store water for beneficial and useful purposes, increase water supply, protect surface water and groundwater from contamination, prevent waste or diminution of the District's water supply, and do any and every lawful act necessary to ensure sufficient water is available for present and future beneficial uses.

WATER SUPPLY AND GROUNDWATER OVERVIEW

The District's water supply system is comprised of storage, conveyance, recharge, treatment, and distribution facilities that include local reservoirs, groundwater subbasins, out-of-county groundwater banking, groundwater recharge facilities, treatment plants, imported supply, and raw and treated water conveyance facilities. Santa Clara County's diverse water supplies include locally developed and managed water, imported water from the Sacramento-San Joaquin Delta, and recycled water.

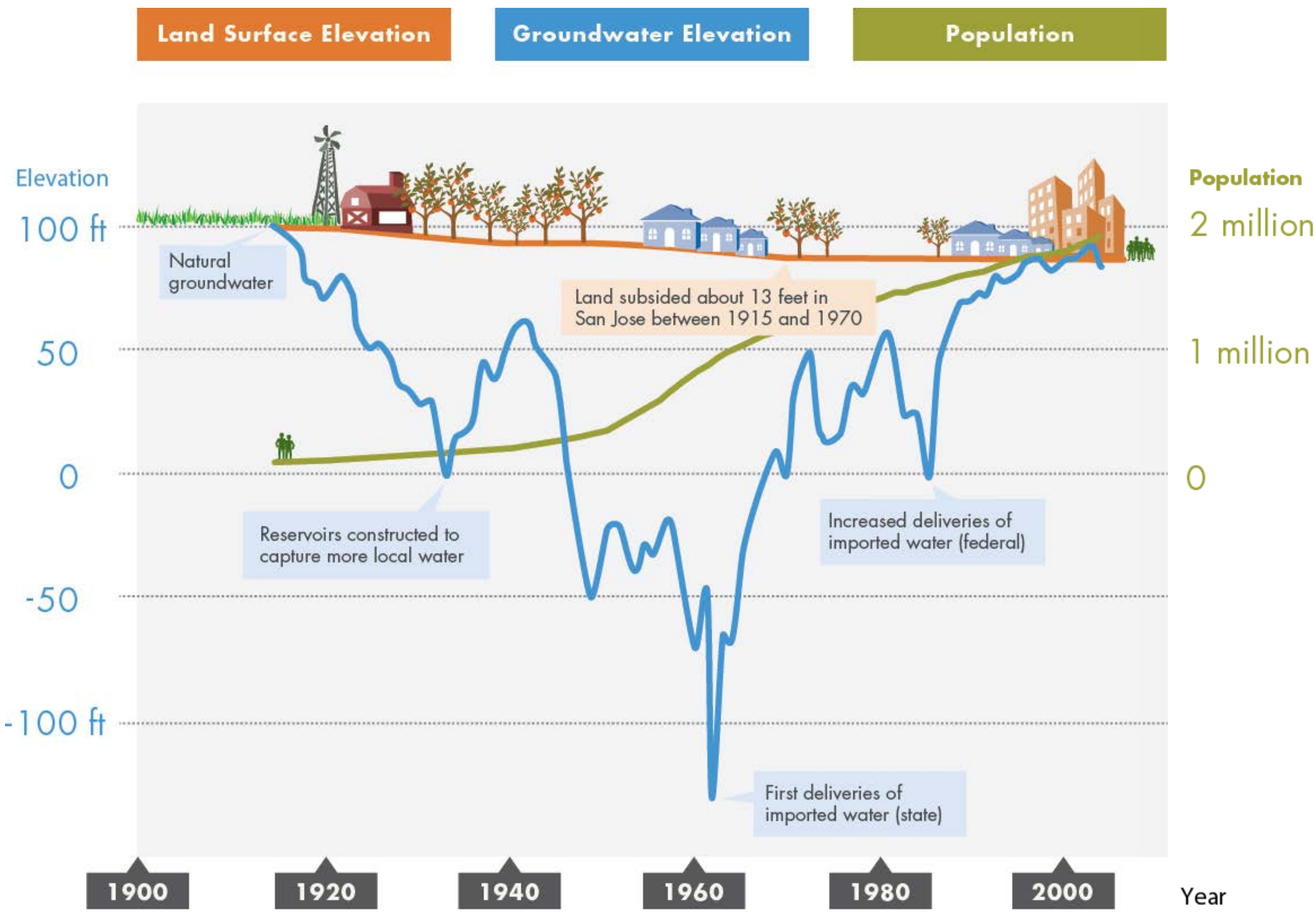
Since the 1930s, the District's water supply strategy has been to maximize conjunctive use, the coordinated management of surface and groundwater supplies, to enhance water supply reliability. Local groundwater resources make up the foundation of the county's water supply, but they need to be augmented by the District's comprehensive water supply management activities in order to reliably meet the needs of county residents, businesses, agriculture and the environment. These activities include the managed recharge of imported and local supplies and in-lieu groundwater recharge through the provision of treated surface water, acquisition of

[1] West's Ann. Cal. Water Code App. §60.

supplemental water supplies, and water conservation and recycling. The District also has programs to protect, manage and sustain water resources.

Figure ES-1 shows how the District's managed recharge programs, imported water deliveries, treated water programs, and other in-lieu recharge have dramatically contributed to a sustainable water supply and have minimized land subsidence in Santa Clara County.

Figure ES-1 History of Groundwater Elevations and Land Subsidence in Santa Clara County



In addition to working to secure adequate water supplies for the county, the District also has a long history of protecting groundwater resources, beginning with efforts to address salt water intrusion adjacent to San Francisco Bay in the late 1950s[2]. In the 1980s, contamination from leaking chemical storage tanks at semiconductor manufacturing facilities brought groundwater quality issues to the forefront. District efforts to aggressively protect groundwater quality have included close coordination with regulatory agencies overseeing cleanup, the implementation of numerous programs including efforts to seal abandoned wells and reduce nitrate loading, the oversight of fuel leak cases, the regulation of wells, and efforts to influence statewide policy from threats such as MTBE, an additive formerly used in gasoline[3].

GROUNDWATER SUBBASINS

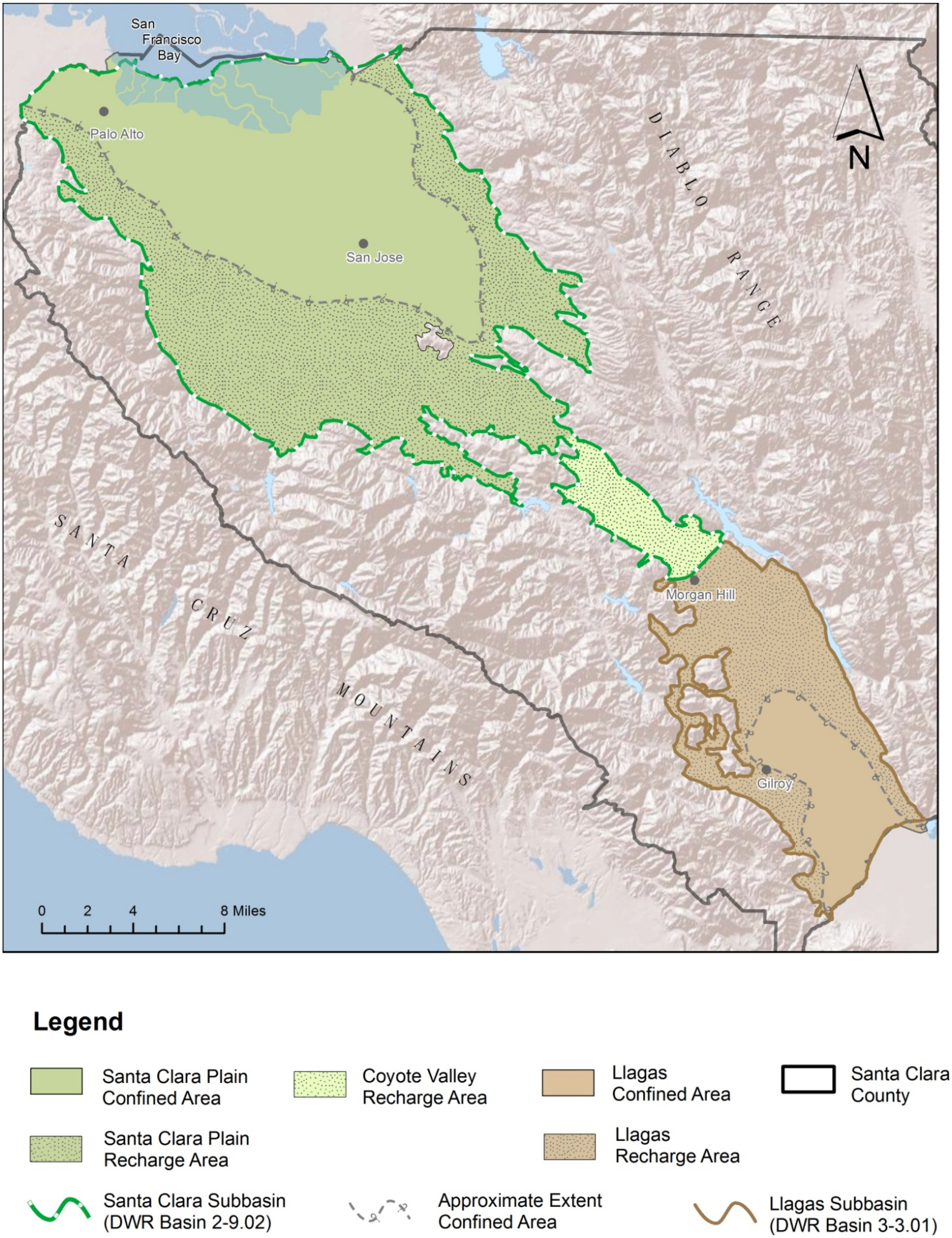
Santa Clara County includes portions of two groundwater basins as defined by the California Department of Water Resources (DWR)[4]: the Santa Clara Valley Basin (Basin 2-9) and the Gilroy-Hollister Valley Basin (Basin 3-3). This plan covers only the groundwater subbasins within Santa Clara County managed by the District: the Santa Clara Subbasin (Subbasin 2-9.02) and the Llagas Subbasin (Subbasin 3-3.01), which cover a surface area of approximately 385 square miles (Figure ES-2). Due to different land use and management characteristics, the District further delineates the Santa Clara Subbasin into two groundwater management areas: the Santa Clara Plain and the Coyote Valley.

The groundwater subbasins provide multiple benefits to residents and businesses in Santa Clara County. Although most of the groundwater pumped is a result of District managed recharge programs, the subbasins provide some groundwater supply resulting from the percolation of rainfall in the recharge areas and natural seepage through local creeks and streams. In addition, the groundwater subbasins serve as an extensive conveyance network, allowing water to move from the recharge areas to individual groundwater wells. The groundwater subbasins also provide some natural filtration of surface water as it percolates through the soil and rock. Unlike surface water, most groundwater in the county can be used for drinking water without additional treatment. Lastly, the groundwater subbasins provide water storage, allowing water to be carried over water from the wet season to the dry season and even from wet years to dry years.

Protecting groundwater resources is a key District mission as shown by District Board Supply Objective 2.1.1: “Aggressively protect groundwater from the threat of contamination and maintain and develop groundwater to optimize reliability and to minimize land subsidence and salt water intrusion.”

[2] Santa Clara Valley Water District, Saltwater Intrusion Investigation, September 1980.
[3] California History Center & Foundation, Water in the Santa Clara Valley: A History, 2005.
[4] California Department of Water Resources, Bulletin 118, 2003.

Figure ES-2 Santa Clara County Groundwater Subbasins



2012 GROUNDWATER MANAGEMENT PLAN

The District's prior Groundwater Management Plan was published in July 2001 and documented ongoing groundwater management programs. Since that time, SB 1938 and other legislation have amended the requirements for groundwater management plans[5]. Many of these requirements are not applicable for agencies such as the District which have the authority to manage groundwater pursuant to other provisions of law[6]. However, to maintain eligibility for state funding for projects relating to groundwater, certain requirements must be met, including the development of basin management objectives and components relating to the monitoring and management of groundwater and land subsidence.

This 2012 Groundwater Management Plan is prepared under existing groundwater management authority granted by the District Act. The purpose of the 2012 GWMP is to characterize the District's groundwater activities in terms of basin management objectives, strategies, and outcome measures. The 2012 GWMP describes existing and potential management actions to achieve the basin management objectives. Clear documentation of these actions will help the District respond to risks and uncertainties that may impact the quality or quantity of groundwater supplies. These challenges include, but are not limited to, increased demand, regulatory changes, constituents of emerging concern, recharge limitations due to dam restrictions, reduced availability of imported water or other supplies, climate change, and intensified land development. According to the District's 2010 Urban Water Management Plan (UWMP), multiple dry years pose the greatest challenge to the District's water supply as storage reserves (including groundwater storage) are depleted.

The District plans to review the GWMP and update as needed every five years. This schedule will ensure that current information on local groundwater management is available to support the five-year updates of Urban Water Management Plans required by state law. As the next UWMP is scheduled to be completed in 2015, the next review and update of the GWMP will be completed in 2014.

Basin Management Objectives and Strategies

Using the District's overall water supply management objectives, the following basin management objectives (BMOs) were developed:

BMO 1: Groundwater supplies are managed to optimize water supply reliability and minimize land subsidence.

BMO 2: Groundwater is protected from existing and potential contamination, including salt water intrusion.

These BMOs describe the overall goals of the District's groundwater management program. The basin management strategies are the methods that will be used to meet the BMOs. Many of these strategies have overlapping benefits to groundwater resources, acting to improve water supply reliability, minimize subsidence, and protect or improve groundwater quality. The strategies are listed below and are also described in detail in Chapter 3 of this report.

1. Manage groundwater in conjunction with surface water through direct and in-lieu recharge programs to sustain groundwater supplies and to minimize salt water intrusion and land subsidence.
2. Implement programs to protect or promote groundwater quality to support beneficial uses.
3. Maintain and develop adequate groundwater models and monitoring systems.
4. Work with regulatory and land use agencies to protect recharge areas, promote natural recharge, and prevent groundwater contamination.

[5] California Water Code §10753.

[6] California Water Code §1750.2(b)

Basin Management Programs and Activities

The District and local partners have implemented numerous programs to protect groundwater resources that support the basin management objectives and strategies as shown in Tables ES-1 and ES-2 below.

Monitoring Programs

The assessment of groundwater conditions and performance of outcome measures relies on timely, accurate, and representative data. The District has established comprehensive monitoring programs related to groundwater levels, land subsidence, groundwater quality, recharge water quality, and surface water flow, which are described in detail in Chapter 5 of this plan.

Outcome Measures

The District has developed the following outcome measures to gauge performance in meeting the basin management objectives:

1. Projected end of year groundwater storage is greater than 278,000 AF in the Santa Clara Plain, 5,000 in Coyote Valley, and 17,000 AF in the Llagas Subbasin.
2. Groundwater levels are above subsidence thresholds at the subsidence index wells.
3. At least 95% of countywide water supply wells meet primary drinking water standards and at least 90% of South County wells meet Basin Plan agricultural objectives.
4. At least 90% of wells in both the shallow and principal aquifer zones have stable or decreasing concentrations of nitrate, chloride, and total dissolved solids (TDS).

These measures will be assessed annually, based on data for the previous year. The basis for these outcome measures and a description of how they will be measured is presented in Chapter 6 of this plan. If evaluation of the outcome measures indicates poor performance toward meeting a basin management objective, the District will first evaluate potential changes to existing programs and activities prior to considering significant groundwater management changes. Any significant policy or investment decisions would be developed and evaluated in consultation with local stakeholders, as the District does in current planning and budgeting processes as described in Chapter 7 of this plan.

Table ES-1: Relation of Programs and Activities to Basin Management Objectives

Program/Activity	BMO 1: Water Supply Reliability and Minimization of Land Subsidence	BMO 2: Groundwater Quality Protection
Managed recharge • Reservoirs and diversions (P) • In-stream and off-stream managed recharge (P) • Treated water pilot injection (P) • Treated groundwater reinjection program (P, C)	X	X
In-lieu recharge • Treated water operations (P) • Water conservation (P, C) • Water recycling (P, C, T)	X	X
Protection of natural recharge (P, C, T)	X	
Groundwater production management • Production measurement (P) • Retailer coordination on source shifts and drought response (P, C) • Groundwater charges and zones (P) • Pricing policies (P)	X	
Groundwater level and storage assessment • Operations planning to meet near-term needs (P) • Contingency planning (P) • Long-term water supply planning (P, C)	X	X
Groundwater for emergency backup supply (P, C)	X	
Asset management (P)	X	X
Water system quality requirements (C)		X
Well ordinance program (P)		X
South County private well testing (P)		X
Vulnerability assessment • Groundwater vulnerability studies (P, C) • Drinking Water Source Assessment and Protection (C, T)		X
Coordination with land use agencies • Land use reviews (C, T) • Septic systems (C, T)	X	X
Coordination with regulatory agencies • Contamination release sites (C, T) • Hazardous materials handling and storage oversight (C, T)		X
Public outreach • Outreach materials (P) • School program (P, C) • Groundwater Guardian (P)	X	X
Salt and nutrient management • Salt and Nutrient Management Plans (P, C) • Recycled water irrigation evaluation (P, C)	X	X
Stormwater management (C, T)		X
Salt water intrusion prevention (P)	X	X
Water accounting (P)	X	X
Watershed management (P, C)	X	X

(P) Indicates that the District has primary jurisdiction and/or responsibility; (C) for cooperation or coordination with others; and (T) for providing technical information and/or serving as advocate

Table ES-2: Relation of Programs and Activities to Basin Management Strategies

Program/Activity	Strategy			
	1	2	3	4
Managed recharge • Reservoirs and diversions (P) • In-stream and off-stream managed recharge (P) • Treated water pilot injection (P) • Treated groundwater reinjection program (P, C)	X	X	X	
In-lieu recharge • Treated water operations (P) • Water conservation (P, C) • Water recycling (P, C, T)	X		X	
Protection of natural recharge (P, C, T)			X	X
Groundwater production management • Production measurement (P) • Retailer coordination on source shifts and drought response (P, C) • Groundwater charges and zones (P) • Pricing policies (P)	X	X	X	
Groundwater level and storage assessment • Operations planning to meet near-term needs (P) • Contingency planning (P) • Long-term water supply planning (P, C)	X		X	
Groundwater for emergency backup supply (P, C)	X		X	
Asset management (P)	X	X	X	
Water system quality requirements (C)		X	X	
Well ordinance program (P)		X		X
South County private well testing (P)		X	X	X
Vulnerability assessment • Groundwater vulnerability studies (P, C) • Drinking Water Source Assessment and Protection (C, T)		X	X	X
Coordination with land use agencies • Land use reviews (C, T) • Septic systems (C, T)	X	X		X
Coordination with regulatory agencies • Contamination release sites (C, T) • Hazardous materials handling and storage oversight (C, T)		X		X
Public outreach • Outreach materials (P) • School program (P, C) • Groundwater Guardian (P)	X	X	X	X
Salt and nutrient management • Salt and Nutrient Management Plans (P, C) • Recycled water irrigation evaluation (P, C)		X	X	X
Stormwater management (C, T)	X	X		X
Salt water intrusion prevention (P)	X	X	X	X
Water accounting (P)	X		X	
Watershed management (P, C)		X		X

(P) Indicates that the District has primary jurisdiction and/or responsibility; (C) for cooperation or coordination with others; and (T) for providing technical information and/or serving as advocate

Strategy 1: Manage groundwater in conjunction with surface water through direct and in-lieu recharge programs to sustain groundwater supplies and to minimize salt water intrusion and land subsidence.

Strategy 2: Implement programs to protect or promote groundwater quality to support beneficial uses.

Strategy 3: Maintain and develop adequate groundwater models and monitoring systems.

Strategy 4: Work with regulatory and land use agencies to protect recharge areas, promote natural recharge, and prevent groundwater contamination.

RECOMMENDATIONS

The District's proactive groundwater management programs and activities have helped to maintain groundwater levels, minimized land subsidence, and improved groundwater protection. To maintain the long-term viability of groundwater resources, the following specific actions are recommended:

1. Maintain existing conjunctive use programs and evaluate opportunities for enhancement or increased efficiency.
2. Continue to aggressively protect groundwater quality through District programs and collaboration with land use agencies, regulatory agencies, and basin stakeholders.
3. Finalize key Water Utility plans.
4. Maintain adequate monitoring programs.
5. Continue and enhance groundwater management partnerships with water retailers and land use agencies.

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1 2012 GROUNDWATER MANAGEMENT PLAN
Introduction

The Santa Clara Valley Water District (District) is the groundwater management agency for the Santa Clara and Llagas Subbasins in Santa Clara County. The District is also the primary water wholesaler, flood manager, and watershed steward for the county. Presently, nearly half of the water used in the county is pumped from groundwater, with some communities relying solely on groundwater. The purpose of this 2012 Groundwater Management Plan (GWMP) is to describe basin management objectives and strategies, programs and activities that support those objectives, and outcome measures to gauge performance.

This chapter provides an overview of the District and the GWMP. It also describes other partners in groundwater management and stakeholder participation in the GWMP.

1.1 DISTRICT OVERVIEW

The mission of the District is to provide for a healthy, safe, and enhanced quality of living in Santa Clara County through watershed stewardship and comprehensive management of water resources in a practical, cost-effective, and environmentally-sensitive manner for current and future generations. A sustainable, high-quality water supply is vital for a prosperous economy, the environment, and quality of life in the county.

The District's service area includes all of Santa Clara County, which is located at the southern end of the San Francisco Bay (Figure 1-1). The county encompasses approximately 1,300 square miles, making it the largest of the nine Bay Area counties. The county supports a population of over 1.8 million, although that is projected to increase to over 2.4 million by 2035. The county also provides almost 30% of the Bay Area's jobs[1].

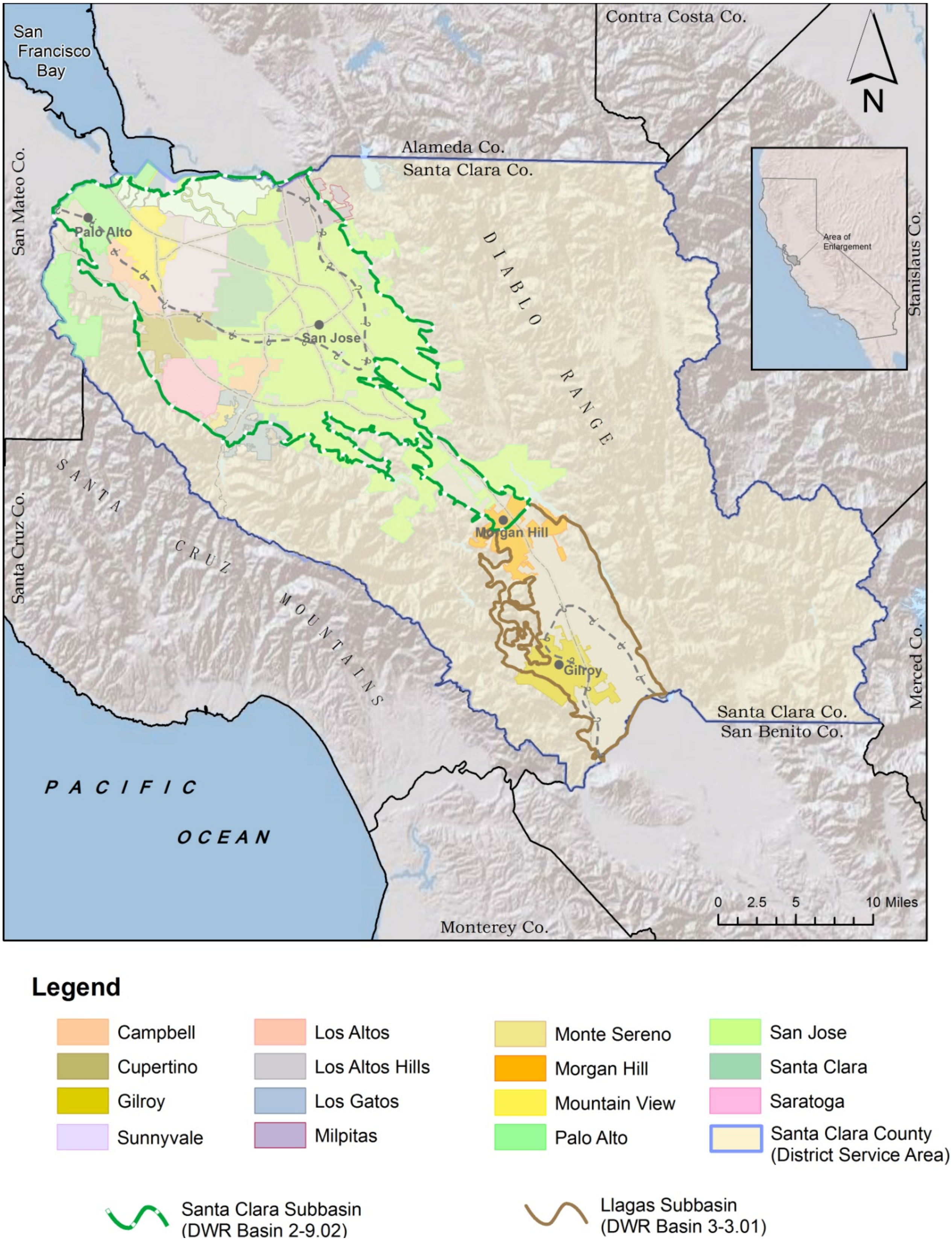
Major topographical features include the Santa Clara Valley, the Diablo Range to the east, Santa Cruz Mountains to the west, San Francisco Bay to the north, and the Pajaro River to the south. The northern part of the valley is extensively urbanized, housing over 90 percent of the county's residents and 13 of the 15 cities. Agriculture is all but gone in the northern valley, with only pockets remaining where there once were numerous orchards. South County remains agricultural and rural, with the exception of the cities of Morgan Hill and Gilroy.

The District manages water resources and wholesales treated water to water retailers within Santa Clara County. For maximum flexibility, the District utilizes a variety of water supply sources including groundwater, local surface water, water imported from the Sacramento-San Joaquin Delta, and recycled water. Water users in the county also rely on Hetch-Hetchy water supplied by the City of San Francisco and sold directly to several water retailers as well as surface water rights held by Stanford University and the San Jose Water Company.

The District manages 10 local reservoirs and water conveyance and distribution facilities. The District also operates three drinking water treatment plants and sells treated water to 7 of the 13 local water retailers that serve communities via their own distribution systems. These activities help sustain groundwater, which provides nearly half the water used in the county each year.

[1] Santa Clara Valley Water District, Urban Water Management Plan, 2010.

Figure 1-1 **Santa Clara County Location Map**



1.2 DISTRICT HISTORY AND AUTHORITY

Local communities have relied on groundwater since the 1850s, when the first wells were drilled to supply water to residents, agriculture, and businesses. By the 1920s, far more water was being pumped than nature could replenish. This groundwater overdraft resulted in declining groundwater levels and land subsidence, the broad sagging of the land surface over many miles. Mountain View, Sunnyvale, Santa Clara, and north San Jose experienced permanent land subsidence, with the ground surface in downtown San Jose dropping about 13 feet over time. The Santa Clara Valley Water Conservation District, the precursor of today's District, was formed in 1929 by an act of the California legislature, with the mission of managing water resources to stop groundwater overdraft and land subsidence.

The District has been a leader in conjunctive use (the coordinated use of surface water and groundwater) since the 1930s. Initially, the District supplemented natural groundwater recharge through the managed recharge of local supplies. As the county continued to grow, so did the variety of managed groundwater recharge sources and methods. When local surface water supplies could no longer meet the growing county's needs, the District turned to imported water for recharge, then to in-lieu recharge through treated water deliveries. More recently, the District has implemented water conservation programs and is working to expand water recycling as part of its integrated water resources management approach.

In addition to working to secure adequate water supplies for the county, the District also has a long history of protecting groundwater resources, beginning with efforts to address salt water intrusion adjacent to San Francisco Bay in the late 1950s[2]. In the 1980s, groundwater contamination from leaking chemical storage tanks at the IBM and Fairchild sites brought groundwater quality issues to the forefront. District efforts to aggressively protect groundwater quality have included close coordination with regulatory agencies overseeing cleanup, the implementation of numerous programs including efforts to seal abandoned wells and reduce nitrate loading, the oversight of fuel leak cases, the regulation of wells, and efforts to influence statewide policy from threats such as MTBE, an additive formerly used in gasoline[3]. A more detailed history related to the District and groundwater is presented in Appendix A.

The District was formed by the Santa Clara Valley Water District Act[4] (District Act) for the primary purpose of providing comprehensive management for all beneficial uses and protection from flooding within Santa Clara County. Per Sections 4 and 5 of the District Act, the District's objectives and authority related to groundwater management are to recharge groundwater basins, conserve, manage and store water for beneficial and useful purposes, increase water supply, protect surface and groundwater from contamination, prevent waste or diminution of the District's water supply, and do any and every lawful act necessary to ensure sufficient water is available for present and future beneficial uses.

The District Act gives the District's Board of Directors (Board) the authority to adopt ordinances to carry out the District's authority under the District Act, including its authority to protect the county's groundwater resources. One such ordinance regulates the construction and destruction of wells and other deep excavations[5]. The District Act also provides the District with the authority to levy groundwater charges and to use those revenues to pay for the cost of constructing, maintaining and operating facilities that import water into the county, the costs of imported water, and the cost of constructing, maintaining and operating facilities which will conserve or distribute water within

[2] Santa Clara Valley Water District, Saltwater Intrusion Investigation, September 1980.
[3] California History Center & Foundation, Water in the Santa Clara Valley: A History, 2005.
[4] Santa Clara Valley Water District Act, Water Code Appendix, Chapter 60.
[5] Santa Clara Valley Water District Ordinance 90-1.

groundwater zones, including facilities for groundwater recharge, surface distribution, and the purification and treatment of such water.

1.3 PARTNERS IN GROUNDWATER MANAGEMENT

Although the District is the groundwater management agency in Santa Clara County per the District Act, many other agencies have significant roles, including local water retailers, land use agencies, and regulatory agencies.

Local water retailers maintain facilities to distribute water directly to their customers and are responsible for meeting applicable regulatory standards established by the U.S. Environmental Protection Agency (USEPA) and California Department of Public Health (CDPH). In addition to groundwater, local retailers may also serve treated water purchased from the District or potable water supplied by the City of San Francisco. Several retailers also maintain local surface water rights and distribute recycled water for non-potable uses. The maintenance of these supplies is critical to maintaining overall water supply reliability in the county. Every five years, the District and local water retailers coordinate to develop individual agencies' Urban Water Management Plans that evaluate water supply reliability over a 20 year period. For water retailers using groundwater, these plans show a continued reliance on groundwater in the future.

Land use agencies, including Santa Clara County and local cities, provide land use planning and permitting functions that play a role in water demand and land use decisions which may impact groundwater quality and recharge. General Plans adopted by land use agencies reflect each agency's policy with regard to future development and many of these plans contain goals to address water supply reliability and the protection of water resources, including groundwater. Land use agencies also permit and inspect hazardous material and waste storage and handling facilities through the fire departments. The Santa Clara County Department of Environmental Health also oversees the leaking underground fuel tank cleanup program, issues permits for septic systems, and regulates drinking water systems with 5 to 14 connections. Local land use agencies also administer stormwater management programs in compliance with National Pollutant Discharge Elimination System (NPDES) requirements.

The District relies on partnerships with regulatory agencies to protect groundwater resources. Agencies including the State Water Resources Control Board, the Department of Toxic Substances Control (DTSC), and the USEPA regulate the cleanup of contaminants in groundwater. Regional Water Quality Control Boards (Water Boards) also define the beneficial uses and water quality objectives for groundwater basins. Two Water Boards have regulatory jurisdiction over water resources in Santa Clara County, the San Francisco Regional Water Board and the Central Coast Water Board.

Figure 1-2 shows the general authorities, roles, and functions of these various agencies with regard to groundwater resources. It should be noted that this figure is intended to provide a general overview rather than a comprehensive list of individual agencies and functions.

Private well owners and the public are also important partners in protecting groundwater supplies. Private well owners are responsible for constructing, maintaining, and properly destroying wells so they do not act as vertical pathways for contaminants. The community also has a role in protecting groundwater supplies by using water wisely and helping reduce the introduction of contaminants from activities at the land surface.

There are also numerous statewide and national organizations engaged in issues related to groundwater, including the Association of California Water Agencies and the California Urban Water Agencies. The District works with these agencies and others on various proposals to protect groundwater resources.

Figure 1-2 Overview of Groundwater Management Roles

U.S. Environmental Protection Agency

Safe Drinking Water Act | Comprehensive Environmental Response, Compensation and Liability Act

- Establishes federal drinking water standards for public water systems
- Regulates cleanup of Superfund sites

California Environmental Protection Agency

Includes: Department of Toxic Substances Control | State Water Resources Control Board | Regional Water Quality Control Boards

California Water Code | Resource Conservation and Recovery Act | California Health and Safety Code

- Develops and implements environmental protection laws that ensure clean air, clean water, clean soil, safe pesticides and waste recycling and reduction
- Allocates water rights and adjudicates water right disputes
- Develops statewide water protection plans and establishes water quality standards
- Regulates facilities that treat, store, and dispose of hazardous waste
- Regulates cleanup of contaminated sites

California Department of Water Resources

California Water Code

- Guides development and management of water resources
- Operates the State Water Project
- Supports local and regional water management through technical and financial assistance.

California Department of Public Health

California Code of Regulations

- Establishes state drinking water standards and regulates public drinking water systems
- Permits recycled water projects

Santa Clara Valley Water District

Santa Clara Valley Water District Act

- Manages the Santa Clara and Llagas Subbasins in Santa Clara County
- Implements programs to protect and augment groundwater
- Conducts managed recharge and in-lieu recharge programs to offset groundwater pumping
- Permits wells and other deep excavations
- Operates and maintains water storage, treatment, distribution, and recharge facilities

Land Use Agencies

City Charters and Other Authorities

- Develop General Plans
- Permit land use and administer stormwater management programs
- Permit hazardous material storage and handling facilities
- Oversee the cleanup of leaking underground tanks (County)
- Regulates septic systems and small water systems (County)

Water Retailers

- Maintain facilities to deliver water to customers
- Ensure compliance with drinking water standards
- May maintain surface water rights or other sources of supply

Well Owners and the Community

- Responsible for maintaining, constructing, and properly destroying wells (well owners)
- Help protect groundwater by using water wisely and minimizing the introduction of contaminants

1.4 REPORT CONTENT AND ORGANIZATION

This 2012 GWMP brings together important information on groundwater management objectives, strategies, and related activities in Santa Clara County. The GWMP is intended to present information that will be useful to water retailers, land use planning agencies, cities, and community members interested in groundwater in Santa Clara County. The 2012 GWMP includes the following chapters:

Chapter 2 Water Supply System: This chapter provides an overview of the county's water supply system and groundwater subbasins.

Chapter 3 Basin Management Objectives and Strategies: This chapter describes the basin management objectives and strategies as well as their relationship to District policy.

Chapter 4 Basin Management Programs and Activities: This chapter describes District programs and activities that support the basin management objectives and strategies.

Chapter 5 Monitoring Programs and Protocols: This chapter summarizes District programs to monitor changes in groundwater levels, groundwater quality, land subsidence, and surface water.

Chapter 6 Outcome Measures: This chapter identifies specific outcomes to measure the effectiveness of basin management strategies and related programs in meeting the basin management objectives.

Chapter 7 Next Steps: This chapter describes future reporting related to the GWMP and discusses potential approaches to consider if the outcome measures indicate improvement is needed or to address future risks and changing conditions. It also includes recommendations for further work.

1.5 2012 GROUNDWATER MANAGEMENT PLAN

The District's prior Groundwater Management Plan was published in July 2001 and documented ongoing groundwater management programs. Since that time, SB 1938 and other legislation have amended the requirements for groundwater management plans[6]. Many of these requirements are not applicable for agencies such as the District which have the authority to manage groundwater pursuant to other provisions of law[7]. However, to maintain eligibility for state funding for projects relating to groundwater, certain requirements must be met, including the development of basin management objectives and components relating to the monitoring and management of groundwater and land subsidence.

[6] California Water Code §10753.
[7] California Water Code §10750.2(b)

This 2012 Groundwater Management Plan is prepared under existing groundwater management authority granted by the District Act. The purpose of the 2012 GWMP is to characterize the District's groundwater activities in terms of basin management objectives, strategies, and outcome measures. Benefits of preparing the 2012 GWMP include the:

- Development of clear basin management objectives that support the District mission and policies
- Documentation of the benefits of existing groundwater management programs and how they support basin management objectives and strategies
- Identification of potential actions that may be needed to achieve those objectives or respond to risks and changing conditions
- Ability to prioritize existing and future activities based on outcome measures
- Continued eligibility for funds administered by the California Department of Water Resources (DWR) for groundwater projects

The 2012 GWMP will describe existing and potential management actions to achieve basin management objectives. Clear documentation of these actions will help the District respond to risks and uncertainties that may impact the quality or quantity of groundwater supplies. These challenges include, but are not limited to, droughts, increased water demand, regulatory changes, contaminants of emerging concern, groundwater recharge limitations due to dam restrictions, reduced availability of imported water or other supplies, climate change, and intensified land development.

Basin Management Objectives

District Board of Directors Policy with regard to groundwater is reflected in Board Water Supply Objective 2.1.1: "Aggressively protect groundwater from the threat of contamination and maintain and develop groundwater to optimize reliability and to minimize land subsidence and salt water intrusion." In accordance with the District Act and this policy, the District has identified the following basin management objectives (BMO):

BMO 1: Groundwater supplies are managed to optimize water supply reliability and minimize land subsidence.

BMO 2: Groundwater is protected from existing and potential contamination, including salt water intrusion.

These basin management objectives, as well as the strategies to achieve them are described in detail in Chapter 3 of this report. Related programs and activities, monitoring, and outcome measures are described in Chapters 4 through 6.

Relation to Other District Studies

The 2012 GWMP provides information on basin conditions and operational considerations and documents groundwater management objectives, strategies and related activities. This information supports other District planning efforts including annual operations plans and other District efforts including the:

- Annual Protection and Augmentation of Water Supplies Report, which provides information on present and future water supply requirements and availability, discusses programs needed to sustain reliability, and presents the basis for recommended groundwater production charges in accordance with the District Act
- Urban Water Management Plan (UWMP) that evaluates water supply reliability over a 25-year period

- Salt and Nutrient Management Plan that assesses the loading of salt and nutrients to groundwater and identifies related management strategies
- Water Supply and Infrastructure Master Plan (Water Master Plan) that documents the District's strategy for ensuring long-term water supply reliability by specifying the needed water supplies to ensure a reliable water supply, identifying future infrastructure capacity needs, and defining operating strategies
- Planning to address specific water management issues, such as the San Luis Low Point Improvement Project and emergency operations planning in the Infrastructure Reliability Project, which could affect future groundwater management

The District plans to update the Groundwater Management Plan every five years, prior to updates of the Urban Water Management Plan, which is also on a five-year update cycle. The GWMP provides information on groundwater conditions and operational considerations, which are critical inputs to the UWMP in the evaluation of future water supply conditions. The Water Master Plan, which is also on a five-year update cycle, builds on the information in the both the GWMP and UWMP to update the District's long-term water supply strategy.

Water Code Components

In September 2002, SB 1938 was signed into law, modifying Section 10753 of the Water Code. Section 10753 states any local agency overlying all or part of a groundwater basin may by ordinance or resolution adopt and implement a groundwater management plan, unless the groundwater basin is being managed pursuant to other provisions of law or a court order, judgment, or decree. The District is the groundwater management agency for the Santa Clara and Llagas Subbasins as established by the District Act and the 2012 GWMP is prepared pursuant to its authority under the District Act. Therefore, many of the requirements of Water Code Section 10753 do not apply to the District's GWMP. However, to continue to be eligible for funds administered by DWR for groundwater projects, the District will adhere to certain portions of California Water Code Section 10753.7 that describe the mandatory components of a groundwater management plan that are required to maintain eligibility for state funding. Water Code Section 10753.8 also identifies several optional components for groundwater management plans. Table 1-1 below presents the mandatory and voluntary plan components and identifies where they can be found in the 2012 GWMP.

Table 1-1 Required and Voluntary Groundwater Management Plan Components

GWMP Required Components (Water Code Section 10753.7)	2012 GWMP Section
Prepare and implement basin management objectives	3, 6, 7
Include components relating to the monitoring and management of groundwater levels, groundwater quality degradation, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping	4, 5, 6
Include a description of how recharge areas identified in the plan substantially contribute to the replenishment of the groundwater basin	2.1, 2.3
Prepare a plan that enables the local agency to work cooperatively with other public entities	1.6, 4
Prepare a map that details the area of the groundwater basin, as defined in DWR Bulletin 118, and the area of the local agency, as well as the boundaries of other local agencies that overlie the basin in which the agency is developing a groundwater management plan	1.1, 2.3
Include a map identifying the recharge areas for the groundwater basin and provide this map to appropriate local planning agencies after adoption of the plan	2.3
Adopt monitoring protocols that are designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence, and surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin	5
If located outside the groundwater basins as delineated in Bulletin 118, shall use geologic and hydrologic principles appropriate to those areas	NA
GWMP Voluntary Components (Water Code Section 10753.8)	**2012 GWMP Section**
Control of saline water intrusion	2.3, 4.3, 3
Identification and management of wellhead protection areas and recharge areas	2.3, 4.2
Regulation of the migration of contaminated groundwater	1.5, 4.2
The administration of a well abandonment and well destruction program	4.2, 4.3
Mitigation of conditions of overdraft	2, 4.1, 3, 7
Replenishment of groundwater extracted by water producers	2.2, 4.1, 3, 7
Monitoring of groundwater levels and storage	4.1, 5, 6, 7
Facilitating conjunctive use operations	2, 3, 4.1, 6, 7
Identification of well construction policies	4.2.2
Construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects	2, 4
The development of relationships with state and federal regulatory agencies	1.5, 1.6, 4, 7
Review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination	1.6, 4.2, 4.3

1.6 PUBLIC OUTREACH FOR THE 2012 GWMP

The California Water Code describes the process for development and adoption of a groundwater management plan that includes public participation. A public hearing on the 2012 GWMP was held at a regularly-scheduled Board meeting and public notice for this hearing included advertisements in local newspapers and the posting of the draft 2012 GWMP on the District website. This publicly-noticed hearing and posted website information provided opportunities for public participation in the development and adoption of the 2012 GWMP. Notices, environmental documentation, and the Board resolution related to the 2012 GWMP are included in Appendix B.

In addition to the publicly-noticed hearing, the District presented information on the development of the GWMP at several meetings of the Water Retailers Groundwater Subcommittee, which includes representatives from local water retailers that depend on groundwater. The GWMP was included as an agenda item for discussion in March 2009, January 2012, and April 2012. Members of the Groundwater Subcommittee were also provided with a copy of the draft GWMP and were given an opportunity to provide feedback prior to finalizing the report.

A map showing the location of groundwater recharge areas will be provided to local land use agencies following adoption of the GWMP. The District will continue to work closely with local partners and the public using the following methods:

- Regularly scheduled meetings, including the Water Retailer Groundwater Subcommittee and publicly-noticed Board meetings
- Review and coordination with land use agencies on land use and development proposals as well as the development of guidelines related to specific issues (e.g., stormwater infiltration, graywater, septic systems)
- Technical coordination with regulatory agencies on contaminant release sites and policies related to groundwater
- Coordination with basin stakeholders and regulatory agencies on long-term resource planning efforts such as the Salt and Nutrient Management Plan
- Outreach including the development of fact sheets and web information and interaction with the public at open houses and other events

2 2012 GROUNDWATER MANAGEMENT PLAN
Water Supply Overview

The District carefully manages groundwater as part of a comprehensive water management network that includes various supplies and management tools. Groundwater management is not an isolated activity, but rather an integrated part of the District's overall water resources management system.

This chapter provides an overview of the county's water supply system and management, and describes the Santa Clara and Llagas Subbasins. The overview presented in this chapter provides important information to understand the basin management objectives, strategies, and related programs that are presented in later chapters.

2.1 WATER SUPPLY SOURCES

In order to meet the county's water needs while maintaining maximum efficiency and flexibility, the District utilizes a variety of water supply sources. The District's water supply system is comprised of storage, conveyance, recharge, treatment, and distribution facilities that include local reservoirs, groundwater subbasins, out-of-county groundwater banking, groundwater recharge facilities, treatment plants, imported supply, and raw and treated water conveyance facilities. Santa Clara County's diverse water supplies include locally developed and managed water, imported water, and recycled water.

Local Supplies

The District captures rainfall and runoff in 10 local reservoirs and has numerous water rights to divert and store local surface water from creeks and streams. Captured local surface water is used to replenish the groundwater subbasins through an actively managed recharge program and provides supply for the District's drinking water treatment plants. Appendix C contains more detailed information on District reservoirs and recharge facilities. Several water retailers also maintain local surface water rights.

Local groundwater subbasins provide some water supply from the deep infiltration of rainfall, but the amount of groundwater pumped far exceeds this natural groundwater yield. The county's groundwater subbasins serve several important functions in that they transmit, filter, and store water. Water from the District's managed recharge program and rainfall enters the subbasins through recharge areas and undergoes natural filtration as it is transmitted into deeper aquifers. This recharge replaces water pumped by groundwater users and helps avoid land subsidence. Storing surplus water in the groundwater subbasins enables part of the county's supply to be carried over from wet years to dry years. Because the groundwater subbasins are able to store the largest amount of local reserves, the District depends on maintaining adequate groundwater to get through extended dry periods or other outages[1].

A small, but important and growing source of water is recycled water, which is used for non-potable uses including irrigation, industry, and agriculture. Using recycled water helps conserve drinking water supplies, provides a drought-proof, locally-controlled water supply and reduces dependency on imported water and groundwater. The District has established partnerships with the four recycled water producers in the county to expand recycled water use.

[1] Santa Clara Valley Water District, Urban Water Management Plan, 2010.

Imported Supplies

Half of the county's water supply comes from hundreds of miles away - first as snow or rain in the Sierra Nevada range, then as water in rivers that flow into the Sacramento-San Joaquin Delta or directly to water conveyance systems. Imported water is brought into the county through the complex infrastructure of the State Water Project (SWP), the federal Central Valley Project (CVP), and San Francisco's Hetch Hetchy system. The District purchases water under long-term contracts, short-term water transfers, and water exchanges. The most significant imported water contracts include those with the SWP and CVP. The District also has a long-term agreement with the Semitropic Groundwater Storage Program to store water in the Kern County groundwater basin for future use. This out-of-county banking provides the District with additional flexibility to divert some of its imported supplies in wet years for use in years when it is needed, such as during multi-year droughts or other supply shortages. The Semitropic Water Bank is an exchange program, meaning that the District does not take groundwater directly from the groundwater basin at Semitropic. Rather, the District receives its water by exchanging its banked water with other SWP water pumped from the Delta. Imported water is sent to the District's three water treatment plants, directly to the recharge ponds or creeks, or to local reservoirs for later release to supplement groundwater recharge.

Eight local water retailers in the northern portions of the county receive imported water directly from the San Francisco Public Utility Commission (SFPUC) Hetch Hetchy system: Milpitas, San Jose Municipal Water System, Santa Clara, Sunnyvale, Palo Alto, Mountain View, Stanford, and the Purissima Hills Water District (serving Los Altos Hills). The District and SFPUC have also constructed an intertie that allows for the exchange of water between the two systems in the event of a facility failure or outage in either system, either planned or unplanned.

Average water supply use and supplies for both North County and South County are shown below in Figures 2-1 and 2-2, respectively. As shown in Figure 2-1, Hetch Hetchy imports account for nearly 20 percent of the water supply in North County. Water imported by the District through the SWP and CVP and used for groundwater recharge provides 36% of North County groundwater used. The District's imported water supplies also provide 86% of the water used at water treatment plants. In South County, the District's imported supplies provide 26% of the groundwater water used. An interruption or outage of Hetch Hetchy or other imported supplies could have significant impacts on the county's water supply reliability.

2.2 CONJUNCTIVE USE

Nearly half of the water used in Santa Clara County is pumped from groundwater, one of the county's greatest natural resources. The District was initially formed to stop groundwater overdraft and land subsidence and preventing the recurrence of these conditions remains a key driver for water supply management. Since the 1930s, the District's water supply strategy has been to maximize conjunctive use, the coordinated management of surface and groundwater supplies, to enhance water supply reliability. Local groundwater resources make up the foundation of the county's water supply, but they need to be augmented by the District's comprehensive water supply management activities in order to reliably meet the needs of county residents, businesses, agriculture and the environment. These activities include the managed recharge of imported and local supplies, in-lieu groundwater recharge through the provision of treated surface water and acquisition of supplemental water supplies, and programs to protect, manage and sustain water resources.

Managed Recharge

The District's managed recharge program uses both runoff captured in local reservoirs and imported water delivered by the raw water conveyance system to recharge groundwater through more than 390 acres of recharge ponds and over 90 miles of local creeks. Between 2009 and 2011, the District recharged an average of 100,000 AF of local and imported water each year[2]. As shown in Figures 2-1 and 2-2, the managed recharge of District imported water and water stored in local reservoirs accounts for the majority of groundwater used in the county. The District's managed recharge facilities are shown in Figure 2-3 and a more detailed description of the District's managed recharge facilities can be found in Appendix C.

