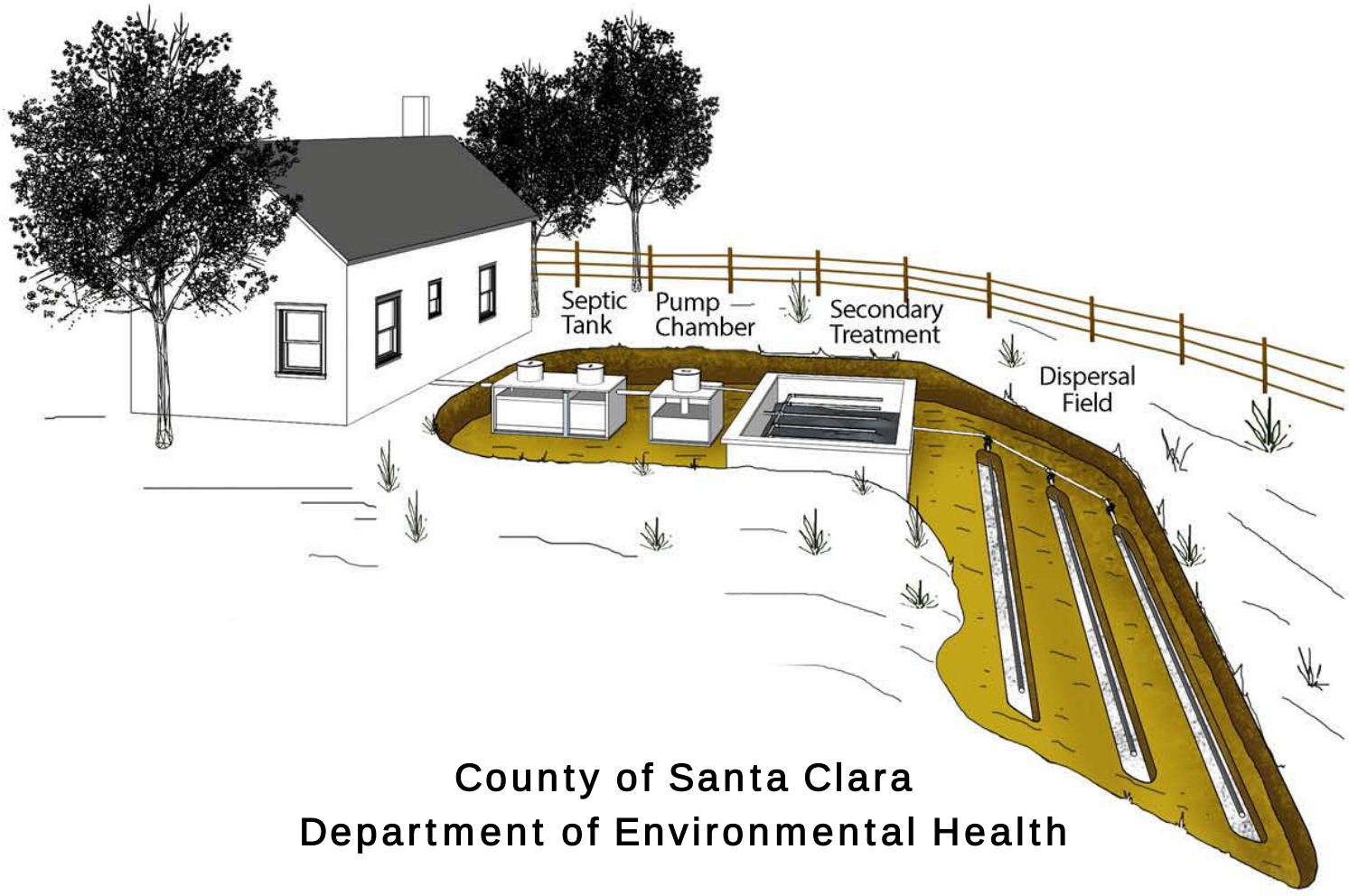
Local Agency Management Plan
For
Onsite Wastewater Treatment Systems



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July 2014

Local Agency Management Plan

for

Onsite Wastewater Treatment Systems

Santa Clara County, California

Submitted to:
California Regional Water Quality Control Board,
San Francisco Bay Region

Santa Clara County
Department of Environmental Health
July 2014

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Section 1:
Introduction and Background

Introduction

This document presents the proposed Local Agency Management Program (LAMP) pertaining to the oversight of onsite wastewater treatment systems (OWTS) within the County of Santa Clara, California. This LAMP has been prepared in accordance with the requirements of the State Water Resources Control Board's (SWRCB) *Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems*, dated June 19, 2012, also referred to as the "OWTS Policy".

The SWRCB OWTS Policy provides a multi-tiered strategy for management of OWTS in California. This LAMP has been prepared by Santa Clara County to obtain approval for OWTS management under Tier 2 of the OWTS Policy. As such, it is intended to allow the County to continue providing local oversight of OWTS by implementing practices that: (a) are suited to the conditions in Santa Clara County; (b) meet or exceed the environmental protections of the "default" siting and design requirements for OWTS identified in Tier 1 of the SWRCB Policy; and (c) ensure the best opportunity for coordinated and comprehensive management of OWTS, public health and water quality in Santa Clara County.

This LAMP is intended to apply to all OWTS within Santa Clara County having wastewater design flows of up to 10,000 gpd, with the exception of those located on State and Federally-owned lands. Any OWTS with a design flow exceeding 10,000 gpd would be regulated by the respective California Regional Water Quality Control Board. California law provides that a county health officer or comprehensive environmental agency is responsible for permitting the installation of and regulating OWTS within its jurisdictional boundaries.[1] In Santa Clara County, the Health Officer has designated the Director of Environmental Health as a Deputy Health Officer for the purpose of enforcing State and local environmental health law. Moreover, all cities within the County have designated the County's Health Officer as their jurisdictions' health officer.

Geographical Area

Santa Clara County is located at the southern end of the San Francisco Bay Area and shares boundaries with Alameda County to the north, Stanislaus and Merced Counties to the east, San Benito County to the south, and Santa Cruz and San Mateo Counties to the west. The county encompasses over 1,300 square miles of territory, or approximately 832,000 acres. The county seat and largest city is San Jose.

[1] Health & Saf. Code, §§ 116275; 116500.

Santa Clara County is bordered on the west by the Santa Cruz Mountains and on the east by the Diablo Range. The Santa Cruz Mountains include rolling grasslands and wooded foothills adjacent to the valley with some steep slopes and dense forest lands. The Diablo Range includes about half of the county's land area. Most of the land is composed of grasslands and brush, with a significant proportion either in public ownership or under conservation easements. Both the Diablo and Santa Cruz ranges include active earthquake faults and areas of slope instability. Between these two ranges lies the Santa Clara Valley.

At the northern tip of the county are San Francisco Bayland and other open space public lands. These bay wetlands are primarily used for wildlife conservation, salt extraction, and low intensity recreational uses. The National Wildlife Refuge on the southern shores of San Francisco Bay is in the Pacific Flyway.