Recharge capacity can be viewed as processing capacity, meaning that surface water recharged through surface spreading is filtered by the soils and distributed to groundwater extraction facilities through the groundwater subbasins; much like water is treated by water treatment plants and distributed to the retailers through the District's distribution pipelines.

Maintaining the District's active managed recharge program requires ongoing operational planning for the distribution of local and imported water to recharge facilities; maintenance and operation of reservoirs, diversion facilities, distribution systems, and recharge ponds; and the maintenance of water supply contracts, water rights, and relevant environmental permits.

[2] Santa Clara Valley Water District, Protection and Augmentation of Water Supplies Report, February 2012.

Figure 2-1 North County Water Supply and Use (2006-2010)

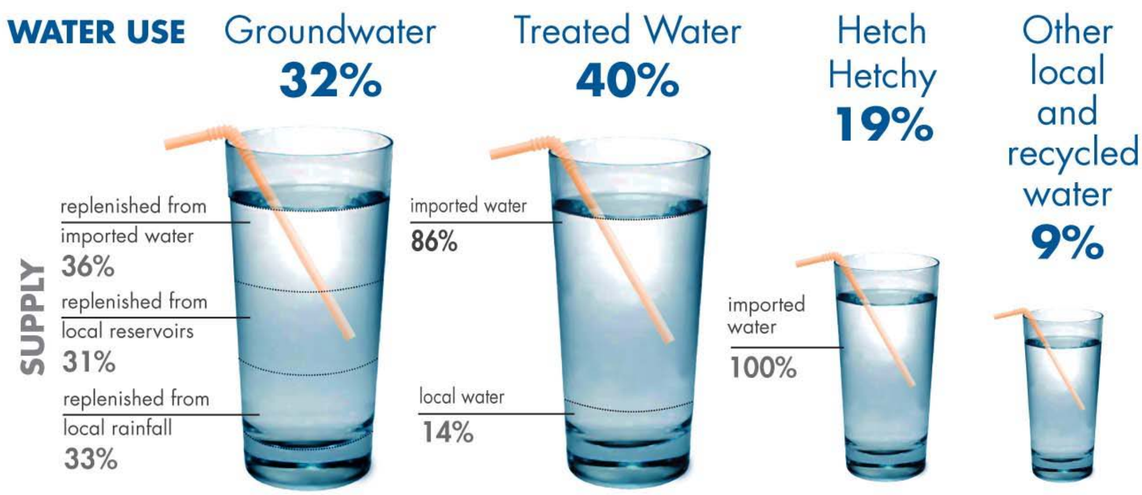


Figure 2-2 South County Water Supply and Use (2006-2010)

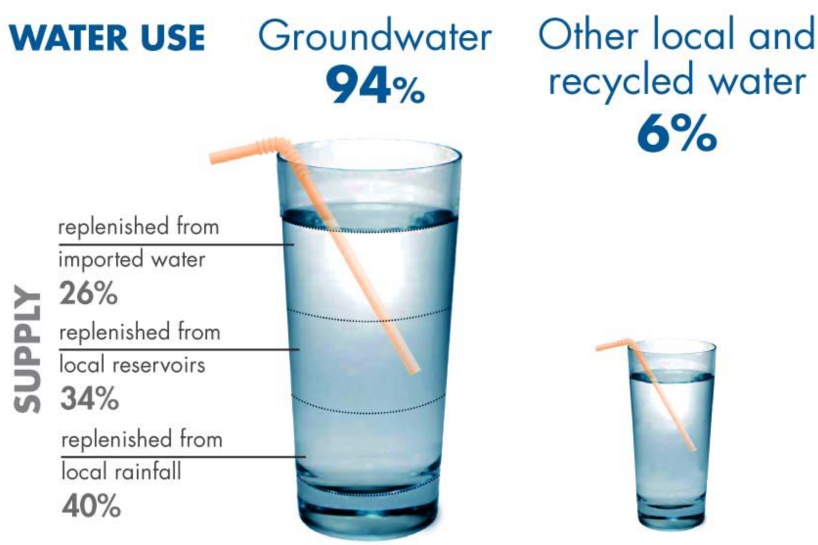
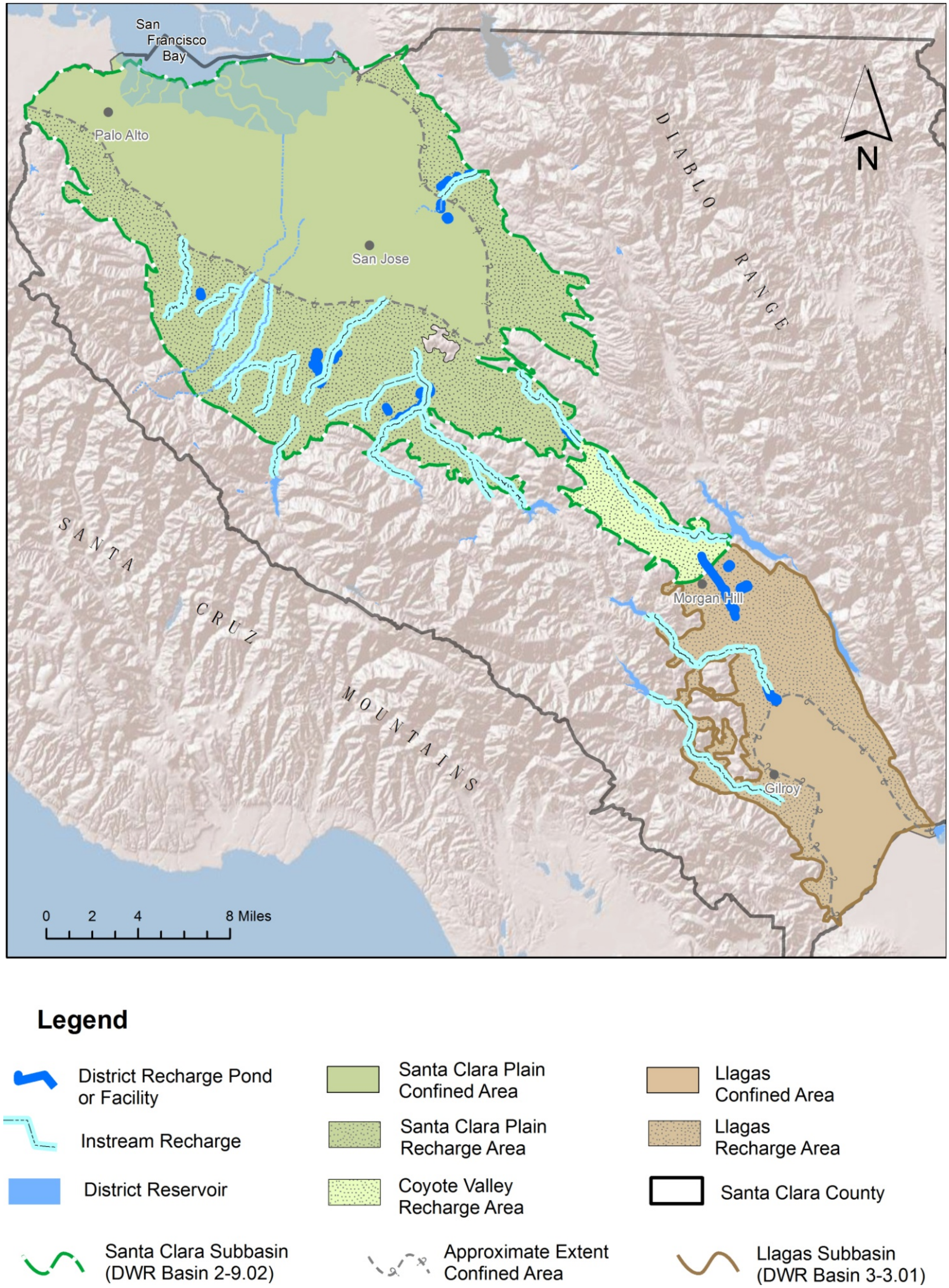


Figure 2-3 District Managed Recharge Facilities



In-Lieu Recharge

Just as important as managed recharge are the District's in-lieu recharge programs, including treated water deliveries, water recycling, and water conservation. These activities indirectly help keep groundwater supplies from diminishing and the land from subsiding by reducing demands on the groundwater subbasins. By meeting demands that would otherwise be met by groundwater, these programs provide in-lieu recharge as if the groundwater subbasins had been recharged by that amount.

The District owns and operates three water treatment plants and distributes the treated surface and imported water to 7 of the 13 water retailers through the District's treated water distribution system. These treatment plants have a combined treatment processing rate of over 200 million gallons per day, reducing groundwater pumping needs in the northern Santa Clara Valley.

The District encourages recycled water development in the county through partnerships with the local wastewater agencies and through financial incentives and technical assistance. An estimated 15,000 AF of recycled water was used in 2011, offsetting demands that might otherwise have been met through other potable supplies such as additional groundwater pumping. Similarly, in fiscal year 2011, the District's water conservation program saved an estimated 52,500 AF of water.

Benefits of Conjunctive Use Programs

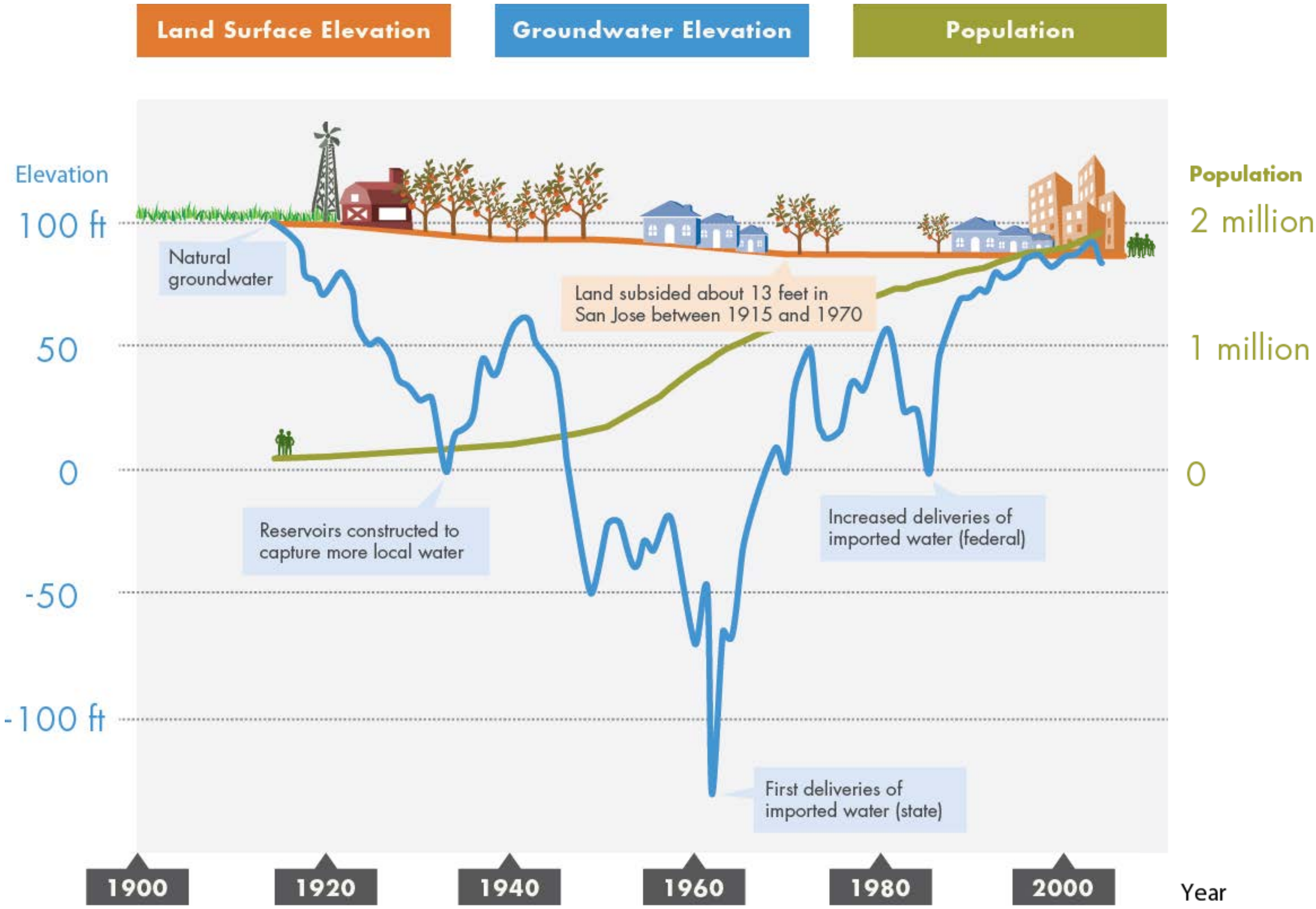
Without the District's conjunctive use programs, groundwater elevations would be considerably lower than they are today, reducing water supply reliability and increasing the risks of continued land subsidence and salt water intrusion. Figure 2-4 illustrates the history of groundwater elevations and land subsidence in Santa Clara County and the role of District water management programs in maintaining groundwater elevations and reducing the rate of land subsidence. This figure shows several time periods with steep declines in groundwater levels due to significant increases in population and overreliance on groundwater. However, the construction of reservoirs for groundwater recharge and the importation of water resulted in the significant recovery of groundwater levels following these actions. The figure also depicts the long-term and permanent effects of land subsidence.

2.3 GROUNDWATER SUBBASINS

This section provides an overview of the Santa Clara and Llagas Subbasins. A more detailed description can be found in Appendix D.

The groundwater subbasins provide multiple benefits to residents and businesses in Santa Clara County. As shown in Figures 2-1 and 2-2, most of the groundwater pumped is a result of District recharge programs using imported water and water stored in District reservoirs. The subbasins also provide some groundwater supply resulting from the percolation of rainfall in the recharge areas and natural seepage through local creeks and streams. In addition, the groundwater subbasins serve as an extensive conveyance network, allowing water to move from the recharge areas to individual groundwater wells. The groundwater subbasins also provide some natural filtration of surface water as it percolates through the soil and rock. Unlike surface water, most groundwater in the county can be used for drinking water without additional treatment. Lastly, the groundwater subbasins provide water storage, allowing water to be carried over from the wet season to the dry season and even from wet years to dry years.

Figure 2-4 History of Groundwater Elevations and Land Subsidence in Santa Clara County

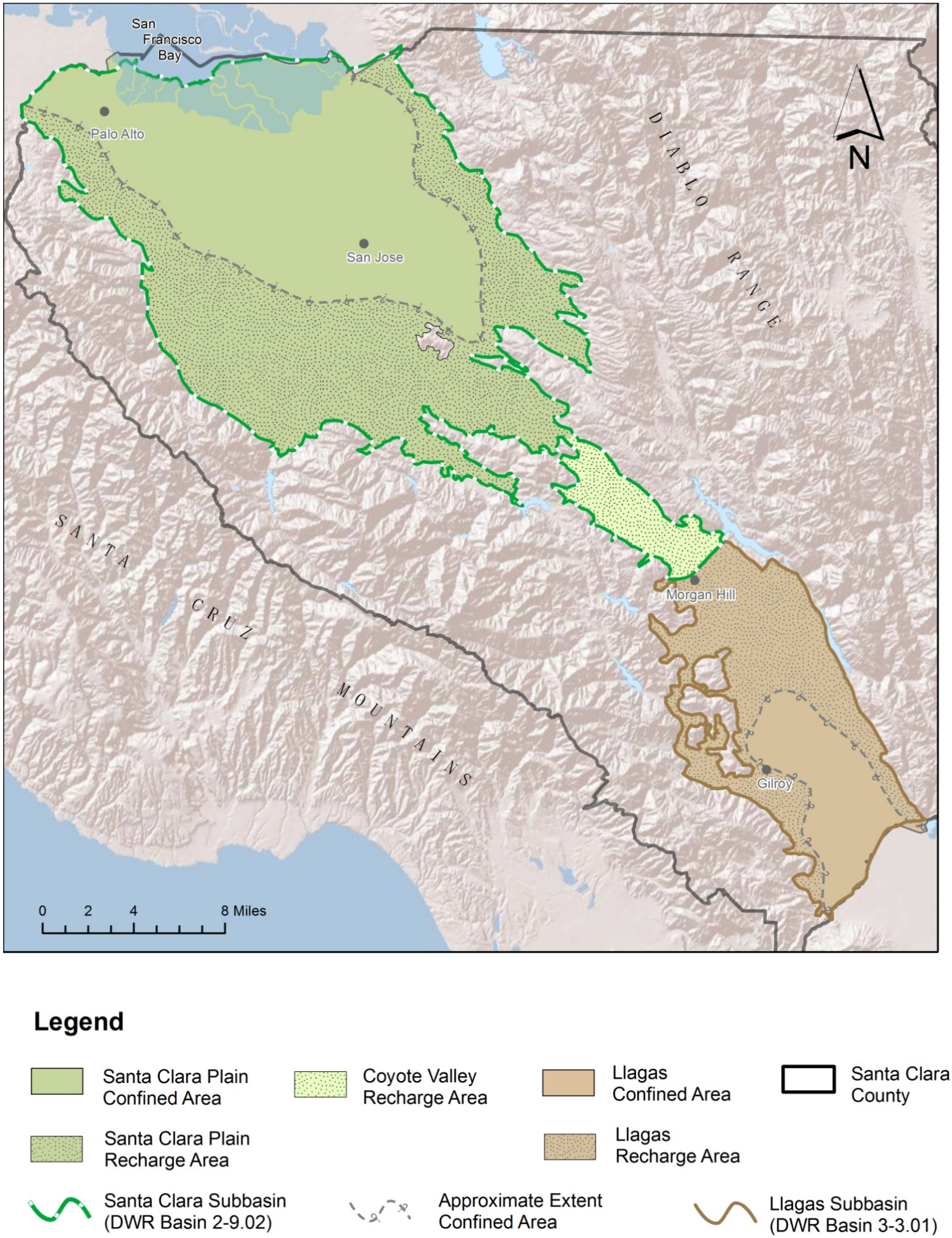


Santa Clara County includes portions of two groundwater basins as defined by the California Department of Water Resources (DWR)[3]: the Santa Clara Valley Basin (Basin 2-9) and the Gilroy-Hollister Valley Basin (Basin 3-3). This plan covers only the groundwater subbasins within Santa Clara County managed by the District: the Santa Clara Subbasin (Subbasin 2-9.02) and the Llagas Subbasin (Subbasin 3-3.01), which cover a surface area of approximately 385 square miles (Figure 2-5). Due to different land use and management characteristics, the District further delineates the Santa Clara Subbasin into two management areas: the Santa Clara Plain and the Coyote Valley. As shown in Figure 2-5, there are some minor discrepancies in the subbasin boundaries as shown by DWR and the District. District staff is working with DWR to resolve these minor differences and update the subbasin boundaries for the county to reflect the most current knowledge of the subbasins.

Both the Santa Clara and Llagas Subbasins are divided into confined and recharge areas. Within confined areas, laterally extensive low permeability clays and silts (confining units or aquitards) divide upper and lower aquifers. The District refers to these as the shallow and principal aquifers, with the latter defined as aquifer materials greater than 150 feet below ground surface. Confining units impede the vertical flow of groundwater, causing principal aquifers to be under pressure. By restricting the movement of contaminants, confining units also provide some natural protection to principal aquifers. Recharge areas are primarily comprised of high permeability aquifer materials like sands and gravels that allow surface water to infiltrate into the aquifers. Most groundwater recharge occurs in these areas through the infiltration of precipitation and the District's managed recharge to augment groundwater supplies.

[3] California Department of Water Resources, Bulletin 118, 2003.

Figure 2-5 Santa Clara County Groundwater Subbasins



2.3.1 Santa Clara Subbasin

The Santa Clara Subbasin (Basin 2-9.02) extends from the southern edge of San Francisco Bay through the Coyote Valley, with the subbasin boundary approximately located at Cochrane Road in Morgan Hill. The thickness of the aquifer materials ranges from about 150 feet near the Coyote Narrows to more than 1,500 feet in the interior of the subbasin. Groundwater movement generally follows surface water patterns, flowing towards the interior of the subbasin and northerly towards San Francisco Bay. As mentioned previously, the District further delineates the Santa Clara Subbasin into two management areas: the Santa Clara Plain and the Coyote Valley.

Santa Clara Plain Hydrogeology

The Santa Clara Plain is the northern portion of the Santa Clara Subbasin (Basin 2-9.02) and extends from southern San Francisco Bay to the Coyote Narrows, near Metcalf Road. The Santa Clara Plain is divided into confined and recharge areas. The confined area is located in the northern and central portion while the recharge area occurs along the edges of the subbasin adjacent to the foothills. Except during periods of extended drought and significantly lowered water levels in the principal aquifer, the vertical gradient in much of the confined area is upward. The gradient in the recharge area and near the edge of the confined area/recharge area boundary is downward.

The Santa Clara Plain is vulnerable to land subsidence, with approximately 13 feet of inelastic (permanent) subsidence observed in San Jose between 1915 and 1969 due to groundwater overdraft. As a result of overdraft, fluid pressure in the aquifers was reduced, resulting in the compression of clay layers and a sinking of the land surface. The land surface subsided by 3 to 6 feet in a larger area which encompasses north San Jose, Santa Clara, Sunnyvale, and Mountain View. Serious problems developed as a result of subsidence including flooding of lands adjacent to San Francisco Bay, decreased ability of local streams to carry away winter flood waters, and damage to well casings. It is estimated that subsidence resulted in at least $30 to $40 million in damage (in 1982 dollars)[4]. This necessitated the construction of additional dikes, levees, and flood control facilities to protect properties from flooding. Figure 2-6 shows historical land subsidence between 1934 and 1967.

Significant inelastic subsidence was essentially halted by about 1970 through the District's expanded conjunctive use programs, which allowed artesian heads to recover substantially. Even with the managed recharge of local and imported water, groundwater alone cannot support this heavily urbanized area, and programs that reduce or offset groundwater pumping (like treated water deliveries and water conservation) are critical to avoid overdraft, additional permanent land subsidence, and salt water intrusion.

Due to high groundwater pumping and land subsidence after World War II, salt water intrusion was observed in the shallow aquifer of the Santa Clara Plain in an area bounded on the south by Highway 101 and Interstate 880. This was mainly caused by the inland migration of saline water through tidal creeks and subsequent transport to groundwater through streambed percolation and downward vertical gradients between shallow and principal zones. Although salt water intrusion has occurred in shallow aquifers near the Bay, significant effects have not been observed in the principal aquifer and many wells monitored are showing decreases in chloride[5].

The operational storage capacity of the Santa Clara Plain has previously been estimated to be 350,000 AF[6]. The operational storage capacity is less than total storage capacity as it accounts for the avoidance of adverse impacts such as inelastic land subsidence and salt water intrusion. The District is currently working to refine the operational storage capacity estimate based on historically observed data.

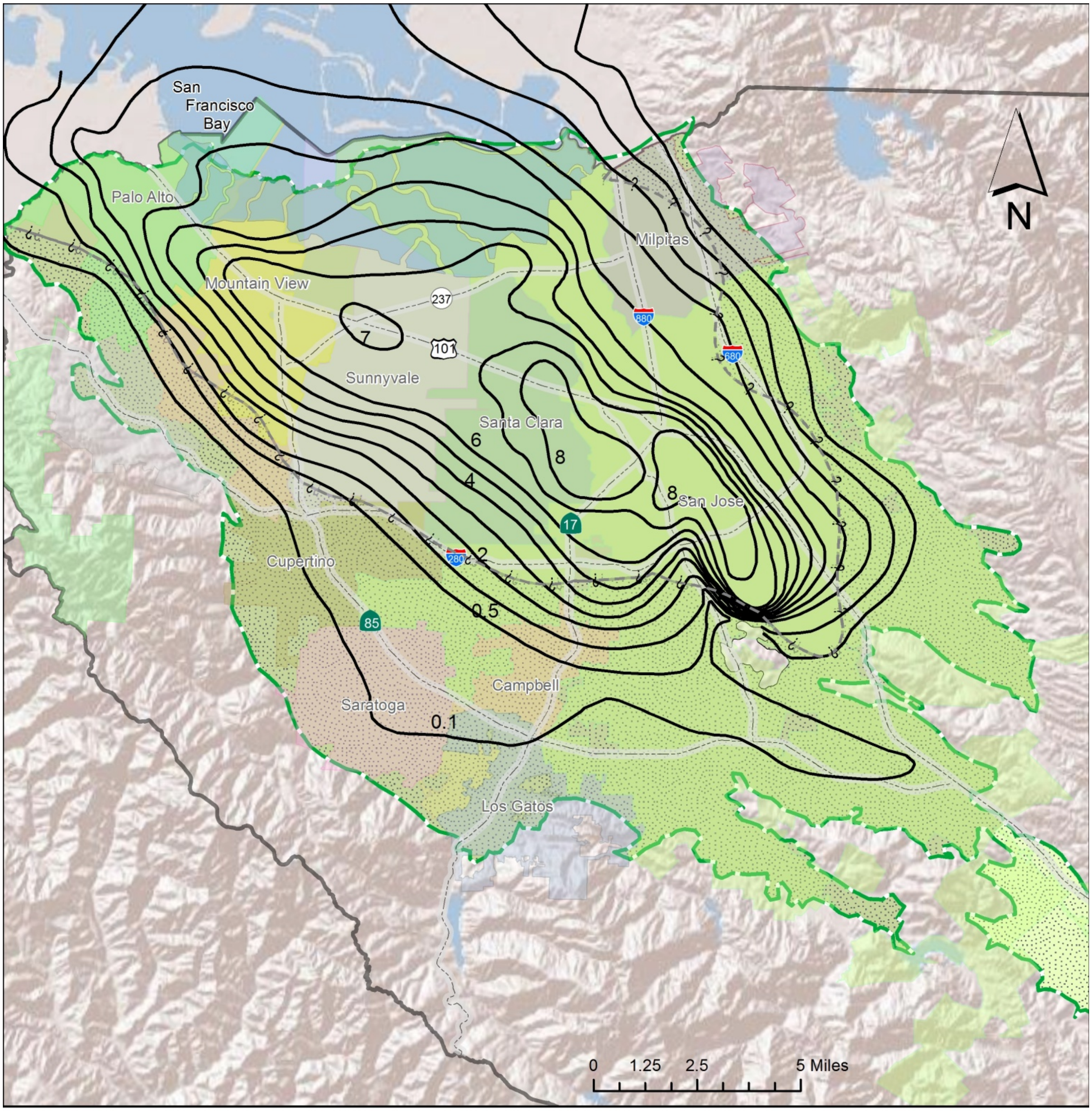
[4] USGS, Land Subsidence in the Santa Clara Valley, California as of 1982, Professional Paper 497-F, 1988.
[5] Santa Clara Valley Water District, 2010 Groundwater Quality Report, June 2011.
[6] Santa Clara Valley Water District, 2001 Groundwater Management Plan, July 2001.

Groundwater levels in the Santa Clara Plain are currently above subsidence thresholds and the risk of inelastic land surface subsidence is low. Predominantly upward vertical gradients in the confined zone minimize the risk of salt water intrusion. A typical hydrograph for the Santa Clara Plain is shown below in Figure 2-7. Groundwater quality in the Santa Clara Plain is typically very good. In 2010, three principal aquifer zone wells out of 166 tested contained contaminants above the Maximum Contaminant Level (MCL) for aluminum or nitrate[4]. This includes testing at both private domestic wells and public water supply wells (which must meet drinking water standards and may blend or treat the water prior to delivery).

Santa Clara Plain Pumping

In 2010, groundwater pumping in the Santa Clara Plain was approximately 81,100 AF. As shown on Figure 2-8, 96% of the water pumped was for municipal and industrial uses, with minor amounts used for agriculture and domestic purposes. Figure 2-8 also shows the number of wells reporting groundwater pumped for each of these uses in 2010. It should be noted that a single well may be used for more than one purpose. Water retailer pumping accounted for nearly 90% of the groundwater pumped from the Santa Clara Plain in 2010. Although there is some variation from year to year, this represents typical recent pumping patterns for the Santa Clara Plain.

Figure 2-6 Historical Land Subsidence in the Santa Clara Plain



Legend

Historical Land Subsidence between 1934 and 1967 (in feet as labeled, subsidence prior to 1934 is not shown)

Santa Clara Plain Confined Area

Santa Clara Plain Recharge Area

Coyote Valley Recharge Area

Santa Clara County

Santa Clara Subbasin (DWR Basin 2-9.02)

Approximate Extent Confined Area

Figure 2-7 Groundwater Level at Santa Clara Plain Well 07S01W25L001

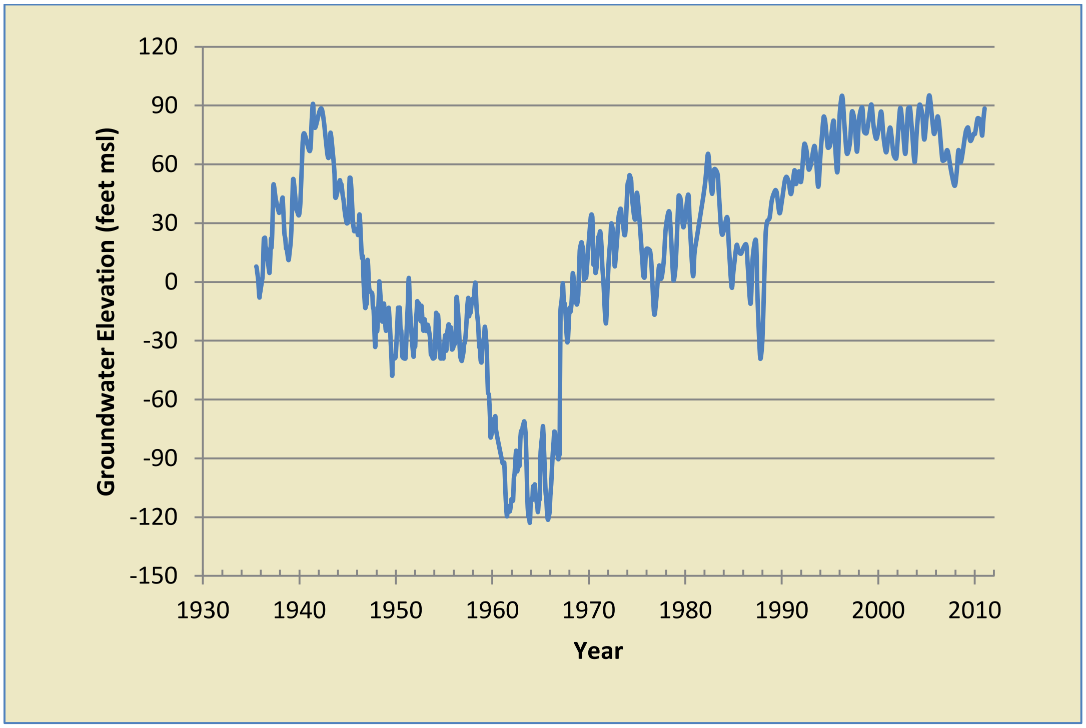
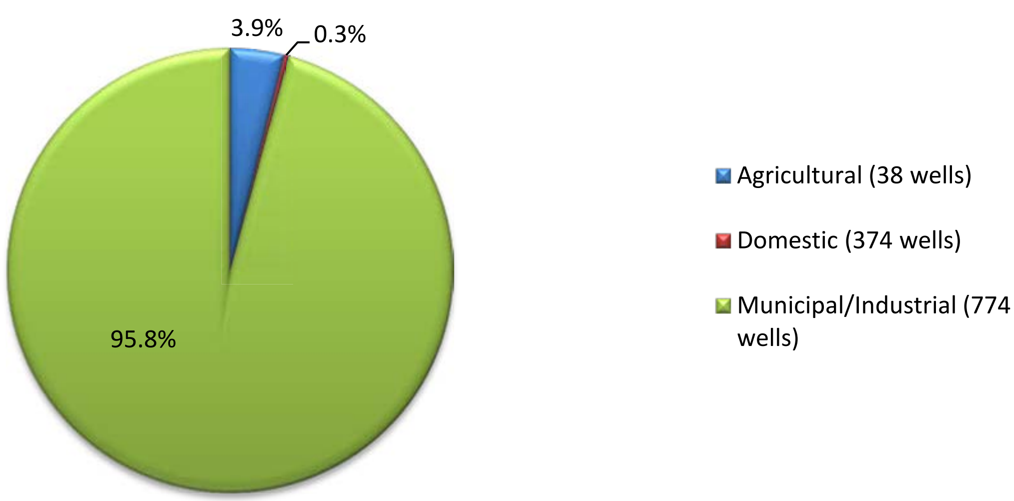


Figure 2-8 Santa Clara Plain 2010 Groundwater Use



Santa Clara Plain Water Budget

As shown in Figure 2-9, long-term groundwater pumping for the Santa Clara Plain averages about 95,000 AF per year based on data from 2002 to 2011. Historical pumping has been as high as 180,000 AF per year, although not without adverse impacts including inelastic land subsidence. The subsurface outflow from the Santa Clara Plain, which includes outflow to San Francisco Bay, was 6,000 AF. Average recharge to the Santa Clara Plain is estimated to be about 94,000 AF per year and sources include the District's managed recharge of local and imported water, the deep percolation of rainfall, natural seepage from creeks, and subsurface inflow from surrounding hills (mountain front recharge). On average, about two-thirds of recharge to the Santa Clara Plain comes from the District's managed recharge program. Subsurface inflow from adjacent aquifer systems including the Coyote Valley is estimated to be about 8,000 AF per year. The average annual change in groundwater storage between 2002 and 2011 is approximately 1,000 AF.

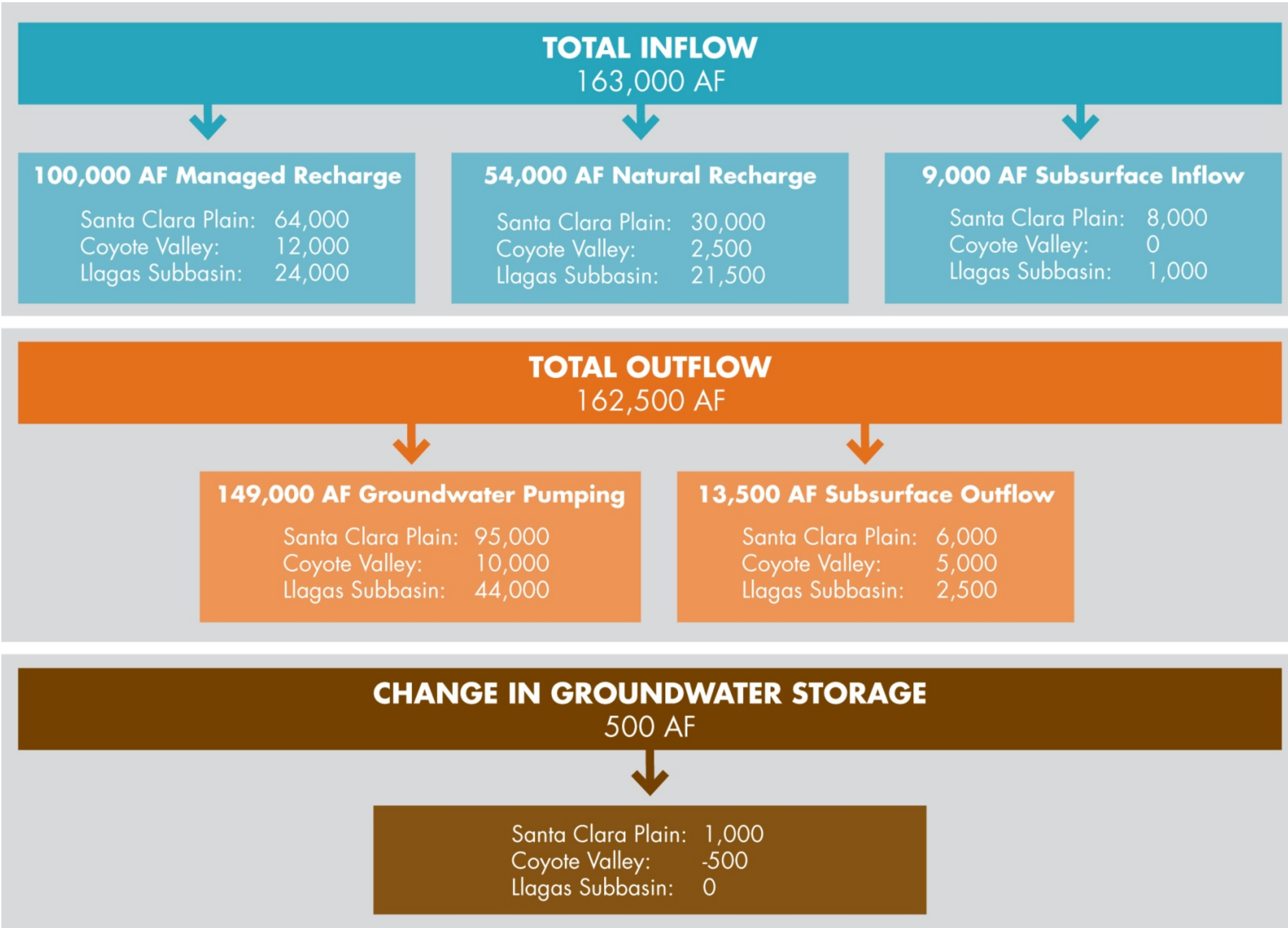
Santa Clara Plain Challenges

Many water retailers overlying the Santa Clara Plain identify groundwater pumping as an emergency backup supply in case of outage or shortage in their other supplies, so it is critical that these other supplies are maintained and that groundwater pumping levels are monitored to ensure that subsidence is not reinitiated. Other challenges include uncertainties in surface water supplies, including constraints and risks related to Delta exports, Hetch Hetchy interruptible contract terms, and climate change. Significant changes in groundwater pumping due to these challenges will increase the risk of renewed land subsidence and salt water intrusion.

In many ways, the Santa Clara Plain has the greatest water supply management flexibility. This area receives recharge water through a number of recharge facilities, using both local and imported water (both the CVP and SWP). It also has the greatest variety of in-lieu recharge programs available, with District treated water sales and Hetch Hetchy deliveries to the area's water retailers, as well as recycled water programs from three wastewater plants.

With a few notable exceptions, including the IBM and Fairchild Superfund sites, drinking water impacts from contamination have been relatively minor, considering the intensity of urbanization and the number of contaminant release sites in the area. However, intensified land use, salt loading, emerging contaminants, expanded recycled water use in recharge areas, and more stringent water quality regulations present significant challenges to groundwater protection. In addition to natural protection provided to the principal aquifer by clay layers in the confined zone, the District's well construction and destruction programs, coordination with land use and regulatory agencies, and the upward pressures and dilution resulting from the District's managed recharge program have helped reduce the migration of pollution into deeper drinking water aquifers. These programs, as well as groundwater monitoring to detect adverse trends, should be continued to help address risks related to groundwater quality.

Figure 2-9 2002 to 2011 Average Groundwater Budget for the Santa Clara Plain, Coyote Valley, and Llagas Subbasin



Notes:

1. Managed recharge represents direct replenishment by the District using local and imported water.
2. Natural recharge includes all uncontrolled recharge, including the deep percolation of rainfall, septic system and/or irrigation return flows, and natural seepage through creeks.
3. Subsurface inflow represents inflow from adjacent aquifer systems. In the Santa Clara Plain, this includes inflow from the Coyote Valley. In the Llagas Subbasin, it represents inflow from the Bolsa Subbasin in San Benito County.
4. Groundwater pumping is based on pumping reported by water supply well owners.
5. Subsurface outflow represents outflow to adjacent aquifer systems. In the Santa Clara Plain, this includes outflows to San Francisco Bay. In Coyote Valley, this includes outflow to the Santa Clara Plain, and in the Llagas Subbasin, this includes outflows to the Bolsa Subbasin in San Benito County.

Coyote Valley Hydrogeology

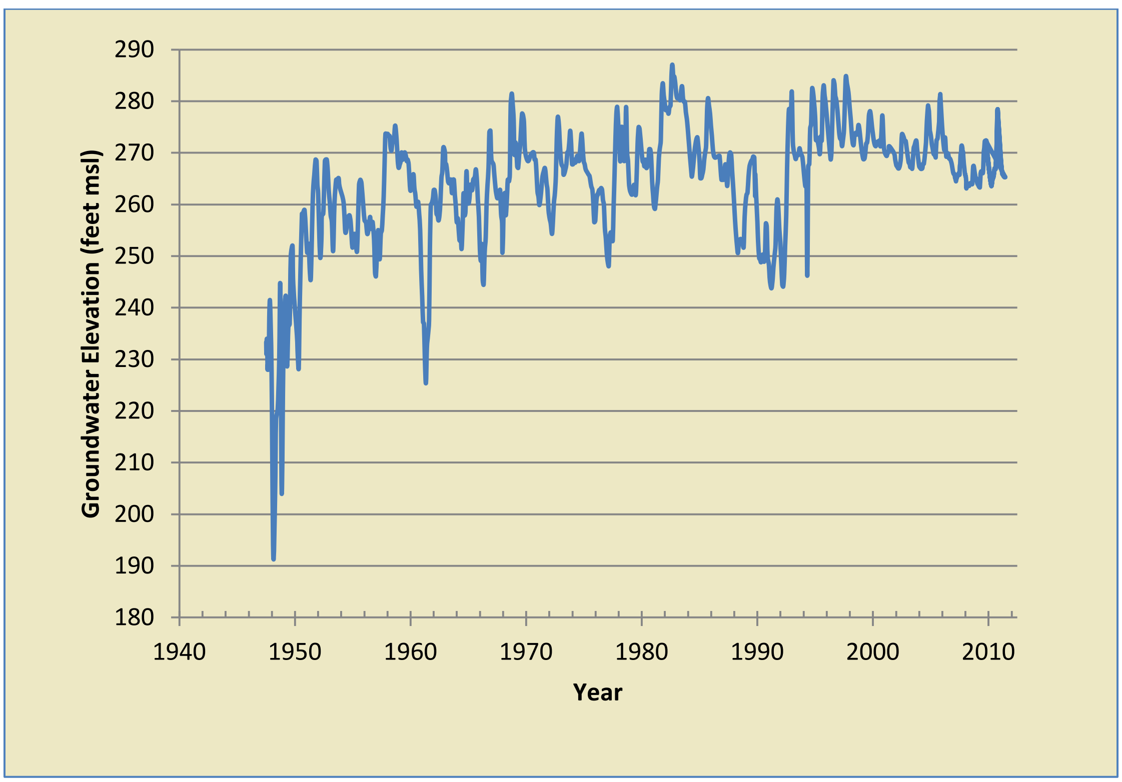
The Coyote Valley, the southern portion of the Santa Clara Subbasin, extends from the Coyote Narrows in the north to Cochrane Road in the south, where it borders the Llagas Subbasin. Unlike the Santa Clara Plain, no significant laterally extensive silt or clay layers exist, and groundwater occurs under unconfined conditions. The Coyote Valley is not vulnerable to land subsidence.

Groundwater is often quite shallow and is typically found between 5 and 40 feet below ground surface, generally flowing northwest and draining into the Santa Clara Plain. Groundwater is the only source of water for water users in the area and most residents rely on private wells. Groundwater levels in the Coyote Valley respond rapidly to changes in hydrology and pumping. Local groundwater moves toward areas of intense pumping, especially at the southeastern and northern parts of the subbasin where retailer groundwater production wells are located.

The operational storage capacity of the Coyote Valley has previously been estimated to range between 23,000 and 33,000 AF[7]. The operational storage capacity is less than total storage capacity as it accounts for the avoidance of adverse impacts. The District is currently working to refine the operational storage capacity estimate based on historically observed data.

Typical groundwater levels for the Coyote Valley are shown below in Figure 2-10. Groundwater quality in the Coyote Valley is generally good. In 2010, 3 wells tested contained contaminants above the MCL for aluminum or nitrate[8]. This includes testing at both private domestic wells and public water supply wells (which must meet drinking water standards and may blend or treat the water prior to delivery).

Figure 2-10 Groundwater Level at Coyote Valley Well 09S02E02J002



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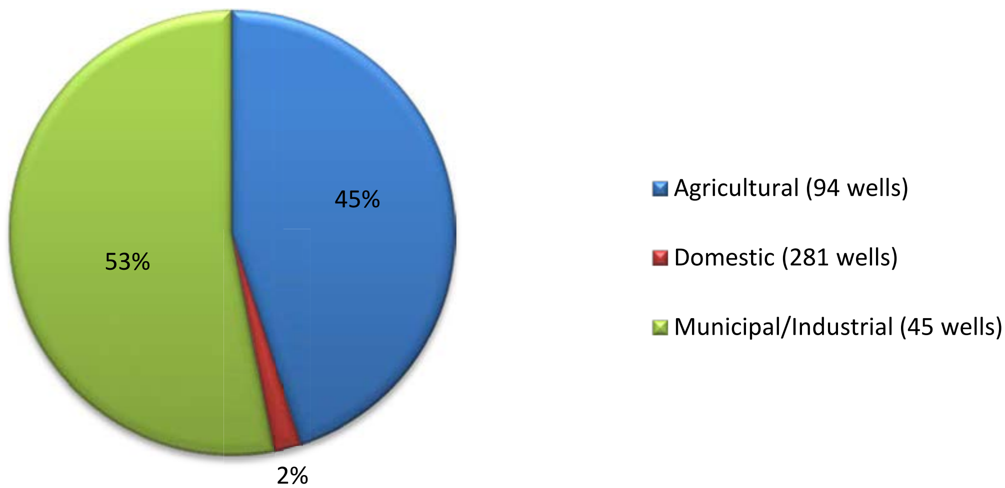
[7] Santa Clara Valley Water District, Operational Storage Capacity of the Coyote and Llagas Groundwater Subbasins, April 2002.

[8] Santa Clara Valley Water District, 2010 Groundwater Quality Report, June 2011.

Coyote Valley Pumping

In 2010, groundwater pumping in the Coyote Valley was approximately 12,300 AF. As shown on Figure 2-11, over half (53%) of groundwater pumped was for municipal and industrial uses (M&I) and 45% of groundwater pumped was used for agriculture. Only 2% of groundwater pumping was for domestic use, although more wells reported domestic use than M&I or agriculture. It should be noted that a single well may be used for more than one purpose. Pumping by water retailers accounted for over 60% of pumping in the Coyote Valley in 2010. Although there is some variation from year to year, this figure represents typical recent pumping patterns for the Coyote Valley.

Figure 2-11 Coyote Valley 2010 Groundwater Use



Coyote Valley Water Budget

The average groundwater pumping between 2002 and 2011 is about 10,000 AF per year as shown in Figure 2-9. The subsurface outflow, which includes flows to the Santa Clara Plain, is estimated to be about 5,000 AF per year. Annual recharge is estimated to be about 14,500 AF per year, with approximately 80 percent of that coming from the District's managed recharge. Natural sources of recharge include the deep percolation of rainfall, subsurface inflow from surrounding hills (mountain front recharge), natural seepage from creeks, and return flows from septic systems and irrigation. Coyote Valley is dependent on Coyote Creek for its water supply, which is predominately fed by District releases from the Anderson-Coyote reservoir system and CVP imported water. The average annual change in storage between 2002 and 2011 is approximately -500 AF.

Coyote Valley Groundwater Challenges

The Coyote Valley is on the threshold of change. Although it has been largely rural with very little increase in water demand over many years, groundwater pumping has increased dramatically since 2006 with the addition of water retailer wells extracting groundwater for use in other areas. Because water supply reliability in the Coyote Valley is dependent on managed recharge, this area has similar water supply uncertainties as the Santa Clara Plain, including constraints and risks related to Delta exports and seismic operating restrictions on local reservoirs. In addition, the area is within the Sphere of Influence of the City of San Jose, which has considered the area for significant future urban development. Significant changes in groundwater pumping due to these challenges will increase the risk of groundwater overdraft. As an unconfined aquifer with little separation between the land surface and groundwater surface, this area is highly sensitive to potential groundwater contamination.

Currently, water supply management flexibility in the Coyote Valley is limited. Historically, low-lying areas in the north and western portions of the valley have experienced drainage difficulties, including high groundwater conditions. Maintaining groundwater supplies while avoiding nuisance high-groundwater conditions is a challenge made more difficult by the important fishery and habitat needs supported by stream flows in Coyote Creek.

2.3.2 Llagas Subbasin

The Llagas Subbasin (Basin 3-3.01) lies to the south of the Santa Clara Subbasin. The Llagas Subbasin extends from a groundwater divide in the north at Cochrane Road to the Pajaro River in the south.

Llagas Subbasin Hydrogeology

The subbasin consists of a number of discontinuous layers of gravel and sand (aquifer materials) and clay and silt (confining units) at various depths beneath the ground surface. Similar to the Santa Clara Plain, the Llagas Subbasin is divided into confined and recharge areas. The recharge area occurs in the northern portion of the subbasin and along the edges of the subbasin adjacent to the foothills. Groundwater occurs under unconfined conditions in the recharge area. In the southern portion of the subbasin, clays and silts become more vertically and laterally extensive, forming a confined area. Within the confined area, laterally-extensive clays and silts divide aquifer materials into shallow and principal zones. Studies conducted using satellite images to measure changes in land surface elevation do not indicate evidence of land subsidence in the Llagas Subbasin[9]. Groundwater movement generally follows surface water patterns, draining south toward the Pajaro River.

The operational storage capacity of the Llagas Subbasin has previously been estimated to range between 152,000 and 165,000 AF[10]. The operational storage capacity is less than total storage capacity as it accounts for the avoidance of adverse impacts. The District is currently working to refine the operational storage capacity estimate based on historically observed data.