Within the Santa Clara Valley, the density of development is influenced by the corridors formed by Highways 85, 101, 17/880, 280 and 680. Radiating out from these major highways are the most intense areas of development within the county. Thirteen of the 15 cities in the county are clustered around these corridors in the northern portion of the valley, including the largest of the cities, San Jose**.** The southern portion of the valley includes the cities of Morgan Hill, Gilroy and the unincorporated area of San Martin. The growth of these urban areas is also influenced by access to Highway 101.

The south county contains large and medium scale agricultural lands, ranchlands and some rural residential areas. To the west of the valley are the foothills of the Santa Cruz Mountains. These are primarily designated as hillside areas and public lands. Much of this area is relatively unstable and heavily wooded. It is primarily open space lands. Along the county's eastern border are large parcels designated as ranchlands and some largely inaccessible public lands. Principal land uses found in the Santa Cruz mountains and the Diablo Range include undeveloped open space in public and private ownership, forest and timber lands, grazing and ranching, mineral extraction, other resource-based land uses, and low density single family residential development.

Regulation of Onsite Wastewater Treatment Systems

The County of Santa Clara County Department of Environmental Health (DEH) is responsible for regulating OWTS throughout the unincorporated areas of the county. The DEH also administers OWTS regulations in the various cities in the county as discussed further below. OWTS are used almost exclusively for properties located outside of municipal sewer service boundaries, which includes large areas in the southern portions of the county, as well as in the eastern and western foothills and mountain regions. Countywide there are currently estimated to be approximately 12,500 OWTS.

The County has historically operated its onsite wastewater systems program under the authority granted to it by two California Regional Water Quality Control Boards: (1) the San Francisco Bay Region for those areas that drain to San Francisco Bay; and (2) the Central Coast

Region for those areas that drain south to Monterey Bay. The north-south drainage divide is in the vicinity of Cochrane Road. **Figure 1-1** is a map of Santa Clara County, showing the unincorporated areas, the heaviest concentration of OWTS, major watersheds, and the Regional Water Quality Control Board boundaries.

In late 2010 the County initiated a study to comprehensively review and evaluate the County's onsite system regulations and management program. This effort resulted in a series updates and changes to the applicable sections of the County Onsite Wastewater Ordinance (Division B11 of the Santa Clara County Code) along with the development of an "Onsite Systems Manual" containing various policies, procedures and technical information for implementation of the Ordinance. These two documents contain all pertinent OWTS requirements for Santa Clara County and form the basis of this LAMP.

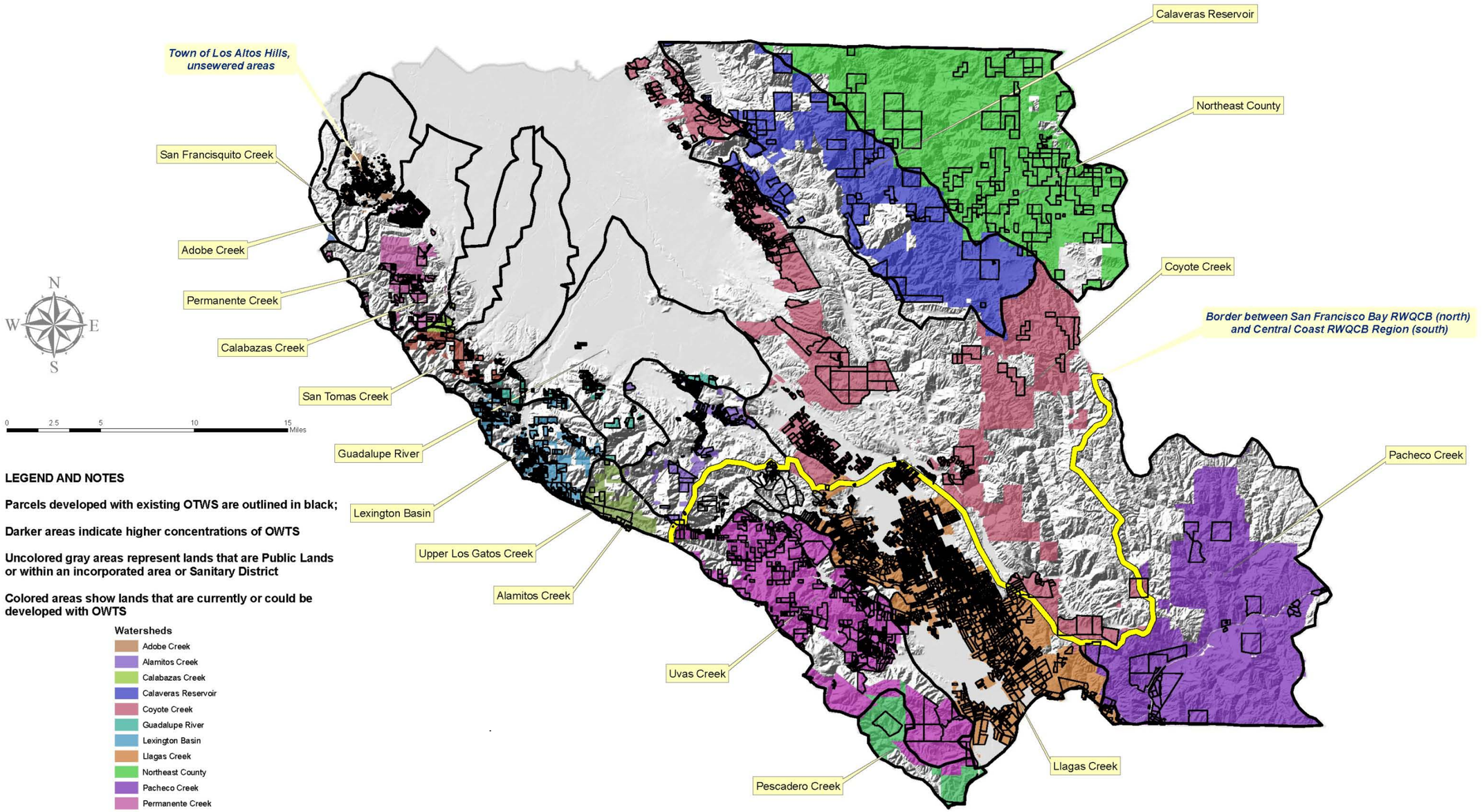
OWTS located within the incorporated areas in the county have historically been regulated by the County under agreements with each city. With the exception of the Town of Los Altos Hills, County Ordinance requirements have been implemented in all cities. In the Town of Los Altos Hills, the County has historically implemented standards for OWTS adopted by the Town that differed slightly from the County Ordinance. Under this LAMP, the County of Santa Clara Department of Environmental Health, as the County's comprehensive environmental agency, is responsible for permitting the installation and regulation of OWTS within the County's jurisdictional boundaries. In addition, all cities within the County have designated the County's Health Officer as their jurisdictions' health officer.

Santa Clara County OWTS Requirements

Requirements for the installation, use and maintenance of OWTS in Santa Clara County are contained in two primary documents (summarized below), which accompany and form the basis for this LAMP.

Onsite Wastewater Ordinance (Division B11-6- through B11-102)

The County Onsite Wastewater Ordinance establishes standards for the approval, installation, and operation of OWTS within Santa Clara County consistent with the County's overall responsibility to prevent the creation of health hazards and nuisance conditions and the protection of surface and groundwater quality. A copy of the Ordinance accompanies and is an integral part of this LAMP. Any change to the Ordinance requires approval by the Santa Clara County Board of Supervisors. **Table 1-1** presents a brief synopsis of various sections of the Ordinance.