Typical groundwater levels for the Llagas Subbasin are shown below in Figure 2-12. Groundwater quality in the Llagas Subbasin is good, with the exception of nitrate and perchlorate. In 2010, the number of wells in principal aquifer zone containing nitrate or perchlorate above the MCL was 9 and 2, respectively, out of 69 wells tested[11]. This includes testing at both private domestic wells and public water supply wells (which must meet drinking water standards and may blend or treat the water prior to delivery).

Llagas Subbasin Pumping

In 2010, groundwater pumping in the Llagas Subbasin was approximately 40,000 AF. As shown on Figure 2-13, nearly half (49%) of groundwater pumped was for agricultural uses while 46% was for municipal and industrial uses. Similar to the Coyote Valley, a small amount of groundwater pumping was for domestic use (5%), although that small use represents over 2,300 individual wells. It should be noted that a single well may be used for more than one purpose. Pumping by water retailers accounted for over 60% of pumping in the Llagas Subbasin in 2010.

[9] Burgmann, R. and Johanson, I. for Santa Clara Valley Water District, South County Subsidence Study, 2005.
[10] Santa Clara Valley Water District, Operational Storage Capacity of the Coyote and Llagas Groundwater Subbasins, April 2002.
[11] Santa Clara Valley Water District, 2010 Groundwater Quality Report, June 2011.

Although there is some variation from year to year, this figure represents typical recent pumping patterns for the Llagas Subbasin.

Figure 2-12 Groundwater Level at Llagas Subbasin Well 10S03E13D003

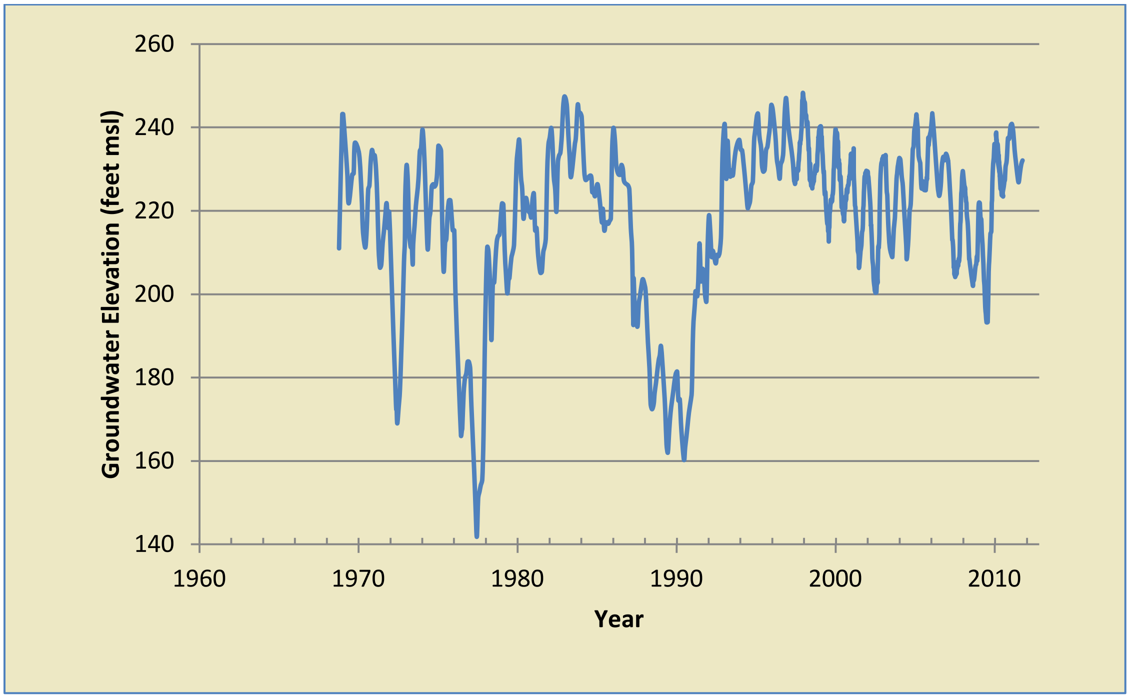
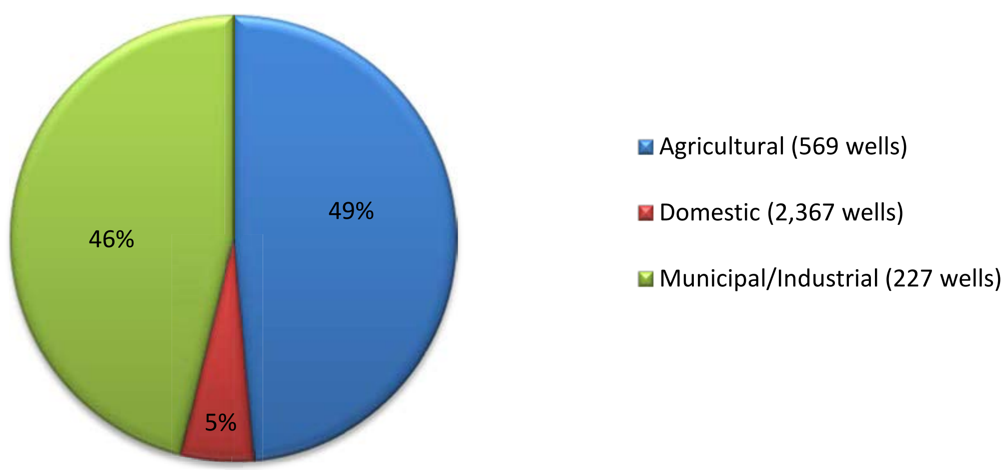


Figure 2-13 Llagas Subbasin 2010 Groundwater Use



Llagas Subbasin Water Budget

Groundwater pumping from the Llagas Subbasin averages about 44,000 AF per year (Figure 2-9). The subsurface outflow, which includes flows to the Bolsa Subbasin in San Benito County, is estimated to be about 2,500 AF per year. Recharge is estimated to be 45,500 AF per year, with about half coming from the District's managed recharge of local and imported water. Both imported (CVP) and locally captured surface water can be recharged in the Llagas Subbasin. Natural sources of recharge include the deep percolation of rainfall, natural seepage from creeks, subsurface inflow from surrounding hills (mountain front recharge), and return flows from septic systems and irrigation. The average annual change in storage between 2002 and 2011 is approximately 0 AF, indicating inflows and outflows are generally balanced over the ten year period evaluated.

Llagas Subbasin Challenges

The Llagas Subbasin, serving the cities of Morgan Hill and Gilroy, is not as urbanized as the Santa Clara Subbasin and areas like San Martin retain the region's rural and agricultural roots. Water supply facilities and operations in South County are not as flexible as in the Santa Clara Plain, with less ability to move water around and no treated surface water or Hetch-Hetchy water available. Water supply management is complicated by the fact that the aquifer materials in the northern extent, where the City of Morgan Hill pumps its water supply, are much thinner than the southern portion of the basin where the City of Gilroy draws its water. This results in the City of Morgan Hill being more susceptible to water supply impacts in the event of drought. Like the Santa Clara Plain and Coyote Valley, the water supply uncertainties in the Llagas Subbasin include constraints and risks related to Delta exports and seismic operating restrictions on local reservoirs, which could have significant effects on the District's managed recharge.

Nitrate from agricultural practices and septic systems is an ongoing groundwater quality concern in the Llagas Subbasin, with many wells approaching or above the 45 milligram per liter MCL established by the California Department of Public Health. There are thousands of private domestic well owners in the Llagas Subbasin that are not required to conduct regular testing of their water, and as such, may be unaware that they may be consuming water with elevated contaminants. The District has implemented numerous programs to try to reduce nitrate loading and customer exposure to nitrate, and continues to work with land use agencies, regulatory agencies, and other basin stakeholders to address elevated nitrate.

In 2003, perchlorate was discovered at the Olin facility in Morgan Hill and over a wide area in the Llagas Subbasin, impacting several hundred private wells and several municipal wells. However, perchlorate concentrations are declining. In 2004, there were 188 domestic wells with perchlorate above the MCL of 6 micrograms per liter (µg/L). In July 2011, there were only 8 domestic wells with perchlorate above the MCL. The District continues to advocate for the timely restoration of groundwater and works closely with the Central Coast Regional Water Quality Control Board who has regulatory jurisdiction over the case.

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3 2012 GROUNDWATER MANAGEMENT PLAN
Basin Management Objectives and Strategies

This chapter summarizes the basin management objectives and strategies. These objectives and strategies were developed within the broader context established by the District Act and District Board policies.

3.1 DISTRICT BOARD POLICY

The District is an independent special district formed by the California legislature under the Santa Clara Valley Water District Act for the primary purpose of providing comprehensive management for all beneficial uses and protection from flooding within Santa Clara County. As stated in the District Act, the District's objectives and authority related to groundwater management are to recharge the groundwater basins, conserve, manage and store water for beneficial and useful purposes, increase water supply, protect surface water and groundwater from contamination, prevent waste or diminution of the District's water supply, and do any and every lawful act necessary to ensure sufficient water is available for present and future beneficial uses.

The District manages the Santa Clara and Llagas Subbasins as an integrated component of the overall water supply, and as such the objectives and strategies for groundwater management are based on the existing District Board of Directors Ends Policies listed below.

- Board Water Supply Goal 2.1: Current and future water supply for municipalities, industries, agriculture, and the environment is reliable.
- Board Water Supply Objective 2.1.1: Aggressively protect groundwater from the threat of contamination and maintain and develop groundwater to optimize reliability and to minimize land subsidence and salt water intrusion.

District programs and activities are developed in accordance with the District Act objectives and based on policy guidance from the Board of Directors. The Chief Executive Officer (CEO) has also developed CEO Interpretations, which include direction, strategies, and outcome measures. Outcome measures are specific, measurable goals to gauge performance toward meeting the Board Ends Policies. The relationship of the District Act, Board policies, and CEO Interpretations is shown below in Figure 3-1.

The basin management objectives and strategies in this 2012 GMWP are developed within this policy framework and share a parallel structure. The relationship between the District Act, District Policies, the basin management objectives (BMOs), and District groundwater programs are shown in Figure 3-2, with each level taking direction from the level above. The basin management objectives and strategies are described below. Programs supporting those objectives and strategies are presented in Chapter 4, with monitoring and performance measurement discussed in Chapters 5 and 6, respectively.

Figure 3-1 District Board Policy Framework

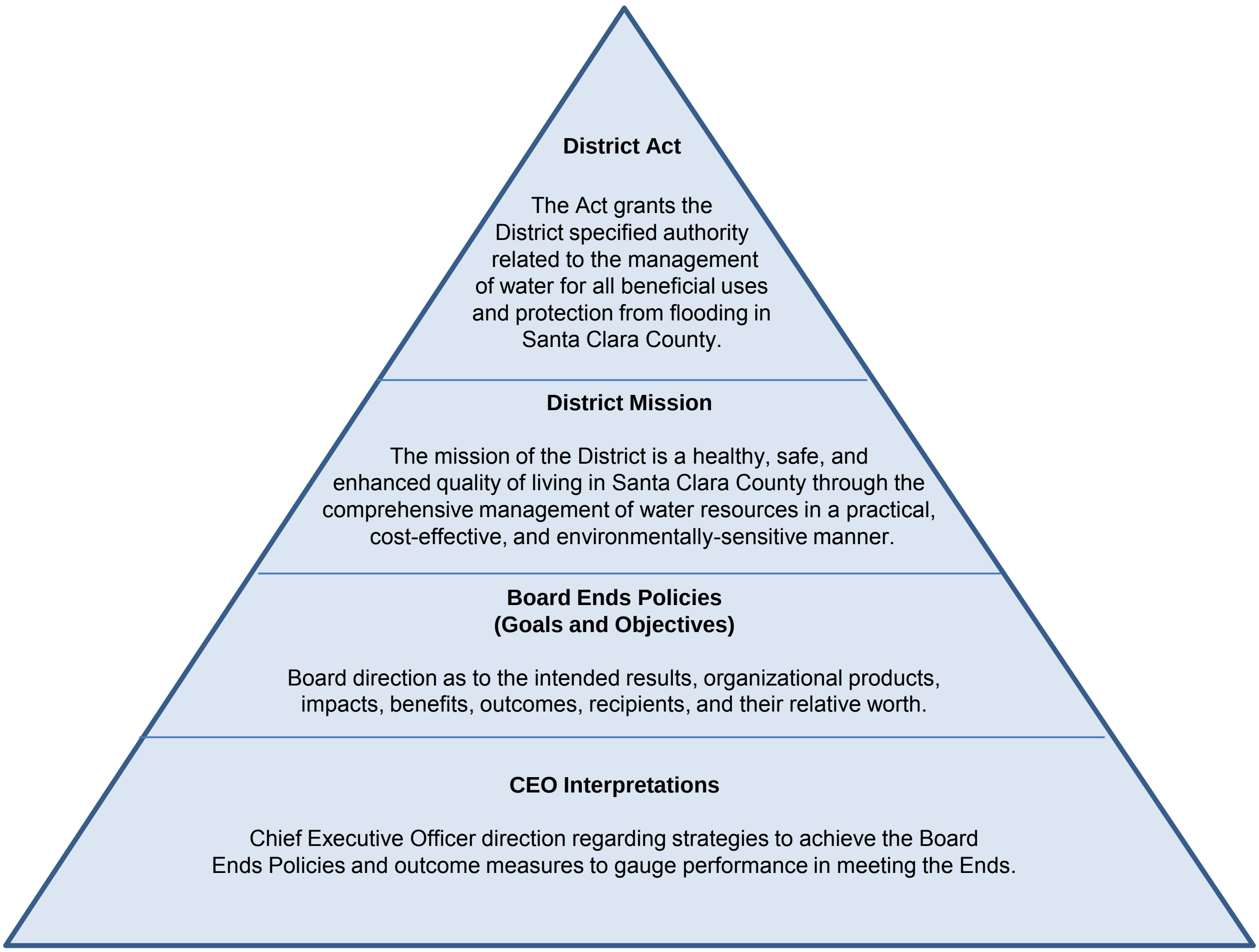
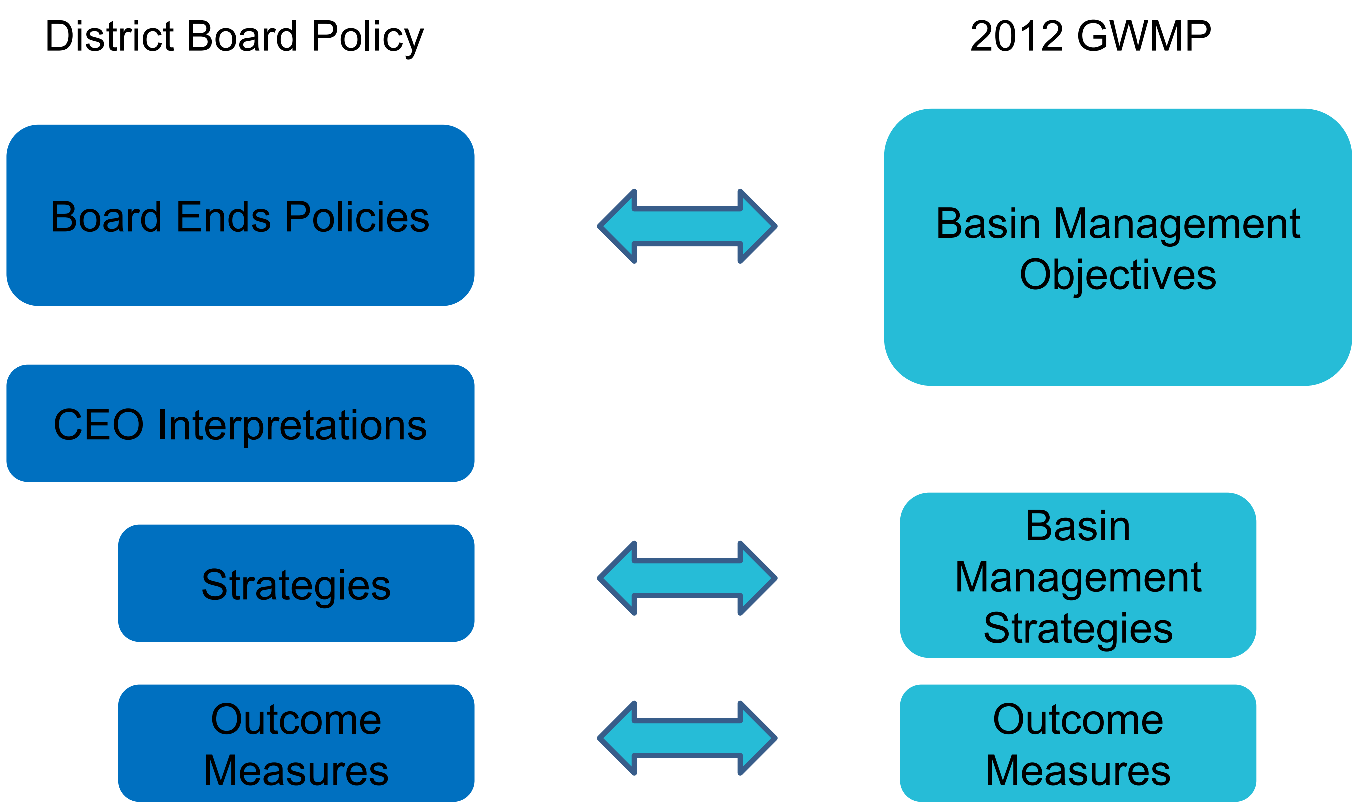


Figure 3-2 Relation Between District Policy and 2012 GWMP



3.2 BASIN MANAGEMENT OBJECTIVES

Using the District's overall water supply management objectives, the following basin management objectives (BMOs) were developed:

BMO 1: Groundwater supplies are managed to optimize water supply reliability and minimize land subsidence.

BMO 2: Groundwater is protected from existing and potential contamination, including salt water intrusion.

These BMOs describe the overall goals of the District's groundwater management program. The rationale and meaning of these objectives, as well as their relationship to District policies, are discussed below.

Water Supply Reliability and Minimization of Land Subsidence (BMO 1)

BMO 1: Groundwater supplies are managed to optimize water supply reliability and minimize land subsidence.

The District relies on groundwater for a significant portion of the county's water supply, particularly in South County where groundwater provides more than 95% of supply for all beneficial uses and 100% of the drinking water supply. Local groundwater resources make up the foundation of the county's water supply, but they need to be augmented by the District's comprehensive water supply management activities in order to reliably meet the needs of county residents, businesses, agriculture and the environment. The District relies on the conjunctive use of groundwater and surface water to meet the county's water demands now and in the future.

The District's goal of minimizing land subsidence is combined with the water supply reliability goal since the actions taken to address one also addresses the other. Significant historical land subsidence due to groundwater overdraft was essentially halted by about 1970 through the District's expanded conjunctive use programs, which allowed groundwater levels to recover substantially. The avoidance of inelastic (or permanent) land subsidence has been a major driver for the District over its history given the extremely high costs associated with reduced carrying capacity of flood control structures, damage to infrastructure, and salt water intrusion.

BMO 1 reflects the District's integrated approach to water supply reliability and commitment to minimizing land subsidence and is consistent with the following Board policies:

- Board Water Supply Goal 2.1: Current and future water supply for municipalities, industries, agriculture, and the environment is reliable.
- Board Water Supply Objective 2.1.1: Aggressively protect groundwater from the threat of contamination and maintain and develop groundwater to optimize reliability and to minimize land subsidence and salt water intrusion.

Groundwater Quality Protection (BMO 2)

BMO 2: Groundwater is protected from existing and potential contamination, including salt water intrusion.

While surface water goes through significant treatment processes before being served as drinking water, groundwater in this county typically does not require wellhead treatment before being served. Although the District does not serve groundwater directly to consumers, as the local groundwater management agency the District works to help ensure that the groundwater used by the residents and businesses of Santa Clara County is of reliably high quality.

In highly urbanized areas such as the Bay Area, there are numerous threats to groundwater quality including urban runoff, industrial chemicals, and underground storage tanks. Residential and agricultural use of pesticides and nitrogen-based fertilizers can also impact groundwater quality. Although the process of moving through soil layers provides some filtration of water, this natural process is not effective for all contaminants.

Groundwater degradation may lead to costly treatment or even make groundwater unusable, resulting in the need for additional supplies. Preventing groundwater contamination is more cost effective than cleaning up polluted groundwater, a process that can take many decades or longer depending on the nature and extent of the contamination. Notable contamination sites in the county requiring significant groundwater cleanup include large solvent releases at the IBM and Fairchild sites in south San Jose in the 1980s and the Olin perchlorate release in Morgan Hill, which was discovered in the early 2000s.

Historically, salt water intrusion has been observed in the shallow aquifer adjacent to San Francisco Bay during periods of higher groundwater pumping and land subsidence. Significant increases in groundwater pumping or sea level rise due to climate change could potentially lead to renewed salt water intrusion.

The goal of the District's groundwater quality protection programs is to ensure that groundwater is a viable water supply for current and future beneficial uses. In addition to the primary deep drinking water aquifers, the District works to protect the quality of all aquifers in the local subbasins, including shallow groundwater, as these are potential future sources for drinking water or other beneficial use.

Section 5 of the District Act authorizes the District to prevent the pollution and contamination of District surface water and groundwater supplies. BMO 2 is consistent with the District Act and with Board Water Supply Objective 2.1.1: Aggressively protect groundwater from the threat of contamination and maintain and develop groundwater to optimize reliability and to minimize land subsidence and salt water intrusion.

3.3 Basin Management Strategies

The basin management strategies are the methods that will be used to meet the BMOs. Many of these strategies have overlapping benefits to groundwater resources, acting to improve water supply reliability, minimize subsidence, and protect groundwater quality. The strategies are listed below and are also described in detail in this section.

1. Manage groundwater in conjunction with surface water through direct and in-lieu recharge programs to sustain groundwater supplies and to minimize salt water intrusion and land subsidence.
2. Implement programs to protect or promote groundwater quality to support beneficial uses.
3. Maintain and develop adequate groundwater models and monitoring systems.
4. Work with regulatory and land use agencies to protect recharge areas, promote natural recharge, and prevent groundwater contamination.

Strategy 1: Manage groundwater in conjunction with surface water through direct and in-lieu recharge programs to sustain groundwater supplies and to minimize salt water intrusion and land subsidence.

The District relies on local groundwater subbasins to help meet water demands, naturally transmit water over a wide area, and provide critical storage reserves for emergencies such as droughts or other outages. Because groundwater pumping far exceeds what is replenished naturally, the District manages groundwater and surface water in conjunction to ensure the groundwater subbasins remain an important component in meeting current and future water demands.

Maintaining the District's comprehensive managed recharge program using both local and imported waters is critical to sustaining groundwater supplies. This requires maintaining water supply sources and existing recharge facilities as well as developing additional recharge facilities to help support future needs as identified in the District's Water Supply and Infrastructure Master Plan. Currently, several of the District reservoirs have restricted storage capacity due to limitations imposed by Division of Safety of Dam (DSOD). Resolving dam safety issues that currently restrict reservoir storage is also an important component of this strategy.

Just as important as direct recharge are the availability of SFPUC supplies to the county, the District's treated water deliveries, water conservation and water recycling programs, which serve as in-lieu recharge by reducing groundwater demands. Together these programs help to maintain adequate groundwater storage, keep groundwater levels above subsidence thresholds, and maintain flow gradients toward San Francisco Bay. This, in turn, supports groundwater pumping and minimizes risks related to land subsidence and salt water intrusion.

The District's managed recharge and in-lieu programs are described in detail in Chapter 4 and specific outcome measures related to groundwater levels and storage are discussed in Chapter 6.

Strategy 2: Implement programs to protect or promote groundwater quality to support beneficial uses.

Groundwater in Santa Clara County is generally of very high quality, with few public water systems requiring wellhead treatment prior to delivery to customers. The District evaluates groundwater quality and potential threats so that changes in groundwater quality can be detected and appropriate action can be taken to protect the quality of groundwater resources. This includes assessing regional conditions and trends, evaluating threats to groundwater quality including emerging contaminants, conducting technical studies such as vulnerability assessments, and implementing strategies to protect groundwater from contaminant sources.

Groundwater protection programs are described in detail in Chapter 4 and specific outcome measures related to groundwater quality are presented in Chapter 6.

Strategy 3: Maintain and develop adequate groundwater models and monitoring systems.

Comprehensive monitoring programs provide critical data to understand groundwater conditions and support operational decisions, including the timing and location of managed recharge. The District has implemented programs to regularly monitor groundwater levels, groundwater quality (including monitoring near recycled water irrigation sites), recharge water quality, surface water flow, and land subsidence. Local water retailers also collect groundwater quality data for compliance with California Department of Public Health regulations and monitor groundwater levels. Data from these programs is essential to evaluating current conditions, preventing groundwater overdraft and subsidence, and measuring the effectiveness of basin management programs and activities. These monitoring programs and related monitoring protocols are described in Chapter 5.

The District has also developed models to support operational decisions and long-term planning. These include operational and water supply system models, as well as models specific to groundwater. The District has developed calibrated flow models for the Santa Clara Plain, Coyote Valley, and Llagas Subbasins, which are used to evaluate groundwater storage and levels under various operational and hydrologic conditions. These models are used to support ongoing water supply operational decisions as well as long-term planning efforts. Maintaining calibrated models that can reasonably forecast groundwater conditions is critical to the District's comprehensive groundwater management strategy.

Strategy 4: Work with regulatory and land use agencies to protect recharge areas, promote natural recharge, and prevent groundwater contamination.

Since the 1950s, land use in the Santa Clara Plain has changed from largely rural and agricultural to a highly developed urban area. The increased amount of land covered by impervious materials has increased runoff and reduced natural recharge. Although not as urbanized as the Santa Clara Plain, the Llagas Subbasin serves the growing cities of Morgan Hill and Gilroy, and significant development has been considered in the Coyote Valley. This strategy calls for working with land use agencies to maximize natural recharge by protecting groundwater recharge areas and supporting the use of low-impact development.

Increased urbanization also increases the risk of contamination, particularly in groundwater recharge areas which are more vulnerable due to the presence of highly permeable sediments. The District coordinates with land use agencies with regard to potentially contaminating land use activities and resource protection. Regulatory agencies also play a critical role in groundwater protection with regard to the establishment of water quality objectives and the cleanup of contaminated sites. The District will continue to work with these agencies and identify opportunities for enhanced cooperation to minimize impacts from existing contamination and prevent additional contamination from occurring. This includes the development of technical studies, participation in policy development, and coordination on proposed development.

The relationship between the basin management objectives, strategies, and related programs and activities is shown below in Figure 3-3.

Figure 3-3 Relation Between Basin Management Objectives, Strategies, and Programs

Basin Management Objectives

BMO 1: Groundwater supplies are managed to optimize water supply reliability and minimize land subsidence.

BMO 2: Groundwater is protected from existing and potential contamination, including salt water intrusion.

Basin Management Strategies

1. Manage groundwater in conjunction with surface water through direct and in-lieu recharge programs to sustain groundwater supplies and to minimize salt water intrusion and land subsidence.
2. Implement programs to protect or promote groundwater quality to support beneficial uses.
3. Maintain and develop adequate groundwater models and monitoring systems.
4. Work with regulatory and land use agencies to protect recharge areas, promote natural recharge, and prevent groundwater contamination.

Programs and Activities (Chapter 4)

Programs to maintain water supply reliability and minimize land subsidence

Programs to protect groundwater quality

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4 2012 GROUNDWATER MANAGEMENT PLAN
Basin Management Programs and Activities

District programs to protect and augment water supplies are implemented under powers granted by the District Act[1], which authorizes the District to provide comprehensive water management for all beneficial uses within Santa Clara County. The District Act authorizes the District to take action to protect and augment water supplies and includes the following actions:

- Conserve and manage water for beneficial and purposes, including spreading, storing, retaining, and groundwater recharge.
- Protect, save, store, recycle, distribute, transfer, exchange, manage, and conserve water.
- Increase and prevent the waste or diminution of the water supply.
- Obtain, retain, protect, and recycle water for beneficial uses.
- To do any and every lawful act necessary to be done that sufficient water may be available for any present or future beneficial use or uses of the lands or inhabitants within the district.

The District has a number of programs and activities that support the groundwater subbasins, and other agencies also implement programs to protect groundwater resources. This chapter describes programs that help maintain a reliable water supply, prevent inelastic (permanent) land subsidence, and protect groundwater quality, both now and in the future. Monitoring programs are described in Chapter 5.

In addition to the programs described in this chapter, the District monitors emerging policy and regulatory trends; collaborates with key decision makers and stakeholders to affect policy change; cultivates relationship building and advocacy opportunities; and works with federal, state, and local government representatives on pending legislation or regulatory standards related to the protection of groundwater resources. The purpose of these activities is to ensure that District interests are communicated and considered in legislative and regulatory processes.

This chapter focuses on operations projects or ongoing basin management activities implemented by the District and other agencies. The District also implements capital projects as needed to support groundwater resources. These projects are described in the District's Capital Improvement Program[2].

4.1 PROGRAMS TO MAINTAIN WATER SUPPLY RELIABILITY AND MINIMIZE LAND SUBSIDENCE

The groundwater subbasins are one part, albeit a critical part, of the overall water supply of the District. The District manages water resources, including groundwater and imported water, and wholesales treated water to water retailers in Santa Clara County to achieve overall water supply reliability. By helping maintain groundwater levels and storage, these programs help avoid groundwater overdraft and prevent the resumption of inelastic land subsidence. Programs and activities supporting BMO 1 (Groundwater supplies are managed to optimize water supply reliability and minimize land subsidence) are described in detail below.

[1] Santa Clara Valley Water District Act, Water Code Appendix Chapter 60.
[2] Santa Clara Valley Water District, 5-Year Capital Improvement Program, 2012-2016.

4.1.1 Managed Recharge

To offset groundwater withdrawals and ensure the long-term sustainability of groundwater resources, the District conducts a conjunctive use program whereby local and imported surface waters are used to replenish the groundwater subbasins through District recharge facilities. This section focuses on managed recharge operations, however it should be noted that many other District programs are needed to carry out the managed recharge program, including programs related to dam maintenance, the administration and management of imported water contracts, local water rights management, groundwater analysis, and maintenance of the raw water conveyance system.

By releasing locally conserved and imported waters from local reservoirs or the District's raw water distribution system, the District significantly increases groundwater recharge. On average, the District's managed recharge program replenishes twice the amount of water replenished naturally. District recharge facilities are designed for high and rapid infiltration based on their permeability and hydraulic characteristics. Through the District's managed recharge operations, approximately 95,200 AF[3] of water recharged the groundwater subbasins in 2011. This water came from a variety of sources, including the yields of the 10 local reservoirs and water imported from both the State Water and Central Valley Projects.

Recharge facilities are closely monitored by operations center personnel using a computerized control system and in the field by technicians. The raw water control system provides for remote operation of water distribution facilities and real-time system performance data. Operations technicians perform daily inspection of recharge facilities and record flows and water levels. Operations include daily monitoring of forecasts, inflows, and storage levels to plan releases for water supply operations, dam safety and bank stability, habitat management, and flood potential reduction.

Reservoirs and Diversions

The District constructed 10 reservoirs and 5 stream diversions to enable appropriation of water supplies under the District's water rights. The primary function of the District's surface water reservoirs is to store local and imported water for groundwater recharge. Dams are operated under certificates of approval from the State Division of Safety of Dams and reservoirs and diversions are operated in accordance with the California Fish and Game Code. Total storage capacity of the District's reservoirs is 169,000 acre-feet. Most of the stored water released from the reservoirs is delivered to streams below the dams. As the water flows downstream, some of it percolates through the streambed and recharges the groundwater subbasins. Some water may be diverted downstream for recharge in off-stream recharge facilities[4]. The District also operates and maintains several diversions to divert water to recharge facilities and enhance recharge. Additional detail on District reservoirs and recharge facilities is in Appendix C.

District recharge operations along streams have been modified in recent years to reflect environmental regulations and concerns, including the protection of native fisheries. In 1996, a complaint was filed with the State Water Resources Control Board (State Board) regarding District water rights licenses on Coyote Creek, Guadalupe River, and Stevens Creek. A cooperative effort between the District, the Complainant, wildlife agencies and stakeholders, the Fish and Aquatic Habitat Collaborative Effort (FAHCE), was convened. FAHCE undertook field investigations and other environmental studies resulting in the development of a draft settlement agreement (Settlement Agreement), which was initialed in May of 2003 by the District, the complainant, and the wildlife agencies, including the National Marine Fisheries Service (NMFS) and the California Department of Fish and Game (DFG).

[3] Santa Clara Valley Water District, Protection and Augmentation of Water Supplies Report, February 2012.
[4] Santa Clara Valley Water District, FY 2012-2016 Water Utility Enterprise Operations Plan.

While the Settlement Agreement was not executed, it serves as a roadmap for future dam releases by the District and is intended to lead to resolution of water rights before the State Board. The Settlement Agreement specifies actions by the District to balance fisheries habitat and stream flow needs of the District such as groundwater recharge. The Settlement Agreement contains several conditions, including the receipt of incidental take permits from NMFS and DFG if required, and the preparation of a habitat conservation plan (HCP) for obtaining such permits. The District is preparing an HCP and will issue an Environmental Impact Statement and an Environmental Impact Report that will cover the HCP and the regulatory actions required to resolve the complaint.

When the Settlement Agreement is implemented, there may be impacts to groundwater recharge because the extent of wetted channel in three North County watersheds (Guadalupe River, Coyote Creek, and Stevens Creek) may change in order to ensure that the in-stream flow needs are met for steelhead trout and other aquatic species and habitat.

The District is currently assessing the seismic stability of its reservoirs and several reservoirs are currently subject to operating restrictions that reduce reservoir storage limits. These operating restrictions may impact groundwater recharge for facilities that depend on local water supplies since the amount of local water that can be captured is reduced.

In-Stream Managed Recharge

The District conducts in-stream managed recharge operations along approximately 110 miles of stream channel in over 30 creeks[2]. About two-thirds of the District's managed recharge occurs through in-stream recharge facilities, with over 60,000 AF recharged as a result of District releases into creeks in most years. As described previously, operation of the managed recharge system involves ongoing planning, monitoring, and inspection of facilities. The District also coordinates operations for flashboard dams and spreader dams under agreements with the California Department of Fish and Game.

Off-Stream Managed Recharge

The District conducts off-stream managed recharge operations in over 70 recharge ponds that range in size from less than 1 acre to more than 20 acres. Recharge through off-stream ponds accounts for about a third of the District's managed recharge, with over 30,000 AF of water delivered to recharge ponds in most years. As with in-stream recharge, water supply system operators continuously coordinate with program engineers, operations planning, and distribution system operators. Ongoing maintenance of off-stream ponds is conducted by removing accumulated fine sediments to maintain optimal recharge rates.

Treated Water Injection Pilot Project

The District's San Tomas Injection Well is a full-scale pilot direct injection facility, with a capacity of 750 AF per year. This facility is able to receive treated water for injection from the District's Rinconada Water Treatment Plant via the District's Campbell Distributary. The injection well is not currently in operation. However, it does provide another element of flexibility to the District's conjunctive use program.

Treated Groundwater Reinjection Program

Over the years, hundreds of thousands of acre-feet of groundwater have been extracted in Santa Clara County to control or mitigate contamination plumes caused by spills or leaks of hazardous materials. To facilitate the cleanup of contamination sites, protect groundwater resources, and minimize the discharge of local waters to storm drains or sanitary sewers, the District adopted Resolution 94-84 to encourage the reuse or recharge of treated groundwater from groundwater contamination cleanup projects. This program includes the review of applications against specific criteria to ensure that groundwater quality is protected and provides a financial incentive for qualifying projects.

4.1.2 In-Lieu Recharge

Although not as obvious a connection as the managed recharge program, the District's treated water sales and water conservation and recycling programs play a critical role in maintaining the groundwater basin storage by meeting water demand that would otherwise be met by groundwater.

Treated Water Operations

The District operates three drinking water treatment plants in the county, which operate 24 hours a day, 7 days a week and provide in-lieu recharge by reducing groundwater demands. The Rinconada Water Treatment Plant, which was constructed in 1967, has a maximum flow rate of 80 million gallons per day (MGD). The Penitencia Water Treatment Plant was constructed in 1974 and has a maximum flow rate of 40 MGD. The Santa Teresa Water Treatment Plant can process 100 MGD[5] and has been on line since 1989. In 2011, approximately 122,000 AF of treated water was delivered to retailers by the District[6].

Water Conservation

The District's water conservation programs for residents, businesses, and agriculture within the county include rebates, giveaways, surveys, direct installation programs, and outreach. These programs help the District to meet long-term water reliability goals as well as short-term demands placed on the water supply system during critical dry periods and/or regulatory drought. They reduce wastewater flows to Bay Area treatment plants, avoiding or deferring facility expansions while protecting the Bay's salt marsh habitat. Water conservation saves energy, reduces greenhouse gas emissions, and helps reduce the occurrence of demand reduction requirements placed on water retailers. The District's water conservation program[4] saved an estimated 52,500 AF of water in 2011[4].

Water Recycling

The District has also been providing financial incentives to recycled water producers since 1995 for recycled water used to displace potable water demand, and has entered partnership agreements with the South County Regional Wastewater Authority and South Bay Water Recycling to further promote recycled water use. Approximately 15,000 AF of recycled water was used 2011[4]. The District is currently constructing the Silicon Valley Advanced Water Purification Center, an advanced water treatment facility to be completed in early 2013 that will produce up to 10 million gallons per day. This near distilled-quality water will be blended into existing recycled water provided by South Bay Water Recycling, which will improve overall recycled water quality for irrigation and industrial purposes.

Longer term, the District anticipates using advanced treated recycled water for replenishment of groundwater basins, similar to the highly successful groundwater replenishment system that has been operated by the Orange County Water District for over 30 years. However, additional stakeholder and community input, technology testing, and research are necessary prior to beginning project-specific planning work.

4.1.3 Protection of Natural Recharge

The District's managed recharge program augments natural recharge, which is insufficient to meet groundwater demands. However, protecting natural recharge capacity is also important. Natural recharge is defined here as any type of recharge not controlled by the District, including: rainfall, subsurface seepage from surrounding hills, net irrigation return flows, net leakage from pipelines and septic systems, and net seepage into the groundwater basin. In 2011, natural recharge was estimated to be 40,000 AF[4].

[5] Santa Clara Valley Water District, Urban Water Management Plan, 2010.
[6] Santa Clara Valley Water District, Protection and Augmentation of Water Supplies Report, February 2012.

District staff reviews land use plans for local cities and the county, encouraging the preservation of natural infiltration and reduction of impervious surfaces in the areas that contribute groundwater recharge to the principal aquifers.

4.1.4 Groundwater Production Management

The subbasins in Santa Clara County are not adjudicated and the District does not control the operation of groundwater wells or the amount of groundwater that wells can produce. The groundwater recharge program, treated water sales, recycled water partnerships and aggressive water conservation programs all offset demand on groundwater resources. Although the District does not restrict groundwater production, it utilizes several tools to influence it.

Groundwater Production Measurement

The amount of groundwater pumped from the groundwater subbasins is recorded in accordance with the District Act, which requires owners to register all wells within the District's groundwater management zones and to file production statements with the District on either an annual, semi-annual or monthly basis depending on the amount of water produced. Although approximately half of the wells within the county are not metered, metered wells extract the vast majority of the groundwater used. Where meters are not used, crop factors are used to determine agricultural water use and average values are used to estimate domestic use.

By District Board Resolution, meters are only installed at those sites determined to be economically feasible according to approved criteria or as required to facilitate the complete and accurate collection of groundwater production revenue. In the Santa Clara Plain, meters are required for facilities producing more than 4 AF of agricultural water or more than 1 AF of non-agricultural water annually. Within the Coyote Valley or Llagas Subbasin, meters are required for facilities producing more than 20 AF of agricultural water or more than 2 AF of non-agricultural water[7].

The District also tracks surface water, treated water and recycled water production within the county, and charges users volumetric rates. Water meter testing and maintenance are performed on a regular basis to ensure meters are performing accurately. When problems are discovered, meters are repaired or replaced. Meters are also replaced on a regular basis for testing and rebuilding.

Retailer Cooperation on Source Shifts and Drought Response

A very critical component of the water supply reliability performance depends on the cooperation of the District's water retailers, particularly in the implementation of programs that offset groundwater pumping such as water use efficiency and treated water deliveries. This cooperation has been critical during times of shortage.

In March 2009, the District Board of Directors adopted Resolution 09-25 calling for 15 percent mandatory water use reduction in response to a third consecutive dry year, court ordered pumping restrictions in the Delta, operational uncertainty, and declining local reserves. In July 2010, the Board extended the call for mandatory water use reduction for three months and decreased the quantity of water use reduction from 15 percent to 10 percent. In September 2010, the Board asked for 10 percent voluntary water use reduction through June 2011. The community responded well to the District's call for water use reductions and exceeded the goal by reducing water use by 19 percent from March 2009 through June of 2011. The steep reduction in water use was probably a result of the combined effects of a lingering economic recession, a wet spring in 2010 and 2011, and success of the District's water conservation outreach and coordination efforts with cities, retailers and the media[8].

[7] Santa Clara Valley Water District, Board of Directors Resolution 91-53.
[8] Santa Clara Valley Water District, Protection and Augmentation of Water Supplies Report, February 2012.

Groundwater Zones and Groundwater Charges

The District has the authority to establish a zone or zones within which it can levy charges for all groundwater-producing facilities within the zone(s). The purpose of these charges is to fund District activities that protect and augment the water supplies for users within the zones. Creation or modification of charge zones can allow different levels of service within the District's service area, with water users in each zone paying appropriately for the services received. Per the District Act, groundwater charges can be used to pay for costs associated with for the following activities, as well as the principal or interest related to these costs:

- Constructing, maintaining and operating facilities to import water.
- Purchasing water for importation.
- Constructing, maintaining and operating facilities to conserve or distribute water, including facilities for groundwater recharge, surface distribution, and the purification and treatment of water.

Pricing Policies

In creating zones and setting water rates, the District utilizes several concepts as presented in Resolution 99-21, including water pooling and water resource management strategies. Under the District's pooling approach, water is considered a single commodity irrespective of the water's source or costs since all users benefit from the availability of multiple sources of water. The costs of the treated water facilities are pooled with all other costs within the zone of benefit, and recouped primarily through the basic user charge assessed to all water pumped from the groundwater subbasins or provided by District treated water deliveries. The treated water surcharge, paid by treated water users in addition to the basic user charge, is set by the District so as to influence its retailers in the choice between treated water purchases and groundwater extraction. For example, the District may offer treated water above contract delivery amounts at a discount to encourage retailers to offset groundwater pumping if water supply and groundwater storage conditions warrant it. This approach allows the greatest flexibility in water resources management, to the overall benefit of all water users in the county, even those that do not receive treated water.

4.1.5 Groundwater Level and Storage Assessment

District staff evaluates current groundwater levels and storage, and projects future groundwater supply conditions under various water supply scenarios to ensure the long-term viability of groundwater resources and the prevention of additional inelastic land subsidence. This analysis supports the District's conjunctive use programs, water supply operations, and water supply planning efforts. Specific activities include the use and maintenance of groundwater models as well as groundwater level and subsidence databases.

District programs that monitor, track, and evaluate rainfall, surface flows, recharge, and reservoir operations allow the preparation of a detailed surface water balance, which in turn provides data used by groundwater models including stage and flow data from stream flow stations, managed recharge estimates, and rainfall data. Along with groundwater pumping data, these data allow the District to project groundwater elevations and storage under different operations scenarios.

On a monthly basis, groundwater storage is calculated and groundwater levels at key locations are compared to subsidence thresholds. These thresholds are the groundwater levels that must be maintained to ensure a low risk of unacceptable land subsidence. This information is presented on a monthly basis in the District's Water Tracker Report, which is available on the District website.

Operations Planning to Meet Near-Term Needs

Each fall, the District initiates an annual operations planning process. Imported and local supplies are estimated and operations scenarios are developed for the following calendar year, using a number of different hydrologic projections. As the water year progresses and more information becomes available, the operations plans are revised accordingly. During the process, imported water deliveries, out-of-county water bank withdrawals or deposits, managed recharge operations, and local water releases to streams and the Bay are projected. If it appears that groundwater reserves will be drawn down below operational targets, then managed recharge operations may be increased where needed or treated water deliveries may be encouraged to offset groundwater pumping needs. In past droughts, the District has also worked with its water retailers to set demand reduction targets and increase conservation promotions to help protect the groundwater subbasins from overdraft.

Contingency Planning

The District's Urban Water Management Plan (UWMP)[9] includes water shortage contingency planning that recognizes groundwater carryover storage as a critical consideration in water supply reliability. An important component of meaningful shortage response is the ability to recognize a pending shortage before it occurs, early enough so that multiple options remain available and before supplies that may be crucial later have been depleted. Given the operational priorities of the District, projected end of the year groundwater carryover storage serves as the best single indicator of possible impending water shortages. The UWMP proposes guidelines for shortage response, based on groundwater storage. If the projected end of year total groundwater storage is anticipated to drop below 300,000 AF, then shortage response is called for, such as short-term water demand reduction programs. These short-term water demand reduction programs are in addition to on-going water conservation programs. The focus of the UWMP is not to define operating targets, but rather to identify at what point demand cutbacks or other response measures may be needed. Chapter 6 of this GWMP includes a breakdown of the 300,000 AF storage target by subbasin.

Planning to Meet Future Needs

The District's water supply plans, the UWMP and the Water Supply and Infrastructure Master Plan, evaluate water supply reliability and subsidence risk under future scenarios. Projections of future groundwater levels and storage are also performed to support other District planning efforts, including the evaluation of the feasibility of indirect potable reuse and wetland projects.

Every five years, urban water suppliers must prepare an UWMP assessing their water demands, supplies, and potential shortfalls over the next 20 years. The 2010 UWMPs show a continued reliance on groundwater in the future, with the Cities of San Jose and Santa Clara projecting large increases in groundwater use. Several retailers that do not typically use groundwater, including Palo Alto and Milpitas, also identify the potential use of wells for emergency backup supplies[10]. The District has increased its efforts to coordinate the water supply projections of its retailers, trying to reconcile the individual projections into a combined water supply future that meets the District's countywide water reliability goals. Water retailers deliver over 85% of the total water used in the county and nearly 95% of the water used in the Santa Clara Plain in northern Santa Clara County. The District's UWMP evaluates whether the projected groundwater use can be sustained over a 25-year planning horizon without risking subsidence or failing to meet water supply reliability targets. The District's UWMP highlights the importance of groundwater reserves, which are key in meeting demands in dry years. Multiple dry years pose the greatest challenge to the District's water supply, as storage reserves become depleted.

The purpose of the District's Water Supply and Infrastructure Master Plan (Water Master Plan) is to identify and plan the new water supply projects and programs that will be needed to ensure future water supply reliability over a 25-year planning horizon. Preparing the Water Master Plan includes developing objectives based on Board policy; performing a baseline system analysis to determine water supply and infrastructure needs; developing a

[9] Santa Clara Valley Water District, Urban Water Management Plan, 2010.
[10] Per individual 2010 Urban Water Management Plans for water retailers in Santa Clara County.

recommended portfolio of projects and programs to meet those needs; conducting appropriate environmental analysis; engaging stakeholders in plan development; and preparing a schedule and budget for implementing the recommended portfolio. The Water Master Plan will be updated at least every five years to reflect current conditions.

District staff also reviews certain Environmental Impact Reports and other environmental documents from land use agencies for water supply impacts. With the passage of SB 610 amending the Urban Water Management Planning Act[11] in 2001, coordination has become more critical and is required for development decisions that meet certain thresholds. This amendment and other later amendments have strengthened the provisions requiring that a reliable water supply be secured before new development projects are approved. The District has been working closely with retailers and cities to address these water supply assessments and other issues.

4.1.6 Groundwater for Emergency Backup Supply

Groundwater reserves are the county's best protection against droughts or other outages. As described above, several local water retailers address the potential use of groundwater as a backup supply for other water sources in their Urban Water Management Plans. The District does not currently operate groundwater wells and is not able to substitute groundwater for surface water. However, the District is pursuing well fields that will tie directly to the treated water distribution system for increased operational flexibility and system reliability. In 2005, the District completed a study to evaluate the reliability of the treated water distribution system during earthquakes or other disasters[12]. The study recommended a portfolio of projects, including the construction of well fields to provide backup supply to the treated water distribution system. An implementation plan was developed in 2009 in coordination with many water retailers. The District and retailers are considering potential options to reduce costs, including the potential use of existing water retailer wells to backup the District's treated water system. A pilot facility, the Campbell Well Field, is currently being constructed by the District.

4.1.7 Asset Management

Maintaining the integrity of the District's existing infrastructure is essential to securing the reliability of the District's water supply. This includes maintaining the existing capacity of recharge facilities and ensuring that other facilities, such as reservoirs, treatment plants, and conveyance and distribution infrastructure are safeguarded. The District maintains a rigorous asset management framework to reduce unplanned disruptions of services and assure reliability of water supply infrastructure. The program helps to minimize operating and capital costs associated with owning assets, enable accurate financial planning to sustainably deliver services, and capture and transfer knowledge and experience to effectively plan for succession[13].

[11] California Water Code Section 10610.
[12] Santa Clara Valley Water District, Water Infrastructure Reliability Report, May 2005.
[13] Santa Clara Valley Water District, FY 2012-2016 Water Utility Enterprise Operations Plan.