LEGEND AND NOTES

Parcels developed with existing OTWS are outlined in black;

Darker areas indicate higher concentrations of OWTS

Uncolored gray areas represent lands that are Public Lands or within an incorporated area or Sanitary District

Colored areas show lands that are currently or could be developed with OWTS

Watersheds

- Adobe Creek
- Alamitos Creek
- Calabazas Creek
- Calaveras Reservoir
- Coyote Creek
- Guadalupe River
- Lexington Basin
- Llagas Creek
- Northeast County
- Pacheco Creek
- Permanente Creek
- San Francisquito Creek
- San Tomas Creek
- Pescadero Creek
- Upper Los Gatos Creek
- Uvas Creek

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SANTA CLARA COUNTY DISTRIBUTION OF OWTS

FIGURE

1-1

Table 1-1. Santa Clara County Onsite Wastewater Ordinance Summary

CHAPTER IV. ONSITE WASTEWATER TREATMENT	
ARTICLE 1. GENERAL	
Section B11-60.	States purpose and applicability of OWTS code chapter, including max 10,000 gpd flow limitation, no community systems, referral to RWQCB for >2,500 gpd, lot size restrictions for subdivisions
Section B11-61.	Releases County from liability for damage associated with OWTS construction or inspection
Section B11-62.	States requirements for connection to available public sanitary sewer if within 300 feet of parcel
Section B11-63.	Prohibits creation of public health, water quality and nuisance impacts from OWTS
Section B11-64.	Definitions
ARTICLE 2. ONSITE WASTEWATER TREATMENT SYSTEMS	
Section B11-65.	States building requirements for inclusion of flush toilet and use of an OWTS
Section B11.66.	Describes provisions for referral of certain OWTS applications to RWQCBs for review and approval
Section B11-67.	Specifies general requirements and siting criteria for conventional OWTS
Section B11-68.	Requires submission of plot plan with OWTS permit application
Section B11-69.	Provides for fees to be set by Board of Supervisors
Section B11-70.	Specifies contractor license requirements for installation, w/exclusion for owner-builder
Section B11-71.	Prohibits issuance of building permit without written OWTS approval by director
Section B11-72.	Prohibits occupancy of building without written OWTS approval by director
Section B11-73.	Establishes Onsite Systems Manual for implementation policies, procedures, and technical details
Section B11-74.	Cumulative impact assessment requirements
Section B11-75.	Prohibition of sewer wells, cesspool and seepage pits
Section B11-76	Restrictions on use of holding tanks and portable toilets
Section B11-77.	Requires OWTS clearance prior to any or building construction, repair, or remodel
Section B11-78.	Reserved
Section B11-79.	Reserved
Section B11-80.	Defines conventional dispersal as subsurface dispersal, gravity trench, up to 3-ft wide & 8-ft deep
Section B11-81.	Specifies OWTS construction inspection requirements
Section B11-82.	Requires operation and maintenance guidelines for OWTS, provided by designer or installer
Section B11-83.	Requirements for: geotechnical report on >20% slopes and unstable land areas; erosion control
Section B11-84.	Addresses OWTS requirements for building additions, remodels, and intensification of use
Section B11-85.	Requires abatement of OWTS failures, including property lien or order to vacate, if necessary
Section B11-86.	Specifies requirements for destruction of abandoned OWTS, including permit from director
Section B11-87.	Describes notice, enforcement process, and cost recovery for OWTS failures/code violations
Section B11-88.	Describes process for appealing any decision of the director pursuant to this code chapter
Section B11-89.	Establishes septic tank pumping, inspection, and reporting requirements
ARTICLE 3. ALTERNATIVE ONSITE WASTEWATER SYSTEMS	
Section B11-90.	States the terms under which alternative OWTS may be utilized
Section B11-91.	Specifies site evaluation, design and permitting requirements for alternative OWTS
Section B11-92.	Describes operating permits and required issuance for all alternative OWTS and some other cases
Section B11-93.	Describes performance monitoring and reporting requirements for alternative OWTS
Section B11-94.	Lists the types of alternative treatment and dispersal systems that may be used
Section B11-95.	Presents the siting criteria, design and construction requirements for alternative OWTS
CHAPTER V. INSPECTION REPORTS OF ONSITE WASTEWATER TREATMENT SYSTEMS	
Section B11-100.	States the provisions for owner-requested OWTS inspection by the director
Section B11-101	Requires payment of OWTS inspection fee
Section B11-102.	Releases County from liability pertaining to OWTS inspection

Onsite Systems Manual

The Onsite Systems Manual provides the policy, procedural and technical details for implementation of the Ordinance. It includes permitting forms and procedures, site evaluation requirements and methods, guidelines for cumulative impact studies and geotechnical reports, design details and guidelines related to both conventional and alternative systems, OWTS performance evaluation procedures, operation and monitoring requirements, and related technical and procedural information. The Onsite Systems Manual will be reviewed and updated from time-to-time, typically annually, to keep pace with new issues, policies, procedures, and technologies affecting the use and management of onsite systems in Santa Clara County. The Onsite Manual will be maintained by the DEH. The initial document submitted with this LAMP, as well as any substantive changes in the future, will require approval by the director and by the Regional Water Quality Control Board.

The Onsite Systems Manual is divided into five main sections as follows:

1. **Part 1: Policies and Administrative Procedures.** This covers DEH policies developed for explanation and/or clarification of various Ordinance provisions along with administrative procedures, such as general requirements for subdivisions, new construction, remodels, and system repairs.

2. **Part 2: Site Evaluation Methods and Investigation Requirements.** This presents the procedures and requirements covering such items soil and site evaluations, percolation testing, wet weather groundwater determinations, geotechnical report requirements, and guidelines for cumulative impact assessments.

3. **Part 3: General and Conventional OWTS Requirements.** This section presents general requirements and technical specifications applicable to all OWTS and specific design and construction requirements for conventional OWTS. This includes, for example: general procedures concerning plan submittal, installation and inspection; wastewater flows for OWTS design; and siting, design and construction requirements for septic tanks, conventional dispersal trenches, pumping systems and appurtenances.

4. **Part 4: Guidelines for Alternative Systems.** This presents requirements and guidelines for design and construction of alternative treatment and dispersal systems permitted under the Ordinance, including: system description and applications, siting, design and construction requirements, typical details, and monitoring and maintenance requirements.

5. **Part 5: Operation, Monitoring, and Maintenance (OM&M).** This presents guidelines and criteria for operation, monitoring and maintenance of conventional and alternative OWTS, including: (a) performance requirements for different components and types of OWTS; (b) monitoring requirements; and (c) guidelines for evaluating the functioning status and performance of OWTS.

Organization of this LAMP

This LAMP is organized to present a comprehensive explanation of the various requirements, policies, procedures and measures used to regulate and oversee the use of OWTS in Santa Clara County. It is also structured as much as possible to address the items listed in the SWRCB OWTS Policy pertaining to Local Agency Requirements and Responsibilities (Section 3.0 of the OWTS Policy) and Local Agency Management Program for Minimum OWTS Standards (Section 9.0 of the OWTS Policy). Reference is made throughout this LAMP to the County's OWTS Ordinance and Onsite Systems Manual, which are attached as part of this LAMP. The following briefly summarize the contents of this document.