4.2 PROGRAMS TO PROTECT GROUNDWATER QUALITY

This section presents a description of the activities performed by the District and other entities that address groundwater quality protection in Santa Clara County. In addition, the District monitors emerging policy and regulatory trends; collaborates with key decision makers and stakeholders to effect policy change; and works with Federal, State, and Local government representatives on pending legislation or regulatory standards related to the protection of groundwater quality. The purpose of these activities is to ensure that District interests are communicated and considered in legislative and regulatory processes.

4.2.1 Water System Quality Requirements

Local water retailers deliver the majority of groundwater used within the county to consumers. In order to ensure that tap water is safe to drink, the USEPA and CDPH prescribe regulations that limit the amount of certain constituents in water provided by public water systems. Water retailers perform numerous water quality tests throughout their distribution systems to ensure that the water they serve is healthful and of high quality. Water retailers provide these results to consumers in annual water quality reports.

To evaluate regional groundwater quality conditions, the District assesses annual monitoring data collected by water retailers and by the District. Monitoring results are compared against drinking water standards and agricultural objectives and are evaluated for potentially adverse trends so that appropriate action can be taken to protect groundwater quality. This information is presented in the District's annual Groundwater Quality Report, which is available on the District website.

4.2.2 Well Ordinance Program

The District Act authorizes the District to prevent the contamination, pollution, or otherwise rendering unfit for beneficial use the surface or subsurface water used or useful in the county[14]. As part of its efforts in exercising this authority, the District developed a well ordinance to protect groundwater resources from contamination. The objective of the Well Ordinance Program is to ensure that wells and other deep excavations are properly constructed, maintained and destroyed so that they will not allow the vertical transport of waters of poor quality into deeper aquifers used for drinking water. Abandoned and unused wells are required to be sealed in accordance with the District Well Ordinance. The District is authorized to take civil action to abate a public nuisance caused by wells creating a water contamination hazard.

Each year, the District permits and inspects approximately 1,500 exploratory borings, well destructions, and water supply and monitoring well installations under the Well Ordinance Program[15]. Through this program, the District:

- Develops standards for the proper construction, maintenance, and destruction of wells and other deep excavations.
- Informs the public, including contractors, consultants and other government agencies about the Well Ordinance and the well standards.
- Verifies that wells are properly constructed, maintained and destroyed using a permitting and inspection mechanism.
- Takes enforcement action against violators of the Well Ordinance.
- Maintains a database and well mapping system to document information about well permitting, well construction and destruction details, a well's location, and well status.

[14] Santa Clara Valley Water District Act, Water Code Appendix, Chapter 60, Section 5(5)
[15] Santa Clara Valley Water District, FY 2012-2016 Water Utility Enterprise Operations Plan.

4.2.3 South County Private Well Testing

Although public water supply systems are required to regularly test their wells for compliance with CDPH regulations, no such regulation exists for private domestic wells. Elevated nitrate is an ongoing groundwater protection challenge due to historic and ongoing sources including fertilizers, septic systems, and animal waste. To better understand the occurrence of nitrate and to help well owners better understand their water quality, the District has implemented several limited duration programs offering free nitrate testing for private well owners in the Coyote Valley and Llagas Subbasin (South County).

In 1998, the District sampled over 600 private wells to obtain data on nitrate and found that over half of the wells tested exceeded the CDPH Maximum Contaminant Level of 45 milligrams per liter[16]. In 2011, the District budget included the South County Water Quality Testing Program that expanded upon the previous nitrate testing program to also include other basic water quality parameters including electrical conductivity, hardness, and bacteria. The program benefits the District by providing more localized information on nitrate and other constituents to supplement regional groundwater monitoring data for better evaluation of hot spots and trends. This pilot testing program also provides basic water quality information to domestic well owners who may be exposed to elevated nitrate or harmful bacteria.

4.2.4 Vulnerability Assessment

Groundwater Vulnerability Studies

In 1985, the San Francisco Regional Board completed a vulnerability study[17], which rated 105 hazardous materials release sites in terms of groundwater pollution potential based on the distance to wells and depth to water as well as the severity of the contamination. The study focused on existing contamination sites and did not consider potentially contaminating activities.

In 1999, the District completed an evaluation of the sensitivity of the groundwater subbasins based on its intrinsic or hydrogeologic characteristics using the USEPA DRASTIC methodology[18]. The DRASTIC evaluation resulted in a Geographic Information System (GIS) coverage which presents the relative sensitivity of different parts of the subbasins to contamination[19].

In October 2010, the District completed a comprehensive groundwater vulnerability study[20] to assess the vulnerability of groundwater subbasins to land use activities. This study updated the previous sensitivity study, incorporating recent hydrogeologic data and a statistical (rather than subjective) weighting approach. It also evaluated the vulnerability of the subbasins to different land uses. The study findings and related GIS tool have been used to help prioritize District work (including the review of high-threat contamination sites) and optimize the groundwater quality monitoring network. The District has also met with several land use and regulatory agencies to discuss the potential use of the GIS tool to assist in their groundwater protection efforts.

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[16] Santa Clara Valley Water District, Private Well Water Testing Nitrate Data Report, December 1998.

[17] San Francisco Water Board, Sanitary Engineering and Environmental Health Research Laboratory, University of Berkeley, and Santa Clara Valley Water District, Assessment of Contamination from Leaks of Hazardous Materials in Santa Clara Groundwater Basin, 205j Report, June 1985.

[18] U.S. EPA, DRASTIC: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings, 1987.

[19] Santa Clara Valley Water District, an Analysis of the Sensitivity to Contamination of the Santa Clara Valley Groundwater Aquifers Based on the USEPA DRASTIC Methodology, 1999.

[20] Todd Engineers and Kennedy/Jenks Consultants for Santa Clara Valley Water District, Revised Final Groundwater Vulnerability Study, Santa Clara County, California, October 2010.

Drinking Water Source Assessment and Protection Program (DWSAP)

The goals of the state's DWSAP required under the 1996 reauthorization of the federal Safe Drinking Water Act are as follows:

- Protect public water systems
- Improve drinking water quality and support effective water resources management
- Inform public and drinking water systems of contaminants and potential contaminating activities that have the potential to affect drinking water
- Promote a proactive approach to protecting drinking water quality and enable communities and drinking water systems to protect water quality
- Refine and focus drinking water source monitoring requirements
- Focus pollution prevention and clean-up on areas that are subject to more serious threats

The District assisted many of the local water retailers in their initial compliance with the state's DWSAP requirements in 2002 and 2003. The assessments included delineating the protection area, inventorying possible contaminating activities and analyzing the vulnerability of the source. The District developed a GIS based application, which was used to delineate protection areas in accordance with state guidelines. In addition, the District shared the application with the state DWSAP data advisory committee. Local water retailers are responsible for completing the DWSAP for any newly installed wells.

4.2.5 Coordination with Land Use Agencies

Land Use Review

As land uses intensify, so can the potential for contaminating the underlying groundwater resource. In highly urbanized areas such as the Bay Area, there are numerous threats to groundwater resulting from commercial, industrial, and residential development including urban runoff, industrial chemicals, and underground storage tanks. Residential and agricultural use of nitrogen based fertilizers and pesticides can also impact groundwater quality.

Land use decisions fall under the authority of the local cities and the County. These agencies, the District, and the water retailers all share an interest in maintaining the water resources that serve the current and future land uses. These agencies work together to try to ensure that groundwater is adequately protected from potentially contaminating activities. Of particular concern are potentially contaminating activities over groundwater recharge areas, which are more vulnerable to contamination due to the presence of more permeability materials and higher groundwater flow rates.

The District reviews some local land use and development plans to identify threats to groundwater and watercourses under District jurisdiction and to other District facilities. The District provides review and comment on proposed land development documents, environmental documents and city and County General Plans. The District has also worked with land use agencies to develop guidelines or model ordinances for specific issues such as the permitting of graywater systems. The District works with the project and regulatory stakeholders to try to ensure that these projects are implemented such that groundwater resources are protected.

Septic Systems

The installation of septic systems is overseen by the County Department of Environmental Health (DEH). Permits are only issued in those areas of the county where a sanitary sewer is not available within 300 feet of the property line (within 200 feet of the building in some cities). Onsite sewage disposal systems cannot be used if soil conditions, topography, high groundwater water or other factors indicate that this method of sewage disposal is unsuitable. DEH has developed sewage disposal system requirements[21] that describe the requirements for development, site evaluation, septic system siting, and installation. Various permits are required in order to install a septic system and the systems are inspected prior to approving completion of the installation.

Recently, the County has initiated the process to update the ordinance regulating onsite wastewater treatment systems. As part of this effort, the County is reviewing existing ordinances, policies, procedures, and practices. They are also evaluating the feasibility of incorporating selected types of alternative wastewater treatment systems into an updated ordinance code. The County has assembled a Wastewater Advisory Group to participate in the review and update process and the District has been an active participant in this group.

4.2.6 Coordination with Regulatory Agencies

Sites with releases of solvents, toxics, fuels or other contaminants pose a threat to groundwater quality since contamination may migrate laterally or vertically into areas or zones that were previously unaffected. If allowed to migrate, such contamination may eventually impact groundwater production wells, forcing well operators to cease operation, implement expensive wellhead treatment, or blend the affected water with other sources of water to dilute the contaminant. In addition, the degradation in water quality can limit the water's beneficial uses and alter plans for production well siting or design.

Hazardous Material Handling and Storage Oversight

The primary causes of groundwater contamination at hazardous material release sites are the improper handling of hazardous materials or leaking storage tanks. Permitting and inspection related to the handling and storage of hazardous materials is overseen by the local or county fire department. The fire departments also oversee the installation, operation, and removal of all underground and above ground storage tanks and associated piping, and notify the DEH and/or Regional Boards in the event that contamination is discovered.

Contaminant Release Sites

There are more than 2,600 fuel leak releases and 800 sites[22] with non-fuel contamination within Santa Clara County, as summarized in Tables 4-1 and 4-2. Fuel leak cases are overseen by the County DEH while the oversight agencies for the non-fuel leak sites vary, as shown in Table 4-2.

As the county's groundwater management agency, the District works with these agencies to protect groundwater resources. Current District interaction with regulatory agencies on point-source cases is mainly focused on the highest threat cases in the county or is in response to specific requests from the agencies.

[21] County of Santa Clara Department of Environmental Health, Sewage Disposal System Requirements, Bulletin A, March 2010.
[22] Fuel leak case summary based on information accessed from the State Water Resources Control Board Geotracker database March 2012. Non-fuel contamination site information is based on District records.

Table 4-1 Summary of Leaking Underground Fuel Tank Sites

Open Case Status	Number of Cases	Percent of Open Cases
Site Assessment	149	56%
Assessment and Interim Remediation	9	3%
Remediation	55	21%
Verification Monitoring	55	21%
Totals		**Percent of Total Cases**
Open	268	10%
Completed – Case Closed	2,365	90%
Grand Total	2,633	

Table 4-2 Summary of Non-Fuel Contamination Sites

Oversight Agency	Status		Total
	Closed	Open	
San Francisco Bay Water Board	274	365	639
California Department of Toxic Substance Control	54	70	124
Environmental Protection Agency	1	28	29
Santa Clara County Department of Environmental Health	4	16	20
Central Coast Regional Water Quality Board	5	9	14
City of San Jose		2	2
Unknown		2	2
Integrated Waste Management Board		1	1
Santa Clara County	1		1
Santa Clara County Fire Department		1	1
Grand Total	339	494	833

4.2.7 Public Outreach

Public outreach is an important component of the District's groundwater protection efforts. Because groundwater is far removed from the public's view, it can be a challenge to make the connection that actions occurring on the land surface can impact groundwater quality. To increase public awareness of groundwater resources, the District conducts active public outreach programs, which are described in this section. Each year, the also District celebrates Groundwater Awareness Week, which is an annual observation of the importance of groundwater and is celebrated by the National Groundwater Association, the U.S. Environmental Protection Agency, and other organizations advocating groundwater protection.

Outreach Materials

The preparation of pamphlets, fact sheets, and summary reports helps to transmit key messages related to groundwater. The District's Guide for the Private Well Owner, which is provided to all new well owners, describes the basics of proper well construction, maintenance, and testing. The District also produces fact sheets to address specific issues, such as nitrate or chromium-6, or to summarize the results of groundwater studies, like the Recycled Water Irrigation and Groundwater Study.

School Program

The District believes it is never too early for children to begin understanding and appreciating their local water resources. To help promote that awareness, the district offers a full range of educational programs for both teachers and students. From puppet plays for kindergarteners to workshops for educators, school outreach projects provide effective, hands-on learning experiences that meet new state standards. Through the district's educational programs, students can tour a groundwater recharge facility, create a simulated pond or explore the plant and animal life in a creek. All activities are geared for specific grade levels, from pre-kindergarten to college.

Groundwater Guardian Program

The Groundwater Guardian Program is sponsored by the Groundwater Foundation, a not-for-profit education organization that strives to increase groundwater awareness. Groundwater Guardian is an annually earned designation for communities and affiliates that take voluntary, proactive steps toward groundwater protection. The District has been designated a Groundwater Guardian based on such activities as conducting irrigation and nutrient management seminars, creating a prototype zone of contribution delineation tool for wellhead protection areas, and conducting the school program. The District will continue to participate in the program by submitting annual work plans for groundwater protection activities and submitting reports documenting our groundwater protection efforts. The District was designated as Groundwater Guardian Affiliate in 2000 and has maintained that designation each year since then.

4.3 Programs Related to Surface Water/Groundwater Interaction

The District has been conducting managed recharge with locally captured and imported water to the aquifers for many decades. The District has been recharging local water into the aquifers since the 1920s and water imported from the Bay-Delta since the 1960s. The District’s managed recharge program is an important management tool that has contributed to aquifer storage recovery, cessation of unacceptable levels of inelastic land subsidence, prevention of salt water intrusion, and improved water quality in impacted areas. A reliable water supply for the county depends on this interaction between surface water and groundwater, and as such, the District closely monitors recharge operations.

The addition of water through managed or incidental recharge can change groundwater quality. This may be for the better by diluting existing contaminants in the aquifer, or for the worse by introducing contaminants. Incidental recharge includes water applied to landscape and agriculture in excess of plant uptake (irrigation return flows), as well as infiltration from stormwater and septic systems.

District programs related to surface water/groundwater interaction are described below.

4.3.1 Salt and Nutrient Management

The most significant non-point source contaminant in Santa Clara County is nitrate. Since the 1990s, the District has implemented nitrate management activities in the Coyote Valley and Llagas Subbasins to ensure the long-term viability of groundwater as a healthful water supply. The goal of these efforts is to reduce the public’s exposure to high nitrate concentrations, reduce further loading of nitrate, and monitor the occurrence of nitrate. The District’s recharge operations serve to dilute existing nitrate concentrations and focused outreach materials and workshops related to rural land use and groundwater protection also support the District’s nitrate management objectives.

District programs for conservation in the agricultural sector benefit salt and nutrient management efforts since improved irrigation efficiency may reduce the transport of these constituents to groundwater.

While applied irrigation water from any source may contribute salts and nutrients, recycled water generally has a higher concentration of these contaminants than groundwater or treated water. The District works to support expanded recycled water use while protecting groundwater quality through various salt and nutrient management activities described below.

Salt and Nutrient Management Plans

In 2009, the State Water Resources Control Board adopted a policy for water quality control for recycled water (Resolution 2009-0011). A major component of this policy is the requirement for regional Salt and Nutrient Management Plans (SNMPs) as "the appropriate way to address salt and nutrient issues." The SNMPs address salt and nutrient loading to groundwater subbasins that may arise from use of recycled water, imported water, agricultural activity, and other sources, and evaluate the overall salt balance in the groundwater subbasins. The District is working with local stakeholders to develop two SNMPs, one for the Santa Clara Subbasin (in coordination with the San Francisco Bay Regional Board) and one for the Llagas Subbasin (in coordination with the Central Coast Regional Board). The plans, which are expected to be completed in 2014, will include: salt and nutrient source identification, a fate and transport analysis, salt and nutrient loading and assimilative capacity estimates, water recycling and stormwater recharge/reuse goals and objectives, implementation measures, a groundwater monitoring plan, and an anti-degradation analysis.

Recycled Water Irrigation Evaluation

Recycled water generally has a higher concentration of salts, nutrients, disinfection byproducts, and emerging contaminants than groundwater or treated water, and these contaminants may be introduced to groundwater through landscape irrigation. Recycled water used within the county undergoes tertiary treatment and is currently used only for non-potable uses like large landscape irrigation, agriculture, and industry. With the exception of the Evergreen and Edenvale areas of San Jose and portions of the Llagas Subbasin in Gilroy, all current use of recycled water is limited to the confined zones, where significant clays and silts offer a measure of natural protection to deeper drinking water aquifers.

Several groundwater monitoring efforts and studies provide data to help assess potential changes to groundwater quality resulting from the irrigation of tertiary treated recycled water. The District evaluates groundwater monitoring data collected for the South Bay Water Recycling Program, which indicates increasing trends for several inorganic constituents, including chloride and boron, following recycled water application[23].

In August 2011, the District's completed the Recycled Water Irrigation and Groundwater Study[24] to evaluate the potential effects of recycled water used for irrigation on groundwater quality in the Santa Clara and Llagas Subbasins and to identify best management practices to protect groundwater. The study included laboratory testing of soils irrigated with recycled water and an 18-month field study at a site using recycled water for irrigation in the Santa Clara Plain. The study found no significant change in groundwater quality for most constituents monitored. However, some changes were noted, including the presence of a few constituents not previously found in shallow groundwater at the site. A common by-product of the water disinfection process, N-Nitrosodimethylamine (NDMA), was detected in groundwater 30 feet below the surface at trace levels of 3 to 4 parts per trillion (ppt) during the study. Subsequent sampling has indicated levels of up to 8.5 ppt. The study findings suggest that best management

[23] Santa Clara Valley Water District, City of San Jose South Bay Water Recycling Groundwater Data Evaluation, May 2008.
[24] Locus Technologies for Santa Clara Valley Water District, Recycled Water Irrigation and Groundwater Study, Santa Clara and Llagas Groundwater Subbasins, Santa Clara County, California, August 2011.

practices and/or changes in recycled water treatment may be warranted when irrigating with recycled water over sensitive parts of the Santa Clara Plain or Llagas Subbasin.

As the shallow and unconfined Coyote Valley is highly vulnerable to contamination, the District has determined that all recycled water applied in that area must be advanced treated to avoid groundwater quality impacts. This determination was made during District review of the Coyote Valley Specific Plan, a large proposed development in the Coyote Valley which has since been postponed indefinitely.

4.3.2 Stormwater Management

To reduce the amount of runoff to creeks and other surface water bodies, urban runoff programs are increasingly encouraging the infiltration of runoff into on-site stormwater infiltration devices (SWIDs). Infiltration of runoff helps reduce peak flows and protect surface water quality. Stormwater can be a beneficial source of groundwater recharge in some areas, but there are potential groundwater quality impacts. Stormwater can pick up pollutants as it runs over the ground surface, which can then migrate to groundwater through infiltration.

The District is part of the Santa Clara Valley Urban Runoff Management Program, which was formed in 1990 to develop and implement efficient and uniform approaches to control non-point source pollution in stormwater runoff that flows to the South San Francisco Bay. The District has worked with the other co-permittees of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) to develop SWID guidelines that allow stormwater infiltration while being adequately protective of both surface water and groundwater resources.

Dry wells are a type of SWID that reduce or eliminate the vertical separation between the infiltration point and groundwater. Because they bypass natural filtering capacity of soils, dry wells are of special concern. Specific standards for dry wells are planned to be incorporated into the next revision to the District Well Standards. The purpose of revising the policy is to clarify permitting and construction standards for dry wells, to expand the definition of devices covered by the Well Standards so that all wells that bypass natural protection processes are subject to standards for protecting groundwater, and to simplify the process by which dry wells are permitted.

4.3.3 Salt Water Intrusion Prevention

The movement of saline water into a freshwater aquifer constitutes saltwater intrusion. This potential exists in groundwater basins adjacent to the sea or other bodies of saline water – in this case, San Francisco Bay. Once freshwater aquifers experience severe saltwater intrusion, it is extremely difficult and costly to reclaim them. Salt water intrusion is driven by groundwater gradients that reverse the normal flow of water out into the bay.

With much higher groundwater pumping and land subsidence in the decades after World War II, salt water intrusion was observed in the shallow aquifer through an area bounded on the south by Highway 101 and Interstate 880. This was mainly caused by the inland migration of saline water through tidal creeks and subsequent transport to groundwater through streambed percolation or the presence of abandoned wells due to downward vertical gradients between shallow and principal zones.

Historically, the District conducted an extensive program of locating and properly destroying abandoned wells in the northern Santa Clara Subbasin along the Bay, so that these wells would not act as conduits for salt water intrusion of the principal aquifer. The District adopted Ordinance 85-1, which gave the District authority to require owners of wells determined to be "public nuisances" to seal and destroy the wells or upgrade them to active or inactive status. The District engaged in a more comprehensive well sealing program from 1984 to 2005 to provide financial assistance to properly destroy abandoned wells near areas of known contamination to prevent contamination of drinking water supplies. Although this assistance program has ended, the District still requires abandoned or unused wells to be sealed in accordance with District and State well standards and takes action as authorized by the District Well Ordinance.

The resumption of land subsidence the greatest potential threat to aggravating saltwater intrusion, as it would further depress the land surface fronting South San Francisco Bay. This would increase the inland hydraulic gradient, exposing a larger portion of the shallow aquifer to intrusion from the greater inland incursion of tidal bay waters. A lowering of the hydraulic head in the principal confined aquifer also increases the potential for salinity intrusion. The District's managed recharge program is critical to maintaining hydraulic heads in the aquifers connected to the Bay, which helps protect the long-term viability of the aquifers from salinity intrusion. As described in Section 5, the District actively monitors land subsidence, groundwater elevations, and groundwater quality to ensure risks related to salt water intrusion are minimized.

4.3.4 Water Accounting

As described in Section 4.1.1, the District uses local and imported surface water to conduct an active managed recharge program to recharge groundwater supplies. Many other District programs are needed to support the recharge program, including programs related to dam maintenance, the administration and management of imported water contracts, local water rights management, and maintenance of the raw water conveyance system.

To reconcile all measured imported water, inflows, releases and changes in surface water storage, a periodic water balance is performed. The results of this balance become the final accounting for distribution and facility processing. The data is used for water rights reporting, accounting for usage of federal water, for facility performance measurement purposes, and for the groundwater subbasin water budget which is integral to the District's annual Protection and Augmentation of the Water Supplies Report. This report establishes the recommended water rates for the next year based on anticipated costs to meet the projected water need.

4.3.5 Watershed Management

Since the majority of surface water collected and stored in the watersheds and reservoirs drain into creeks and recharge ponds, the protection of these source waters is paramount to protecting groundwater. The protection of the watersheds' water quality is also vital to assuring a healthy environment for their inhabitants. The District seeks to balance watershed uses, such as the rights of private property owners and public recreational activities, with the protection and management of natural resources. The District recognizes that preserving beneficial watershed uses can benefit reservoir water quality, which in turn benefits water quality delivered to the District treatment plants and recharged into the groundwater subbasins.

The District works to protect the water quality and supply reliability of the District's reservoirs through regular monitoring, coordination with external agencies on source water quality issues, and efforts to protect local reservoirs from potentially contaminating activities. The District also implements projects to evaluate and prioritize actions to address pollutants affecting freshwater, such as mercury.

The District has also developed guidelines and standards for land use near streams in cooperation with local cities, the county, local businesses, agriculture, streamside property owners, and environmental interests through the Water Resources Protection Collaborative. Participation in other collaborative, stakeholder-driven efforts such as the Santa Clara Basin Watershed Management Initiative also strive to balance the objectives of water supply management, habitat protection, flood management, and protection of water quality.

Programs and activities supporting basin management objectives and strategies are shown below in Tables 4-3 and 4-4, respectively.

Table 4-3 Relation of Programs and Activities to Basin Management Objectives

Program/Activity	BMO 1: Water Supply Reliability and Minimization of Land Subsidence	BMO 2: Groundwater Quality Protection
Managed recharge • Reservoirs and diversions (P) • In-stream and off-stream managed recharge (P) • Treated water pilot injection (P) • Treated groundwater reinjection program (P, C)	X	X
In-lieu recharge • Treated water operations (P) • Water conservation (P, C) • Water recycling (P, C, T)	X	X
Protection of natural recharge (P, C, T)	X	
Groundwater production management • Production measurement (P) • Retailer coordination on source shifts and drought response (P, C) • Groundwater charges and zones (P) • Pricing policies (P)	X	
Groundwater level and storage assessment • Operations planning to meet near-term needs (P) • Contingency planning (P) • Long-term water supply planning (P, C)	X	X
Groundwater for emergency backup supply (P, C)	X	
Asset management (P)	X	X
Water system quality requirements (C)		X
Well ordinance program (P)		X
South County private well testing (P)		X
Vulnerability assessment • Groundwater vulnerability studies (P, C) • Drinking Water Source Assessment and Protection (C, T)		X
Coordination with land use agencies • Land use reviews (C, T) • Septic systems (C, T)	X	X
Coordination with regulatory agencies • Contamination release sites (C, T) • Hazardous materials handling and storage oversight (C, T)		X
Public outreach • Outreach materials (P) • School program (P, C) • Groundwater Guardian (P)	X	X
Salt and nutrient management • Salt and Nutrient Management Plans (P, C) • Recycled water irrigation evaluation (P, C)	X	X
Stormwater management (C, T)		X
Salt water intrusion prevention (P)	X	X
Water accounting (P)	X	X
Watershed management (P, C)	X	X

(P) Indicates that the District has primary jurisdiction and/or responsibility; (C) for cooperation or coordination with others; and (T) for providing technical information and/or serving as advocate

Table 4-4 Relation of Programs and Activities to Basin Management Strategies

Program/Activity	Strategy			
	1	2	3	4
Managed recharge • Reservoirs and diversions (P) • In-stream and off-stream managed recharge (P) • Treated water pilot injection (P) • Treated groundwater reinjection program (P, C)	X	X	X	
In-lieu recharge • Treated water operations (P) • Water conservation (P, C) • Water recycling (P, C, T)	X		X	
Protection of natural recharge (P, C, T)			X	X
Groundwater production management • Production measurement (P) • Retailer coordination on source shifts and drought response (P, C) • Groundwater charges and zones (P) • Pricing policies (P)	X	X	X	
Groundwater level and storage assessment • Operations planning to meet near-term needs (P) • Contingency planning (P) • Long-term water supply planning (P, C)	X		X	
Groundwater for emergency backup supply (P, C)	X		X	
Asset management (P)	X	X	X	
Water system quality requirements (C)		X	X	
Well ordinance program (P)		X		X
South County private well testing (P)		X	X	X
Vulnerability assessment • Groundwater vulnerability studies (P, C) • Drinking Water Source Assessment and Protection (C, T)		X	X	X
Coordination with land use agencies • Land use reviews (C, T) • Septic systems (C, T)	X	X		X
Coordination with regulatory agencies • Contamination release sites (C, T) • Hazardous materials handling and storage oversight (C, T)		X		X
Public outreach • Outreach materials (P) • School program (P, C) • Groundwater Guardian (P)	X	X	X	X
Salt and nutrient management • Salt and Nutrient Management Plans (P, C) • Recycled water irrigation evaluation (P, C)		X	X	X
Stormwater management (C, T)	X	X		X
Salt water intrusion prevention (P)	X	X	X	X
Water accounting (P)	X		X	
Watershed management (P, C)		X		X

(P) Indicates that the District has primary jurisdiction and/or responsibility; (C) for cooperation or coordination with others; and (T) for providing technical information and/or serving as advocate

Strategy 1: Manage groundwater in conjunction with surface water through direct and in-lieu recharge programs to sustain groundwater supplies and to minimize salt water intrusion and land subsidence.
Strategy 2: Implement programs to protect or promote groundwater quality to support beneficial uses.
Strategy 3: Maintain and develop adequate groundwater models and monitoring systems.
Strategy 4: Work with regulatory and land use agencies to protect recharge areas, promote natural recharge, and prevent groundwater contamination.

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5 2012 GROUNDWATER MANAGEMENT PLAN
Monitoring Programs and Protocols

The District conducts a wide range of activities to support water supply reliability and maintain groundwater quality, and to avoid further land subsidence. Assessing how well these activities are meeting the Basin Management Objectives requires a reliable monitoring program to ensure that the groundwater management activities are effective and efficient. This chapter describes programs to monitor groundwater levels, land subsidence, surface water and groundwater quality, as well as the availability of data collected under these programs.

5.1 Groundwater Level Monitoring

To obtain comprehensive and accurate measurements of groundwater levels, the District collects depth to water data from up to 364 wells at varying frequencies. The District regularly measures approximately 222 wells each year to obtain groundwater levels. In addition, water retailers provide water levels from approximately 142 water supply wells.

Monitoring well locations and measurement frequencies have evolved over many years in response to data requirements to support groundwater flow modeling, gauging and forecasting groundwater supply, and efforts to monitor recharge operations, areas of concentrated pumping, and land subsidence. Monitoring frequency is based on data requirements, with wells measured biweekly, monthly, quarterly, annually, or even hourly (using transducers and dataloggers).

The District's groundwater level monitoring network consists of depth-discrete monitoring wells (including multi-level or "nested" monitoring wells) and water supply wells with single or multiple perforated zones of varying lengths. The variety of monitoring well types employed by the District to measure groundwater levels ensures that the data obtained is flexible enough to serve different purposes, including assessment of regional conditions or analysis of particular aquifer zones.

In 2008, the District deployed pressure transducers and data loggers in 87 wells. At 26 locations comprising 46 wells or discrete-depth monitoring points, telemetry equipment was installed to permit remote retrieval of water level data by cellular phone contact and satellite uplink.

The specific schedule of monitoring wells and measurement frequencies is determined based on well availability, well characteristics, and program efficiency. The locations of wells used in the District's groundwater level monitoring program in 2011 for the Santa Clara and Llagas Subbasins are displayed in Figures 5-1 and 5-2.

In 2009, the Governor signed SBX7 6, which established the California Statewide Groundwater Elevation Monitoring (CASGEM) program under DWR. The law requires that statewide groundwater level monitoring be implemented to determine seasonal and long-term trends in groundwater elevations. Local agencies may take on the responsibility for data collection and reporting to DWR. As the local groundwater management agency with a well-established and robust groundwater level monitoring network, the District will serve as the designated monitoring entity for the subbasins in Santa Clara County and will regularly report water level data for 107 District-owned monitoring wells.

Figure 5-1 2011 District Groundwater Level Monitoring – Santa Clara Subbasin

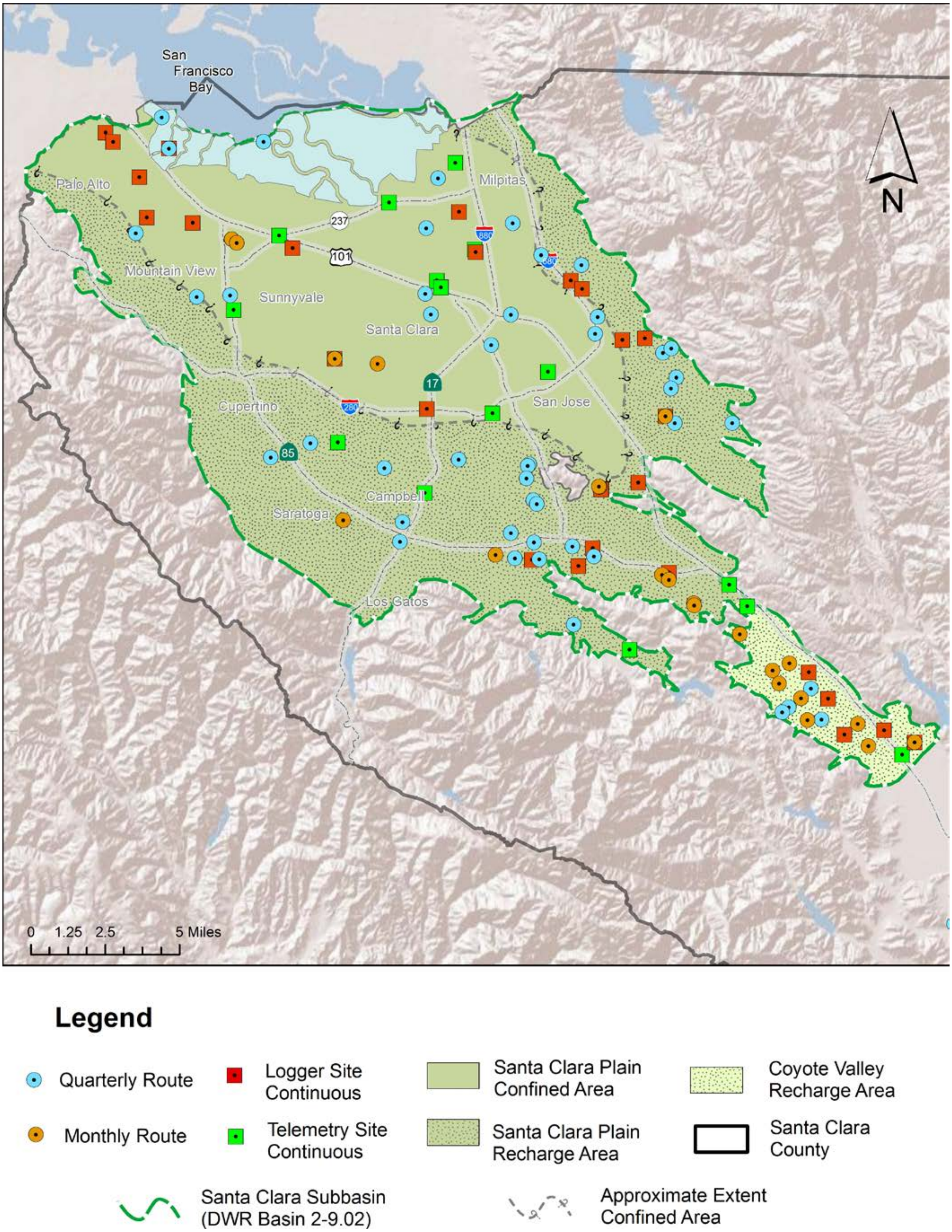
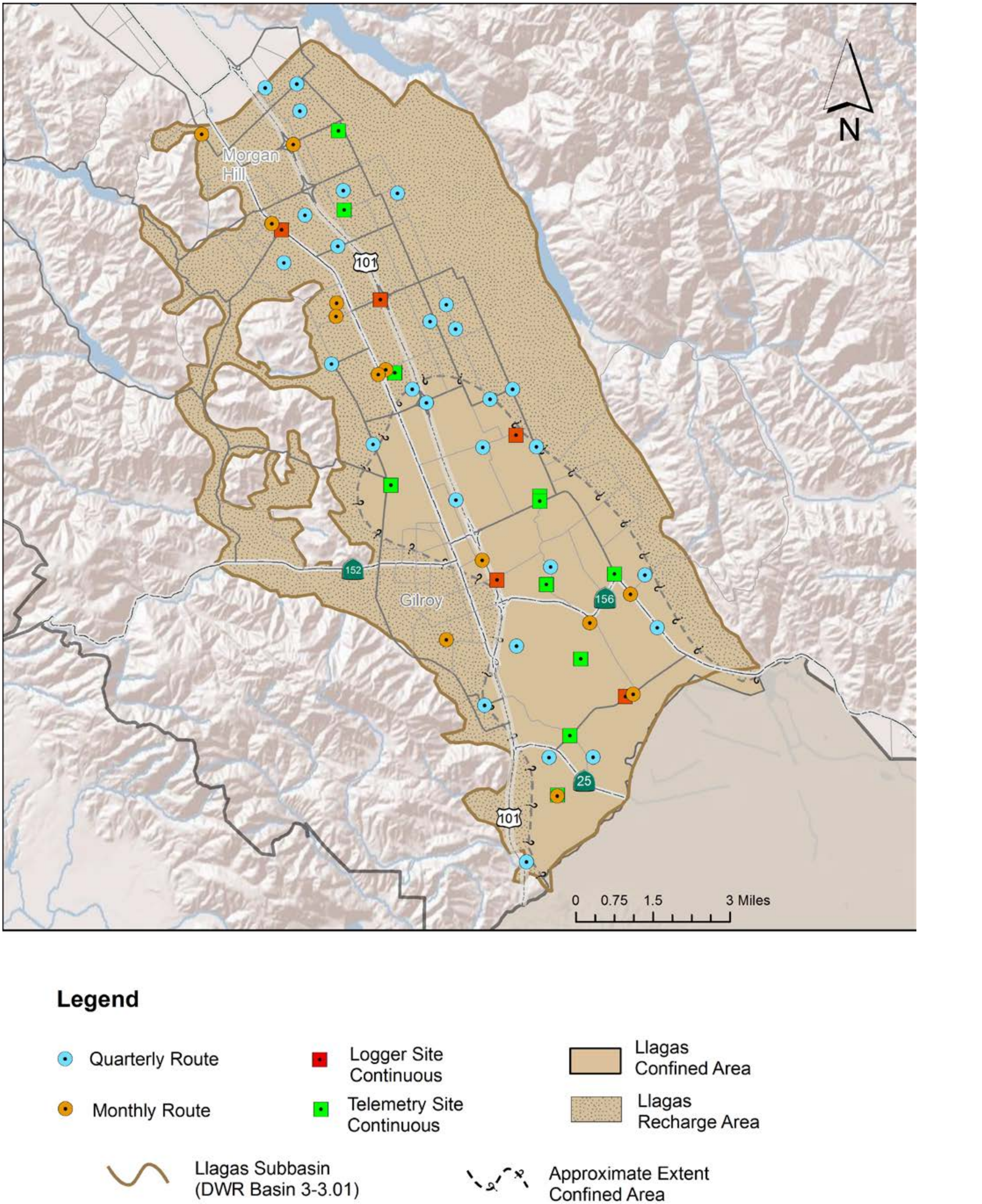


Figure 5-2 2011 District Groundwater Level Monitoring – Llagas Subbasin



5.2 Land Subsidence Monitoring

The District conducts annual monitoring of land surface elevation benchmarks and continuous monitoring of extensometers to determine if land subsidence is occurring or is threatening to exceed established subsidence thresholds. Monitoring of land subsidence is performed by annual spirit leveling of three established routes, and continuous measurement of vertical ground movement at two extensometers (also called compaction recorders).

Some amount of elastic subsidence occurs annually in response to seasonal pumping and recharge as substantiated by ground surface elevations measured with Interferometric Synthetic Aperture Radar (InSAR)[1]. The District has established an acceptable subsidence rate of no more than 0.01 feet per year on average, which has been endorsed by the Water Retailer Groundwater Subcommittee. Monitoring data indicates that this target has generally been met.

In 1991, the District evaluated the remaining land subsidence potential in order establish water level thresholds to avoid additional permanent subsidence due to groundwater overdraft[2]. Ten index wells throughout the Santa Clara Subbasin were selected as control points for subsidence calibration and prediction and the tolerable rate of 0.01 feet per year of inelastic subsidence was applied to determine threshold groundwater levels for these wells. These subsidence thresholds are the groundwater levels that must be maintained to ensure a low risk of unacceptable land subsidence. The location of the subsidence index wells is shown in Figure 5-3.

Elevation Surveys

Periodic surveys of land elevation have been conducted in Santa Clara County since 1934[3]. The District's current benchmark leveling program consists of annual surveys to determine the elevations of survey benchmarks along the three level circuits below.

- Los Altos Circuit, which runs west-east from Los Altos to Milpitas and has been measured since about 1960, with some modification
- Alum Rock Circuit, which runs west-east line from Los Gatos to Alum Rock Park in east San Jose and has been re-leveled since 1999
- Guadalupe Circuit, a north-south route that connects the Los Altos and Alum Rock Circuits and generally follows the Guadalupe River between north and south San Jose and has been re-leveled since 1989

The location of these three level circuits is shown in Figure 5-3.

Extensometer Monitoring

The USGS installed extensometers in Santa Clara County in 1960 to monitor the magnitude and the change in rate of subsidence as part of a study on subsidence. The extensometers measure vertical ground motion relative to a central, isolated pipe that is set beneath the water bearing units. The USGS terminated the field monitoring in January 1983, at which time monitoring was transferred to the District. Two 1,000 foot deep extensometer sites are currently monitored, one in Sunnyvale near Moffett Field ("Sunny") and the other near downtown San Jose ("Martha"), as shown in Figure 5-3.

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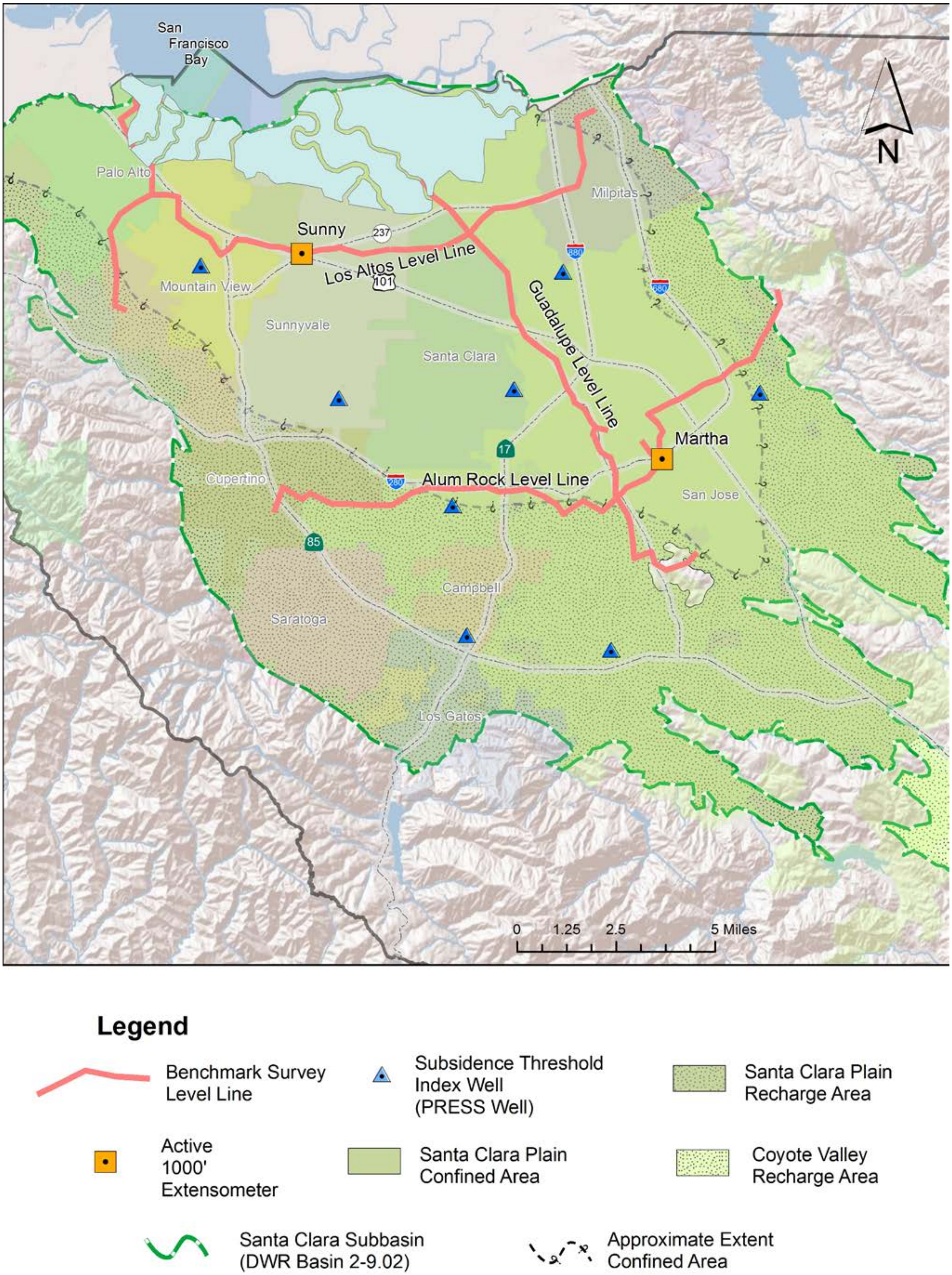
[1] Schmidt, D.A. and Burgmann, R., Time-Dependent Land Uplift and Subsidence in the Santa Clara Valley, California from a Large Interferometric Synthetic Aperture Radar Data Set, Journal of Geophysical Research, Volume 108, No. B9, 2003.
[2] Geoscience Support Services Inc. for Santa Clara Valley Water District, Subsidence Thresholds in the North County Area of Santa Clara Valley, 1991.
[3] USGS, Land Subsidence in the Santa Clara Valley, California as of 1982, Professional Paper 497-F, 1988.

Figure 5-3 Location of Subsidence Index Wells, Level Circuits, and Extensometers



5.3 Groundwater Quality Monitoring

The District conducts groundwater quality monitoring to characterize regional groundwater quality conditions, determine the severity and extent of any contamination, evaluate temporal trends in water quality, and identify any threats to groundwater to determine where further study or action is warranted to protect groundwater resources.

District Annual Groundwater Quality Monitoring

The District's annual groundwater quality monitoring program assesses regional groundwater quality conditions and includes both dedicated monitoring wells and water supply wells owned by the District, local water retailers, and private well owners. Each fall, more than 70 wells are sampled. Samples are analyzed for basic water quality parameters, major ions, total dissolved solids, and nutrients. Volatile and semi-volatile organic compounds (which are infrequently detected) and trace metals (which are commonly detected, but seldom show a significant change) are sampled on a staggered 3 year cycle.

Wells are chosen to provide adequate geographic representation throughout the Santa Clara and Llagas Subbasins while avoiding spatial bias. Monitoring includes both the shallow and principal aquifer zones, although there are currently relatively few shallow zone wells included in the District's monitoring network. The District's annual Groundwater Quality Report is posted on the District website[4] and describes groundwater quality results for wells sampled the previous calendar year. Wells monitored in 2011 are shown in Figures 5-4 and 5-5.

District Focused Groundwater Quality Monitoring

The District also monitors about 50 additional wells at 30 locations on a three-year cycle. These "focus wells" are intended to address specific concerns and allow characterization of water quality in particular zones and areas. Focus wells are monitored every three years and include wells located near San Francisco Bay to monitor salt water intrusion and depth-discrete wells with short screened intervals that allow a vertical profile of groundwater quality to be evaluated. The District has also proposed monitoring focus wells in areas with very high groundwater vulnerability, although none are currently available. The locations of the focus wells are presented in Figure 5-6.

Water Supplier Monitoring

Local water retailers and other public water suppliers in the county perform water quality analysis of well samples in order to comply with CDPH requirements and make operational decisions. In general, compliance monitoring is completed at least once every three years following a schedule set by CDPH. Each year, the District acquires the CDPH database for all public water systems in Santa Clara County and includes that data in the annual evaluation of groundwater quality. In 2011, the District obtained CDPH water quality compliance data from 246 production wells, as shown on Figures 5-4 and 5-5.

Groundwater Ambient Monitoring and Assessment (GAMA) Program

The GAMA program was created by the Groundwater Quality Monitoring Act of 2001 (AB 599), with the goals of improving statewide groundwater monitoring and increasing the availability of groundwater data to the public. The State Water Resources Control Board program is performed by the U.S. Geological Survey and Lawrence Livermore National Laboratory. This program uses special protocol and equipment to obtain very low detection limits, allowing detections at concentrations typically 1 to 3 orders of magnitude below drinking water standards.

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[4] www.valleywater.org

The Santa Clara Subbasin was first sampled for the GAMA program in 2001 and 2002 (under the precursor California Aquifer Susceptibility program[5]) and was re-sampled in the summer of 2007[6]. The Llagas Subbasin was also first sampled in 2001 and 2002 and was sampled again in 2008[7].

[5] Lawrence Livermore National Laboratory, California Aquifer Susceptibility, A Contamination Vulnerability Assessment for the Santa Clara and San Mateo County Groundwater Basins, 2004.

[6] USGS, Ground-water quality data in the San Francisco Bay study unit, 2007: Results from the California GAMA program: U.S. Geological Survey Data Series 396, 2009.

[7] USGS, Groundwater-quality data in the South Coast Interior Basins study unit, 2008: Results from the California GAMA program: U.S. Geological Survey Data Series 463, 2009.

Figure 5-4 2011 Groundwater Quality Monitoring – Santa Clara Subbasin

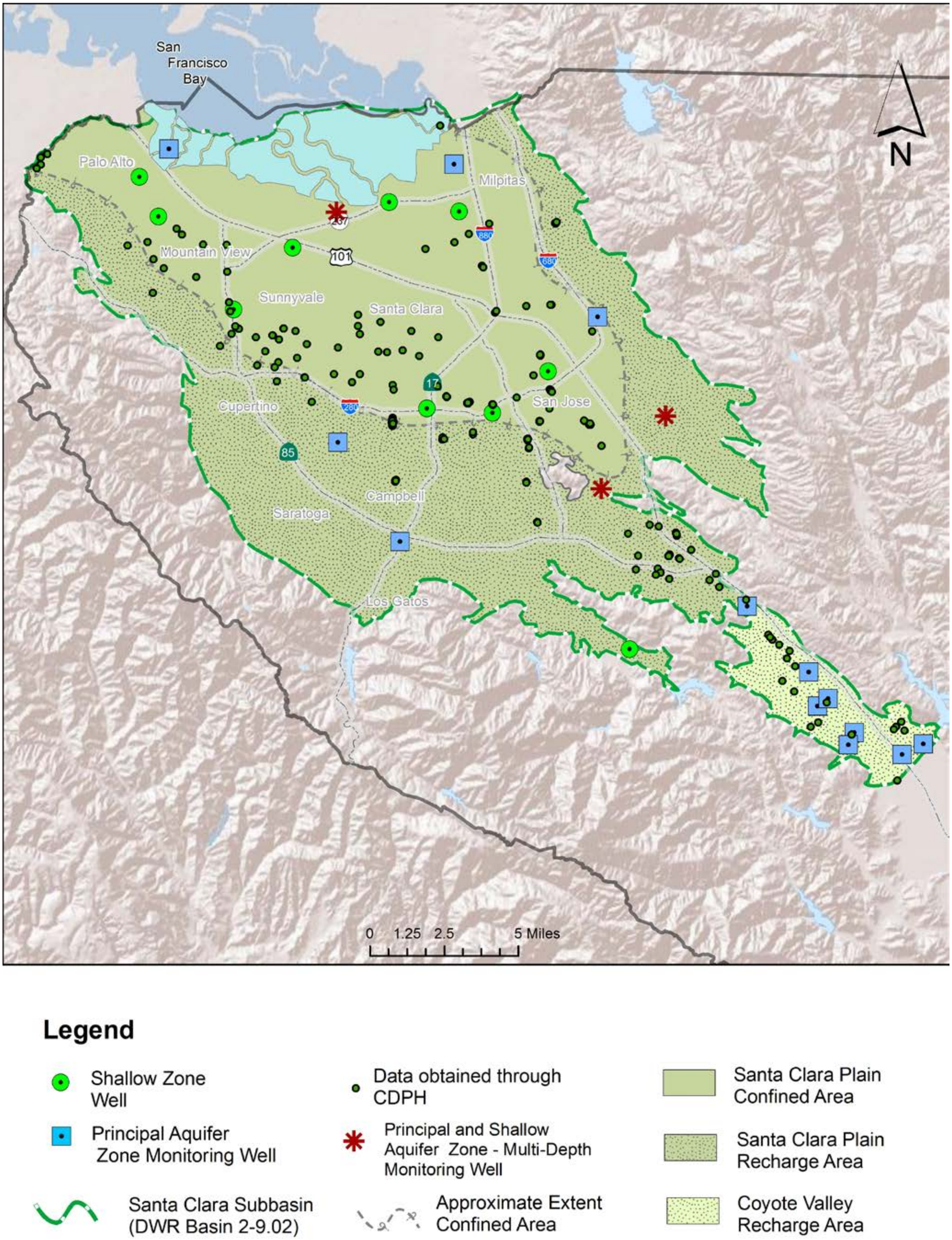


Figure 5-5 2011 Groundwater Quality Monitoring – Llagas Subbasin

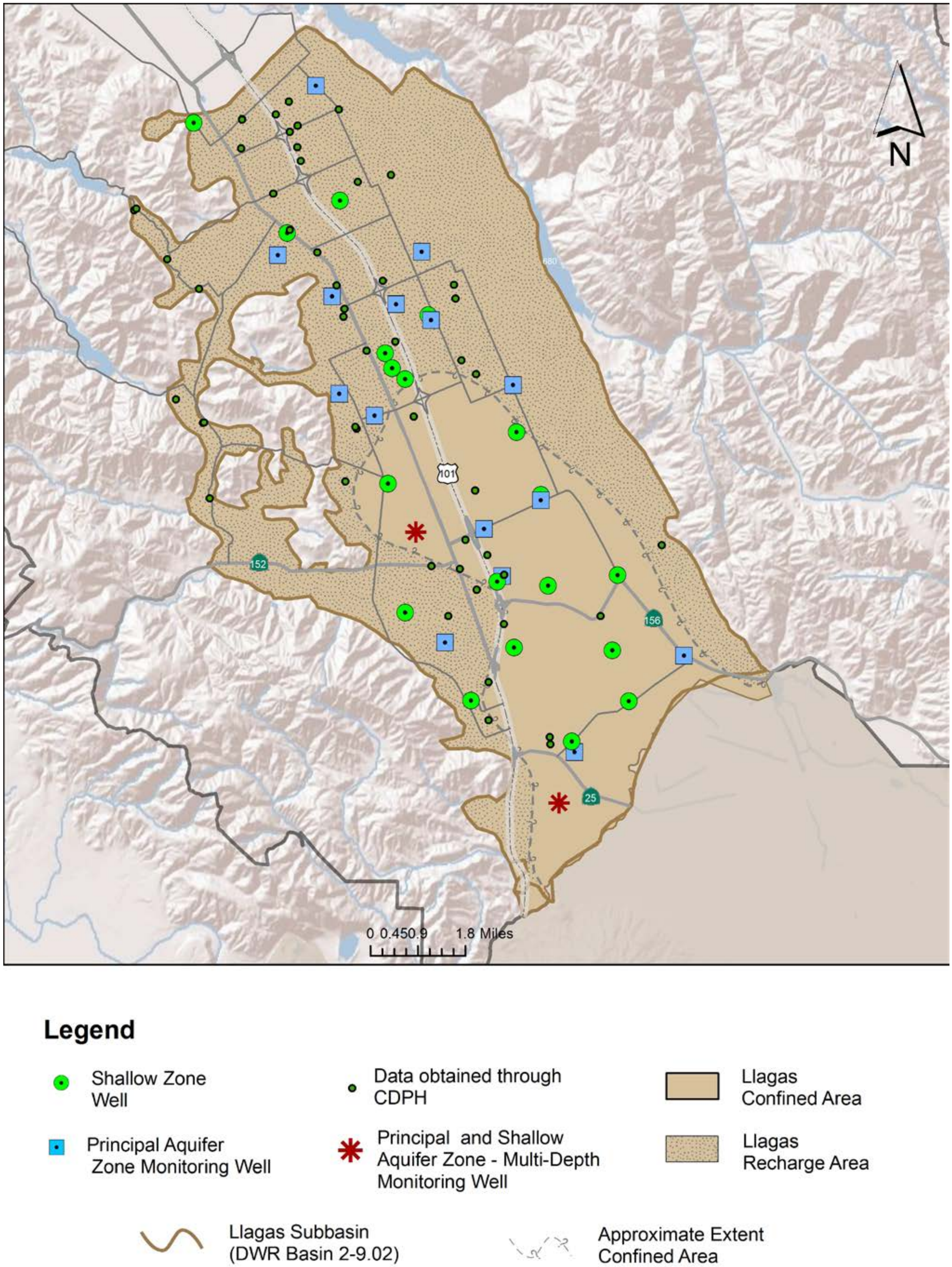
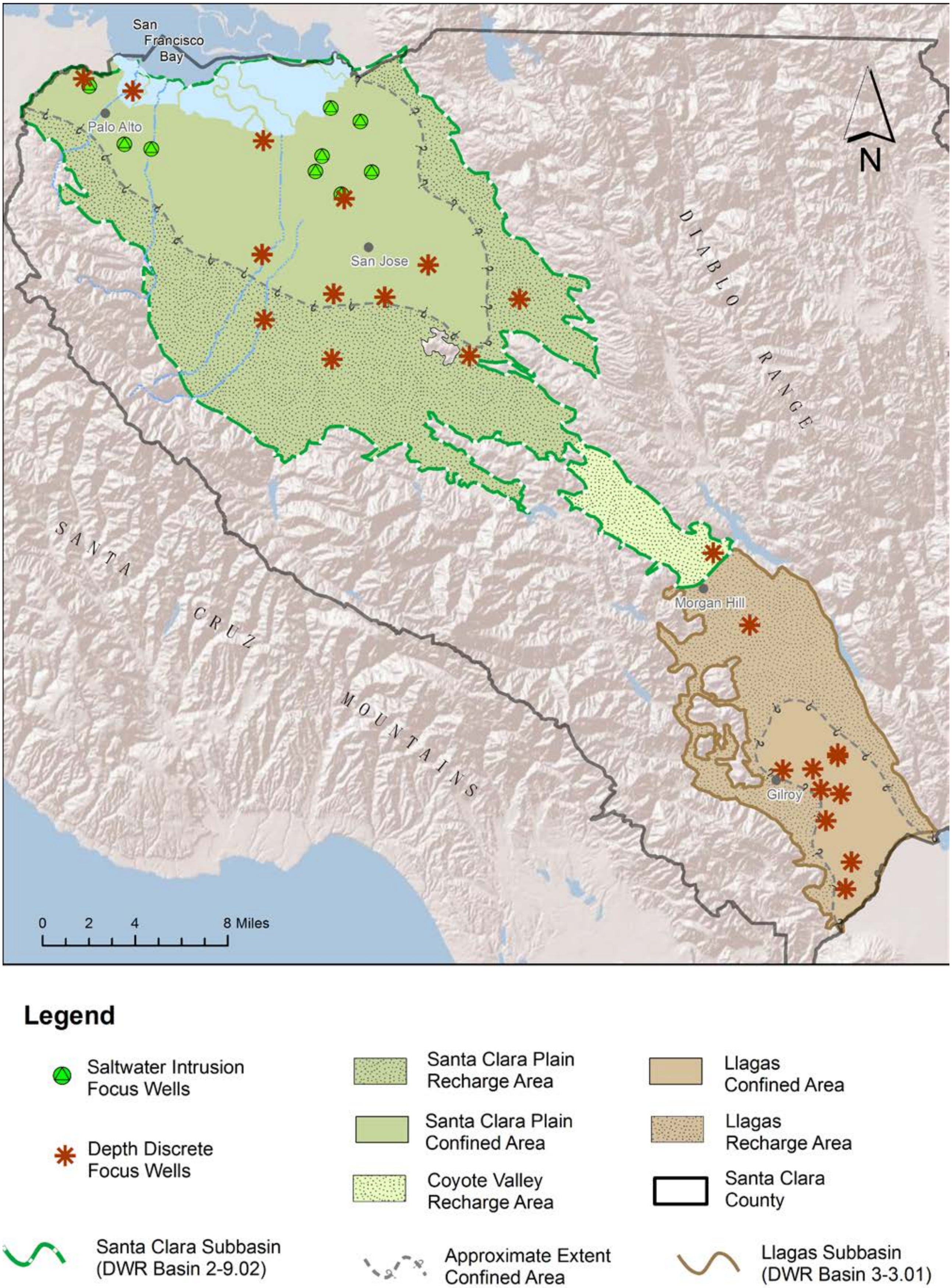


Figure 5-6 Location of Groundwater Quality Monitoring Focus Wells



5.4 Surface Water Monitoring

Recharge Water Quality Monitoring

The District monitors water quality for water supply sources that feed the District's water treatment plants, specifically those reservoirs designated as drinking water resources and imported raw water from the Sacramento/San Joaquin Delta. This monitoring effectively covers most, but not all, of the water used in the managed groundwater recharge program. The District has recently begun to monitor the water quality at District facilities used to recharge groundwater, such as ponds and creeks. These facilities may receive a blend of local runoff and imported water, and may be susceptible to contamination from nearby land use activities such as roads and highways.

The purpose of the District's recharge water quality monitoring program is to characterize the quality of water used for managed recharge at District facilities, to identify constituents of concern that may impact groundwater quality, and to determine whether changes to existing groundwater water quality monitoring programs or recharge operations are necessary to protect groundwater.

Monitoring is performed during both the wet season and dry season at recharge ponds and creeks used by the District for managed recharge. In order to sample each recharge system, the sampling frequency consists of a rotating schedule designed to sample each major recharge system at least once every three years. Constituents analyzed included major and minor ions, trace elements, total dissolved solids, electrical conductivity, and alkalinity. Additionally, samples from selected recharge facilities are tested for semi-volatile and volatile organic compounds during the wet season based on the proximity and types of potentially contaminating land use activities. The recharge facilities sampled and parameters analyzed each year are described in the District's annual Recharge Water Quality Monitoring Report, which is posted on the District's website[8].

Between 9 and 16 recharge facilities were sampled on multiple occasions in fiscal years 2010, 2011, and 2012 as shown in Figure 5-7.

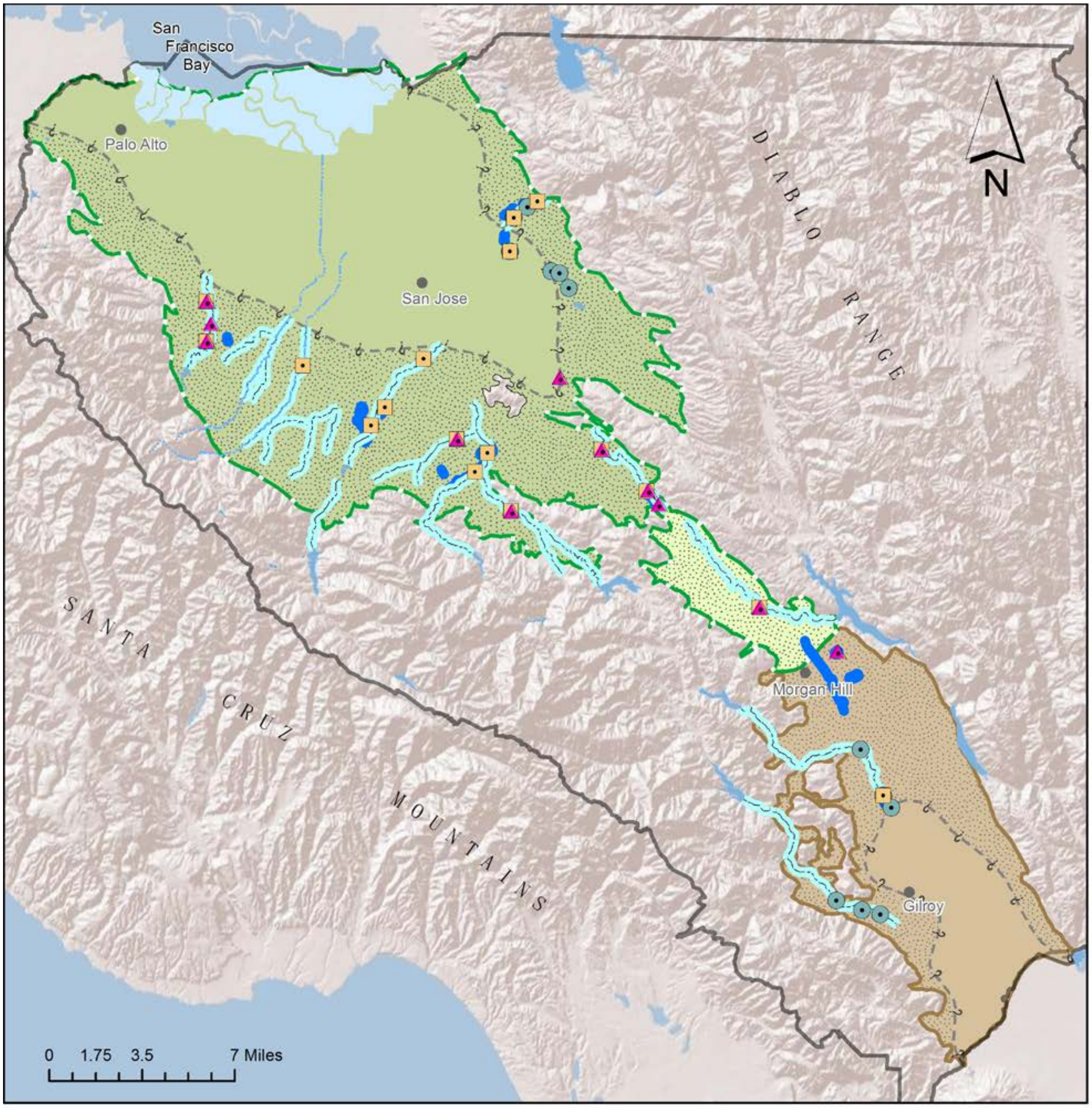
Surface Water Flow Monitoring

Surface water stage and flow rates are measured to ensure that recharge facilities are receiving the appropriate flows, to comply with water rights reporting and reservoir restrictions, and to meet environmental requirements. Surface water flow data also helps the District evaluate which reaches of streams are gaining streams or losing streams with regard to groundwater interaction as described in Section 4.3.4 (Water Accounting). Stream gauging stations monitored by the District are presented in Figure 5-8.

Stream gauging data is available on the District's website[8] in real-time through the ALERT system (Automated Local Evaluation in Real Time) using radio telemetry.

[8] www.valleywater.org

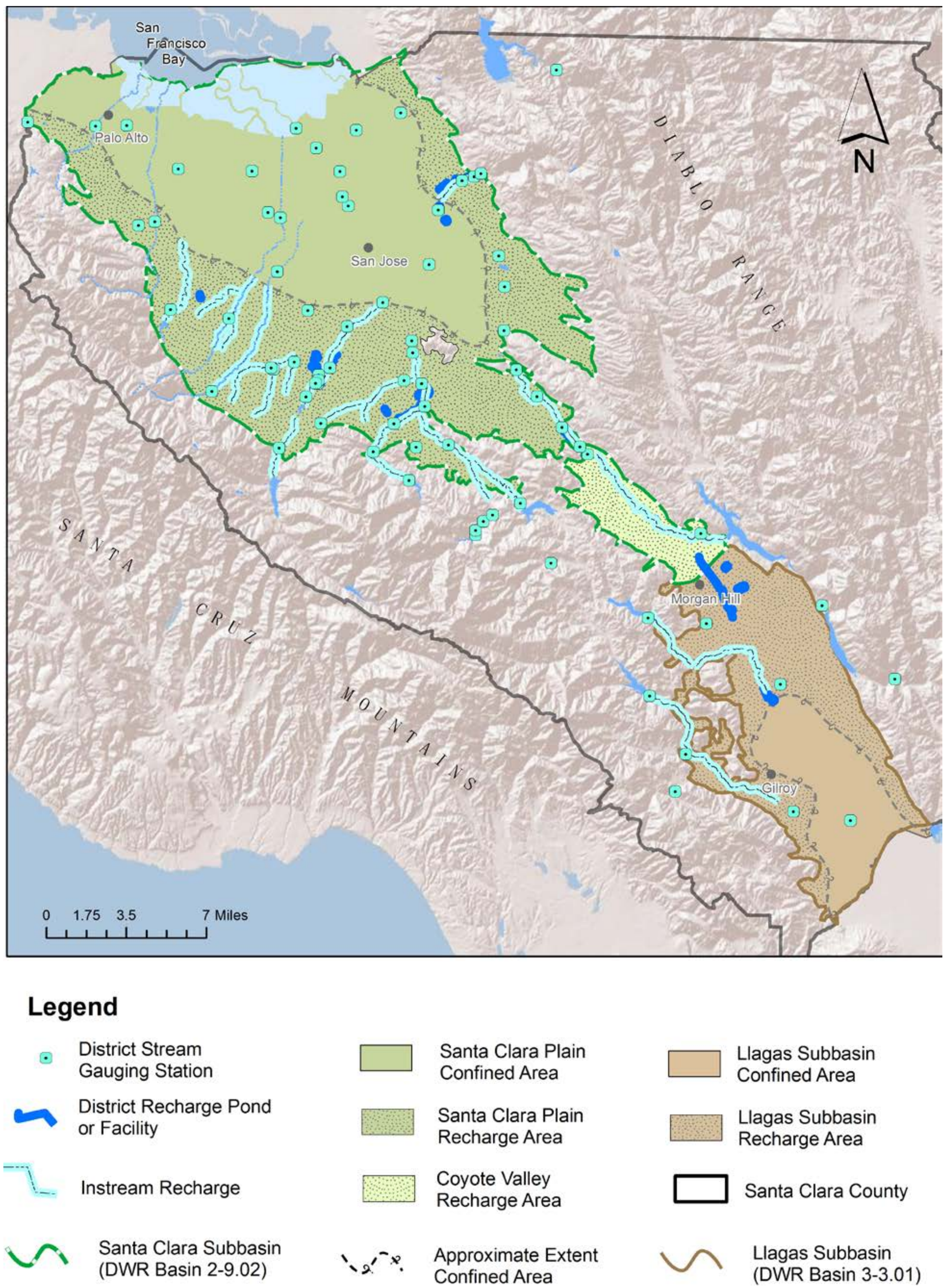
Figure 5-7 Recharge Water Quality Monitoring Locations



Legend

- Recharge Monitoring Locations FY 2012
- Recharge Monitoring Locations FY 2011
- Recharge Monitoring Locations FY 2010
- District Recharge Pond or Facility
- Santa Clara Subbasin (DWR Basin 2-9.02)
- Instream Recharge
- Santa Clara Plain Confined Area
- Santa Clara Plain Recharge Area
- Approximate Extent Confined Area
- Coyote Valley Recharge Area
- Llagas Confined Area
- Llagas Recharge Area
- Llagas Subbasin (DWR Basin 3-3.01)

Figure 5-8 Location of Stream Gauging Stations



5.5 Collection, Management, and Reporting of Monitoring Data

As described above, the District collects a significant amount of data each year related to groundwater levels, land subsidence, groundwater quality, and recharge water quality. Data collected through various monitoring programs are stored in the District's databases to allow for subsequent retrieval and data analysis. The District's monitoring protocols described in this section help ensure data is properly measured, analyzed, and recorded.

Monitoring Protocols

The District is certified under the International Standards for Organizations (ISO) 9000 and 14000 series. As part of the compliance with these standards, the District has developed a Quality Environmental Management System (QEMS). The monitoring programs described above have written protocols that have been established or are in the process of being established to ensure that the data is of high quality and able to meet the District's needs. The District follows standard industry practices and methodology as described briefly below.

The District collects groundwater level data, as well as reservoir and stream gauging data, in accordance with standard practices developed by the USGS. Site conditions, field measurements, and other relevant observations are recorded at the time of monitoring. Elevation surveys are performed in accordance with standard practices developed by the U.S. Army Corp of Engineers.

The District collects water quality samples from wells and recharge facilities in accordance with standard practices developed by the USGS. Site conditions, field measurements, and other relevant observations are recorded in field notebooks or field computers and standard chain-of-custody procedures are followed. Samples are handled and stored in accordance with the analytical method requirements and are delivered to state-certified laboratories for analysis. The District's laboratory, which is certified under the California Department of Public Health's Environmental Laboratory Accreditation Program, is used for sample analysis whenever possible.

Reporting of Monitoring Data

Monitoring data provides the basis for numerous District programs, projects, and management decisions, including annual water supply operations and long-term water utility planning. Data collected by the District is made publicly available on the District website[9] through a number of regular publications as shown in Table 5-1 below.

[9] www.valleywater.org

Table 5-1 Availability of District Monitoring Data

Report	Frequency of Publication	Contents
Protection and Augmentation of Water Supplies Report	Annual (February)	Information on water supply and use; groundwater recharge, pumping, levels, and storage; in-lieu recharge, projected water supply availability and demand, and activities to protect and augment water supplies as required by the District Act
Water Tracker	Monthly	Current data for groundwater levels at select wells, pumping, recharge, and estimated groundwater storage
Groundwater Quality Report	Annual (June)	Groundwater quality data for the Santa Clara and Llagas Subbasins, including comparison to water quality objectives and evaluation of trend
Recharge Water Quality Report	Annual (June)	Recharge water quality data for facilities monitored

In addition to the reports listed, the District website also has real-time data for stream flow gauges, rain gauges, reservoir gauges, and a weather station. As the designated monitoring entity for Santa Clara County under the CASGEM program, water level data collected by the District is also reported to DWR and posted on the CASGEM website.

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6 2012 GROUNDWATER MANAGEMENT PLAN
Outcome Measures

This chapter describes key performance measures in meeting the following basin management objectives: (1) Groundwater supplies are managed to optimize water supply reliability and minimize land subsidence; and (2) Groundwater is protected from existing and potential contamination, including salt water intrusion. These outcome measures, which are described in detail in this chapter, are as follows:

1. Projected end of year groundwater storage is greater than 278,000 AF in the Santa Clara Plain, 5,000 AF in Coyote Valley, and 17,000 AF in the Llagas Subbasin.
2. Groundwater levels are above subsidence thresholds at the subsidence index wells.
3. At least 95% of countywide water supply wells meet primary drinking water standards and at least 90% of South County wells meet Basin Plan agricultural objectives.
4. At least 90% of wells in both the shallow and principal aquifer zones have stable or decreasing concentrations of nitrate, chloride, and total dissolved solids (TDS).

These measures will be assessed annually, based on data for the previous year. The basis for these outcome measures and a description of how they will be measured is presented below.

6.1 GROUNDWATER STORAGE

Outcome Measure: Projected end of year groundwater storage is greater than 278,000 AF in the Santa Clara Plain, 5,000 AF in Coyote Valley, and 17,000 AF in the Llagas Subbasin.

Groundwater storage is a critical consideration in water supply reliability and is the county's best protection against drought or other facility outage. The end of year groundwater storage is projected to support operational decisions, including the timing and location of reservoir releases and managed recharge, and decisions related to imported water such as short-term water exchanges or out of county banking.

The District's Urban Water Management Plan[1] contains a water shortage contingency plan that uses groundwater storage to indicate potential water shortages and outlines the overall strategy for dealing with water shortages, including contingency actions. The "normal" stage where no contingency action is needed occurs when projected end of year groundwater storage is above 300,000 AF.

While the UWMP provides an overall storage target of 300,000 AF, more specificity is needed with regard to the management of individual subbasins and groundwater management areas. Based on groundwater storage observed historically, the end of year storage targets established in this 2012 GWMP are 278,000 AF for the Santa Clara Plain, 5,000 AF for the Coyote Valley, and 17,000 AF for the Llagas Subbasin.

6.2 GROUNDWATER LEVELS AND LAND SUBSIDENCE

Outcome Measure: Groundwater levels are above subsidence thresholds at the subsidence index wells.

Inelastic land subsidence in the Santa Clara Plain began in the early twentieth century, due mainly to a reduction of artesian pressure from excessive groundwater pumping. Lands near the Bay sank below sea level, resulting in salt water intrusion and requiring investments in additional flood control facilities. Significant inelastic subsidence (up to 13 feet in San Jose) was essentially halted by about 1970 through the District's expanded conjunctive use programs, which allowed a substantial recovery in groundwater levels. The avoidance of inelastic land subsidence

[1] Santa Clara Valley Water District, Urban Water Management Plan, 2010.

has been and continues to be a major driver for the District given the extremely high costs associated with damaged infrastructure, reduced carrying capacity of flood control structures, and salt water encroachment into fresh water aquifers.

In 1991, the District evaluated the remaining land subsidence potential so as to avoid additional inelastic subsidence due to groundwater overdraft[2]. Ten index wells throughout the Santa Clara Subbasin were selected as control points for subsidence calibration and prediction and the tolerable rate of 0.01 feet per year of inelastic subsidence was applied to determine threshold groundwater levels for these wells. These subsidence thresholds are the groundwater levels that must be maintained to ensure a low risk of unacceptable land subsidence.

Based on the findings of this study, the District has established an acceptable subsidence rate of no more than 0.01 feet per year on average. This rate was presented to and endorsed by the Water Retailer Groundwater Subcommittee following the study, and the related subsidence thresholds have been used historically to measure performance in meeting Board policy. Monitoring data indicates that target has generally been met.

This outcome measure relies on continued observation of groundwater levels at the subsidence index wells and comparison to subsidence thresholds to ensure groundwater levels are maintained above these thresholds. Since inelastic subsidence is irreversible, it is critical that it is prevented rather than observed. Therefore, to be proactive, the District also performs scenario modeling to project future groundwater conditions so changes in operations or groundwater management can be made to avoid inelastic subsidence before it occurs.

6.3 GROUNDWATER QUALITY

Outcome Measure: At least 95% of countywide water supply wells meet primary drinking water standards and at least 90% of South County wells meet Basin Plan agricultural objectives.

Water supply reliability depends on maintaining both an adequate supply of water and protecting water quality. While surface water goes through significant treatment before being served as drinking water, groundwater in the county typically does not require wellhead treatment before being served. This makes protecting groundwater quality all the more critical. The groundwater subbasins in Santa Clara County have good water quality overall, but maintaining that quality is not without its challenges. Threats to groundwater quality come from a variety of sources and include urban, rural, and agricultural activities. Elevated nitrate is fairly widespread South County and each year, a few detections above maximum contaminant levels are also noted for constituents such as perchlorate and aluminum.

To protect the quality of groundwater for beneficial uses, this outcome measure evaluates the percentage of water supply wells that meet all primary Maximum Contaminant Levels (MCLs) and South County wells meeting agricultural objectives for irrigation. Since the focus of this outcome measure is on groundwater currently used and most of the groundwater extracted is from deeper aquifers, data from water supply wells in the principal aquifer zone are used for this measure. This outcome measure will be evaluated annually using data collected at water supply wells by the District and water retailers. Data from dedicated monitoring wells will not be used as it is less representative of water being pumped for beneficial use.

The target percentage for water supply wells meeting primary MCLs is set high (95%) since these are health-based regulatory standards that must be met by public water systems. This measure is not set at 100% for several reasons. CDPH does not consider a single detection of a contaminant to be indicative of contamination and would not consider a single detection to be an actual finding without a follow-up detection. Water served to customers may not have had the contaminant present at that concentration since water systems may perform treatment or blending

[2] Geoscience Support Services Inc. for Santa Clara Valley Water District, Subsidence Thresholds in the North County Area of Santa Clara Valley, 1991.

prior to service. Also, some of the wells monitored by the District are private domestic wells, which are assumed to have less stringent wellhead protection, maintenance, and testing. The water quality at these wells may be more influenced by local land use and conditions near the well as they are typically shallower than public water supply wells and domestic wells are not subject to drinking water standards.

The target percentage for South County water supply wells meeting Basin Plan agricultural objectives for irrigation is set at 90%. The lower target for the agricultural outcome measure reflects the less serious consequences; not meeting this target does not adversely impact human health but may reduce plant yield. Ideally, the measurement would rely on agricultural wells, however the District has monitoring access to very few of these wells. Agricultural wells are assumed to have similar construction as water supply wells (multiple screened intervals) so water supply wells are used as a proxy. This measure is only applicable to water supply wells in the Coyote Valley and Llagas Subbasin since there is very little remaining agriculture in the Santa Clara Plain. Water quality data will be compared to agricultural objectives for irrigation per the San Francisco Bay Basin Plan for the Coyote Valley and the Central Coast Basin Plan for the Llagas Subbasin.

6.4 GROUNDWATER QUALITY TRENDS

Outcome Measure: At least 90% of wells in both the shallow and principal zones have stable or decreasing concentrations of nitrate, chloride, and total dissolved solids (TDS).

The timely identification of adverse trends is important so that appropriate action can be taken to protect groundwater resources. This outcome measure will evaluate long-term trends in groundwater quality for nitrate, chloride, and TDS on an annual basis using ten years of data from both water supply and dedicated monitoring wells. This will help the District to better understand how groundwater quality is changing over time and highlight areas that may warrant further study or action to protect the beneficial use of groundwater.

Nitrate trends will be evaluated because nitrate affects the largest number of wells in the county. Common sources of nitrate in groundwater are synthetic fertilizers, septic systems, and animal wastes. Elevated nitrate is common in the Llagas Subbasin due to historic and ongoing sources; however there are also localized areas with nitrate concerns in the Santa Clara Subbasin. Chloride is used to measure potentially adverse trends related to salt water intrusion, which has occurred historically adjacent to San Francisco Bay. Evaluating long-term trends will help assess the potential for renewed intrusion. TDS is used as an indicator of salt loading and of overall water quality. The salts from applied water remain in the soil layer, and can eventually be leached into groundwater by rainfall or over-irrigation.

This outcome measure tracks the trend in nitrate, chloride, and TDS concentrations to evaluate potentially adverse conditions. The measure evaluates shallow and principal aquifer zone wells separately since changes in shallow wells might be detectable before changes appear in deeper wells. Trends will be analyzed for all available wells, including both water supply and dedicated monitoring wells. The outcome measure uses a target percentage of 90% to serve as a broad indicator of trends in these constituents, while recognizing that groundwater quality can fluctuate at any given well over time due to hydrology, pumping, or other factors. Also, the mere presence of a statistically significant increasing trend does not necessarily indicate a problem; the magnitude of change also needs to be considered. While the target percentage of 90% will serve as an overall indicator of trends in groundwater quality, the magnitude of trend will also be evaluated to identify potential areas of concern so that additional action can be taken if necessary to protect groundwater resources.

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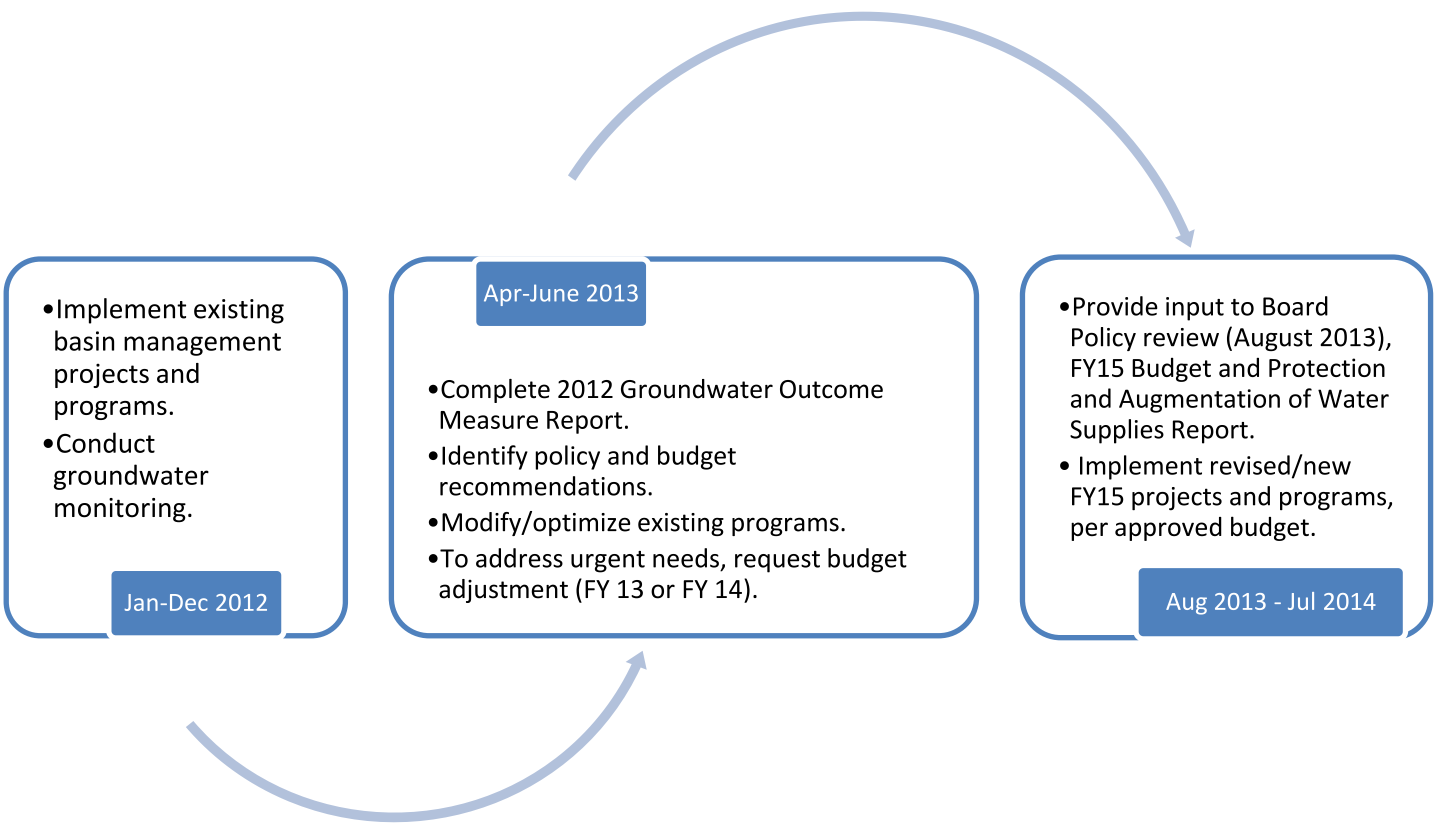
7 2012 GROUNDWATER MANAGEMENT PLAN
Next Steps

Previous chapters of this 2012 Groundwater Management Plan outlined the District's basin management objectives, strategies to meet those objectives, related programs and activities, and key outcome measures to gauge performance. This chapter describes potential actions that may be taken if an outcome measure is not met. This chapter also presents specific report recommendations.

7.1 EVALUATION AND REPORTING OF OUTCOME MEASURES

The outcome measures presented in the 2012 Groundwater Management Plan will be evaluated on a regular basis for the previous operational year as described in Chapter 6. The results of this evaluation will be presented in an annual Groundwater Outcome Measure Report, which will also include recommendations for action if any outcome measure indicates improvement is needed. Recommended actions may include changes to existing programs that can be implemented immediately, as well as new initiatives that may be included in future budget proposals. As an example, the evaluation and reporting cycle for 2012 groundwater management is shown in Figure 7-1 below.

Figure 7-1 Reporting Cycle for 2012 Groundwater Management



The 2012 Groundwater Management Plan is based on a "Plan, Do, Check, Act" framework or model of continuous improvement:

- Identify basin management objectives and strategies in accordance with the District Act and Board policy. ("Plan")

- Implement basin management programs and activities in accordance with strategies to achieve basin management objectives. (“Do”)
- Conduct monitoring, analyze results, and compare to outcome measures. (“Check”)
- Modify existing programs or evaluate and develop new strategies and tools if outcome measures indicate improvement is needed. (“Act”)

The District plans to review the Groundwater Management Plan (GWMP) and update as needed every five years. This schedule will ensure that current information on local groundwater management is available to support the five-year updates of Urban Water Management Plans (UWMPs) required by State law. As the next UWMP is scheduled to be completed in 2015, the next review and update of this 2012 GWMP will be completed in 2014.

7.2 ADDRESSING OUTCOME PERFORMANCE ISSUES

The District’s approach to groundwater management has evolved over decades in response to numerous challenges, relying upon authorities contained in the District Act, the cooperation of retail water agencies, and the support of local groundwater users as well as a broad array of stakeholders. If evaluation of the outcome measures indicates poor performance toward meeting a basin management objective, the District will first evaluate potential changes to existing programs and activities prior to considering significant groundwater management changes. Any significant policy or investment decisions would be developed and evaluated in coordination with other District planning efforts and in consultation with local stakeholders, as the District does in current planning and budgeting processes.

Water Supply Reliability and Minimization of Land Subsidence

Future challenges to maintaining reliable groundwater supplies and minimizing land subsidence are analyzed in the District’s 2010 Urban Water Management Plan. Strategies to address these challenges are currently being developed in the Water Supply and Infrastructure Master Plan that is anticipated to be complete in 2012. Although county-wide water supplies are generally sufficient to meet demands in normal years through 2030, shortages may occur during future extended droughts (up to 47,000 acre-feet per year, on average). In addition, these plans acknowledge certain risks that could change this water supply outlook, and further impact the District’s ability to maintain groundwater supplies. These risks include increased water needs beyond current projections, and uncertainties in surface water supplies, including San Francisco Public Utilities Commission contract renewal, constraints on Delta exports, and climate change.

Existing groundwater management tools for ensuring groundwater reliability and minimizing land subsidence include:

- Implementation of additional managed recharge and groundwater pumping offsets through treated water sales and expansion of water use efficiency programs;
- Cooperation with water retailers on source shifts and drought demand reductions;
- Coordination with water retailers and cities on Urban Water Management Plans and water use assessments required under SB610.

Potential groundwater management tools that could also be considered include:

- Creation or modification of groundwater charge zones;
- Changes to the groundwater charge rate structure;
- Changes in the District’s well permitting process;
- Institutional agreements with water retailers related to groundwater management;

- Regulation of groundwater pumping if groundwater is endangered and regulation is necessary to avoid permanent damage in the form of diminution, contamination, pollution, or soil compaction in accordance with the District Act

Groundwater Quality Protection

Challenges to protecting groundwater quality include intensified land use, emerging contaminants, and responding to changing regulatory standards. The District works in cooperation with water retailers, land use agencies, regulatory agencies, and the public to protect groundwater resources. If the performance measures for groundwater quality are not met, there are a number of additional activities that can be considered to improve groundwater protection, depending on the nature of the observed contamination or the identified threat, including:

- Increased coordination with regulatory agencies to ensure that high-threat contamination is promptly and adequately addressed
- Expanded outreach efforts to raise awareness of groundwater protection, including outreach to agricultural users in coordination with local partners and the Central Coast Water Board
- Coordination with local land use agencies and others to develop guidelines or best management practices related to specific threats
- Expanded efforts with legislators and others to target significant threats and fund regulatory efforts
- Enhanced recharge programs to further dilute contaminants
- Providing point-of-use or wellhead treatment of pumped groundwater to reduce exposure to nitrate
- Re-initiation of the District's abandoned well destruction assistance program to address vertical conduit threats
- New groundwater protection ordinance or regulatory solutions, if needed to protect groundwater quality

7.3 RECOMMENDATIONS

The District's proactive groundwater management programs and activities have maintained groundwater levels, minimized land subsidence, and improved groundwater protection. To maintain the long-term viability of groundwater resources, the following specific actions are recommended:

1. **Maintain existing conjunctive use programs and evaluate opportunities for enhancement or increased efficiency.**

   Conjunctive use programs maintain groundwater levels and flow gradients and are essential to prevent groundwater overdraft, land subsidence, and salt water intrusion. Priorities include efforts to:

   a. Ensure the reliability of and maintain the District's existing water utility infrastructure, including local dams and reservoirs, diversion structures, pipelines, pumping stations, treatment plants and managed recharge facilities.

   b. Implement high-priority capital projects that support conjunctive use, including seismic stability projects to improve dam safety and restore full reservoir storage capacity.

   c. Secure local and imported sources of supply, including a long-term solution for reliable Delta conveyance.

   d. Continue and expand where possible in-lieu recharge programs to offset pumping, including treated water sales, water recycling and water conservation, to reduce demands on the groundwater subbasins.

e. Encourage water retailers to maintain other water supply sources, including San Francisco Public Utilities Commission contract deliveries to Santa Clara County.

f. Maintain and optimize operations activities that support the conjunctive use program, including modeling, forecasting, systems control, and water accounting.

2. **Continue to aggressively protect groundwater quality through District programs and collaboration with land use agencies, regulatory agencies, and basin stakeholders.**

A reliable water supply depends not only on quantity, but on quality. Unlike surface water, most groundwater pumped in the county does not require treatment prior to drinking or beneficial use, making protection of this local resource all the more important. Priorities include efforts to:

a. Continue to implement comprehensive programs to evaluate groundwater quality conditions so potentially adverse trends can be quickly identified and appropriate action can be taken before conditions become severe.

b. Collaborate with local partners and regulatory agencies on efforts including salt and nutrient management, storm water management, land use and policy review, and recycled water expansion.

c. Evaluate opportunities for expanded partnerships to maximize groundwater protection.

3. **Finalize key Water Utility plans.**

a. Complete the Water Supply and Infrastructure Master Plan by December 2012 to address future challenges to maintaining reliable groundwater supplies and minimizing land subsidence.

b. Complete the Salt and Nutrient Management Plan by December 2013 to address changes in land use, expansion of recycled water, and other water quality management issues.

4. **Maintain adequate monitoring programs.**

The assessment of groundwater conditions and performance of outcome measures relies on timely, accurate, and representative data. The District has established comprehensive monitoring programs and related protocols for measurement of groundwater levels, land subsidence, groundwater quality, recharge water quality, and surface water flow. However, many of these programs have spatial data gaps due to the lack of appropriate wells, well destruction, loss of access to private wells, and other issues. Priorities include efforts to:

a. Validate existing monitoring networks and identify gaps.

b. Secure long-term access for sustainable monitoring networks.

c. Prepare justifications for construction of additional monitoring wells as needed.

5. **Continue and enhance groundwater management partnerships with water retailers and land use agencies.**

a. Continue regular Water Retailer meetings, including the Groundwater Subcommittee.

b. Meet regularly with South County water retailers to discuss Llagas Subbasin management issues.

c. Explore options for improved management of local water and San Francisco Public Utilities Commission supplies in Santa Clara County.

d. Further develop contingency plans and management options for water shortages, as well as for local or Delta-related interruptions in supply.

e. Coordinate with water retailers and local land use agencies on water supply assessments and the development of 2015 Urban Water Management Plans.

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APPENDIX A – GROUNDWATER MANAGEMENT HISTORY

History of the County's Groundwater[1]

Water has played an important part in the development of Santa Clara County since the arrival of the Spaniards in 1776. Unlike the indigenous peoples, who for thousands of years depended upon the availability of wild food, the Spaniards cultivated food crops and irrigated with surface water. Population growth and the United States' conquest of the area in 1846 increased agricultural demands, which forced the use of the groundwater basin. The first well in the county was drilled in 1854 in San Jose. Groundwater was drawn to the surface by windmill pumps or flowed up under artesian conditions.

By 1865, there were close to 500 artesian wells in the valley and already signs of potential misuse of groundwater supplies. In the valley's newspapers a series of editorials and letters appeared which complained of farmers and others who left their wells uncapped, and blamed them for water shortages and erosion damage to the lowlands.

As a result of several dry years in the late 1890s, more and more wells were installed. Dry winters in the early 1900s were accompanied by a growing demand for the county's fruits and vegetables, which were irrigated with groundwater. This trend of increased irrigation and well drilling continued until 1915. During this period, less water replenished the groundwater basin than was removed, causing groundwater levels to drop rapidly.

In 1913, a group of farmers asked the federal government for relief from the increased cost of pumping that resulted from a lower groundwater table. The farmers formed an irrigation district to investigate possible reservoir sites; however, the following year was wet and no action was taken. It was not until 1919 that the Farm Owners and Operators Association presented a resolution to the County Board of Supervisors expressing their strong opposition to the waste resulting from the use of artesian wells, and again raised the issue of building dams to supplement existing water supplies. By that year, subsidence of 0.4 feet had occurred in San Jose.

In 1921, a report was presented to the Santa Clara Valley Water Conservation Committee showing that far more water was being pumped from the ground than nature could replace[2]. The committee planned to form a water district that differed from others in the state by having a provision for groundwater recharge. Their effort to form the water district failed, but they were able to implement several water recharge and conservation programs. Continued overdraft of the basin resulted in a further decline in groundwater levels and inelastic land subsidence, thereby increasing flood impacts in the northern part of the County. Between 1912 and 1932, subsidence ranged from 0.35 feet in Palo Alto to 3.66 feet in San Jose. In 1929, county voters approved the Santa Clara Valley Water Conservation District (SCVWCD), with the initial mission of stopping groundwater overdraft and ground surface subsidence.

The SCVWCD was the forerunner of today's Santa Clara Valley Water District (District), which was formed through the consolidation and annexation of other flood control and water districts within Santa Clara County. By 1935, the District had completed the construction of Almaden, Calero, Guadalupe, Stevens Creek, and Vasona dams. Later dams completed include Coyote in 1936, Anderson in 1950, and Lexington in 1952. The Gavilan Water District in

[1] California History Center & Foundation, Water in the Santa Clara Valley: A History, 2005.

[2] Tibbets F.H. and Kiefer S.E., Santa Clara Valley Water Conservation Project, Report to the Santa Clara Valley Water Conservation Committee, 1921.

the southern portion of the County constructed Chesbro Dam in 1955 and Uvas Dam in 1957. These dams enabled the District to capture surface water runoff and release it for groundwater recharge.

The late 1930s to 1947 marked a period of recovery in groundwater levels that reduced the rate of subsidence. In 1947, conditions became dry, groundwater levels declined rapidly and subsidence resumed. In 1950 almost all of the county's water requirements were met by water pumped from the groundwater, resulting in an all-time low groundwater level in the Santa Clara Plain.

In 1952, the San Francisco Public Utilities Commission began delivering imported water to water retailers in northern Santa Clara County through the Hetch Hetchy southern aqueduct, however some delivery of this supply into the county took place as early as 1939[3]. By 1960, the population of the county had doubled from that of 1950. To supply this growth, groundwater pumping increased and groundwater levels continued to decline. In addition to continued land subsidence, widespread salt water intrusion of shallow aquifers was observed adjacent to San Francisco Bay in the late 1950s[4]. By the early 1960s, it was evident that the combination of Hetch Hetchy and local water supplies could not meet the area's water demands, so the District entered into a contract with the state to receive 100,000 acre-feet (AF) of State Water Project (SWP) water per year through the South Bay Aqueduct (SBA).

With this new source of supply, the District added a new tool to its groundwater management toolbox: treated surface water sales to offset demand that would otherwise be met through groundwater pumping. The District constructed its first water treatment plant (WTP), the Rinconada WTP. In 1967, the District started delivering treated surface water to North County residents, thus reducing the need for pumping in the Santa Clara Plain. This led to a recovery of groundwater levels and reduced the rate of subsidence.

From 1960 to 1970, the county's population nearly doubled yet again, with the semiconductor and computer manufacturing industries contributing over 30 percent of the job growth. The growth and prosperity of the county continued, and jobs grew nearly 40 percent between 1970 and 1980. In 1974, Penitencia (the District's second WTP) started delivering treated water. In response to the 1976-1977 drought, the District began its first programs related to conservation education and outreach.

The county's explosive growth and transformation from a predominantly agricultural economy was not without its problems. In the early 1980s, groundwater contamination was brought to the forefront when large underground tanks storing solvents for computer-related manufacturing processes in south San Jose were discovered to be leaking. In 1981, Fairchild notified the District that "a substantial amount of chemicals were missing from their tanks and that a leak was suspected." Subsequent testing of a nearby public water supply well revealed significant contamination, which resulted in shutdown of the well. The District, the Regional Water Quality Control Board, and the Department of Health Services, worked together to sample water supply wells in the county and search for other leaking tanks, resulting in the identification of additional contaminant release sites.