- ***Section 1 - Introduction and Background.*** This introductory section describes the overall purpose, scope, geographical coverage and overview of the key elements of the LAMP.

- ***Section 2 - Environmental Conditions, OWTS Usage and Water Quality Management in Santa Clara County.*** This section provides background information on environmental conditions pertinent to the use and suitability for OWTS, extent of OWTS usage in the County, and summary of OWTS management approaches and requirements adopted for protection of water quality in Santa Clara County.

- ***Section 3 - OWTS Siting, Design, and Construction Requirements.*** This section presents excerpts from the County Ordinance and the Onsite Systems Manual describing the key requirements for siting, design and construction of OWTS, per the requirement of section 9.2 and covering applicable items listed under Tier 1 (Sections 7.0 and 8.0) of the OWTS Policy.

- **Section 4 – Special Management Issues.** This section describes the provisions contained in the Santa Clara County LAMP corresponding with special OWTS management issues listed in Sections 9.2.1 through 9.2.12 of the SWRCB OWTS Policy.

- ***Section 5 - Prohibitions*.** This section describes the provisions contained in the Santa Clara County LAMP corresponding with the required prohibitions set forth in Section 9.4 of the SWRCB OWTS Policy.

- ***Section 6 – Program Administration.*** This section presents the County's plan for addressing the administrative aspects of the LAMP, including record keeping, on-going assessment of water quality issues related to OWTS, and reporting to the RWQCB, as required under Section 9.3, of the OWTS Policy.

- ***Appendix A – Supporting Rationale.*** This presents discussion of the supporting rationale (including literature sources) for the various siting and design requirements,

focusing on vertical separation requirements for conventional and alternative OWTS, comparison with Tier 1 standards of the OWTS Policy, and highlighting the requirements and management practices that are more protective than the provisions of the OWTS Policy.

- ***Appendix B – Nitrate and Salt Loading.*** This presents estimates that have been made of wastewater discharge volumes, nitrate loading and salt loading contributions to groundwater from the approximately 12,500 existing OWTS in Santa Clara County. This will be part of the County's ongoing assessment of water quality impacts from OWTS.

Section 2:
Environmental Conditions, OWTS Usage and Water Quality Management in Santa Clara County

This section provides background information on environmental conditions, OWTS usage and management approaches adopted for protection of water quality in Santa Clara County.

Surface Water Hydrology

The surface water hydrology of Santa Clara County is influenced mainly by climate, topographical and land form conditions, and water resources management activities.

The climate of the region is a Mediterranean type climate, generally temperate throughout the year, with warm dry summers and cool wet winters. Precipitation, mostly occurring as rainfall, is mainly concentrated in the winter months from November through April. Mean annual precipitation varies widely from as little as 13 inches in the valley areas to about 45 inches in the higher elevations of the Santa Cruz Mountains.

Santa Clara County is characterized generally by northwest-southeast trending mountain ranges with intervening valleys. The dominant feature of the county is the Santa Clara Valley, a flat alluvial plain situated between the Santa Cruz Mountains to the west and the southern Diablo Range to the east. The majority of the county drains in a northerly direction through various streams into San Francisco Bay; the southern portions drain into the Pajaro River, which ultimately discharges to the Pacific Ocean at Monterey Bay.

For the purposes of their water resources management activities, the Santa Clara Valley Water District (SCVWD) has defined five principal watershed management areas in the county. From north to south, these include: (a) Lower Peninsula; (b) West Valley; (c) Guadalupe; (d) Coyote; and (e) Uvas-Llagas. All but the Uvas-Llagas watershed area drain into San Francisco Bay. The SCVWD watershed designations do not cover certain areas that drain into neighboring counties and where there are no SCVWD water management facilities. These include: (1) a large area in the northeastern portions of the county, that drains north into Alameda County; (2) the southeastern area that drains to San Benito County and the Pajaro River; and (3) a small area in the southwestern tip of the county that drains into Santa Cruz County.

For the 2013 study of onsite wastewater treatment and dispersal systems, Questa Engineering developed a more detailed breakdown of watershed sub-basins within the county, as shown in **Figure 2-1**. The figure also shows the north-south drainage divide, which coincides with the boundary between the San Francisco Bay and Central Coast Regional Water Quality Control Boards. **Table 2-1** lists the sub-basins, the corresponding SCVWD watershed management areas, and respective watershed areas. The listed acreages include: (1) the total watershed area of each sub-basin; and (2) estimates of the total "developable" unincorporated lands, which excludes sanitary sewer areas, public parcels and open space easement areas.

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SANTA CLARA COUNTY WATERSHEDS

FIGURE

2-1

Table 2-1
Santa Clara County Watershed Sub-basins

SCVWD Watershed Management Area (WMA)	Watershed Sub-basins	Total Watershed Area[1] (square miles)	Area Served by OWTS[2] (square miles)
North County			
Lower Peninsula	San Francisquito	4.9	<0.1
	Adobe Creek	28.3	6.1
	Permanente Creek	46.5	21.8
West Valley	Calabasas Creek	20.8	1.3
	San Tomas Creek	44.5	10.9
Guadalupe	Guadalupe River	92.3	16.6
	Lexington Basin	27.0	25.5
	Upper Los Gatos	10.2	10.2
	Alamitos Creek	38.1	25.3
Coyote	Coyote Creek	334.3	227.6
N/A	Calaveras Reservoir	116.9	114.1
N/A	Northeast County	127.1	127.1
South County			
Uvas-Llagas	Llagas Creek	123.2	93.2
	Uvas Creek	77.9	74.3
N/A	Pacheco Creek	153.6	152.3
N/A	Pescadero Creek	14.2	9.5

[1]Within Santa Clara County

[2] Area not served by sanitary sewers, including unincorporated lands plus portions of San Jose and Town of Los Altos Hills served by OWTS.

Source: Questa Engineering, derived from *Growth Projections and Cumulative Wastewater Loading from Implementation of Santa Clara County Onsite Wastewater Ordinance Changes,* June 2012.

An important feature of Santa Clara County's surface water resources are the series of 10 reservoirs developed and managed by the SCVWD primarily for water supply and flood control purposes. The reservoirs have a total storage capacity of approximately 170,000 acre-feet and were constructed in the 1930s and 1950s for water conservation to catch storm runoff that otherwise would flow into San Francisco Bay. The reservoirs also provide incidental flood protection by containing runoff early in the rainfall season, serve recreational needs, and benefit the environment by storing water to maintain flow in the creeks. Of special concern are the reservoirs that serve as a local source of supply for drinking water, along with the land uses and activities in the source watershed areas. These include Almaden, Anderson, Calero, Coyote, and Lexington Reservoirs. Protection of the quantity and quality of water in these reservoirs and tributaries for existing and potential future drinking water uses is of highest priority for the SCVWD.

An additional note is that the northwestern portions of the county drain to non-SCVWD water supply reservoirs located partially or entirely in Alameda County. These include: (a) Calaveras and San Antonio Reservoirs, owned and operated by the City and County of San Francisco; and (b) Del Valle Reservoirs, owned and operated by the Alameda County Flood Control and Water Conservation District, Zone 7.

Groundwater

The Santa Clara Valley Water District's Groundwater Management Plan divides Santa Clara County into two main interconnected groundwater sub-basins - the Santa Clara Sub-basin and the Llagas Sub-basin (**Figure 2-2**). The Santa Clara Sub-basin is further divided into the Santa Clara Plain and Coyote Valley inventory units. The Santa Clara Plain groundwater unit is bounded by the Diablo Range and Santa Cruz mountains on the east and west, and runs north-south from the county's northern border to the Coyote Narrows at Metcalf Road. The Coyote Valley groundwater unit continues south between the two mountain ranges from the Coyote Narrows to Cochran Road where it joins the Llagas Sub-basin at a groundwater divide. The Llagas Sub-basin continues south past the southern border of the county to the Pajaro River.

The aquifers comprising these groundwater basins consist principally of gravel, sand, and silty sand alluvial deposits, extending to depths of more than 1,000 feet in the Santa Clara Plain and Llagas Sub-basins, and to approximately 500 feet in the Coyote Valley area. The sub-basins contain recharge areas as well as confined zones, where lower permeability clay and silt deposits restrict the downward flow of groundwater and separate shallow and deep aquifer zones. The low permeability deposits restrict the movement of contaminants, providing a degree of natural protection to deeper aquifers.

The county's groundwater basins have a vast storage capacity and combine to transmit and filter water through the gravelly deposits, providing nearly half of the county's annual water supply needs (approximately 150,000 acre-feet) for domestic, municipal, industrial and agricultural uses. However, natural sources and rates of groundwater recharge are insufficient to meet the annual pumping demands. The Santa Clara Valley Water District (formed in 1929) is responsible for managing the groundwater resources in the county, including the development of recharge programs to counterbalance the land subsidence effects of over-pumping and maintain a sustainable supply of groundwater. Currently, along with other water conservation and water resources management programs, the SCVWD utilizes local runoff and imported surface water in combination with more than 90 miles of local creeks and more than 300 acres of percolation ponds to replenish groundwater resources.

In the mountainous areas of the county groundwater conditions vary locally, depending on specific geologic conditions. The occurrence of groundwater is dependent on the presence of porous, permeable rock stratum capable of storing and transmitting water. In hard and fine-grained rock formations, as occur in the Santa Cruz Mountains and Diablo Range, water available to wells is commonly from the secondary permeability and porosity, which results from deep weathering, shearing and fracturing of the rock. Groundwater of sufficient quantity

Source: Santa Clara Valley Water District

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SANTA CLARA COUNTY GROUNDWATER SUBBASINS

FIGURE
2-2

to supply individual domestic wells and springs can also occur locally in deep colluvial and landslide deposits in the mountainous regions of the county.

Groundwater levels vary throughout the county and by season. Portions of the County near the margins of the San Francisco Bay tend to have some of the shallowest groundwater, sometimes only a few feet below the ground surface; however, there are very few OWTS located in this highly urbanized area of the county. Groundwater is also very shallow in many areas of the Coyote Valley located within the Santa Clara Sub-basin and in the Llagas Sub-basin, where many OWTS are located. In the Coyote Valley, groundwater is generally unconfined and is typically encountered between 5 and 40 feet below ground surface. The Llagas Sub-basin also has areas with shallow groundwater and, like the Coyote Valley, has permeable soils and high recharge rates. The 2012 "Groundwater Vulnerability Study for Santa Clara County" (Kennedy Jenks and Todd Engineers, prepared for Santa Clara Valley Water District) indicated that groundwater in the Coyote Valley and Llagas Sub-basin is highly vulnerable to land use related potentially contaminating activities. There are more than 3,000 domestic wells in the Coyote Valley and Llagas Sub-basin, where groundwater is the only drinking water source.

Soils and OWTS Suitability Mapping

General Soils Map

Figure 2-3 presents a General Soils Map of Santa Clara County compiled from information contained in several soil surveys and mapping published by the U.S. Department of Agriculture, which include: (1) Soil Survey of the Gilroy Area, California, 1927; (2) Soil Survey Santa Clara Area, California, 1958; (3) Soil Survey of Eastern Santa Clara Area, California, 1974; and (4) Online soils data base maintained by the Natural Resources Conservation Service (NRCS). The General Soils Map contained in the 1974 Soil Survey of Eastern Santa Clara County provided the baseline groupings of general soil associations, which were extended to cover the other (western) portions of the County, as shown in **Figure 2-3**.

In general, soils in the County can be grouped into three general landform classifications as follows:

1. **Alluvial Plains, Fans and Stream Benches.** Soils found in the northern portions of the Santa Clara Valley (Santa Clara Plain region) are deep, well drained, fertile soils derived from sedimentary parent material and formed in alluvial plains, fans and stream benches. The deep, well drained clay loam soils in these areas are well suited for conventional onsite wastewater systems. Deep alluvial soils continue throughout the southern portions of the Santa Clara Valley. In the San Martin area, soils are typified by well drained gravelly loams and clay loams that are generally suitable for onsite wastewater systems, although limited in some locations by excessively drained (rapidly permeable) gravelly soils combined with shallow groundwater levels. Some areas of poorly drained clays in agricultural areas generally south of Gilroy are characterized by