In the 1980s, District significantly increased its efforts to protect groundwater quality. The District worked with the Santa Clara County Fire Chiefs Association, the City Managers Association, and environmental groups to develop a countywide Hazardous Materials Storage Permit Ordinance. The ordinance, adopted by the Santa Clara County Intergovernmental Council, set tough new standards on hazardous material storage and handling. This first in the nation ordinance served as an example and the state and federal government soon passed similar laws[2]. The District also developed well guidelines for the construction and destruction of wells, the majority of which were being installed for the investigation and clean-up at contaminant release sites. The District's abandoned well program was

[3] Per personal communication with City of Palo Alto staff, the City of Palo Alto began receiving Hetch Hetchy water in 1939 through a different connection.

[4] Santa Clara Valley Water District, Saltwater Intrusion Investigation, September 1980.

developed to address existing wells that were no longer in use and posed a threat to groundwater resources by acting as vertical conduits that could allow contaminants to migrate directly from shallow to deep aquifers.

In the late 1980s, the District began oversight of petroleum hydrocarbon Leaking Underground Storage Tank (LUST) sites in Santa Clara County. From 1988 through 2004, the District provided oversight for the investigation and clean-up of over 2,500 LUST sites. The District's fuel leak program became nationally known for its proactive and innovative approaches and influenced the direction of the state's UST clean-program. By the time the District transferred the program to the County Department of Environmental Health in July 2004, less than 400 fuel leak cases remained open.

Groundwater pumping accounted for about half of the total water use by the mid-1980s. The rate of inelastic land subsidence was reduced to about 0.01 feet per year compared to 1 foot per year in 1961. To provide a reliable source of supply the District contracted with the federal government for the delivery of 152,500 AF per year of imported water from the Central Valley Project (CVP) through the San Felipe Project. The county's first delivery of CVP water took place in 1987, but it was not until 1989 that the District's Santa Teresa WTP began operating to fully utilize this additional source of imported supply.

The extended drought from 1987 to 1992 led to expanded District conservation programs, including more aggressive outreach campaigns and rebate programs for residents and businesses installing water saving fixtures. In the mid-1990s the District began offering financial and technical assistance to entities interested in expanding the use of recycled water. This included agreements with the cities of San Jose, Santa Clara, and Milpitas (the South Bay Water Recycling Program); Gilroy and Morgan Hill (the South County Regional Wastewater Authority); Sunnyvale; and Palo Alto and Mountain View. This commitment to supplementing local supplies with recycled water was strengthened in 1997 when the District Board established a policy supporting the expanded use of recycled and setting numeric targets for future recycled water use.

Nitrate and Methyl Tertiary Butyl-ether (MTBE) emerged as significant groundwater quality threats in the 1990s. Elevated nitrate from agriculture, septic systems, and animal wastes was identified as early as the 1950s, however the concern became more acute in the early 1990s as an increasing number of wells were impacted. The District developed a comprehensive Nitrate Management Plan, which included public outreach programs to educate the residents on fertilizer use, septic system maintenance, and well location and construction. The District also offered free nitrate testing for South County residents in 1998. Later efforts included programs to reduce nitrate loading in cooperation with farmers, including programs to evaluate infield nutrient use.

In 1992, California began using oxygenates, primarily MTBE, in gasoline to satisfy federal clean air requirements, The District began investigating the potential for MTBE contamination in 1995, which led to the discovery of MTBE contamination in soil at 292 sites, primarily service stations, and at low concentrations in the District's reservoirs. The District provided the first guidelines in the state for owners of LUST sites on how to identify and clean-up MTBE releases in 1997. Along with many others, the District's action and leadership in addressing MTBE led to a statewide ban in 2004.

In the 2000s, the District again demonstrated its leadership and commitment to aggressively protecting groundwater resources in response to the discovery of perchlorate contamination at a former flare manufacturing facility in Morgan Hill. Perchlorate was discovered at the facility in August 2002, and further site investigation by the responsible party indicated perchlorate detections in wells several miles to the south. Due to concerns that the contamination could be larger than first assumed, the District initiated its own sampling program, which included over 1,000 wells. As a result of this data, the Central Coast Water Board expanded and expedited the site investigation and clean-up activities. To ensure the safety of South County residents who rely on groundwater for their drinking water the District also initiated a temporary bottled water program for well owners impacted by perchlorate. The District is continuing to work with the Central Coast Water Board, the County, the cities of Morgan

Hill and Gilroy, and the local residents through the Perchlorate Community Advisory Group to assure that the contaminated groundwater is cleaned up as soon as possible.

APPENDIX B – DOCUMENTS REGARDING ADOPTION AND PUBLIC PARTICIPATION

Board Resolution Adopting 2012 GWMP

RESOLUTION NO. 12- 59

RESOLUTION OF THE BOARD OF DIRECTORS
OF SANTA CLARA VALLEY WATER DISTRICT
APPROVING THE 2012 GROUNDWATER MANAGEMENT PLAN

WHEREAS, the Santa Clara Valley Water District Act (California Water Code Appendix, Chapter 60) provides the Santa Clara Valley Water District (District) with broad groundwater management authority, including the authority to protect, spread, store, retain, and cause water to percolate in the soil within Santa Clara County; and

WHEREAS, pursuant to such authority, the District has prepared the 2012 Groundwater Management Plan (GWMP); and

WHEREAS, District staff presented information on the draft 2012 GWMP to the Water Retailers Groundwater Subcommittee representing key basin stakeholders on several occasions; and

WHEREAS, the District did, on July 10 and 24, 2012, conduct public hearings for purposes of receiving input with regard to the draft 2012 GWMP, and consider the inclusion of appropriate comments as input to the 2012 GWMP.

NOW, THEREFORE BE IT RESOLVED THAT the Board of Directors of the Santa Clara Valley Water District DOES HEREBY approve the 2012 GWMP.

PASSED AND ADOPTED by the Board of Directors of Santa Clara Valley Water District by the following vote on July 24, 2012.

AYES:	Directors	D.Gage, P. Kwok, T. Estremera, J. Judge, R. Santos, B. Schmidt, L. LeZotte
NOES:	Directors	None
ABSENT:	Directors	None
ABSTAIN:	Directors	None

SANTA CLARA VALLEY WATER DISTRICT

By: [signature]
LINDA J. LEZOTTE
Chair/Board of Directors

ATTEST: MICHELE L. KING, CMC

[signature]
Clerk/Board of Directors

RL12866.docx

Public Notices for 2012 GWMP

A4 BAY AREA NEWS GROUP 111 TUESDAY, JUNE 26, 2012

Court bars mandatory life terms for juveniles

Individual judges can use no-parole sentences, however

By Jesse J. Holland
Associated Press

WASHINGTON — The U.S. Supreme Court on Monday continued to limit how severely states may punish juvenile criminals, saying it is unconstitutional to mandate life in prison without parole for youth offenders convicted of murder.

The 5-4 decision split along ideological lines: The court's four liberals and swing vote Justice Anthony Kennedy joined to order states and the federal government to allow judges and juries to consider a juvenile's age when they hand down sentences for some of the harshest crimes, instead of automatically sending them to prison for life without parole.

By making youth "irrelevant to imposition of that harshest prison sentence, such a scheme poses too great a risk of disproportionate punishment," wrote Justice Elena Kagan, who was joined in the majority opinion by Kennedy and Justices Ruth Bader Ginsburg, Stephen Breyer and Sonia Sotomayor.

Following recent decisions outlawing the death penalty and life in prison for non-murders for juveniles, the Supreme Court, voting 5-4, said states violate the constitutional ban on cruel and unusual punishment when they don't allow for the option of a shorter sentence.

California is one of 15 states that allows the life without parole sentences for juveniles but does not mandate them, unlike Arkansas and Alabama, which have the mandatory sentencing laws challenged in the Supreme Court. The Supreme Court even cited California as one of the states with a different approach in Monday's ruling. The state has 309 juveniles serving such sentences, now all adults ranging in age between their mid-20s to their mid-40s, according to California prison figures.

State Sen. Leland Yee, D-San Francisco, has been pushing legislation to abolish life without parole sentences in California.

Monday's court decision was in line with others the court has made, including ruling out the death penalty for juveniles and life without parole for young people whose crimes did not involve killing.

The court left open the possibility that individual judges could sentence juveniles to life without parole in individual cases of murder, but said state and federal laws cannot automatically impose such a sentence.

Dissenting, the court's four conservatives said nothing in the Constitution forbids laws requiring mandatory life in prison without parole for juveniles. Chief Justice John Roberts was joined in the main dissent by Justices Antonin Scalia, Clarence Thomas and Samuel Alito. According to data provided to the court, roughly 2,500 people are behind bars for life with no chance of winning their freedom for murders they committed before their 18th birthday. More than 2,000 of them were there because the sentence was mandated by a legislature.

Staff writer Howard Mintz contributed to this report.

Members of the media stand outside the Supreme Court building in Washington, D.C., on Monday. The high court ruled on campaign finance and juvenile sentencing.
ANDREW HARRER BLOOMBERG

Montana's challenge of corporate campaign finance ruling rejected

By Mark Sherman
Associated Press

WASHINGTON — The Supreme Court on Monday turned away a plea to revisit its 2-year-old campaign finance decision in the Citizens United case and instead struck down a Montana law limiting corporate campaign spending.

The same five conservative justices in the Citizens United majority that freed corporations and labor unions to spend unlimited amounts in federal elections joined Monday to reverse a Montana court ruling upholding the state's century-old law. The four liberal justices dissented.

"The question presented in this case is whether the holding of Citizens United applies to the Montana state law. There can be no serious doubt that it does," the court said in an unsigned opinion.

The Citizens United decision paved the way for unlimited spending by corporations and labor unions in elections for Congress and the president, as long as the dollars are independent of the campaigns they are intended to help.

But Montana aggressively defended its 1912 law against a challenge from corporations seeking to be free of spending limits, and the state Supreme Court sided with the state.

The state court said a history of corruption showed the need for the limits, even as Justice Anthony Kennedy declared in his Citizens United opinion that independent expenditures by corporations "do not give rise to corruption or the appearance of corruption."

In a brief dissent Monday, Justice Stephen Breyer said campaign spending since 2010 "casts grave doubt on the court's supposition that independent expenditures do not corrupt or appear to do so."

State leaders in Montana swiftly condemned the decision.

Montana Attorney General Steve Bullock called the nation's high court just "another political body," while Gov. Brian Schweitzer says the Supreme Court is now endorsing "dirty, secret, corporate, foreign money."

Twenty-two states and the District of Columbia, as well as Sen. John McCain and other congressional champions of stricter regulations on campaign money, joined with Montana.

New York Attorney General Eric Schneiderman said Monday's "decision gives short shrift to states' vital interests in protecting their democratic processes and institutions from the threats posed by unlimited corporate spending in campaigns."

Public Hearing Notice — Santa Clara Valley Water District

2012 Groundwater Management Plan

Who: Santa Clara Valley Water District Board of Directors

What: Public Hearing to Receive Comments

When: July 10, 2012, 9 a.m.

Where: Santa Clara Valley Water District Board Room
5700 Almaden Expressway San Jose, CA 95118

What:
Please join the Santa Clara Valley Water District to discuss the 2012 Groundwater Management Plan (GWMP). The plan describes basin conditions and identifies basin management objectives (BMOs), strategies, and outcome measures to gauge performance. The plan also documents existing and potential management actions to achieve the BMOs. Clear documentation of these actions and the performance evaluation process will help the District respond to risks and uncertainties that may impact the quality or quantity of groundwater supplies. These challenges include droughts, increased demand, regulatory changes, constituents of emerging concern, recharge limitations due to dam restrictions, reduced availability of imported water or other supplies, and intensified land development.

Prior to the public hearing, the draft 2012 GWMP will be available to the public on the water district's website and a single hard copy will be available for public review between normal business hours of 8:00 a.m. to 5:00 p.m. at the Santa Clara Valley Water District headquarters building. The public hearing will be closed on July 24, 2012. After the close of the public hearing, the final plan shall be adopted by the District Board. For more information, please visit our website at www.valleywater.org, or contact **Vanessa De La Piedra, (408)265-2607, ext. 2788.**

Reasonable efforts will be made to accommodate persons with disabilities wishing to attend this public hearing. For additional information on attending this hearing including requesting accommodations for disabilities or interpreter assistance, please contact the Office of the Clerk of the Board at (408) 265-2607, Ext. 2277, at least three days prior to the hearing.

THURSDAY, JUNE 28, 2012 111 BAY AREA NEWS GROUP A7

Forum may break Syria impasse

Meeting of leaders comes after attack on TV station

By Elizabeth A. Kennedy
Associated Press

AGENCE FRANCE PRESSE VIA GETTY IMAGES

A picture released by the official Syrian news agency SANA shows a general view of damage at the site of an attack on the pro-government Al-Ikhbariya TV station outside Damascus, where seven employees were killed on Wednesday.

BEIRUT — Gunmen attacked a pro-government TV station Wednesday near the Syrian capital, killing seven employees in the latest barrage of violence as world powers prepared for a high-level meeting that the U.S. hopes will be a turning point in the crisis.

Invitations to Saturday's gathering in Geneva were sent by special envoy Kofi Annan to the five permanent members of the U.N. Security Council — including Syrian allies Russia and China — but not to major regional players Iran and Saudi Arabia.

The absence of those two countries, as well as the lack of any appetite for international military intervention, could make it difficult for the group to find the leverage to end the bloodshed in Syria. An effort by Annan to broker a peace plan failed earlier this year.

Diplomatic hopes have rested on Russia — Syria's most important ally and protector — agreeing on a transition plan that would end the Assad family dynasty, which has ruled Syria for more than four decades. But Moscow has rejected efforts by outside forces to end the conflict or any plan to force regime change in Damascus.

The United Nations said Wednesday that the conflict, which began in March 2011 as part of the Arab Spring that swept aside entrenched leaders across the region, is descending into sectarian warfare.

President Bashar Assad has so far appeared largely impervious to world pressure, and he has warned the international community from meddling in the crisis, which has seen a sharp escalation in violence in recent months. He said this week that his country is in "a genuine state of war," an increasingly common refrain from the Syrian leader.

Assad denies there is any popular will behind the uprising, which is in its 16th month, saying terrorists are driving a foreign conspiracy to destroy the country. Activists say more than 14,000 people have been killed in the violence.

An Associated Press photographer said the attack on the Al-Ikhbariya TV station in the town of Drousha, about 14 miles south of the capital Damascus, left bloodstains on the ground and bullet holes in the walls. The attack heavily damaged five portable buildings used for offices and studios.

Al-Ikhbariya is privately owned but strongly supports the regime.

"What happened today is a massacre," Information Minister Omran al-Zoebi said. He blamed terrorists — the same term the government uses for rebels.

The rebels deny they target the media. Activists blamed the attack on elite Syrian troops who defected from the regime Tuesday. The allegation could not be independently confirmed.

Chinese boats raise tension in sea dispute

By Jim Gomez
Associated Press

MANILA, Philippines — Chinese fishing boats have returned to a lagoon in a disputed South China Sea shoal despite an agreement to clear the area of all vessels, dashing hopes of an early resolution of a territorial rift with the Philippines, officials in Manila said Wednesday.

Meanwhile, Vietnam protested a Chinese state oil company's invitation for bids for energy development in different area of the South China Sea, adding to concern that tension in the disputed waters could escalate.

Long-standing disputes involving China, the Philippines, Vietnam, Taiwan, Malaysia and Brunei straddle busy sea lanes that are believed to be rich in oil and gas deposits. Many fear the disputes could spark a conflict.

The standoff between China and the Philippines in the Scarborough Shoal off the northwestern Philippines began in April when the Philippines accused Chinese fishermen of poaching in its exclusive economic zone. During the tensions, both sides have sent government ships to the area.

A recent agreement saw both countries withdraw vessels, but the Philippines Department of Foreign Affairs spokesman, Raul Hernandez, said six Chinese fishing boats and 17 smaller dinghies were spotted by a Philippine plane inside the lagoon on Monday afternoon. He said five Chinese government ships were sighted outside the lagoon in the vicinity of the shoal.

Hernandez urged China to abide by its commitment in talks aimed at diffusing the rift. "It is important for parties in negotiations and discussion on any issue to always act in good faith," he said.

The Chinese Embassy in Manila did not reply to a request for comment.

India: Evidence Pakistan in on attacks

Kirachi site linked to Mumbai attack, authorities say

By Hari Kumar
New York Times

NEW DELHI — India's home minister said Wednesday there was new evidence of Pakistani state support for the 2008 Mumbai attacks, citing information provided by Abu Jindal, an Indian man suspected of being one of the planners.

The Indian authorities say that Jindal, who was recently captured by the Indian police, and five others guided the Mumbai attacks from a "control room" in Karachi, Pakistan.

The authorities in India say they have recordings of phone conversations during the attack that included Jindal's voice.

At a news conference in Tiruananthpuram, Home Minister Palaniappan Chidambaram said that Jindal confirmed during an interrogation that he was in the Karachi control room that had given orders to the 10 gunmen who killed more than 160 people in a three-day attack on multiple locations in Mumbai in 2008.

"Some state support was there for these people," Chidambaram said, referring to men in the control room with Jindal. And he claimed Jindal had identified some of those other men, adding that any argument that there was no Pakistani state involvement "is no longer valid."

"The way we are going has put us in a good light and put Pakistan in a bad light," he added. "It is Pakistan which is under pressure and not India."

Pakistan has rejected Indian accusations that its top military spy agency, Inter-Services Intelligence, was involved in the attacks, which are thought to have been carried out by the militant group Lashkar-e-Taiba.

On Wednesday, Rehman Malik, a senior adviser to the Pakistani president on interior issues, denied the new charges as well. "Why are you blaming Pakistan?" he said Wednesday at a news conference. "He is your citizen. You fail to control your citizen."

Pakistan warned India three years ago that it had its "own Taliban," Malik said. "See the result. I wish best of luck to India."

Indian intelligence experts said that the arrest of Jindal was more significant than that of Ajmal Qasab, the last known surviving attacker. Ajit Doval, former chief of India's Intelligence Bureau said: "Abu Jindal is more important because he is the eyewitness in what happened in Pakistan during the attack and about preparations. He is a planner, organizer, motivator and trainer. Qasab is only a one-event man."

Australia saves 130 from capsized ship

By Matt Siegle
New York Times

SYDNEY — Australian officials said Wednesday that 130 survivors, most of them reported to be women and children, had been rescued after a ship full of apparent asylum seekers trying to reach Australia capsized in the Indian Ocean.

The Australian Customs and Border Protection Authority said there were 134 people aboard and that four had died in the accident, which occurred about 115 miles south of the main Indonesian island of Java — roughly halfway to Christmas Island, a remote Australian territory that has become a magnet for immigration attempts in overcrowded boats.

The capsizing was the second major accident in those waters involving asylum seekers in less than a week.

The Australian Maritime Safety Authority said in a statement that the survivors had been picked up by an Australian naval patrol boat and several merchant ships that responded to the stricken vessel's distress call early Wednesday.

As recently as Sunday, the navy was searching the same area for survivors or bodies from another rickety boat that capsized last Thursday.

Some 90 people are thought to have died in that accident; about 110 were rescued.

The episodes are the latest in a long line of maritime disasters involving asylum seekers trying to reach Australian territory. In December 2010, about 48 people died when their boat broke apart against Christmas Island's rocky coast in front of horrified onlookers.

Last December, about 200 died when their overcrowded ship sank off Java.

Taliban puts on bloody display

Pakistani soldiers' heads displayed

By Ishtiaq Mahsud
Associated Press

DERA ISMAIL KHAN, Pakistan — The Taliban released a video Wednesday that they say shows the heads of 17 Pakistani soldiers captured in a cross-border raid from Afghanistan this week and beheaded.

In violence Wednesday, a bomb in a railway station in Pakistan's southwest killed at least five people, police said, and the leader of an anti-Taliban militia was killed in Peshawar in the northwest.

The Pakistani Taliban's bloody cross-border raid Sunday night showed the threat still posed by the group, despite multiple army offensives. Increasingly, the militants have used sanctuaries in eastern Afghanistan to attack border areas in Pakistan's northwest.

Pakistan has criticized NATO and Afghan forces for not doing enough to stop the attacks, but it has received little sympathy. The Afghan government and its allies have long faulted Pakistan for failing to target Afghan Taliban militants and their allies who use Pakistani territory to launch attacks in Afghanistan.

The Pakistani and Afghan Taliban are allies, but the former has focused on fighting the Pakistani government, while the latter has concentrated on attacking foreign and local forces in Afghanistan.

The Pakistani Taliban said in the video that they killed 18 soldiers, but 17 heads were displayed on a bloody white sheet on the ground outside.

Public Hearing Notice

2012 Groundwater Management Plan

Santa Clara Valley Water District

Who: Santa Clara Valley Water District Board of Directors

What: Public Hearing to Receive Comments

When: July 10, 2012, 9 a.m.

Where: Santa Clara Valley Water District Board Room
5700 Almaden Expressway San Jose, CA 95118

What:
Please join the Santa Clara Valley Water District to discuss the 2012 Groundwater Management Plan (GWMP). The plan describes basin conditions and identifies basin management objectives (BMOs), strategies, and outcome measures to gauge performance. The plan also documents existing and potential management actions to achieve the BMOs. Clear documentation of these actions and the performance evaluation process will help the District respond to risks and uncertainties that may impact the quality or quantity of groundwater supplies. These challenges include droughts, increased demand, regulatory changes, constituents of emerging concern, recharge limitations due to dam restrictions, reduced availability of imported water or other supplies, and intensified land development.

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SAN JOSE POST-RECORD

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SANTA CLARA VALLEY WATER DIST
P.O. BOX 20670
SAN JOSE, CA - 95160-0670

PROOF OF PUBLICATION

(2015.5 C.C.P.)

State of California)
County of SANTA CLARA) ss

Notice Type: GOV - GOVERNMENT LEGAL NOTICE

Ad Description:
2012 GROUNDWATER MANAGEMENT PLAN

I am a citizen of the United States and a resident of the State of California; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer and publisher of the SAN JOSE POST-RECORD, a newspaper published in the English language in the city of SAN JOSE, county of SANTA CLARA, and adjudged a newspaper of general circulation as defined by the laws of the State of California by the Superior Court of the County of SANTA CLARA, State of California, under date 02/03/1922, Case No. 27844. That the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

06/27/2012, 06/29/2012

Executed on: 06/29/2012
At Los Angeles, California

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Signature

SJ#: 2327592

Public Hearing Notice

Topic: 2012 Groundwater Management Plan
Who: Santa Clara Valley Water District Board of Directors
What: Public Hearing to Receive Comments
When: July 10, 2012, 9:00 a.m.
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6/27, 6/29/12

SJ-2327592#

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APPENDIX C – DISTRICT RESERVOIRS AND RECHARGE FACILITIES

District Reservoirs

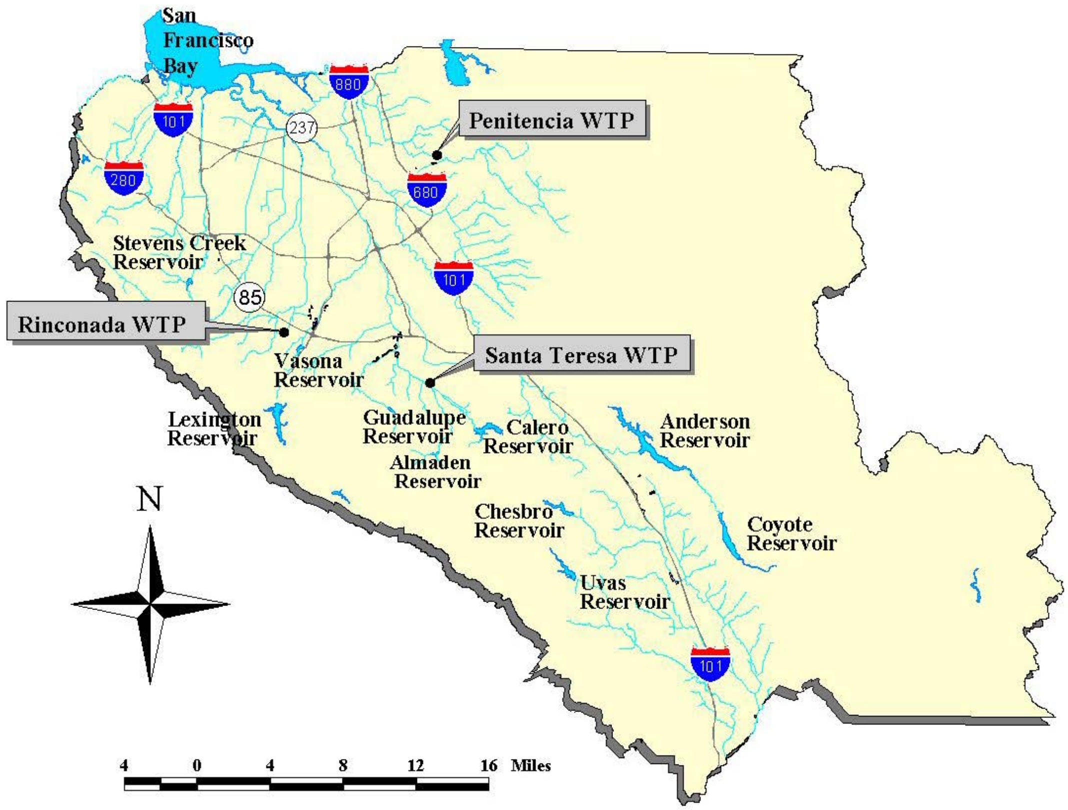
Local reservoirs are used to capture and store local runoff and imported water for beneficial use including groundwater recharge and treatment for drinking water. As noted in Table C-1 below, several of the reservoirs have restricted capacity due to dam safety operating restrictions. The District's reservoirs are also shown in Figure C-1.

Table C-1 Original and Restricted Capacities of Major District Reservoirs

Reservoir	Year Built	Reservoir Capacity (AF)	Restricted Capacity (AF)	Use
Almaden*	1935	1,586	1,472	Groundwater recharge, Treated for drinking water
Anderson*	1950	90,373	61,810	Groundwater recharge, Treated for drinking water
Calero*	1935	9,934	4,585	Groundwater recharge, Treated for drinking water
Chesbro	1955	7,945	7,945	Groundwater recharge
Coyote*	1936	23,244	12,382	Groundwater recharge, Treated for drinking water
Guadalupe*	1935	3,415	2,218	Groundwater recharge
Lexington	1952	19,044	19,044	Groundwater recharge
Stevens Creek	1935	3,138	3,138	Groundwater recharge
Uvas	1957	9,835	9,835	Groundwater recharge
Vasona	1935	495	495	Groundwater recharge
TOTAL		169,009	122,924	

* Reservoirs with dam safety operating restrictions

Figure C-1 Location of District Reservoirs and Water Treatment Plants



District Recharge Facilities

The District's managed recharge program uses both runoff captured in local reservoirs and imported water delivered by the raw water conveyance system to recharge the basin through more than 390 acres of off-stream ponds and over 90 miles of local creeks.

The recharge facilities have been organized into seven systems based on watersheds, as described below. The facilities have been sorted in this way to simplify describing management of a complex and interconnected network. These systems are not independent, but rather share sources of supply and recharge the same groundwater subbasins. Water recharged in one system may be extracted many miles away.

Coyote Recharge System

This system has a recharge capacity of approximately 27,000 AF per year. The major features of this system include Anderson and Coyote Reservoirs and Coyote Creek in-stream recharge. Water sources for this system include the large Coyote Creek watershed, draining much of the west-facing slope of the Diablo Range. After leaving the hills below Anderson Reservoir, Coyote Creek flows north to San Francisco Bay, recharging both the Santa Clara Plain and Coyote Valley. Through the Santa Clara Conduit, water from this system can also be diverted south into the Llagas Water Supply Management Systems, recharging the Llagas Subbasin. In addition to local water, imported water can be delivered to the system from the Santa Clara Conduit. Imported water can be stored in Anderson Reservoir using the Anderson Force Main, and later released to Coyote Creek or diverted to the Cross Valley Pipeline for recharge elsewhere or as a water supply source for the District's surface water treatment plants. Recharge operations have been conducted in this system since 1934.

Guadalupe Recharge System

This system has a recharge capacity of approximately 25,000 AF per year, The major features of this system include Almaden, Guadalupe, and Calero Reservoirs; Guadalupe Creek, Guadalupe River, Alamitos Creek, Calero, and Ross Creek in-stream recharge; and the Los Capitancillos, Alamitos, Kooser, and Guadalupe off-stream ponds. Water can be diverted from Almaden Reservoir to Calero Reservoir via the Almaden-Calero Canal. Local water supplies are developed from the Almaden, Guadalupe, and Calero Watersheds, and imported water from the State Water Project (SWP) and Central Valley Project (CVP) can be diverted into the system via the Cross Valley Pipeline, the Almaden Valley Pipeline, and the Central Pipeline. This system recharges the Santa Clara Plain, and water can also be diverted from Calero Reservoir to the District's surface water treatment plants via the Cross Valley Pipeline. Recharge operations have been conducted in this system since 1932.

Los Gatos Recharge System

The Los Gatos recharge system has a recharge capacity of approximately 30,000 AF per year. The major features of this system include Lexington and Vasona Reservoirs, Los Gatos Creek in-stream recharge, and several off-stream systems including Page, Kirk, Oka, McGlincey, Budd, Sunnyoaks, and Camden ponds. The majority of the source water for this system is from the Los Gatos Creek Watershed in the Santa Cruz Mountains, although imported water from SWP and CVP is also delivered to the system through the District's Central Pipeline. This system recharges the Santa Clara Plain. Recharge operations have been conducted in this system since 1934.

Penitencia Recharge System

This small system is predominately served by imported water from the SWP, although local water from the Penitencia Creek Watershed also contributes to in-stream recharge in Penitencia Creek and the Overfelt and Mabury ponds. The other facilities in the system, which exclusively recharge SWP water, include the Penitencia, Piedmont, Helmsley, and Park ponds. The system has a recharge capacity of about 7,000 AF per year and recharges the Santa Clara Plain. Recharge operations have been conducted in this system since 1934.

West Side Recharge System

This system has a recharge capacity of about 15,000 AF per year. Major facilities in the system include Stevens Creek Reservoir, the McClellan off-stream ponds, and the various streams receiving water from the Stevens Creek Pipeline including Stevens, Calabasas, Regnart, Rodeo, Saratoga, Wildcat, San Tomas, and Smith Creeks. In addition to local water from the west side watersheds, imported water from SWP and CVP is delivered to the system using the Stevens Creek Pipeline. This system recharges the Santa Clara Plain. Recharge operations have been conducted in this system since 1935.

Lower Llagas Recharge System

This system has a recharge capacity of about 21,000 AF per year. Major facilities in the system include Uvas and Chesbro Reservoirs, in-stream recharge in Llagas and Uvas Creeks, the Church off-stream ponds, and the Uvas-Llagas pipeline which can divert water from Uvas Reservoir to Llagas Creek. This system is entirely dependent on local water from the Uvas and Llagas Watersheds, and recharges the Llagas Subbasin. Recharge operations have been conducted in this system since 1955.

Upper Llagas Recharge System

This system has a recharge capacity of about 19,000 AF per year. Major facilities include Llagas in-stream recharge, the Madrone Channel, and the San Pedro and Main Avenue ponds. This system recharges the Llagas Subbasin, predominately with imported CVP water.

The facilities within each District recharge system and the associated recharge capacity are shown below in Table C-2. Table C-3 provides a summary of in-stream and off-stream recharge capacity for groundwater charge zones W2 and W5.

Table C-2 District Recharge Facilities

Groundwater Charge Zone	Recharge System	In-Stream Recharge (Creeks)	Annual Creek Recharge Capacity (AF)[1]	Off-Stream Recharge (Ponds)	Annual Pond Recharge Capacity (AF)[1]
Zone W2	Penitencia	Upper Penitencia Creek	2,200		
				Penitencia Ponds	3,100
				Piedmont	
				City Park Pond	
				Helmsley	
				Mabury	
				County Park Pond	
				Capitol	
				Overfelt Ponds	1,500
		Creek Total	**2,200**	**Pond Total**	**4,600**
		Recharge System Total: 6,800			
	Los Gatos	Los Gatos Creek	5,800		
				Page Ponds	5,300
				Budd Ave Ponds	5,000
				Sunnyoaks Ponds	2,200
				Camden Ponds	2,200
				McGlincey Ponds	7,700
				Oka Ponds	1,500
		Creek Total	**5,800**	**Pond Total**	**23,900**
		Recharge System Total: 29,700			
	West Side	Regnart Creek	700		
		Calabazas Creek	2,600		
		Rodeo Creek	700		
		Saratoga Creek	4,400		
		Wildcat Creek	400		
		San Tomas Creek	400		
		Smith Creek[2]	700		
		Stevens Creek	3,600		
				McClellen Ponds	1,700
		Creek Total	**13,500**	**Pond Total**	**1,700**
		Recharge System Total: 15,200			
	Guadalupe	Alamitos Creek	2,200		
		Calero Creek	900		
		Guadalupe River	4,200		
		Guadalupe Creek	2,900		
		Ross Creek	2,200		
				Alamitos Ponds	1,500
				Guadalupe Ponds	6,600
				Los Cap Ponds	2,900
				Kooser Ponds	1,700
		Creek Total	**12,400**	**Pond Total**	**12,700**
		Recharge System Total: 25,100			

Groundwater Charge Zone	Recharge System	In-Stream Recharge (Creeks)	Annual Creek Recharge Capacity (AF)[1]	Off-Stream Recharge (Ponds)	Annual Pond Recharge Capacity (AF)[1]
Zone W2	**Coyote**	Lower Coyote Creek	1,500		
				Coyote Percolation Pond[2]	10,900
Zone W5		Upper Coyote Creek	14,600		
		Creek Total	**16,100**	**Pond Total**	**10,900**
		Recharge System Total: 27,000			
	Upper Llagas	Madrone Channel[2]	10,000		
		Tennant Creek	-		
		East Little Llagas	1,100		
				Main Avenue Ponds	2,700
				San Pedro Ponds	4,700
		Creek Total	**11,100**	**Pond Total**	**7,400**
		Recharge System Total: 18,500			
	Lower Llagas	Uvas Creek	8,100		
		Llagas Creek	5,800		
				Church Ponds	7,300
		Creek Total	**13,900**	**Pond Total**	**7,300**
		Recharge System Total: 21,200			

Notes:

1. The annual recharge capacity shown assumes water is available all year and that ponds are in normal operational condition.
2. Includes in-stream spreader dam facilities.

Table C-3 District Annual Managed Recharge Capacity Summary

Groundwater Charge Zone	In-Stream Recharge (AF)	Off-Stream Recharge (AF)	Total Recharge (AF)
Zone W2	35,400	53,800	89,200
Zone W5	39,600	14,700	54,300
Total	75,000	68,500	143,500

APPENDIX D – GROUNDWATER SUBBASIN CHARACTERIZATION

This appendix describes the subbasins: their storage capacities, the inflows and outflows for each subbasin, and trends in pumping, groundwater elevation, water quality, and land subsidence. The intent of this appendix is to provide technical information on the subbasins to aid in understanding the basin management objectives and the programs and projects that support those objectives that are presented in this plan.

GROUNDWATER BASINS

Santa Clara County includes portions of two groundwater basins as defined by the California Department of Water Resources (DWR) Bulletin 118 Update 2003 (DWR, 2003): the Santa Clara Valley Basin (Basin 2-9) and the Gilroy-Hollister Valley Basin (Basin 3-3).

The Santa Clara Valley and Gilroy-Hollister Valley Groundwater Basins are located in the California Coast Ranges physiographic province. These basins generally form an elongated valley bounded by the Santa Cruz Mountains to the west and Diablo Range to the east. The basis for basin boundary delineation is the geologic, hydrologic and topographic features in the area. The geologic basin boundary is the contact between consolidated and unconsolidated sediment deposits and bedrock.

The boundary between the Santa Clara Valley and the Gilroy-Hollister Valley Groundwater Basins is the Coyote Creek alluvial fan in the Morgan Hill area, which forms a topographic and hydrologic divide between the groundwater and surface water flowing to the San Francisco Bay and water flowing to the Monterey Bay. The groundwater divide is approximately located at Cochrane Road in Morgan Hill. The boundary moves as much as a mile to the north or south depending on local groundwater conditions.

The Santa Clara Valley Basin extends from southern San Jose north into Alameda and San Mateo counties. It is divided into four subbasins, including the Santa Clara Subbasin within the District's service area. The Gilroy-Hollister Groundwater Basin extends from the groundwater divide in Morgan Hill into San Benito County, including the Llagas Subbasin within the District's service area.

GROUNDWATER SUBBASINS

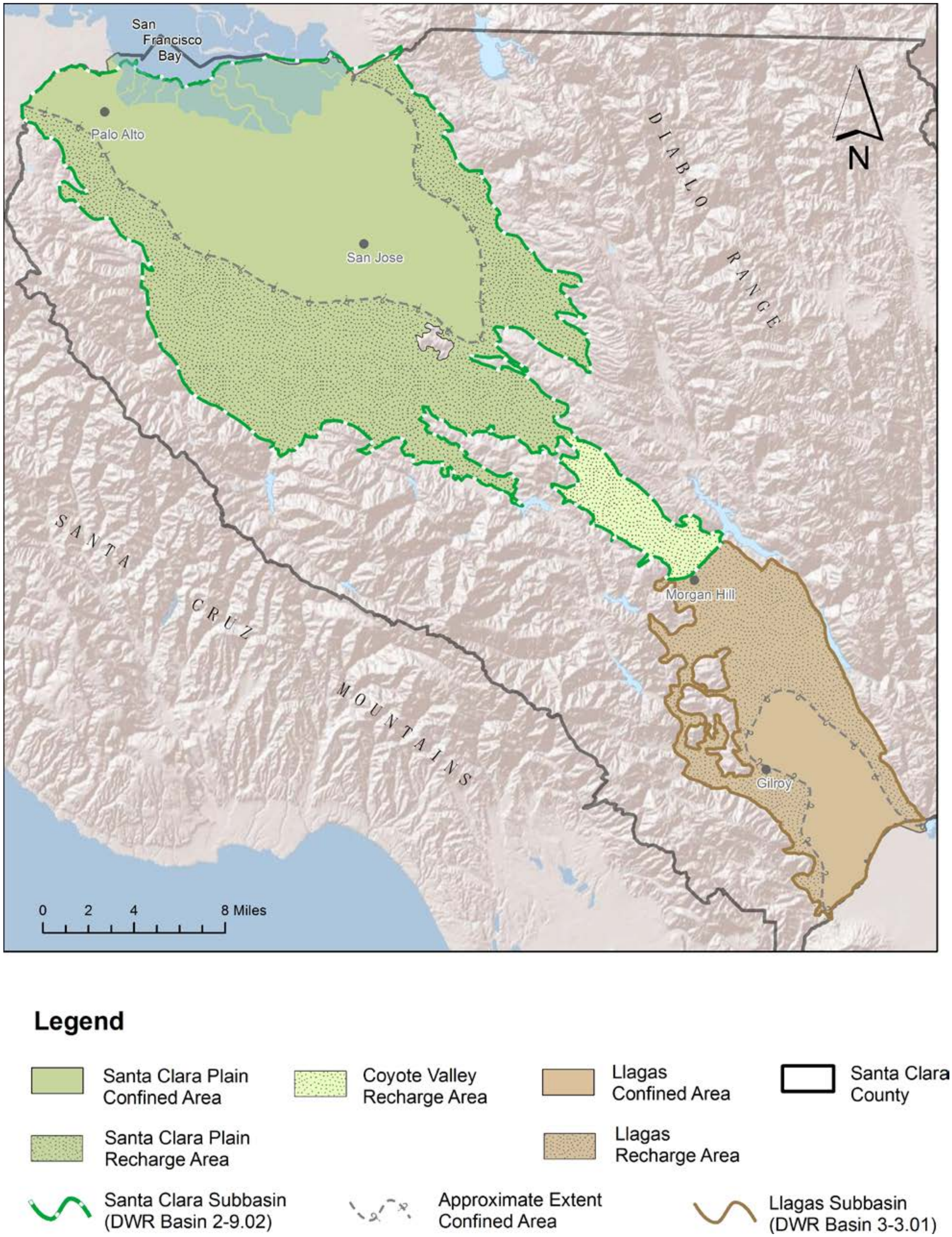
While basin boundaries are primarily based on geologic and hydrologic information, subbasins are commonly based on institutional boundaries. DWR Bulletin 118 states that "subbasins are created for the purpose of collecting and analyzing data, managing water resources, and managing adjudicated basins"[5].

The District identifies three groundwater management areas within the county: Santa Clara Plain, Coyote Valley, and Llagas Subbasin. The Santa Clara Plain and Coyote Valley are part of the Santa Clara Subbasin. Although hydraulically connected to the Santa Clara Plain, the District refers to the Coyote Valley separately since it is largely agricultural and relies primarily on independent pumpers, unlike the Santa Clara Plain which is largely urban and primarily served by major water retailers.

This plan covers only the areas within Santa Clara County managed by the District: the Santa Clara Subbasin (DWR Basin 2-9.02) and the Llagas Subbasin (DWR Basin 3-3.01). The hydrogeology of the three groundwater management areas is summarized in the following sections. Basin boundaries as defined in DWR Bulletin 118 as well as the District groundwater management areas are shown in Figure D-1.

[5] California Department of Water Resources, California's Groundwater: Bulletin 118 Update 2003.

Figure D-1 Santa Clara County Subbasins



Santa Clara Plain

Santa Clara Plain Hydrogeology

The Santa Clara Plain is the northern area of the Santa Clara Subbasin, which is the southern extension of the Santa Clara Valley Groundwater Basin. The Santa Clara Plain is 280 square miles comprising a large trough-like depression filled with alluvium, or unconsolidated sediments such as gravel, sand, silt and clay that were deposited from the mountains by water and gravity into the valley. The alluvium comprises inter-fingering alluvial fans, stream deposits and terrace deposits. The thickness of the alluvium varies from a few feet at the subbasin boundaries to over 1,500 feet in the basin interior[6]. The alluvium thins towards the western and eastern edges of the Santa Clara Plain.

The Santa Clara Plain is divided into confined and recharge (unconfined) areas (Figure D-1). The recharge area includes the alluvial fan and fluvial deposits found along the edge of the groundwater subbasin where high lateral and vertical permeability allow surface water to infiltrate the aquifers. The percolation of surface water in recharge areas replenishes unconfined groundwater within the recharge area and contributes to the recharge of deep aquifers in the confined area through subsurface flow. As groundwater pumping exceeds natural recharge, the District operates managed groundwater recharge facilities within the recharge area to replenish groundwater storage.

The confined area of the Santa Clara Plain is located in the northern and central portion of the subbasin. It is characterized by upper and lower aquifers, divided by laterally extensive low permeability materials such as clays and silts, which restrict the vertical flow of groundwater. The District refers to these aquifers as the shallow and principal aquifer zones, respectively. Principal aquifers are less vulnerable to contamination than shallow aquifers since the confining layers also restrict the movement of contaminants that may be present in infiltrating water. The boundary between the confined and recharge areas is a simplification of the natural conditions in the subbasin and two prior versions of this boundary have been published by the USGS[7] and State Water Resources Control Board[8]. A generalized cross-section of the Santa Clara Plain is shown in Figure D-2.

Although most areas in the confined area of the Santa Clara Plain are approximately at sea level and have an imperceptible slope, there are areas which lie below sea level as a result of historic inelastic land subsidence. From about 1915 to 1966, groundwater pumping increased dramatically due to growing agricultural use and population growth, resulting in a decline of groundwater levels by as much as 200 feet. As a result of overdraft, fluid pressure in the pores of aquifer systems was reduced, resulting in the compression of clay layers and a sinking of the land surface. The land surface subsided by about 13 feet in downtown San Jose and 3 to 6 feet in a larger area which encompasses north San Jose, Santa Clara, Sunnyvale, and Mountain View. Serious problems developed as a result of subsidence including flooding of lands adjacent to San Francisco Bay, decreased ability of local streams to carry away winter flood waters, and damage to well casings. It is estimated that subsidence resulted in at least $30 to $40 million in damage in 1982 dollars[9]. This necessitated the construction of additional dikes, levees, and flood control facilities to protect properties from flooding.

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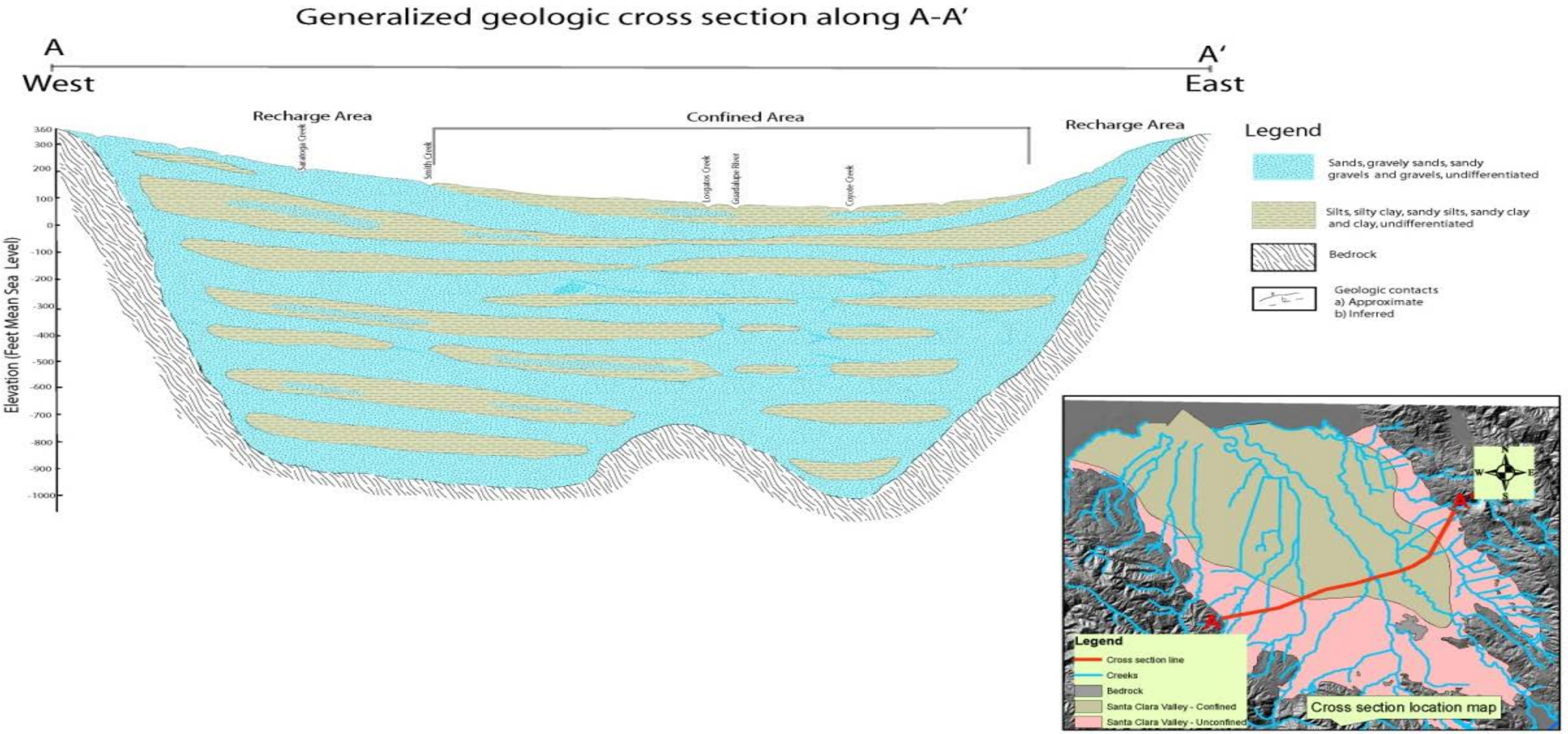
[6] Santa Clara Valley Water District, Standards for the Construction and Destruction of Wells and other Deep Excavations in Santa Clara County, June 1989.

[7] USGS, Ground water in Santa Clara Valley, California, Water-Supply Paper 519, 1924.

[8] California State Water Resources Control Board, Santa Clara Valley Investigation, Bulletin Number 7, 1955.

[9] USGS, Land Subsidence in the Santa Clara Valley, California, as of 1982, Professional Paper 497-F, 1988.

Figure D-2 Santa Clara Plain Generalized Cross Section



San Jose was the first area in the United States where inelastic land subsidence due to groundwater withdrawal was recognized[10]. Land subsidence was effectively halted by the District by 1970 through the importation of surface water, managed recharge, and careful management of the aquifer system. However, the potential for renewed subsidence is an ongoing concern, and the District manages water supplies to minimize the risk of renewed inelastic land subsidence.

Groundwater in the Santa Clara Plain is found at different depths in the unconfined aquifer and under artesian conditions in the confined aquifer. Groundwater movement generally follows surface water patterns, flowing to the northwest. Local groundwater also moves toward areas of intense pumping. Regional groundwater elevations in the Santa Clara Plain range from about 60 to 90 feet below mean sea level in the middle of the subbasin to about 220 to 480 feet above mean sea level near the southern extent of the eastern and western hills of the Santa Clara Plain. There has been a significant rebound in groundwater levels since the District's managed groundwater recharge program was started. As seen in the hydrograph typical seasonal fluctuations are about 10 to 20 feet.

Santa Clara Plain Storage Capacity

The operational storage capacity of the Santa Clara Plain has previously been estimated to be 350,000 AF[11]. The operational storage capacity represents the volume of groundwater that can be stored based on the District's management strategy, which accounts for the avoidance of adverse impacts such as inelastic land subsidence and salt water intrusion. The District is currently working to refine this estimate based on historically observed data.

Santa Clara Plain Water Budget

A water budget for the Santa Clara Plain for calendar years 2002 through 2011 is shown in Table D-1. The water budget is based on the District groundwater flow model for the Santa Clara Plain, and represents inflows and outflows for the principal aquifer. A majority of the inflow to the Santa Clara Plain is a result of managed recharge of local and imported supplies. Although the water budget can vary significantly from year to year, on average, there was a slight annual increase in storage for the Santa Clara Plain over this 10 year period.

Santa Clara Plain Land Subsidence Trends

Groundwater levels have recovered over time due to several factors including considerable surface water imports, the construction of facilities for the recharge of local and imported surface water, treated water deliveries, and water use efficiency programs. These activities have helped to take the burden off groundwater subbasins. Proactive conjunctive water management by the District helps to ensure that the potential for renewed inelastic subsidence is minimized. Currently, groundwater levels at key wells show that subbasin groundwater elevations are above subsidence thresholds, and inelastic land surface subsidence risk is low.

Santa Clara Plain Groundwater Elevation Trends

Groundwater elevations are affected by natural and managed recharge and groundwater extraction and are an indicator of how much groundwater is in storage at a particular time. Both low and high elevations can cause adverse conditions. Low groundwater levels can lead to land subsidence or salt water intrusion and high water levels can lead to nuisance conditions for below ground structures. Figure D-3 shows a typical hydrograph for the Santa Clara Plain. Annual fluctuations reflect both increased recharge in winter and spring and increased pumping in summer.

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[10] Tolman, C. F., and Poland, J. F., Ground-water Infiltration, and Ground-surface Recession in Santa Clara Valley, Santa Clara County, California, Eos Trans. AGU, 21, 23– 34, 1940.

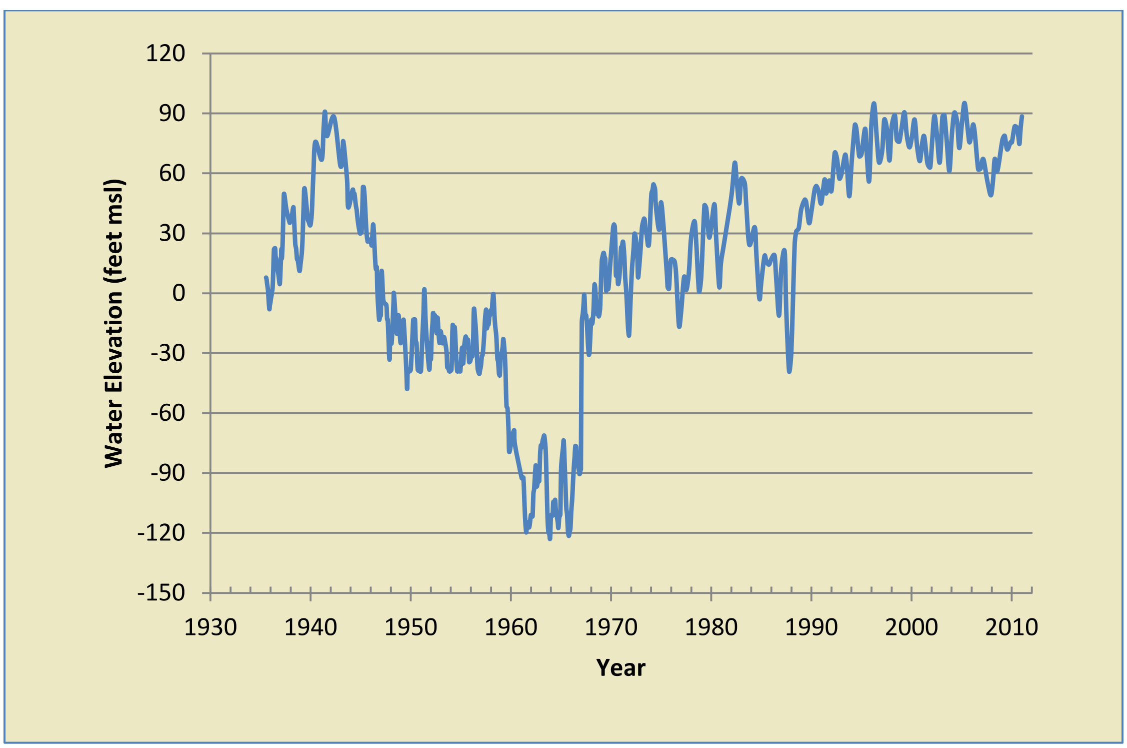
[11] Santa Clara Valley Water District, 2001 Groundwater Management Plan, July 2001.

Table D-1 Santa Clara Plain Principal Aquifer Water Budget (2002 to 2011)

Water Budget Component	Acre-Feet
Inflow	
Managed Recharge	64,000
Natural Recharge	30,000
Subsurface Inflow	8,000
Total Inflow	102,000
Outflow	
Groundwater Pumping	95,000
Subsurface Outflow	6,000
Total Outflow	101,000
Change in Storage	1,000

Notes:
1. Managed recharge represents direct replenishment by the District using local and imported water.
2. Natural recharge includes all uncontrolled recharge, including the deep percolation of rainfall, septic system and/or irrigation return flows, and natural seepage through creeks.
3. Subsurface inflow represents inflow from adjacent aquifer systems, including inflow from the Coyote Valley.
4. Groundwater pumping is based on pumping reported by water supply well owners.
5. Subsurface outflow represents outflow to adjacent aquifer systems, including outflows to San Francisco Bay.

Figure D-3 Groundwater Elevation in Santa Clara Plain Well 07S01W25L001



The increasing groundwater levels through the late 1930s and early 1940s can be attributed to the construction of many of the District's local reservoirs and increased recharge programs. Downward trends starting in the 1940s reflect growing population and industrial demands in Silicon Valley. The general increase in groundwater levels in the late 1960s and 1970s coincides with the delivery of State Water Project water to the area through the South Bay Aqueduct and the completion of the District's first two treatment plants, Rinconada and Penitencia Water Treatment Plants. Although there was a significant drought between 1987 and 1992, groundwater levels in the subbasin actually started to improve beginning in 1989 due to the addition of federal San Felipe Project deliveries to the area, the completion of the District's largest treatment plant (the Santa Teresa Water Treatment Plant), and calls for conservation.

Santa Clara Plain Groundwater Pumping Trends

Subbasin water levels, which are generally indicative of storage, are strongly influenced by groundwater pumping. The distribution and pumping of these wells for 2010 indicate that the greatest numbers of high production wells (500 to 4,000 AF per year) are in the central and southern portion of the Santa Clara Plain as shown in Figure D-4.

Annual groundwater production for the San Jose Plain since 1970 is shown in Figure D-5. For the time period shown, a maximum of 181,000 AF was pumped in the Santa Clara Plain in 1985. A sharp decrease in groundwater pumping can be noted in 1989, the year the District's third and largest water treatment plant (Santa Teresa) came on-line to utilize water imported from the Central Valley Project. Prior to 1989, the average annual pumping in the Santa Clara Plain was 157,000 AF. After Santa Teresa came on-line, average pumping dropped to 106,000 AF per year. Managed recharge provides the majority of water available for groundwater production, as shown in Table D-1 and Figure D-5.

Santa Clara Plain Groundwater Quality

The Santa Clara Plain generally produces water of excellent quality for municipal, irrigation, and domestic supply. Within the Santa Clara Plain, calcium and magnesium constitute the principal cations and bicarbonate is the most prevalent anion. Total dissolved solids (TDS) content is typically 200 to 500 mg/L, with the exception of localized areas including the Evergreen area of San Jose and Palo Alto. The median TDS content for the principal aquifer zone is 400 mg/L. Some shallow aquifers adjacent to the San Francisco Bay have been affected by salt water intrusion, and high TDS is noted in some wells close to the bay. Typically, very few wells sampled each year contain contaminants above primary maximum contaminant levels (MCL)[12]. A summary of the shallow and principal aquifer water quality from 2002 to 2011 is presented in Tables D-2 and D-3, respectively.

Tables D-4 and D-5 present the organic chemicals that were detected between 2002 and 2011 in the shallow and principal aquifers, respectively. Although some organic chemicals have been detected in the Santa Clara Plain, detections are infrequent and are typically low concentrations[13].

[12] Santa Clara Valley Water District, 2010 Groundwater Quality Report, June 2011.

[13] Lawrence Livermore National Laboratory, California Aquifer Susceptibility, A Contamination Vulnerability Assessment for the Santa Clara and San Mateo County Groundwater Basins, 2004.

Figure D-4 2010 Groundwater Pumping in the Santa Clara and Llagas Subbasins

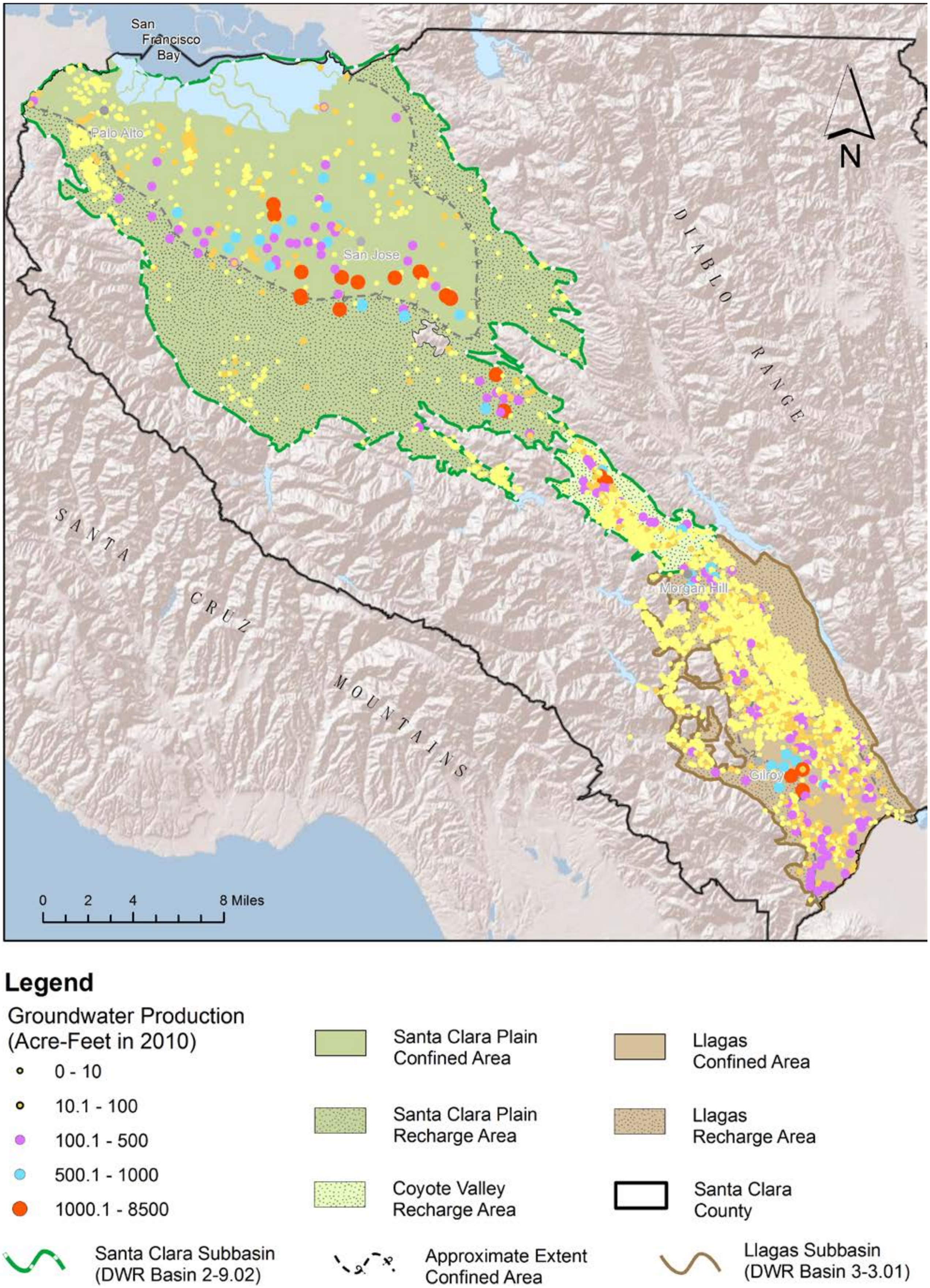


Figure D-5 Santa Clara Plain Groundwater Pumping and Managed Recharge

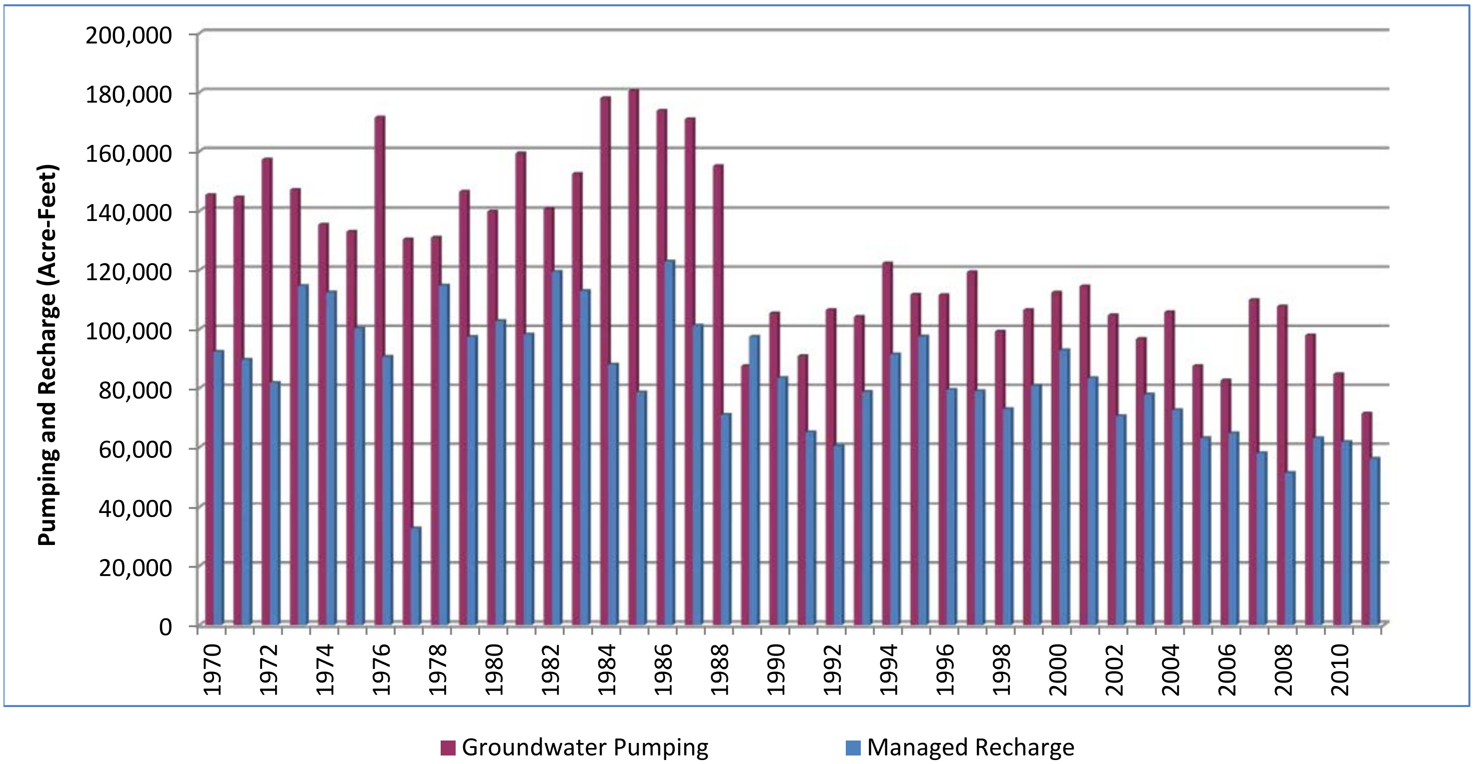


Table D-2 Santa Clara Plain Shallow Aquifer Zone[1] Groundwater Quality Summary Statistics

Parameter[2]	2002 - 2011 Results[3]			Population Median[4]		MCL[5]		n[6]
	25th Percentile	50th Percentile (Median)	75th Percentile	Lower	Upper	Primary	Secondary	
Aluminum (ug/L)	12.3	23.0	43.0	14.4	36.9	1,000	200	34
Arsenic (ug/L)	0.37	1.0	2.6	0.42	2.3	10	NE	33
Barium (ug/L)	75.5	118	170	91.2	140	1.000	NE	33
Boron (ug/L)	148	234	371	186	295	NE	NE	34
Cadmium (ug/L)	--	<1	--	--	--	5	NE	33
Chloride (mg/L)	43.0	62.0	93.0	49.0	86.0	NE	250	35
Chromium, Total (ug/L)	--	<10	--	--	--	50	NE	33
Copper (ug/L)	--	<50	--	--	--	NE	1,000	33
Fluoride (mg/L)	0.10	0.15	0.23	0.10	0.21	2	NE	27
Iron (ug/L)	6.6	25.1	95.7	11.5	55.0	NE	300	34
Lead (ug/L)	--	<5	--	--	--	NE	NE	137
Manganese (ug/L)	23.3	75.1	241.7	41.6	136	NE	50	33
Mercury (ug/L)	--	<1	--	--	--	2	NE	124
Nickel (ug/L)	1.8	3.4	6.3	2.1	5.3	100	NE	33
Nitrate as NO3 (mg/L)	0.30	1.4	6.4	0.60	3.3	45	NE	35
Perchlorate (ug/L)	--	<4	--	--	--	6	NE	145
Selenium (ug/L)	--	<5	--	--	--	50	NE	139
Silver (ug/L)	--	<10	--	--	--	NE	100	138
Specific Conductance (µS/cm)	674	927	1,394	752	1,275	NE	900	36
Sulfate (mg/L)	44.3	64.7	189	52	84.9	NE	250	35
Total Dissolved Solids (mg/L)	410	588	840	440	820	NE	500	31
Zinc (ug/L)	--	<50	--	--	--	NE	5,000	34

Notes:

1. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet.
2. ug/L= micrograms per liter (or parts per billion); mg/L = milligrams per liter (or parts per million); µS/cm = microSiemens per centimeter
3. The percentile is the value below which a certain percent of observations fall (e.g., the 50th percentile, or median, is the value below which half of the observations fall). For parameters with results reported at multiple reporting limits, the Maximum Likelihood Estimate (MLE) method is used.
   -- indicates the value was not computed since more than 80% of all results are non-detect. In these cases, the exact value of the median cannot be determined and the value shown represents the highest detection limit.
4. The lower and upper estimates of the population median are determined using a 95% confidence interval (alpha = 0.05).
5. Primary and secondary maximum contaminant levels (MCLs) are from the California Code of Regulations. Primary MCLs are health-based drinking water standards, while secondary MCLs are aesthetic-based standards. For secondary MCLs with a range, the lower, recommended threshold is shown. NE= Not Established
6. n represents the number of wells tested.

Table D-3 Santa Clara Plain Principal Aquifer Zone[1] Groundwater Quality Summary Statistics

Parameter[2]	2002 - 2011 Results[3]			Population Median[4]		MCL[5]		n[6]
	25th Percentile	50th Percentile (Median)	75th Percentile	Lower	Upper	Primary	Secondary	
Aluminum (ug/L)	1.9	5.7	17.4	4.0	8.0	1,000	200	273
Arsenic (ug/L)	0.25	0.47	0.85	0.37	0.58	10	NE	270
Barium (ug/L)	86.8	118	161.5	112	125	1,000	NE	273
Boron (ug/L)	86.2	172	342	148	199	NE	NE	187
Cadmium (ug/L)	---	<1	---	---	---	5	NE	273
Chloride (mg/L)	37.6	45.0	54.4	44.0	47.0	NE	250	277
Chromium, Total (ug/L)	2.1	3.5	5.8	3.0	4.1	50	NE	263
Copper (ug/L)	0.91	2.2	5.3	1.6	3.0	NE	1,000	273
Fluoride (mg/L)	0.07	0.11	0.18	0.11	0.12	2	NE	267
Iron (ug/L)	4.5	16.0	56.6	10.8	23.5	NE	300	273
Lead (ug/L)	0.25	0.49	0.93	0.39	0.61	NE	NE	257
Manganese (ug/L)	0.51	2.6	13.0	1.7	4.0	NE	50	273
Mercury (ug/L)	---	<1	---	---	---	2	NE	270
Nickel (ug/L)	---	<10	---	---	---	100	NE	273
Nitrate as NO3 (mg/L)	4.2	9.3	20.8	8.1	10.7	45	NE	288
Perchlorate (ug/L)	---	<4	---	---	---	6	NE	268
Selenium (ug/L)	0.71	1.3	2.3	1.0	1.6	50	NE	272
Silver (ug/L)	---	<10	---	---	---	NE	100	271
Sodium Adsorption Ratio	1.8	2.2	3.1	2.1	2.4	NE	NE	86
Specific Conductance (µS/cm)	578	665	825	642	690	NE	900	282
Sulfate (mg/L)	35.5	44.7	56.2	42.5	47.0	NE	250	277
Total Dissolved Solids (mg/L)	337	400	490	384	410	NE	500	273
Zinc (ug/L)	--	<50	--	--	--	NE	5,000	273

Notes:

1. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet.
2. ug/L= micrograms per liter (parts per billion); mg/L = milligrams per liter (or parts per million); µS/cm = microSiemens per centimeter
3. The percentile is the value below which a certain percent of observations fall (e.g., the 50th percentile, or median, is the value below which half of the observations fall). For parameters with results reported at multiple reporting limits, the Maximum Likelihood Estimate (MLE) method is used.
   -- indicates the value was not computed since more than 80% of all results are non-detect. In these cases, the exact value of the median cannot be determined and the value shown represents the highest detection limit.
4. The lower and upper estimates of the population median are determined using a 95% confidence interval (alpha = 0.05).
5. Primary and secondary maximum contaminant levels (MCLs) are from the California Code of Regulations. Primary MCLs are health-based drinking water standards, while secondary MCLs are aesthetic-based standards. For secondary MCLs with a range, the lower, recommended threshold is shown. NE= Not Established
6. n represents the number of wells tested.

Table D-4 Summary of Organic Parameters Detected in the Santa Clara Plain Shallow Aquifer Zone[1] (2002-2011)

Parameter	Wells Tested	Percent of Wells Tested with Detection	Tests	Percent of Tests with Detection	Maximum Concentration (ug/L)	Primary MCL[2] (ug/L)
1,1,1-Trichloroethane	30	6.7%	137	18.2%	2.1	200
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	29	3.4%	132	0.8%	4.64	1,200
Bromochloroacetic Acid	1	100%	2	50.0%	1	NE
Bromoform (THM)	30	3.3%	137	0.7%	0.63	NE
Chloroform (THM)	30	3.3%	137	0.7%	0.6	NE
Di(2-Ethylhexyl)Phthalate	2	50.0%	6	16.7%	0.501	4
Di-N-Butylphthalate	1	100%	1	100%	2.489	NE

Notes:

1. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet.
2. NE = not established

Table D-5 Summary of Organic Parameters Detected in the Santa Clara Plain Principal Aquifer Zone[2] (2002-2011)

Parameter	Wells Tested	Percent of Wells Tested with Detection	Tests	Percent of Tests with Detection	Maximum Concentration (ug/L)	Primary MCL (ug/L)
1,1,1-Trichloroethane	278	9.7%	1,881	11.9%	5.8	200
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	276	2.9%	1,719	1.0%	30	1,200
1,1,2-Trichloroethane	278	0.7%	1,882	0.1%	2.7	5
1,1-Dichloroethene	277	2.2%	1,875	1.9%	5.7	6
1,2,3-Trichlorobenzene	275	0.4%	1,655	0.1%	0.58	NE
1,2,3-Trichloropropane	255	0.4%	1,335	0.1%	1	NE
Acetone	13	7.7%	14	7.1%	5	NE
Bromodichloromethane (THM)	277	2.9%	1,674	0.5%	3.1	NE
Bromoform (THM)	277	4.3%	1,676	1.1%	9.85	NE
Chloroform (THM)	277	5.8%	1,676	1.6%	20	NE
Chloromethane	260	2.3%	1,158	0.5%	3.1	NE
DCPA (Total Di & Mono Acid Degradates)	180	1.1%	389	0.5%	2.7	NE
Di(2-Ethylhexyl)Phthalate	221	1.4%	710	0.4%	4.5	4
Dibromoacetic Acid (DBAA)	37	2.7%	52	1.9%	1	NE
Dibromochloromethane	277	4.0%	1,674	0.8%	4.2	NE
Dibromochloropropane (DBCP)	223	0.9%	700	0.3%	0.016	0.2
Dichlorodifluoromethane (Freon 12)	277	1.4%	1,668	0.3%	87	NE
Dichloromethane	277	1.1%	1,877	0.2%	1.1	5
Di-N-Butylphthalate	8	12.5%	14	7.1%	2.58	NE
Diquat	211	0.5%	581	0.2%	2.2	20
HAA5 - Haloacetic Acids (HAA5)	30	3.3%	44	2.3%	1	60
Isopropylbenzene	275	0.4%	1,644	0.1%	0.72	NE
Naphthalene	273	1.1%	1,593	0.2%	2	NE
Tert-Butyl Alcohol	143	0.7%	367	0.3%	5	NE
Tetrachloroethene	278	0.4%	1,877	0.3%	0.8	5
Toluene	278	2.2%	1,880	0.4%	4.7	150
Total Trihalomethanes	226	12.4%	1359	0.4%	20	80
Trichloroethene	3	33.3%	1878	0.1%	1.2	5
Trichlorofluoromethane (Freon 11)	278	0.4%	1864	0.1%	5	150

Notes: 1. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet. 2. NE = not established

Coyote Valley

Coyote Valley Hydrogeology

The Coyote Valley is the southern extension of the Santa Clara Valley Groundwater Basin, covering a surface area of 17 square miles. The Coyote Valley is approximately 7 miles long, and ranges from 3 miles wide to about a half mile wide at the boundary with the Santa Clara Plain to the north. The alluvial sediments overlying the Santa Clara Formation vary in thickness from a few feet or less along the west side of the subbasin to more than 400 feet along the east side[14]. The alluvial sediments are mainly composed of a thick alluvial sand and gravel with inter-bedded thin and discontinuous clays. A generalized cross-section of the Coyote Valley is presented in Figure D-6.

The Coyote Valley is generally unconfined and groundwater is typically encountered between 5 and 40 feet below ground surface. Groundwater movement generally follows surface water patterns, flowing to the northwest and draining into the Santa Clara Plain. Regional groundwater elevations in the subbasin range from 200 to 220 feet near the Coyote Narrows to about 350 feet at Cochrane Road in Morgan Hill.

Groundwater levels in the Coyote Valley respond rapidly to changes in hydrology and pumping. Local groundwater moves toward areas of intense pumping, especially at the southeastern and northern parts of the subbasin where retailer groundwater production wells are located. Groundwater recharge occurs along Coyote Creek due to the District managed recharge releases from Anderson Reservoir and stream seepage. The District does not have off-stream managed groundwater recharge facilities in the Coyote Valley.

Coyote Valley Storage Capacity

The operational storage capacity of the Coyote Valley has previously been estimated to range between 23,000 and 33,000 AF[15]. The District is currently working to refine the operational storage capacity estimate based on historically observed data.

Coyote Valley Water Budget

A water budget for average Coyote Valley inflows and outflows for calendar years 2002 to 2011 is presented in Table D-6. The Coyote Valley is almost entirely dependent on Coyote Creek for its water supply, which is largely fed by releases from the Anderson-Coyote reservoir system. Imported water from the San Felipe Project can also be released to Coyote Creek. Although this area is less urbanized than the Santa Clara Plain, recharge of direct precipitation is small compared to District managed recharge and natural recharge along Fisher Creek. Natural recharge from rainfall and other sources typically account for less than 25% of the inflows to the Coyote Valley. Over the 10 year period evaluated, the Coyote Valley has seen a slight annual decrease in storage.

Coyote Valley Groundwater Elevation Trends

Groundwater elevations are affected by natural and managed recharge and groundwater extraction and are an indicator of how much groundwater is in storage at a particular time. Groundwater elevations have been relatively stable since about 1970, although there has been a slight decreasing trend since the late 1990's. A typical hydrograph is shown below in Figure D-7.

[14] McCloskey, T.F. and Finnemore, E.J., Estimating Hydraulic Conductivities in an Alluvial Basin from Sediment Facies Models, Groundwater Vol. 34, No. 6, November-December 1995.

[15] Santa Clara Valley Water District, Operational Storage Capacity of the Coyote and Llagas Groundwater Subbasins, April 2002.

Figure D-6 Coyote Valley Generalized Cross Section

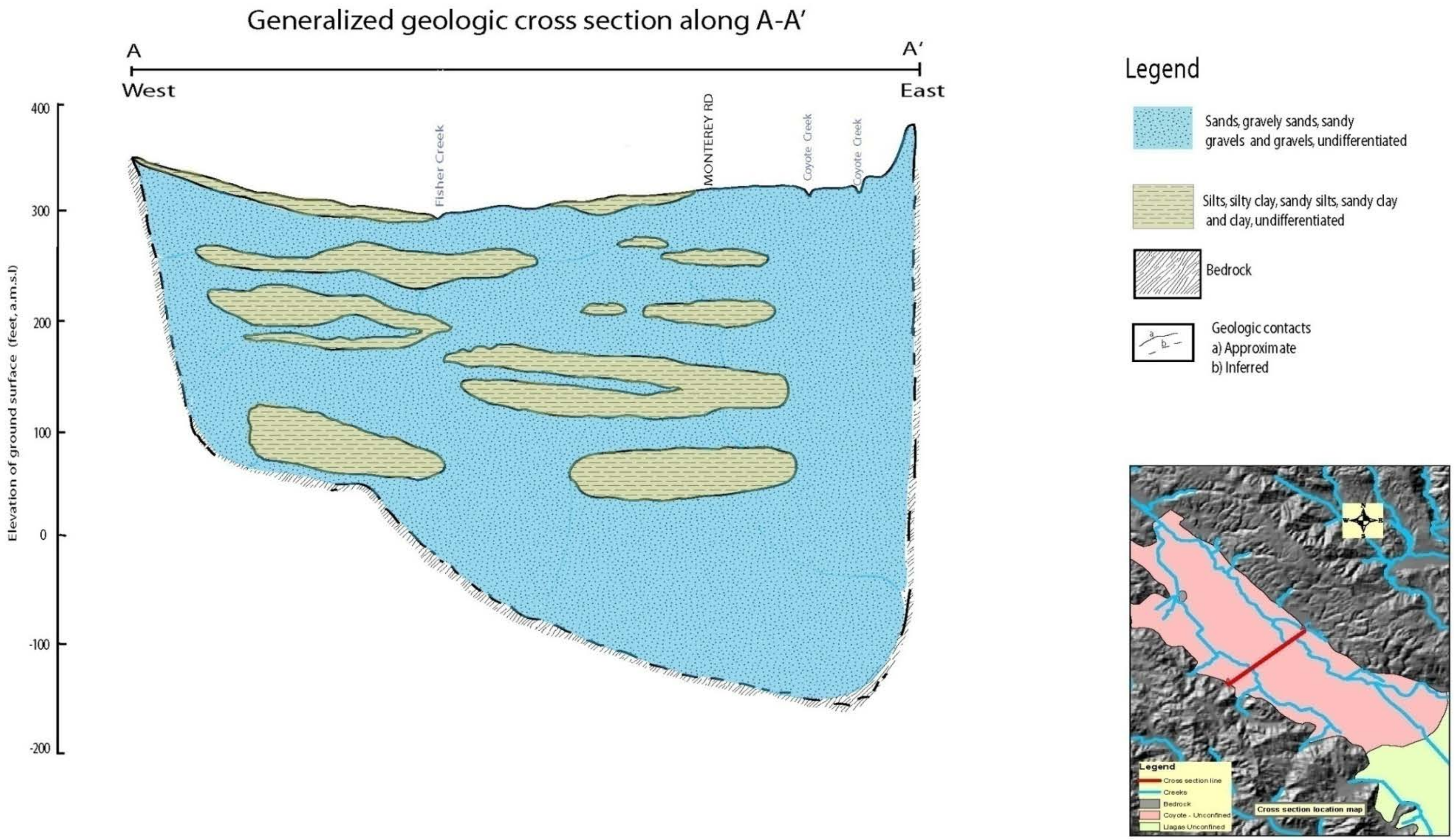
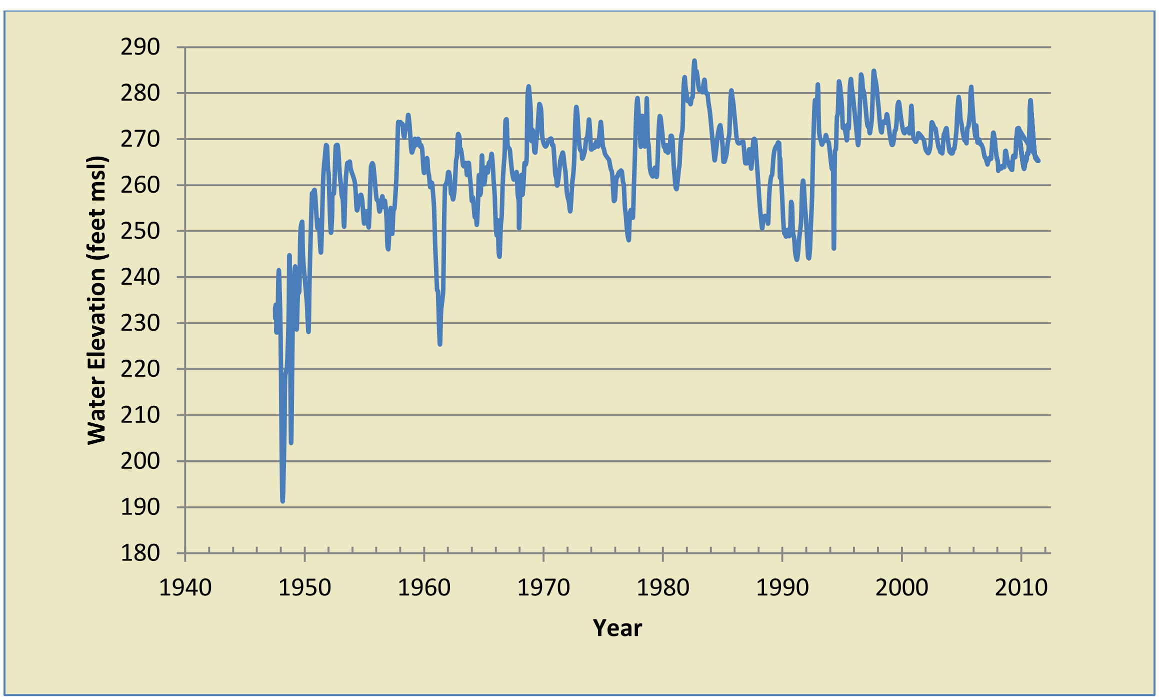


Table D-6 Coyote Valley Water Budget (2002 to 2011)

Water Budget Component	Acre-Feet
Inflow	
Managed Recharge	12,000
Natural Recharge	2,500
Subsurface Inflow	0
Total Inflow	14,500
Outflow	
Groundwater Pumping	10,000
Subsurface Outflow	5,000
Total Outflow	15,000
Change in Storage	-500

Notes:
1. Managed recharge represents direct replenishment by the District using local and imported water.
2. Natural recharge includes all uncontrolled recharge, including the deep percolation of rainfall, septic system and/or irrigation return flows, and natural seepage through creeks.
3. Subsurface inflow represents inflow from adjacent aquifer systems.
4. Groundwater pumping is based on pumping reported by water supply well owners.
5. Subsurface outflow represents outflow to adjacent aquifer systems, including outflow to the Santa Clara Plain.

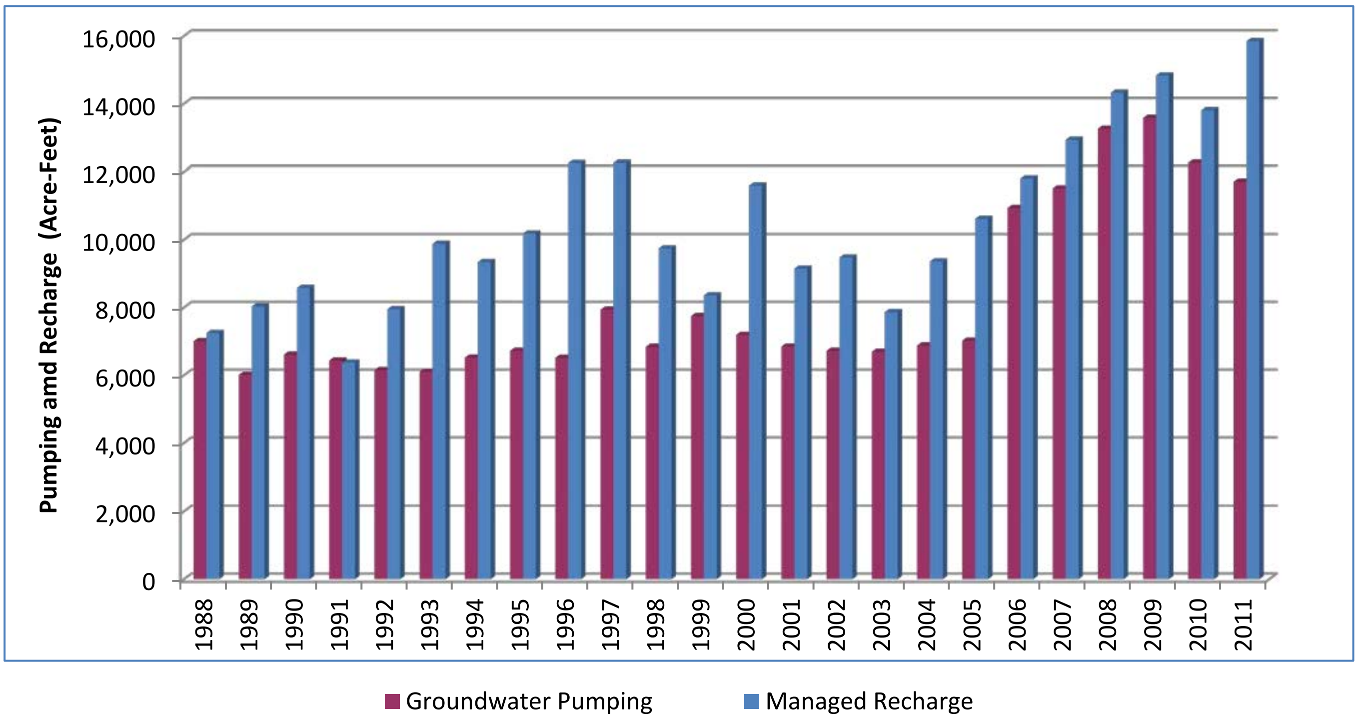
Figure D-7 Groundwater Elevation in Coyote Valley Well 09S02E02J002



Coyote Valley Groundwater Pumping Trends

As shown in Figure D-4, most of the high production wells (500 to 4,000 AF) are in the southern portion of Coyote Valley. Annual groundwater pumping for the Coyote Valley is shown in Figure D-8. The District assumed management of the Coyote Valley and Llagas Subbasin in 1987; prior to that date, limited groundwater pumping data are available. Coyote Valley groundwater pumping remained fairly consistent until 2006, when new water retailer wells began extracting water from Coyote Valley to serve customers in other areas. Managed recharge provides the majority of water available for groundwater production, as shown in Table D-6 and Figure D-8. Managed recharge in the Coyote Valley supports the maintenance of subsurface flows to the Santa Clara Plain, as they are both part of the Santa Clara Subbasin.

Figure D-8 Coyote Valley Groundwater Pumping and Managed Recharge



Coyote Valley Groundwater Quality

The Coyote Valley generally produces water of good quality for municipal, irrigation, and domestic supply. The typical water type is dominated by calcium-magnesium and bicarbonate. The median TDS concentration is 368 mg/L, which is below the CDPH recommended secondary maximum contaminant level of 500 mg/L. The median nitrate concentration is 15 mg/L, below the MCL of 45 mg/L. Typically, very few wells sampled each year contain contaminants above primary maximum contaminant levels (MCL)[16]. A summary of Coyote Valley water quality data is presented in Table D-7. Table D-8 summarizes the detections of organic water quality parameters in the Coyote Valley.

[16] Santa Clara Valley Water District, 2010 Groundwater Quality Report, June 2011.

Table D-7 Coyote Valley Groundwater Quality Summary Statistics

Parameter[1]	2002 - 2011 Results[2]			Population Median[3]		MCL[4]		n[5]
	25th Percentile	50th Percentile (Median)	75th Percentile	Lower	Upper	Primary	Secondary	
Aluminum (ug/L)	0.52	2.6	13.3	0.23	29.7	1,000	200	130
Arsenic (ug/L)	---	<2	---	---	---	10	NE	34
Barium (ug/L)	<100	79.1	115	<100	100	1,000	NE	34
Boron (ug/L)	18.6	53.7	155.2	27.0	106.7	NE	NE	27
Cadmium (ug/L)	---	<1	---	---	---	5	NE	34
Chloride (mg/L)	32.3	37.0	43.8	34.0	40.0	NE	250	33
Chromium, Total	0.94	1.8	3.4	0.88	3.6	50	NE	113
Copper (ug/L)	---	<50	---	---	---	NE	1,000	34
Fluoride (mg/L)	0.11	0.14	0.17	0.13	0.16	2	NE	35
Iron (ug/L)	2.7	12.6	57.7	3.0	52.1	NE	300	121
Lead (ug/L)	---	<5	---	---	---	NE	NE	34
Manganese (ug/L)	0.15	1.1	8.4	0.08	15.9	NE	50	33
Mercury (ug/L)	---	<1	---	---	---	2	NE	34
Nickel (ug/L)	---	<10	---	---	---	100	NE	
Nitrate as NO3 (mg/L)	3.7	15.0	43.0	4.5	29.8	45	NE	39
Perchlorate (ug/L)	---	<4	---	---	---	6	NE	33
Selenium (ug/L)	---	<5	---	---	---	50	NE	34
Silver (ug/L)	---	<10	---	---	---	NE	100	34
Specific Conductance (µS/cm)	552	614	654	565	630	NE	900	38
Sulfate (mg/L)	33.5	38.2	52.0	35.0	50.1	NE	250	31
Total Dissolved Solids (mg/L)	320	368	414	328	405	NE	500	29
Zinc (ug/L)	0.40	2.7	18.8	0.30	25.1	NE	5,000	34

Notes:

1. ug/L= micrograms per liter (parts per billion); mg/L = milligrams per liter (or parts per million); µS/cm = microSiemens per centimeter
2. The percentile is the value below which a certain percent of observations fall (e.g., the 50th percentile, or median, is the value below which half of the observations fall). For parameters with results reported at multiple reporting limits, the Maximum Likelihood Estimate (MLE) method is used.
   -- indicates the value was not computed since more than 80% of all results are non-detect. In these cases, the exact value of the median cannot be determined and the value shown represents the highest detection limit.
3. The lower and upper estimates of the population median are determined using a 95% confidence interval (alpha = 0.05).
4. Primary and secondary maximum contaminant levels (MCLs) are from the California Code of Regulations. Primary MCLs are health-based drinking water standards, while secondary MCLs are aesthetic-based standards. For secondary MCLs with a range, the lower, recommended threshold is shown. NE= Not Established
5. n represents the number of wells tested.

Table D-8 Summary of Organic Parameters Detected in the Coyote Valley (2002 to 2011)

Parameter	Wells Tested	Percent of Wells Tested with Detection	Tests	Percent of Tests with Detection	Maximum Concentration (ug/L)	Primary MCL (ug/L)
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	33	3.0%	126	2.4%	4.4	1,200
Acetone	4	50.0%	4	50.0%	6.3	5
Atrazine	18	5.6%	68	1.5%	1	1
Bromoform (THM)	33	3.0%	122	0.8%	0.81	NE
Chloroform (THM)	33	6.1%	122	1.6%	5.3	NE
Dichloromethane	33	3.0%	129	1.6%	2.3	5
Toluene	33	3.0%	128	0.8%	0.56	150
Total Trihalomethanes	19	15.8%	60	6.7%	6	80
Xylenes (Total)	33	3.0%	127	0.8%	0.82	1,750

Notes: NE = not established.

Llagas Subbasin

Llagas Subbasin Hydrogeology

The Llagas Subbasin is part of the Gilroy-Hollister Valley Groundwater Basin (DWR Basin Number 3-3) and covers a surface area of approximately 88 square miles. The Llagas Subbasin is about 15 miles long in the northwest/southeast direction and 3 to 6 miles wide.

The Llagas Subbasin is comprised of alluvial sediments ranging in thickness from about 500 feet at the apex at the northern divide to over 1,000 feet thick beneath the Pajaro River[17]. The subbasin consists of a number of discontinuous layers of gravel, sand and rock fragments (aquifer materials) and clay and silt (aquitards) at various depths beneath the ground surface. Water-bearing sediments occur in discontinuous and heterogeneous lenses that do not form well-defined laterally continuous layers.

The recharge area is located at the north, western, and eastern edges of the subbasin and is the area where active groundwater recharge takes place. Toward the south end of the subbasin, confining layers become more frequent and laterally and vertically extensive. Thus in the vicinity of the Pajaro River, the aquifer system is mostly confined[18]. This low permeability zone ranges in thickness from about 40 to 100 feet, and is most commonly encountered between 20 and 100 feet below ground surface[22]. Within the confined area, low permeability units restrict the vertical flow of groundwater and divide the subbasin into shallow and principal aquifer zones. The boundary between the recharge and confined areas was originally defined on the basis of flowing artesian wells[19]. The boundary is gradual and broad, and not as precise as its depiction on maps and figures implies. A generalized cross-section is presented in Figure D-9.

Groundwater movement generally follows surface water patterns, draining south toward the Pajaro River in San Benito County. Locally, groundwater also moves toward areas of intense pumping. Groundwater levels are influenced by the District’s managed recharge activities in the recharge area. Vertical gradients are predominately downward, although several monitoring wells at the southern end of the subbasin are flowing artesian. Historic marshes located east of Gilroy and south of Pacheco Highway indicate an area of upward flow and groundwater discharge.

Llagas Subbasin Storage Capacity

The operational storage capacity of the Llagas Subbasin has previously been estimated to range between 152,000 and 165,000 AF[20]. The District is currently working to refine the operational storage capacity estimate based on historically observed data.

Llagas Subbasin Water Budget

A water budget for the Llagas Subbasin for calendar years 2002 to 2011 is presented in Table D-9. Although some variability can be observed from year to year due to changes in groundwater pumping and recharge, on average, there was a slight annual decrease in storage for the Llagas Subbasin over this time period.

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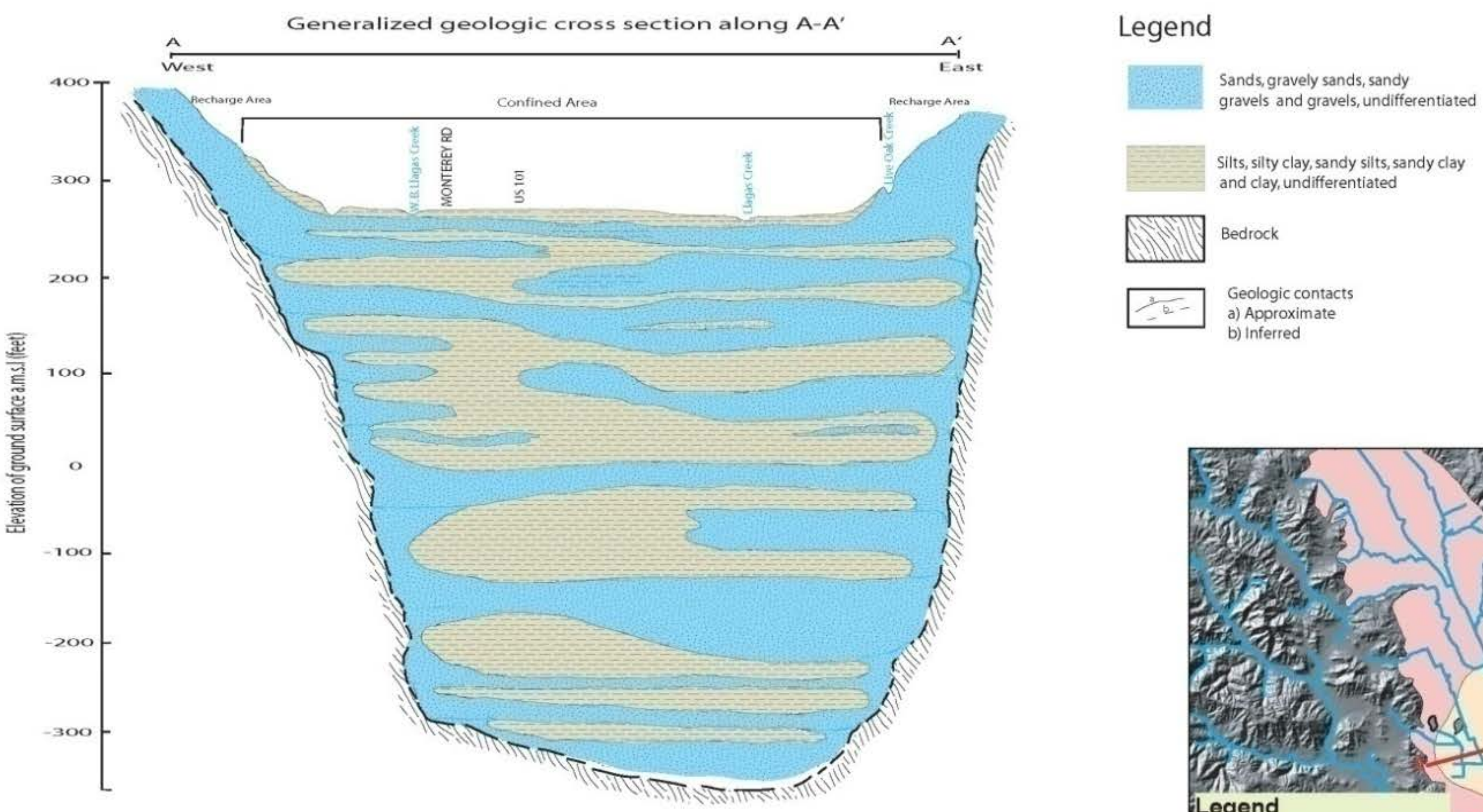
[17] Santa Clara Valley Water District, Standards for the Construction and Destruction of Wells and other Deep Excavations in Santa Clara County, June 1989.