Santa Clara County Soils and City Boundaries

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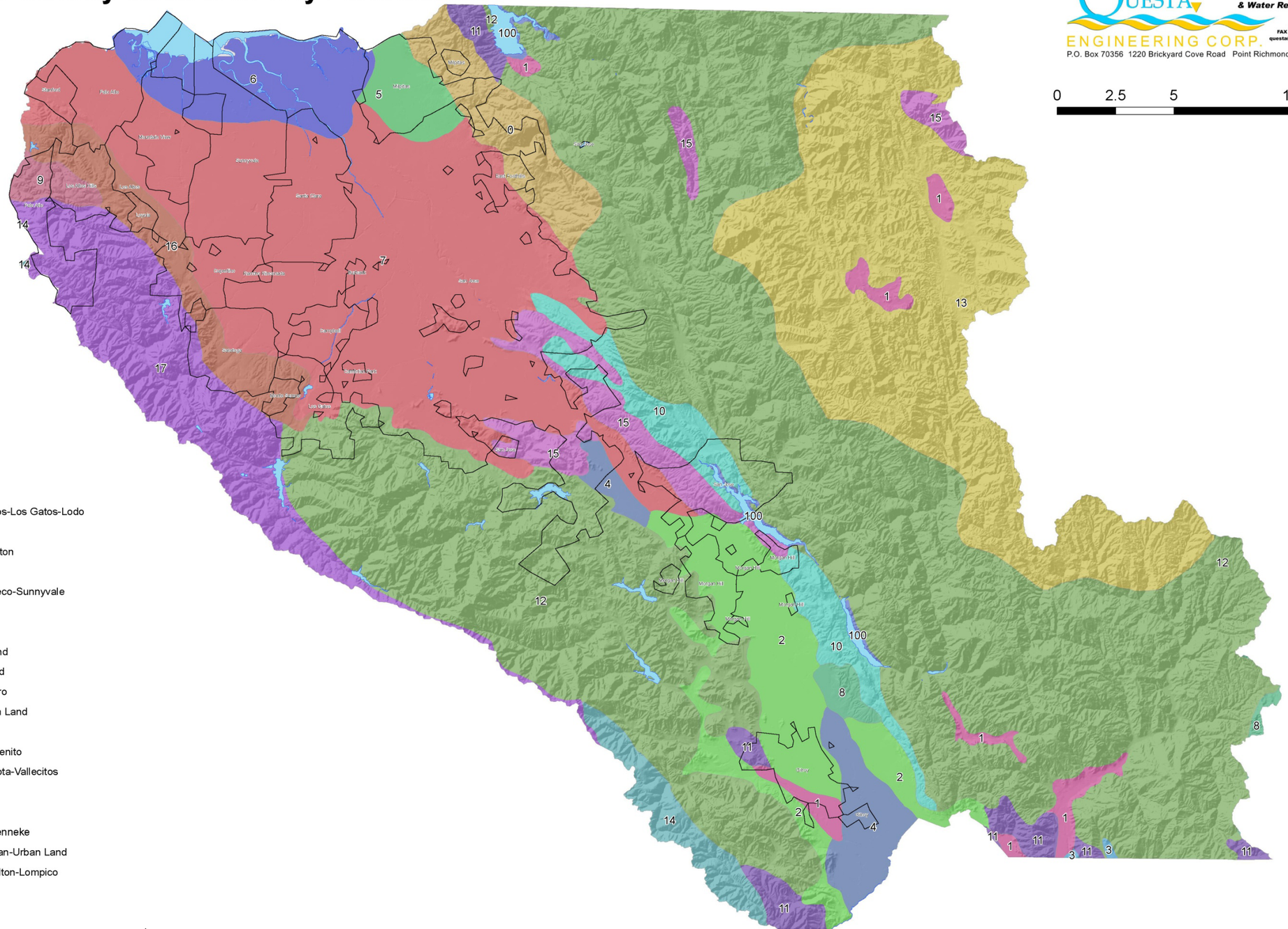

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SANTA CLARA COUNTY GENERAL SOILS MAP

FIGURE
2-3

perching layers, slow percolation, and poor drainage that pose constraints for onsite wastewater systems.

2. **Old Fans and Terraces.** The foothill soils of Santa Clara County are generally shallower, located on old fans and terraces that lie between the more recent alluvial soils on the valley floor and the soils of the uplands. Soils range from clays and clay loams to loam derived from the alluvium of sedimentary and various other parent rock landforms. Limited soil depth over bedrock and shallow depth to groundwater pose moderate constraints for onsite wastewater systems in the foothill regions.

3. **Uplands.** The mountain soils of the Diablo Range to the east and the Santa Cruz Mountains to the west are typically shallow, well drained to excessively well drained clay, silt or gravelly loams derived from hard sandstone or shale. In these areas, the shallow soil depths over bedrock and steep slopes up to 75% combine with drainage features to pose moderate to severe constraints for onsite wastewater systems. In the experience of County DEH staff, slope and soil constraints tend to be more significant in the Diablo Range than in the Santa Cruz Mountains. Some upland areas near southern San Jose have soils derived from serpentine and basalt bedrock that similarly are severely constrained for onsite wastewater systems by shallow soil depth over bedrock and steep slopes of up to 75%. Rock outcrops and eroded areas are common. Some of the best upland soil conditions for onsite wastewater systems occur in the County's northwest mountainous regions of Palo Alto, Los Altos Hills, Saratoga, Los Gatos and portions of the Lexington Basin. These areas are typified by deeper sand, clay or gravelly loams derived from residuum, although they may be limited on specific sites by steep slopes, soil depth or slow permeability

Soil-OWTS Suitability

The general mapping of soil conditions takes into account location and landform conditions, depth to bedrock, slope, subsurface texture, and drainage conditions of the soils, which are all key factors that can affect the suitability of the soils for onsite wastewater treatment. **Table 2-2** was developed from the published soil survey information, summarizing the soil characteristics of the general soil associations mapped in **Figure 2-3.**

The far right-hand column in **Table 2-2** highlights the key constraints and overall suitability designation for OWTS for each general soil association. The designations were developed and assigned based on the USDA soils information combined with input from DEH staff and best professional judgment. This is provided as a general assessment tool and is not a substitute for site-specific investigation of and planning for onsite wastewater treatment systems. It provides a general indication of the management and design issues likely to be encountered in each area. It does not take into account local constraints such as steep slopes, setback or other anomalous conditions that may be found on a particular site.

Table 2-2.
Santa Clara County General Soil Associations and OWTS Suitability

	Map Unit	Soil Name	Parent Material Landform	Slope	Soil Depth	Soil Texture	Drainage	OWTS Suitability and Constraints Summary
Alluvial Plains, Fans and Stream Benches	**0**	Millsholm-Los Osos-Los Gatos-Lodo	Fine-grained sandstone, shale and metamorphosed shale	15-75%	24-48”	Gravelly clay loam	Well drained	**Moderately to Severely Constrained, l**imited by shallow soil depths over bedrock and steep slopes
	1	Yolo Association	Alluvium from sedimentary rock	0-9%	60+”	Loams and silty clay loams	Well drained	**Generally to Highly Suitable** for conventional OWTS
	2	Arbuckle-Pleasanton	Alluvium from sedimentary rock	0-15%	60+”	Gravelly loams and loams	Well drained	**Generally Suitable, l**imited locally by areas of rapidly permeable soils
	3	Cropley-Rincon	Calcareous alluvium from mixed sources	0-9%	60+”	Clays and clay loams	Well drained	**Moderately to Severely Constrained, l**imited by slowly permeable soils
	4	Clear Lake-Pacheco-Sunnyvale	Alluvium from sedimentary rock	<2%	60+” 16-26” to mottled layer	Clays and clay loams	Poorly drained	**Moderately to Severely Constrained, l**imited by shallow restrictive (perching) layer, variable permeability, high groundwater and flooding
	5	Clear Lake	Alluvium from sedimentary rock	<2%	60+” 26” to mottled layer	Clays	Poorly drained	**Moderately to Severely Constrained, l**imited by shallow restrictive (perching) layer, high ground water and flooding
	6	Novato-Reyes	Tidal flats alluvium from various rock and hydrophytic plant material	<2%	60+”	Clays	Very poorly drained and somewhat poorly drained	**Unsuitable for OWTS** due to flooding and slowly permeable soils
	7	Botella-Urban land	Alluvium from various rock	0-5%	60+”	Clay loam	Well drained	**Generally to Highly Suitable** for conventional OWTS, but mostly occupied by urban land uses