[18] Todd Engineers/Kennedy Jenks Consultants for Santa Clara Valley Water District, Revised Final Groundwater Vulnerability Study, Santa Clara County, California, October 2010.

[19] USGS, Ground water in Santa Clara Valley, California, Water-Supply Paper 519, 1924.

[20] Santa Clara Valley Water District, Operational Storage Capacity of the Coyote and Llagas Groundwater Subbasins, April 2002.

Figure D-9 Llagas Subbasin Generalized Cross Section



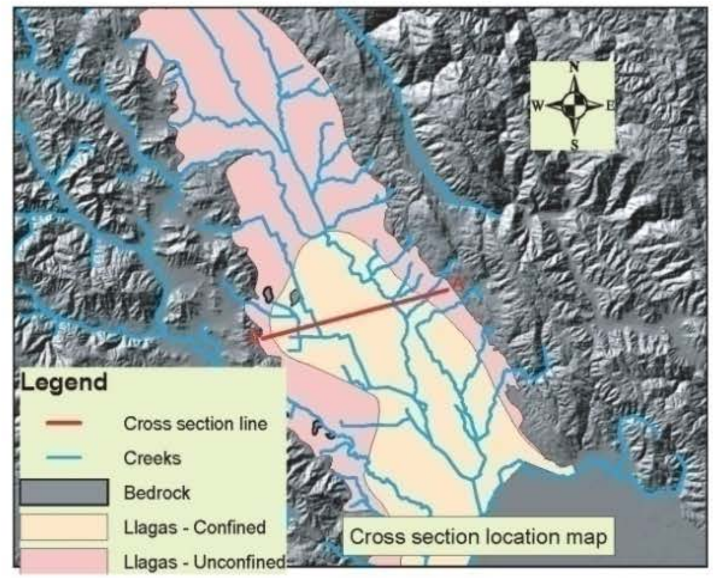


Table D-9 Llagas Subbasin Principal Aquifer Water Budget (2002 to 2011)

Water Budget Component	Acre-Feet
Inflow	
Managed Recharge	24,000
Natural Recharge	21,500
Subsurface Inflow	1,000
Total Inflow	46,500
Outflow	
Groundwater Pumping	44,000
Subsurface Outflow	2,500
Total Outflow	46,500
Change in Storage	0

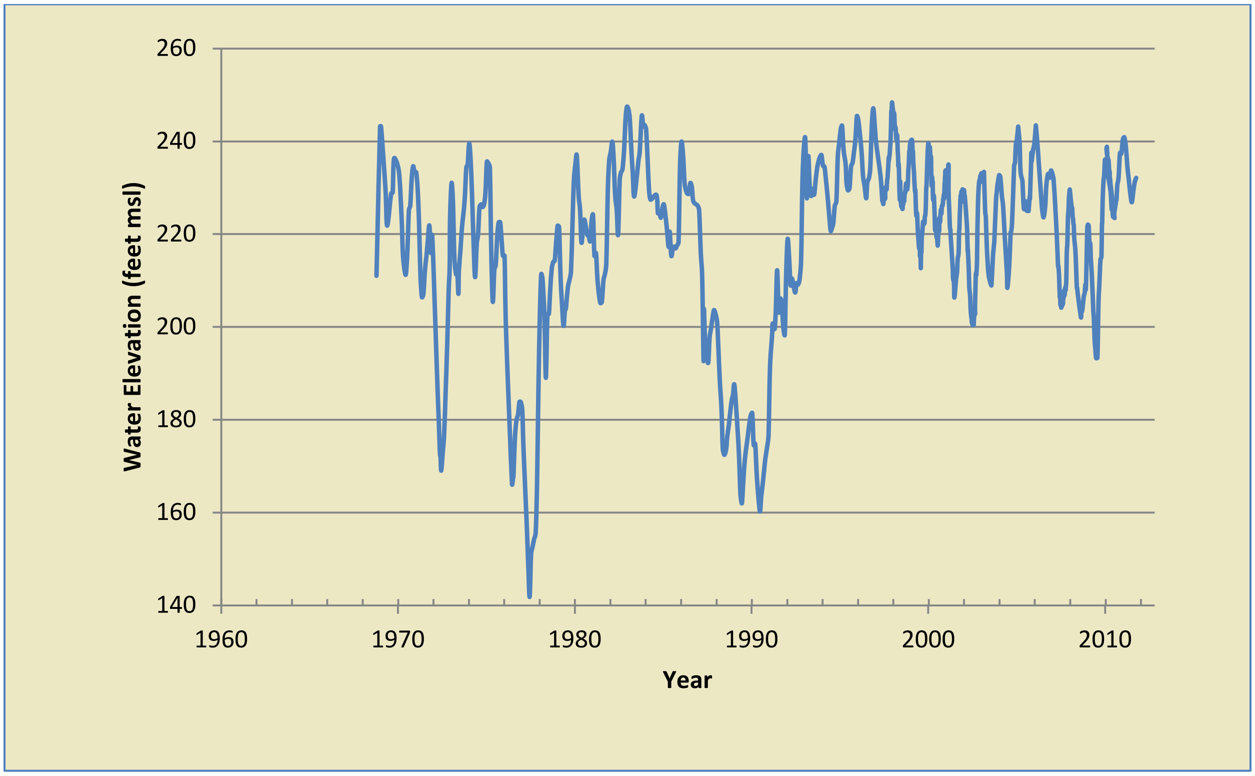
Notes:
1. Managed recharge represents direct replenishment by the District using local and imported water.
2. Natural recharge includes all uncontrolled recharge, including the deep percolation of rainfall, septic system and/or irrigation return flows, and natural seepage through creeks.
3. Subsurface inflow represents inflow from adjacent aquifer systems, including inflow from the Bolsa Subbasin in San Benito County.
4. Groundwater pumping is based on pumping reported by water supply well owners.
5. Subsurface outflow represents outflow to adjacent aquifer systems, including outflow to the Bolsa Subbasin in San Benito County.

This budget is based on the District groundwater flow model for the Llagas Subbasin and represents general subbasin inflows and outflows. Managed recharge occurs through the Upper and Lower Llagas recharge systems and from water released from Anderson Reservoir. Approximately half of the inflows to the Llagas Subbasin are from managed recharge, while the other half are from natural recharge.

Llagas Subbasin Groundwater Elevation Trends

A typical hydrograph for the Llagas Subbasin is shown in Figure D-10, with water levels fluctuating about 10 to 30 feet on seasonal basis. The droughts of 1976-77 and the late 1980 to early 1990s are seen from the hydrograph of this well.

Figure D-10 Groundwater Elevation in Llagas Subbasin Well 10S03E13D003

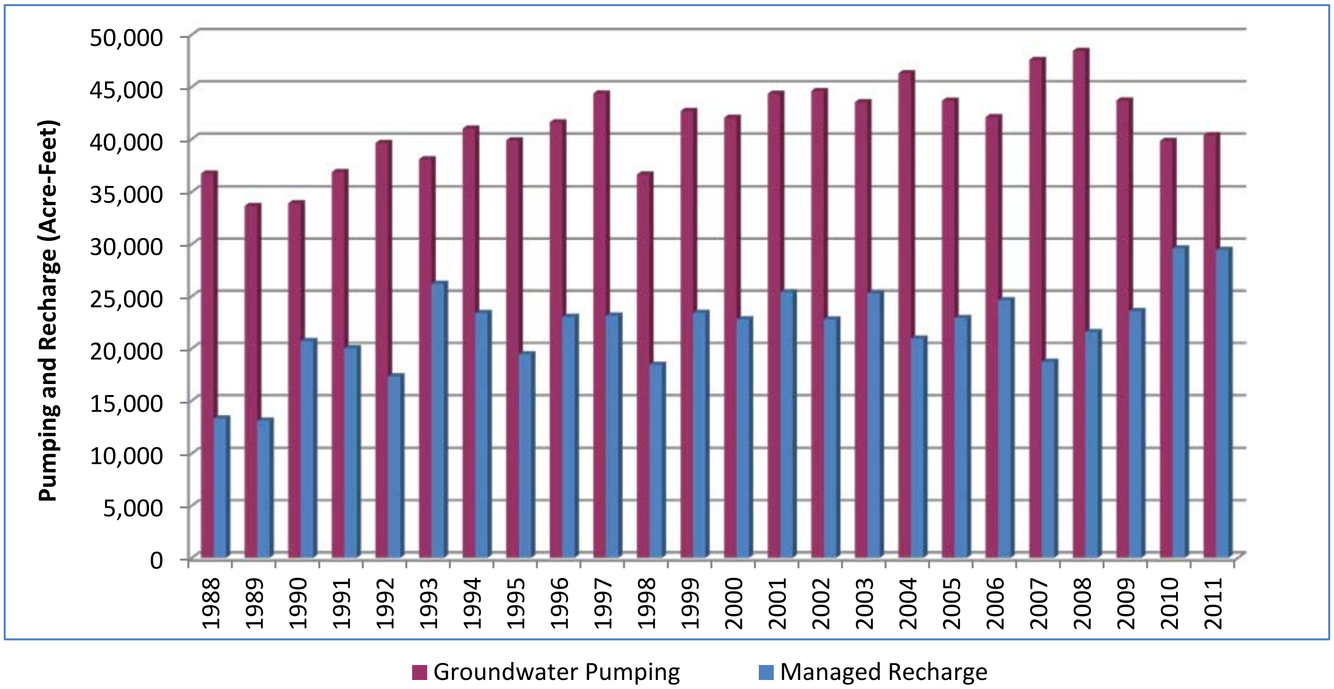


Llagas Subbasin Groundwater Pumping Trends

Figure D-4 indicates that for 2010, most high production wells (500 to 4,000 AF) are in the northern and southern portions of the Llagas Subbasin. The Llagas Subbasin contains more water supply wells than the Santa Clara Subbasin, but the majority of these produce modest amounts of water (<100 AF) typical of domestic and small agricultural use in this mostly rural area of the county.

The District assumed management of the Llagas Subbasin in 1987; prior to that date, only limited groundwater pumping data are available. Figure D-11 shows annual pumping from 1988 through 2011 in the Llagas Subbasin, indicating fairly consistent pumping over time. The increase in urban water demand has coincided with decreases in agricultural water demand as land use is converted. Managed recharge provides much of the water available for groundwater pumping, as shown in Table D-9 and Figure D-11.

Figure D-11 Llagas Subbasin Groundwater Pumping and Managed Recharge



Llagas Subbasin Groundwater Quality

The Llagas Subbasin generally produces water of good quality for municipal, irrigation, and domestic uses. Calcium and magnesium constitute the principal cations and bicarbonate is the principal anion. The median TDS concentration in the principal aquifer zone is 350 mg/L, well below the recommended CDPH secondary MCL of 500 mg/L. Some shallow aquifers located in the southern regions of the Llagas Subbasin produce water with higher TDS (up to 1,000 mg/L). Tables D-10 and D-11 present a summary of inorganic water quality in the Llagas Subbasin, while Tables D-12 and D-13 present a summary of detections of organic parameters.

Compared to the Santa Clara Subbasin, there are typically more detections of parameters above the MCL in the Llagas Subbasin, primarily nitrate and perchlorate[21]. Nitrate is an ongoing concern in the Llagas Subbasin due to historic and ongoing sources, including synthetic fertilizers, septic systems, and animal waste. Between 2002 and 2011, nitrate was detected above the MCL of 45 mg/L in at least one sample for 33% of the 143 wells tested as part of the District's regional groundwater monitoring program. However, trend analyses for the same time period show 20% of principal zone wells exhibiting a decreasing trend in nitrate concentrations with 5% showing a increasing trend.

In 2003, perchlorate was discovered over a wide area of the Llagas Subbasin due to releases from the Olin facility in Morgan Hill. In July 2011, there were only 8 domestic wells with perchlorate above the MCL of 6 μg/L compared to 188 wells in 2004. The median perchlorate concentration for the principal aquifer zone is 2.2 to 3.2 μg/L. The characterization and clean up of perchlorate is being conducted by the Olin Corporation under a Clean-up and Abatement Order from the Central Coast Water Board and the District continues to advocate for the timely restoration of groundwater.

[21] Santa Clara Valley Water District, 2010 Groundwater Quality Report, June 2011.

Table D-10 Llagas Subbasin Shallow Aquifer Zone[1] Groundwater Quality Statistics

Parameter[2]	2002 - 2011 Results[3]			Population Median[4]		MCL[5]		n[6]
	25th Percentile	50th Percentile (Median)	75th Percentile	Lower	Upper	Primary	Secondary	
Aluminum (ug/L)	5.9	11.0	20.5	5.8	20.8	1,000	200	33
Arsenic (ug/L)	---	<2	---	---	---	10	NE	33
Barium (ug/L)	---	<2	---	---	---	1,000	NE	33
Boron (ug/L)	66.0	112	189	84.8	147	NE	NE	33
Cadmium (ug/L)	---	<1	---	---	---	5	NE	33
Chloride (mg/L)	23.7	42.4	76.1	31.8	56.6	NE	250	35
Chromium, Total (ug/L)	---	<10	---	---	---	50	NE	33
Copper (ug/L)	---	<50	---	---	---	NE	1,000	33
Fluoride (mg/L)	0.11	0.13	0.16	0.12	0.14	2	NE	33
Iron (ug/L)	1.8	5.6	17.4	1.9	16.2	NE	300	33
Lead (ug/L)	---	<5	---	---	---	NE	NE	33
Manganese (ug/L)	0.26	1.4	7.4	0.21	9.2	NE	50	33
Mercury (ug/L)		<1				2	NE	29
Nickel (ug/L)	0.39	1.3	4.5	0.34	5.1	100	NE	33
Nitrate as NO3 (mg/L)	4.9	19.9	80.2	10.1	38.9	45	NE	37
Perchlorate (ug/L)	---	<4	---	---	---	6	NE	36
Selenium (ug/L)	---	<5	---	---	---	50	NE	33
Silver (ug/L)	---	<10	---	---	---	NE	100	33
Specific Conductance (µS/cm)	543	743	984	639	913	NE	900	37
Sulfate (mg/L)	32.9	54.9	73.05	39.1	61.8	NE	250	33
Total Dissolved Solids (mg/L)	319.5	480	604	402	564	NE	500	31
Zinc (ug/L)	---	<50	---	---	---	NE	5,000	33

Notes:
1. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet.
2. ug/L= micrograms per liter (parts per billion); mg/L = milligrams per liter (or parts per million); µS/cm = microSiemens per centimeter
3. The percentile is the value below which a certain percent of observations fall (e.g., the 50th percentile, or median, is the value below which half of the observations fall). For parameters with results reported at multiple reporting limits, the Maximum Likelihood Estimate (MLE) method is used.
   -- indicates the value was not computed since more than 80% of all results are non-detect. In these cases, the exact value of the median cannot be determined and the value shown represents the highest detection limit.
4. The lower and upper estimates of the population median are determined using a 95% confidence interval (alpha = 0.05).
5. Primary and secondary maximum contaminant levels (MCLs) are from the California Code of Regulations. Primary MCLs are health-based drinking water standards, while secondary MCLs are aesthetic-based standards. For secondary MCLs with a range, the lower, recommended threshold is shown. NE= Not Established
6. n represents the number of wells tested.

Table D-11 Llagas Subbasin Principal Aquifer Zone[1] Groundwater Quality Statistics

Parameter[2]	2002 - 2011 Results[3]			Population Median[4]		MCL[5]		n[6]
	25th Percentile	50th Percentile (Median)	75th Percentile	Lower	Upper	Primary	Secondary	
Aluminum (ug/L)	---	<50	---	---	---	1,000	200	97
Arsenic (ug/L)	---	<2	---	---	---	10	NE	94
Barium (ug/L)	52.0	86.2	143	72.7	102	1,000	NE	93
Boron (ug/L)	59.6	97.9	161	82.3	116	NE	NE	82
Cadmium (ug/L)	---	<1	---	---	---	5	NE	96
Chloride (mg/L)	27.0	41.5	61.3	35.0	48.5	NE	250	102
Chromium, Total (ug/L)	0.14	0.40	1.2	0.08	2.1	50	NE	96
Copper (ug/L)	---	<50	---	---	---	NE	1,000	93
Fluoride (mg/L)	0.11	0.13	0.17	0.13	0.14	2	NE	98
Iron (ug/L)	6.3	19.1	58.5	10.7	34.1	NE	300	94
Lead (ug/L)	---	<5	---	---	---	NE	NE	96
Manganese (ug/L)	---	<20	---	---	---	NE	50	93
Mercury (ug/L)	---	<1	---	---	---	2	NE	93
Nickel (ug/L)	---	<10	---	---	---	100	NE	96
Nitrate as NO3 (mg/L)	9.8	22.4	51.2	18.3	27.4	45	NE	143
Perchlorate (ug/L)	1.8	2.7	4.1	2.3	3.2	6	NE	175
Selenium (ug/L)	---	<10	---	---	---	50	NE	96
Silver (ug/L)	---	<10	---	---	---	NE	100	93
Sodium	19.6	26.0	41.6	24.0	30.0	NE	NE	102
Specific Conductance (µS/cm)	530	577.5	740	560	610	NE	900	107
Sulfate (mg/L)	27.6	33.9	42	31.9	38	NE	250	92
Total Dissolved Solids (mg/L)	320	350	435	339	382	NE	500	102
Zinc (ug/L)	5.3	12.3	28.5	7.8	19.3	NE	5,000	94

Notes:

1. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet.
2. ug/L= micrograms per liter (parts per billion); mg/L = milligrams per liter (or parts per million); µS/cm = microSiemens per centimeter
3. The percentile is the value below which a certain percent of observations fall (e.g., the 50th percentile, or median, is the value below which half of the observations fall). For parameters with results reported at multiple reporting limits, the Maximum Likelihood Estimate (MLE) method is used.
   -- indicates the value was not computed since more than 80% of all results are non-detect. In these cases, the exact value of the median cannot be determined and the value shown represents the highest detection limit.
4. The lower and upper estimates of the population median are determined using a 95% confidence interval (alpha = 0.05).
5. Primary and secondary MCLs are from the California Code of Regulations. Primary MCLs are health-based drinking water standards, while secondary MCLs are aesthetic-based standards. For secondary MCLs with a range, the lower, recommended threshold is shown. NE= Not Established
6. n represents the number of wells tested.

Table D-12 Summary of Organic Parameters Detected in the Llagas Subbasin Shallow Aquifer Zone[1]

Parameter	Wells Tested	Percent of Wells Tested with Detection	Tests	Percent of Tests with Detection	Maximum Concentration (ug/L)	Primary MCL[2] (ug/L)
1,1,1-Trichloroethane	33	3.0%	124	1.6%	0.8	200
Bromodichloromethane (THM)	33	3.0%	137	0.7%	2	NE
Chloroform (THM)	33	12.1%	137	6.6%	26	NE
Methyl-Tert-Butyl-Ether (MTBE)	33	3.0%	125	0.8%	0.7	13
Naphthalene	33	3.0%	124	0.8%	0.88	NE
Total Trihalomethanes	9	33.3%	14	28.6%	4	80

Table D-13 Summary of Organic Parameters Detected in the Llagas Subbasin Principal Aquifer Zone[3]

Parameter	Wells Tested	Percent of Wells Tested with Detection	Tests	Percent of Tests with Detection	Maximum Concentration (ug/L)	Primary MCL[2] (ug/L)
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	96	2.1%	527	0.6%	3.854	1,200
Bromodichloromethane (THM)	98	1.0%	528	0.2%	2.2	NE
Bromoform (THM)	98	4.1%	530	1.3%	3.6	NE
Chloroform (THM)	98	2.0%	530	0.4%	1	NE
Dibromochloromethane (THM)	98	3.1%	529	0.6%	3.3	NE
Dichlorodifluoromethane (Freon 12)	98	2.0%	542	5.4%	0.98	NE
Methyl-Tert-Butyl-Ether (MTBE)	99	1.0%	726	0.1%	4.5	13
Tetrachloroethylene	98	3.1%	537	23.1%	4.2	5
Total Trihalomethanes	49	12.2%	261	3.1%	9.7	80
Trichloroethylene	98	1.0%	540	0.6%	21	5

Notes:

1. The shallow aquifer zone is represented by wells primarily drawing water from depths less than 150 feet.
2. NE = not established
3. The principal aquifer zone is represented by wells primarily drawing water from depths greater than 150 feet.

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San Jose, CA 95118-3686
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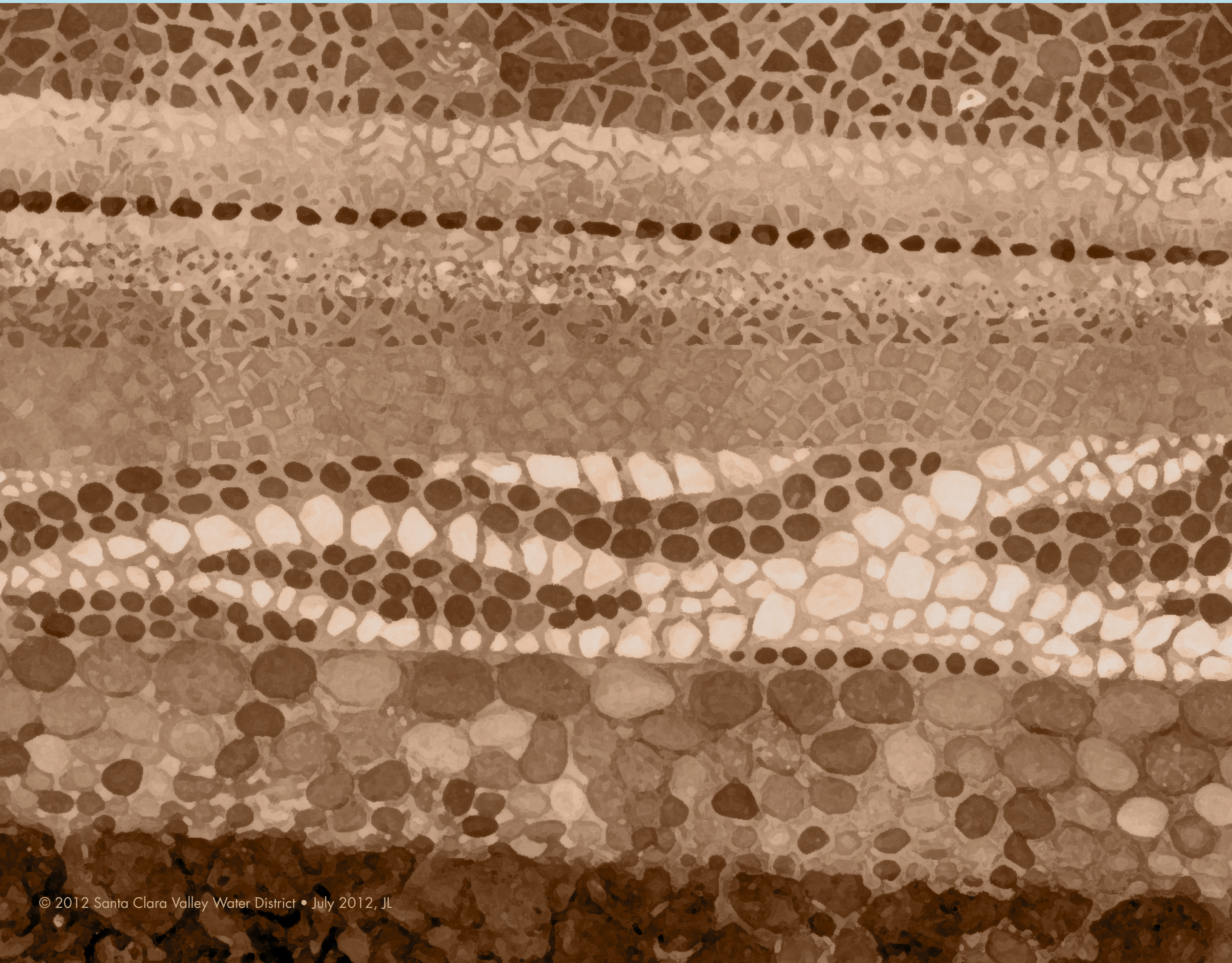
www.valleywater.org



San Francisco Bay Hydrologic Region

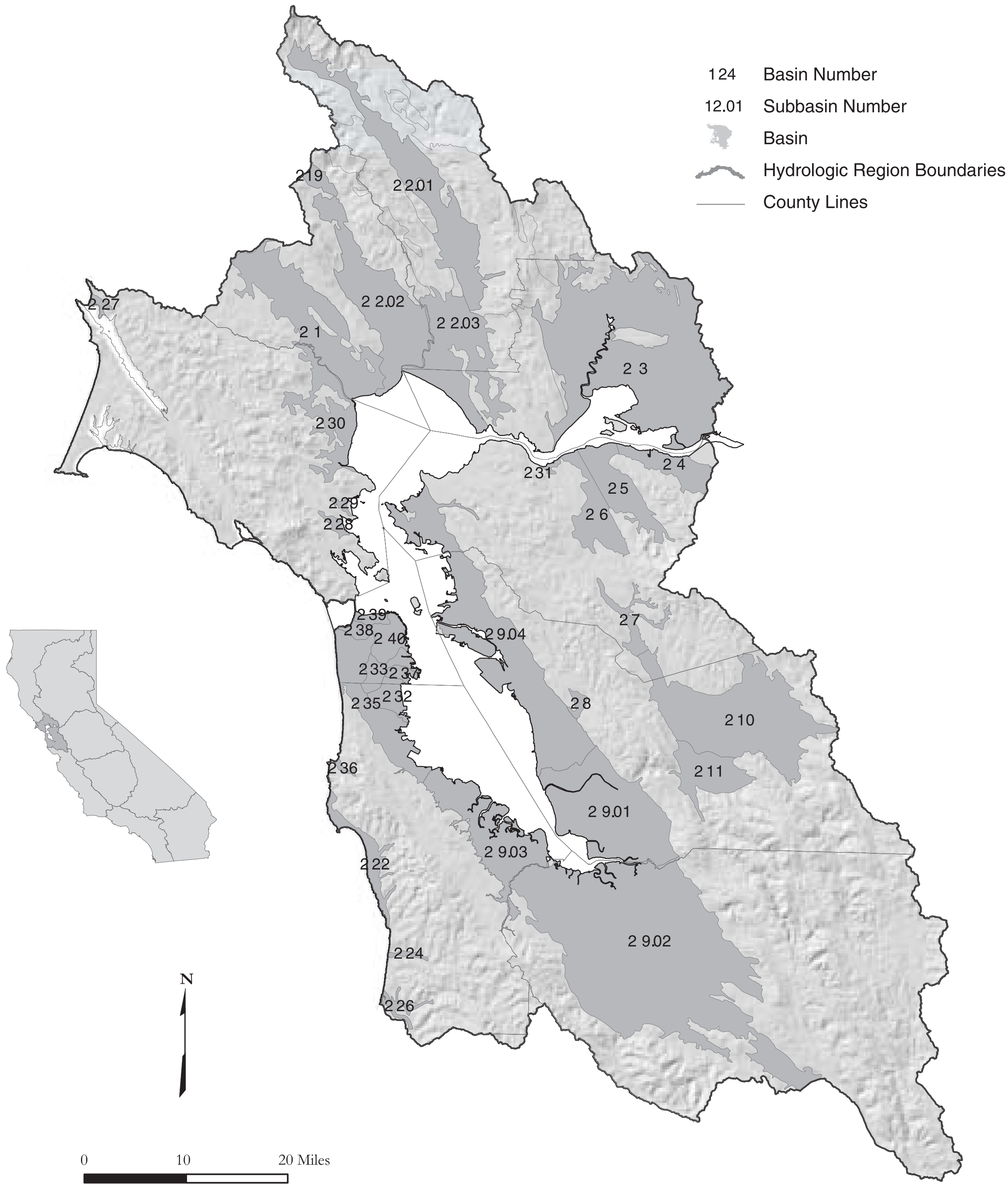


Figure 27 San Francisco Bay Hydrologic Region

Basins and Subbasins of the San Francisco Bay Hydrologic Region

Basin/subbasin	Basin name
2-1	Petaluma Valley
2-2	Napa-Sonoma Valley
2-2.01	Napa Valley
2-2.02	Sonoma Valley
2-2.03	Napa-Sonoma Lowlands
2-3	Suisun-Fairfield Valley
2-4	Pittsburg Plain
2-5	Clayton Valley
2-6	Ygnacio Valley
2-7	San Ramon Valley
2-8	Castro Valley
2-9	Santa Clara Valley
2-9.01	Niles Cone
2-9.02	Santa Clara
2-9.03	San Mateo Plain
2-9.04	East Bay Plain
2-10	Livermore Valley
2-11	Sunol Valley
2-19	Kenwood Valley
2-22	Half Moon Bay Terrace
2-24	San Gregorio Valley
2-26	Pescadero Valley
2-27	Sand Point Area
2-28	Ross Valley
2-29	San Rafael Valley
2-30	Novato Valley
2-31	Arroyo Del Hambre Valley
2-32	Visitacion Valley
2-33	Islais Valley
2-35	Merced Valley
2-36	San Pedro Valley
2-37	South San Francisco
2-38	Lobos
2-39	Marina
2-40	Downtown San Francisco

Description of the Region

The San Francisco Bay HR covers approximately 2.88 million acres (4,500 square miles) and includes all of San Francisco and portions of Marin, Sonoma, Napa, Solano, San Mateo, Santa Clara, Contra Costa, and Alameda counties (Figure 27). The region corresponds to the boundary of RWQCB 2. Significant geographic features include the Santa Clara, Napa, Sonoma, Petaluma, Suisun-Fairfield, and Livermore valleys; the Marin and San Francisco peninsulas; San Francisco, Suisun, and San Pablo bays; and the Santa Cruz Mountains, Diablo Range, Bolinas Ridge, and Vaca Mountains of the Coast Range. While being the smallest in size of the 10 HRs, the region has the second largest population in the State at about 5.8 million in 1995 (DWR 1998). Major population centers include the cities of San Francisco, San Jose and Oakland.

Groundwater Development

The region has 28 identified groundwater basins. Two of those, the Napa-Sonoma Valley and Santa Clara Valley groundwater basins, are further divided into three and four subbasins, respectively. The groundwater basins underlie approximately 896,000 acres (1,400 square miles) or about 30 percent of the entire HR.

Despite the tremendous urban development in the region, groundwater use accounts for only about 5 percent (68,000 acre-feet) of the region's estimated average water supply for agricultural and urban uses, and accounts for less than one percent of statewide groundwater uses.

In general, the freshwater-bearing aquifers are relatively thin in the smaller basins and moderately thick in the more heavily utilized basins. The more heavily utilized basins in this region include the Santa Clara Valley, Napa-Sonoma Valley, and Petaluma Valley groundwater basins. In these basins, the municipal and irrigation wells have average depths ranging from about 200 to 500 feet. Well yields in these basins range from less than 50 gallons per minute (gpm) to approximately 3,000 gpm. In the smaller basins, most municipal and irrigation wells have average well depths in the 100- to 200-foot range. Well yields in the smaller and less utilized basins are typically less than 500 gpm.

Land subsidence has been a significant problem in the Santa Clara Valley Groundwater Basin in the past. An extensive annual monitoring program has been set up within the basin to evaluate changes in an effort to maintain land subsidence at less than 0.01 feet per year (SCVWD 2001). Additionally, groundwater recharge projects have been implemented in the Santa Clara Valley to ensure that groundwater will continue to be a viable water supply in the future.

Groundwater Quality

In general, groundwater quality throughout most of the region is suitable for most urban and agricultural uses with only local impairments. The primary constituents of concern are high TDS, nitrate, boron, and organic compounds.

The areas of high TDS (and chloride) concentrations are typically found in the region's groundwater basins that are situated close to the San Francisco Bay, such as the northern Santa Clara, southern Sonoma, Petaluma, and Napa valleys. Elevated levels of nitrate have been detected in a large percentage of private wells tested within the Coyote Subbasin and Llagas Subbasin of the Gilroy-Hollister Valley Groundwater Basin (in the Central Coast HR) located to the south of the Santa Clara Valley (SCVWD 2001). The shallow aquifer zone within the Petaluma Valley also shows persistent nitrate contamination. Groundwater with high TDS, iron, and boron levels is present in the Calistoga area of Napa Valley, and elevated boron levels in other parts of Napa Valley make the water unfit for agricultural uses. Releases of fuel hydrocarbons from leaking underground storage tanks and spills/leaks of organic solvents at industrial sites have caused minor to significant groundwater impacts in many basins throughout the region. Methyl tertiary-butyl ether (MTBE) and chlorinated solvent releases to soil and groundwater continue to be problematic. Environmental oversight for many of these sites is performed either by local city and county enforcement agencies, the RWQCB, the Department of Toxic Substances Control, and/or the U.S. Environmental Protection Agency.

Water Quality in Public Supply Wells

From 1994 through 2000, 485 public supply water wells were sampled in 18 of the 33 basins and subbasins in the San Francisco Bay HR. Analyzed samples indicate that 410 wells, or 85 percent, met the state primary MCLs for drinking water standards. Seventy-five wells, or 15 percent, have constituents that exceed one or more MCL. Figure 28 shows the percentages of each contaminant group that exceeded MCLs in the 75 wells.

Table 16 lists the three most frequently occurring contaminants in each contaminant group and the number of wells in the HR that exceeded the MCL for those contaminants.

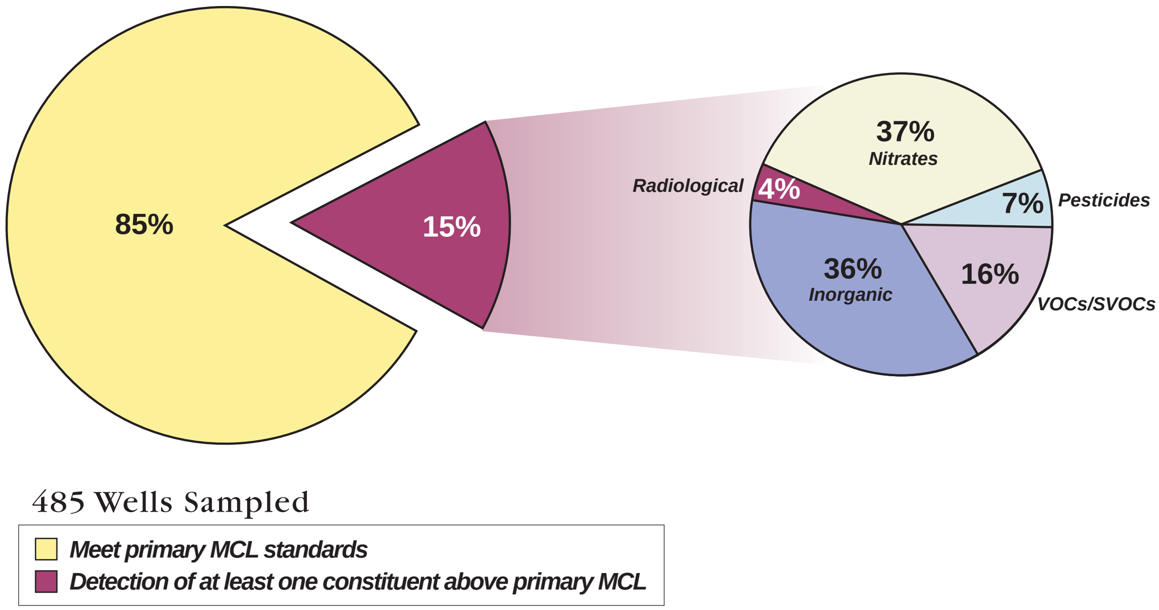


Figure 28 MCL exceedances in public supply wells in the San Francisco Bay Hydrologic Region

Table 16 Most frequently occurring contaminants by contaminant group in the San Francisco Bay Hydrologic Region

Contaminant group	Contaminant - # of wells	Contaminant - # of wells	Contaminant - # of wells
Inorganics	Iron – 57	Manganese – 57	Fluoride – 7
Radiological	Gross Alpha – 2	Radium 226 – 1	
Nitrates	Nitrate (as NO_3) – 27	Nitrate + Nitrite – 3	Nitrite (as N) – 1
Pesticides	Di(2-Ethylhexyl)phthalate – 4	Heptachlor – 1	
VOCs/SVOCs	PCE – 4	Dichloromethane – 3	TCE– 2 Vinyl Chloride – 2

TCE = Trichloroethylene
PCE = Tetrachloroethylene
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Coumpound

Changes from Bulletin 118-80

Since Bulletin 118-80 was published, RWQCB 2 boundary has been modified. This resulted in several basins being reassigned to RWQCB 1. These are listed in Table 17.

Table 17 Modifications since Bulletin 118-80 of groundwater basins in San Francisco Bay Hydrologic Region

Basin name	New number	Old number
McDowell Valley	1-56	2-12
Knights Valley	1-50	2-13
Potter Valley	1-51	2-14
Ukiah Valley	1-52	2-15
Sanel Valley	1-53	2-16
Alexander Valley	1-54	2-17
Santa Rosa Valley	1-55	2-18
Lower Russian River Valley	1-60	2-20
Bodega Bay Area	1-57	2-21

No additional basins were assigned to the San Francisco Bay HR in this revision. However, the Santa Clara Valley Groundwater Basin (2-9) has been subdivided into four subbasins instead of two, and the Napa-Sonoma Valley Groundwater Basin is now three subbasins instead of two.

There are several deletions of groundwater basins from Bulletin 118-80. The San Francisco Sand Dune Area (2-34) was deleted when the San Francisco groundwater basins were redefined in a USGS report in the early 1990s. The Napa-Sonoma Volcanic Highlands (2-23) is a volcanic aquifer and was not assigned a basin number in this bulletin. This is considered to be a groundwater source area as discussed in Chapter 6. Bulletin 118-80 identified seven groundwater basins that were stated to differ from 118-75: Sonoma County Basin, Napa County Basin, Santa Clara County Basin, San Mateo Basin, Alameda Bay Plain Basin, Niles Cone Basin, and Livermore Basin. They were created primarily by combining several smaller basins and subbasins within individual counties. This report does not consider these seven as basins. There is no change in numbering because the basins were never assigned a basin number.

Table 18 San Francisco Bay Hydrologic Region groundwater data

Basin/Subbasin	Basin Name	Area (acres)	Groundwater Budget Type	Well Yields (gpm)		Active Monitoring			TDS (mg/L)	
				Maximum	Average	Levels	Quality	Title 22	Average	Range
2-1	PETALUMA VALLEY	46,100	C	100	-	16	7	24	347	58-650
2-2	NAPA-SONOMA VALLEY									
2-2.01	NAPA VALLEY	45,900	A	3,000	223	19	10	23	272	150-370
2-2.02	SONOMA VALLEY	44,700	C	1,140	516	18	9	35	321	100-550
2-2.03	NAPA-SONOMA LOWLANDS	40,500	C	300	98	0	6	9	185	50-300
2-3	SUISUN-FAIRFIELD VALLEY	133,600	C	500	200	21	17	35	410	160-740
2-4	PITTSBURG PLAIN	11,600	C	-	-	-	-	9	-	-
2-5	CLAYTON VALLEY	17,800	C	-	-	-	-	48	-	-
2-6	YGNACIO VALLEY	15,500	C	-	-	-	-	-	-	-
2-7	SAN RAMON VALLEY	7,060	C	-	-	-	-	-	-	-
2-8	CASTRO VALLEY	1,820	C	-	-	-	-	-	-	-
2-9	SANTA CLARA VALLEY									
2-9.01	NILES CONE	57,900	A	3,000	2,000	350	120	20	-	-
2-9.02	SANTA CLARA	190,000	C	-	-	-	10	234	408	200-931
2-9.03	SAN MATEO PLAIN	48,100	C	-	-	-	2	14	407	300-480
2-9.04	EAST BAY PLAIN	77,400	A	1,000	UNK	29	16	7	638	364-1,420
2-10	LIVERMORE VALLEY	69,500	A	-	-	-	-	36	-	-
2-11	SUNOL VALLEY	16,600	C	-	-	-	-	2	-	-
2-19	KENWOOD VALLEY	3,170	C	-	-	-	-	13	-	-
2-22	HALF MOON BAY TERRACE	9,150	C	-	-	5	-	9	-	-
2-24	SAN GREGORIO VALLEY	1,070	C	-	-	-	-	-	-	-
2-26	PESCADERO VALLEY	2,900	C	-	-	3	-	4	-	-
2-27	SAND POINT AREA	1,400	C	-	-	-	-	6	-	-
2-28	ROSS VALLEY	1,770	C	-	-	-	-	-	-	-
2-29	SAN RAFAEL VALLEY	880	C	-	-	-	-	-	-	-
2-30	NOVATO VALLEY	20,500	C	-	-	-	-	1	-	-
2-31	ARROYO DEL HAMBRE VALLEY	790	C	-	-	-	-	-	-	-
2-32	VISITACION VALLEY	880	C	-	-	-	-	-	-	-
2-33	ISLAIS VALLEY	1,550	C	-	-	-	-	-	-	-
2-35	MERCED VALLEY	10,400	C	-	-	-	-	10	-	-
2-36	SAN PEDRO VALLEY	880	C	-	-	-	-	-	-	-
2-37	SOUTH SAN FRANCISCO	2,170	C	-	-	-	-	-	-	-
2-38	LOBOS	2,400	A	-	-	-	-	-	-	-
2-39	MARINA	220	A	-	-	-	-	-	-	-
2-40	DOWNTOWN SAN FRANCISCO	7,600	C	-	-	-	-	-	-	-

gpm - gallons per minute
mg/L - milligram per liter
TDS - total dissolved solids

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Santa Clara Valley Groundwater Basin, Santa Clara Subbasin

- Groundwater Basin Number: 2-9.02
- County: Santa Clara
- Surface Area: 153,600 acres (240 square miles)

Basin Boundaries and Hydrology

The Santa Clara subbasin occupies a structural trough parallel to the northwest trending Coast Ranges. TheDiablo Range bounds it on the west and the Santa Cruz Mountains form the basin boundary on the east. It extends from the northern border of Santa Clara County to the groundwater divide near the town of Morgan Hill. The dominant geohydrologic feature is a large inland valley (Fio and Leighton 1995). The valley is drained to the north by tributaries to San Francisco Bay including Coyote Creek, the Guadalupe River, and Los Gatos Creek. Annual precipitation for the Santa Clara basin ranges from less than 16 inches in the valley to more than 28 inches in the upland areas.

Hydrogeologic Information

Water Bearing Formations

The water bearing formations of the Santa Clara subbasin include Pliocene to Holocene age continental deposits of unconsolidated to semi-consolidated gravel, sand, silt and clay. Two members form this group, the Santa Clara Formation of Plio-Pleistocene age and the younger alluvium of Pleistocene to Holocene age (DWR 1975). Lithologic similarities make distinction between these two units difficult based on available well data. The combined thickness of these two units probably exceeds 1500 feet (DWR 1967).

Santa Clara Formation. The Santa Clara Formation is of Plio-Pleistocene age and rests unconformably on impermeable rocks that mark the bottom of the groundwater subbasin (DWR 1975). The Santa Clara Formation is exposed only on the west and east sides of the Santa Clara Valley. Where exposed, it is composed of poorly sorted deposits ranging in grain size from boulders to silt (DWR 1975). Well logs indicate that permeability increases from west to east and that in the central part of the valley permeability and grain size decrease with depth (DWR 1975).

Pleistocene-Holocene Alluvium. The Pleistocene to Holocene alluvium is the most important water bearing unit in the Santa Clara subbasin. The permeability of the valley alluvium is generally high and principally all large production wells derive their water from it (DWR 1975). Comprised generally of unconsolidated gravel, sand, silt, and clay it is deposited principally as series of convergent alluvial fans. It becomes progressively finer-grained at the central portions of the valley. A confined zone is created in the northern portion of the subbasin where overlain by a clay layer of low permeability (SCVWD 2001). The southern portion of the subbasin is generally unconfined and contains no thick clay layers (SCVWD 2001).

Recharge Areas

Natural recharge occurs principally as infiltration from streambeds that exit the upland areas within the drainage basin and from direct percolation of precipitation that falls on the basin floor.

The Santa Clara Valley Water District conducts an artificial (facility) recharge program. This is conducted by releasing locally conserved or imported water to in-stream and off-stream facilities (SCVWD 2001). District wide controlled in-stream recharge accounts for about 45 % groundwater recharge in district facilities (SCVWD 2001). In-stream recharge occurs along stream channels in the alluvial apron upstream from the confined zone. Spreader dams (creating temporary or permanent impoundments in the stream channel) are a key component of the in-stream recharge program, increasing recharge capacity by approximately 10 % (SCVWD 2001).

Off-stream recharge facilities include abandoned gravel pits and areas specifically excavated for recharge purposes. Recharge from water delivered to these facilities accounts for approximately 35 % of the recharge district wide (SCVWD)

Groundwater Level Trends

Historically, since the early 1900,s through the mid-1960's water level declines from groundwater pumpage have induced subsidence in the Santa Clara subbasin and caused degradation of the aquifer adjacent to the bay from saltwater intrusion. Prior to importation of surface water via the Hetch Hetchy Aqueduct and South Bay Aqueduct and the introduction of an artificial recharge program water levels declined more than 200 feet in the Santa Clara Valley (Poland and Ireland 1988). Groundwater levels have generally increased since 1965 as a result of increase in recharge and decreases in pumpage (Fio and Leighton 1995). Current hydrographs of index wells within the subbasin maintained by Santa Clara Valley Water District support this trend (www.scvwd.dst.ca/gwuse/gwmimap.htm, 2001).

Groundwater Storage

Groundwater Storage Capacity. Operational groundwater storage capacity is an estimate of the storage capacity based on "District Operations" (SCVWD 2001). Operational storage capacity is generally less than total storage capacity. It must account for available pumping capacity, avoidance of land subsidence, and problems associated with high groundwater levels. The operational storage capacity of the Santa Clara Valley subbasin is estimated to be 350,000 acre-feet (SCVWD 2001). This estimate is based on an area defined by the Santa Clara Valley Water District that is approximately 15 square miles smaller than the Santa Clara subbasin boundaries used by the California Department of Water Resources for this publication.

Groundwater in Storage. No published report was found addressing the quantity of groundwater presently in storage.

Groundwater Budget (Type C)

Not enough published information was found to present a current groundwater budget detailing inflows and outflows for this basin. Additional information may be available from Santa Clara Valley Water District.

Groundwater Quality

Characterization. The groundwater in the major producing aquifers within the basin is generally of a bicarbonate type, with sodium and calcium the principal cations (DWR 1975). Although hard, it is if good to excellent mineral composition and suitable for most uses. Drinking water standards are met at public supply wells without the use of treatment methods (SCVWD 2001).

Impairments. Areas with somewhat elevated mineral levels, perhaps associated with historical saltwater intrusion have been observed in the northern basin (SCVWD 2001). Some wells with elevated nitrate concentration have been identified in the southern portion of the basin (SCVWD 2001).

Water Quality in Public Supply Wells

Constituent Group[1]	Number of wells sampled[2]	Number of wells with a concentration above an MCL[3]
Inorganics – Primary	257	9
Radiological	234	1
Nitrates	268	10
Pesticides	253	3
VOCs and SVOCs	252	4
Inorganics – Secondary	257	29

[1] A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).
[2] Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.
[3] Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Production characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: – 1,650	Average: 425 (DWR 1975)
	Total depths (ft)	
Domestic	Range: 15 - 800	Average: 263 (Based on 314 Wells)
Municipal/Irrigation	Range: 17 – 1,186	Average: 278 (Based on 262 Wells)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
SCVWD and Cooperators	Groundwater levels	108 Wells Quarterly, 168 Wells Monthly
DWR	Miscellaneous water quality	10 Wells
Department of Health Services and cooperators	Title 22 water quality	234 Wells

Basin Management

Groundwater management:

Water agencies

Public	Aldercroft Heights Co WD, Purissima Hills WD, San Martin Co WD, Santa Clara Valley WD
Private	

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Errata

Changes made to the basin description will be noted here.