	Map Unit	Soil Name	Parent Material Landform	Slope	Soil Depth	Soil Texture	Drainage	OWTS Suitability and Constraints Summary
Old Fans and Terraces	**8**	Hillgate-San Ysidro	Alluvium from sedimentary rock	0-50%	60+" 10-26" to limiting layer	Clays and clay loams	Well drained	**Moderately Constrained,** limited locally by soil permeability and groundwater separation
	9	Francisquito -Urban land	Old alluvium from various rock	5-15%	60+" 16-26" to limiting layer	Loam to clay loam and clay	Well drained	**Moderately Constrained,** limited locally by soil permeability and groundwater separation
Uplands	**10**	Azule-Altamont	Soft sediments	9-75%	44-60+" 12-34" to limiting layer	Clays and clay loams	Well drained	**Moderately to Severely Constrained, l**imited by shallow soil depths over bedrock and steep slopes
	11	Los Osos-San Benito	Sandstone and shale	15-75%	20-48" 10-26" to limiting layer	Clay loams	Well drained	**Moderately to Severely Constrained, l**imited by shallow soil depths over bedrock and steep slopes
	12	Los Gatos-Gaviota-Vallecitos	Hard sandstone and shales	5-75%	6-50"	Gravelly loams and loams	Well drained and somewhat excessively drained	**Moderately to Severely Constrained,** limited by shallow soil depths over bedrock and steep slopes
	13	Gaviota	Hard sandstone and shales	30-75%	6-19"	Eroded gravelly loams	Somewhat excessively drained	**Moderately to Severely Constrained, l**imited by shallow soil depths over bedrock and steep slopes
	14	Felton-Maymen	Sandstone and shale	15-75%	11-59"	Silt loams and fine sandy loams	Well drained and somewhat excessively drained	**Moderately to Severely Constrained, l**imited by shallow soil depths over bedrock and steep slopes
	15	Montara-Inks-Henneke	Serpentine and metamorphosed basalt bedrock	15-75%	10-19	Clay loams and gravelly loams	Somewhat excessively drained	**Severely Constrained,** limited by soil depth, bedrock and steep slopes

Map Unit	Soil Name	Parent Material Landform	Slope	Soil Depth	Soil Texture	Drainage	OWTS Suitability and Constraints Summary
16	Accelerator-Fagan-Urban land	Residuum derived from sandstone, shale and siltstone	5-15%	40-60"	Loam to clay loam and gravelly loam	Well drained	**Generally Suitable,** limited locally by areas of slowly permeable soils
17	Ben Lomond-Felton-Lompico	Residuum derived from sandstone, shale, siltstone and granitic rock	5-75%	37-60+"	Loams and sandy loams	Well drained	**Generally Suitable,** limited locally by steep slopes and soil depth

OWTS Usage Estimates

Parcel Development Status

Since a comprehensive inventory of existing OWTS usage in Santa Clara County does not exist, estimates were made in 2012 by Questa Engineering in connection with environmental studies supporting the updates to the County Onsite Wastewater Ordinance. This included a systematic GIS-based inventory to determine the development status (i.e., developed or vacant) of all parcels in non-sewered areas of the County, which was taken as the best estimate of the current number of OWTS in the county.

The geographic area covered in the analysis included the unincorporated area of Santa Clara County, plus those portions of the City of San Jose and Town of Los Altos Hills which do not have municipal sewer service and instead rely on the use of OWTS. The portions of San Jose served by OWTS are: (a) areas on the east side of the City in the foothills along the base of Mt. Hamilton; and (b) areas in the southern end of the City in the vicinity of Almaden and Calero Reservoirs. In Los Altos Hill about half of the Town is on public sewers and the other half is served by OWTS.

Throughout the remaining incorporated areas of Santa Clara County there are a number of individual lots and small pockets development not connected to municipal sewers. These lots were not included in usage estimates, as they tend to be widely scattered and represent a very small fraction of the total OWTS in the County.

Watershed Sub-basins

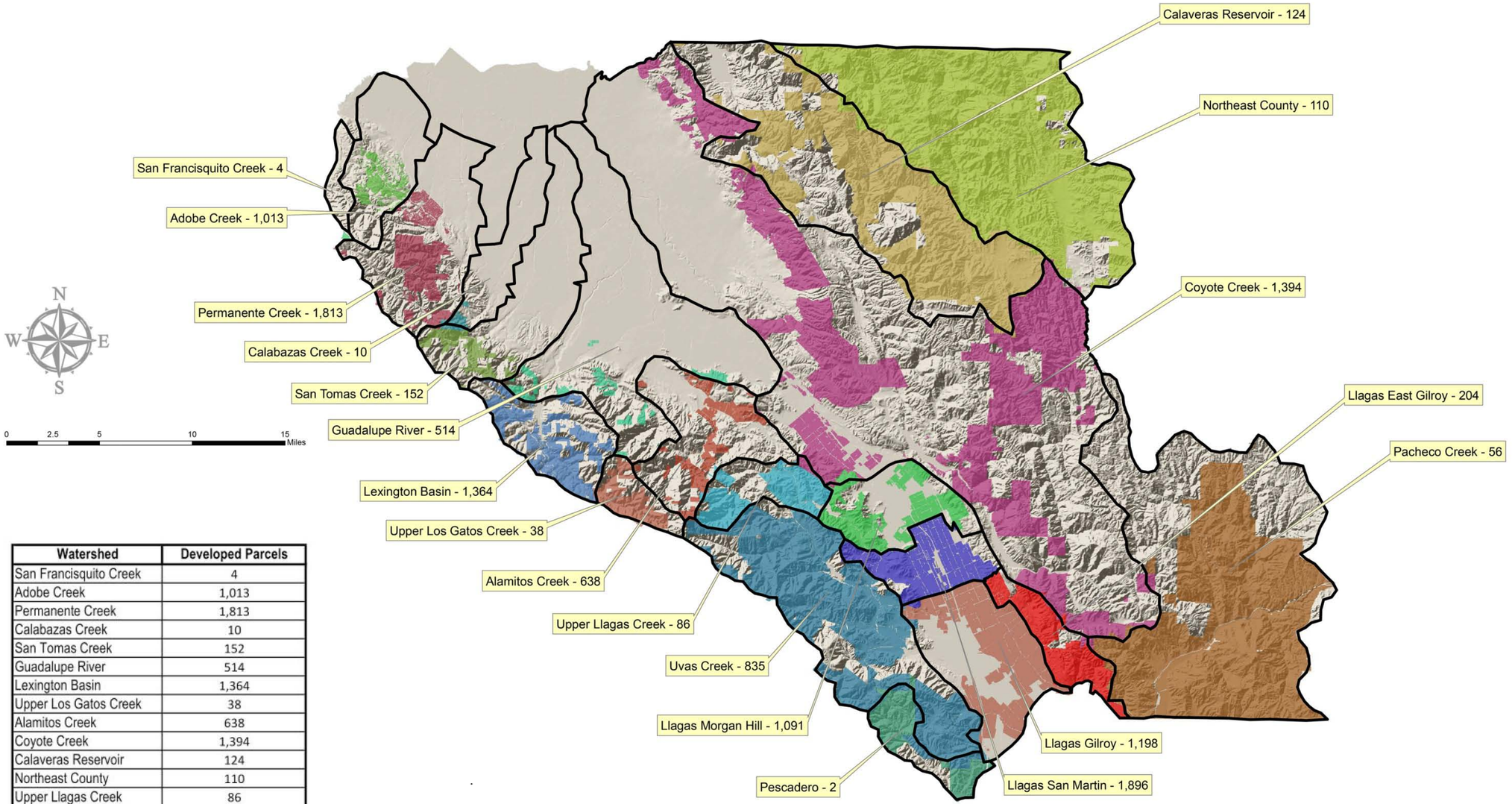
To assist with present and future management of OWTS and water quality assessments, the SCVWD watershed management areas (per **Table 2-1**) have been amended to encompass all unincorporated lands in the County and subdivided into smaller sub-basin areas to provide more detailed breakdown in geographic areas having higher concentrations of OWTS. For

example, Guadalupe watershed was sub-divided into four sub-basins: Guadalupe River, Lexington Basin, Upper Los Gatos Creek and Alamitos Creek. Also, the Uvas-Llagas watershed management area was divided into Uvas Creek and Llagas Creek watersheds, and Llagas Creek was further subdivided into five geographic sub-basins: Upper Llagas; Llagas Morgan Hill; Llagas San Martin; Llagas Gilroy; and Llagas East Gilroy.

Figure 2-4 shows the watershed sub-basin areas along with the estimates of the OWTS usage in each sub-basin. **Tables 2-3** and **2-4** list the parcel development status (developed or vacant) for each sub-basin in the North County and South County, respectively, also showing the breakdown for parcel sizes less than and greater than one-acre. These tables constitute the best current estimates of the usage and distribution of OWTS in Santa Clara County.

Table 2-3.
North County Area (RWQCB 2)
Estimated Existing OWTS by Watershed Sub-basin

Watershed Name	Non-sewered Area (acres)	Existing Parcel Status (<1 Acre)			Existing Parcel Status (> 1 Acre)		
		Total Parcels	Developed	Vacant	Total Parcels	Developed	Vacant
San Francisquito Creek	100	2	0	2	5	4	1
Adobe Creek	3,936	270	180	90	964	833	131
Permanente Creek	7,715	1,302	1,188	113	737	625	112
Calabazas Creek	711	2	1	1	15	9	6
San Tomas Creek	2,857	18	9	9	218	143	75
Guadalupe River	3,817	368	323	45	260	191	69
Lexington Basin	9,480	1,289	777	512	880	587	293
Upper Los Gatos Creek	4,042	2	0	2	70	38	32
Alamitos Creek	5,636	274	209	65	561	429	132
Coyote Creek	91,180	467	342	125	1,568	1,052	516
Calaveras Reservoir	50,820	31	13	18	292	111	181
Northeast County	78,712	1	0	1	393	110	283
TOTAL	**226,348**	**4,026**	**3,042**	**984**	**5,963**	**4,132**	**1,831**



Watershed	Developed Parcels
San Francisquito Creek	4
Adobe Creek	1,013
Permanente Creek	1,813
Calabazas Creek	10
San Tomas Creek	152
Guadalupe River	514
Lexington Basin	1,364
Upper Los Gatos Creek	38
Alamitos Creek	638
Coyote Creek	1,394
Calaveras Reservoir	124
Northeast County	110
Upper Llagas Creek	86
Llagas Morgan Hill	1,091
Llagas San Martin	1,896
Llagas East Gilroy	204
Llagas Gilroy	1,198
Uvas Creek	836
Pacheco Creek	56
Pescadero Creek	2
TOTAL	**12,543**

DATE:	8/15/2013
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PROJECT NO.:	1000064
DRAWN:	MF
APPROVED:	NH

QUESTA ENGINEERING CORP.

SANTA CLARA COUNTY
EXISTING DEVELOPMENT OF OWTS

FIGURE
2-4

Table 2-4.
South County Area (RWQCB 3)
Estimated Existing OWTS by Watershed Sub-basin

Watershed Name	Non-sewered Area (acres)	Existing Parcel Status (< 1 Acre)			Existing Parcel Status (> 1 Acre)		
		Total Parcels	Developed	Vacant	Total Parcels	Developed	Vacant
Upper Llagas Creek	7,694	13	4	9	153	82	71
Llagas Morgan Hill	8,804	283	164	119	1,162	927	235
Llagas San Martin	11,397	530	409	121	1,809	1,487	322
Llagas East Gilroy	9,744	11	6	5	313	198	115
Llagas Gilroy	17,679	219	125	94	1,356	1,073	283
Uvas Creek	41,458	126	48	78	1,349	788	561
Pacheco Creek	75,546	14	1	13	282	55	227
Pescadero Creek	6,049	1	0	1	15	2	13
TOTAL	**178,371**	**1,197**	**757**	**440**	**6,439**	**4,612**	**1,827**

Water Quality Management Measures

The following summarizes how key site suitability, land use and development factors have been addressed in the OWTS requirements of Santa Clara County's LAMP for protection of water quality. This summary is organized to correspond with the elements listed under Section 9.1 of the SWRCB OWTS Policy.

Groundwater Quality Protection

1. **Soil Conditions.** Soil suitability is the single most critical aspect of onsite wastewater treatment and dispersal. The soil provides the medium for the absorption and treatment of wastewater discharged through sub-surface dispersal systems. This is accomplished mainly through a combination of physical filtering, biological and chemical processes, and dilution. Protection of underlying groundwater relies on provision of an adequate depth of permeable soil below the dispersal field (zone of aeration) for absorption and treatment to occur. Santa Clara County Onsite Wastewater Ordinance requires detailed site evaluation to document suitable soil characteristics and depth for each OWTS installation consistent with industry practices and appropriate for the conditions and requirements in Santa Clara County (see **Section 3**). The observed depth and percolation characteristics of the soil are used to select the appropriate location, sizing and design of the OWTS to achieve proper effluent dispersal and groundwater protection.

2. **Geologic Factors.** Geology is important to the suitability and performance of OWTS due to its influence on topography and landforms, the type and characteristics of soils that develop at the surface, the occurrence and movement of sub-surface water, and slope stability. A large percentage of OWTS usage in Santa Clara County occurs throughout the valley-alluvial areas, where geology plays a relatively small role. Geologic conditions are of greater significance in the mountainous regions, where the rock formations may influence the suitability for and effects of OWTS. Geologic factors are addressed for new OWTS based on: (a) information from basic site evaluations for all installations; and (b) for systems located on slopes over 20% or near areas of unstable land masses, the completion of a geotechnical study, including assessment of hydrogeologic conditions, water movement and slope stability.

3. **Groundwater Conditions.** Groundwater conditions are of high importance for OWTS usage in Santa Clara County due to the extensive reliance on local aquifers for both public and private water supplies. Site evaluation practices include requirements for documenting groundwater conditions, which include procedures for wet weather observations (see Onsite Systems Manual – Part 2, Attachment B). Documentation of groundwater levels, in combination with soil permeability (percolation rate), provide the basis for selection of the appropriate OWTS design and maintenance of an appropriate vertical separation distance between the point of effluent dispersal and the water table for protection against pathogen impacts. Siting and design criteria addressing groundwater separation requirements have been developed to provide the following:

    - Vertical separation distance guided by soil percolation rate;
    - Vertical separation distance of 5 to 20 feet for conventional OWTS;
    - Reduced vertical separation distance based on inclusion of supplemental treatment and/or alternative dispersal designs (e.g., mounds, pressure distribution, drip dispersal) found to provide more effective use of the shallow unsaturated soil zones for improved absorption and biodegradation of wastewater constituents, including pathogens.
    - No provision for vertical separation distance of less than 2 feet.

    Appendix A provides further discussion of the supporting rationale, including literature sources, for the OWTS groundwater separation requirements adopted by Santa Clara County.

4. **Areas with High Usage of Domestic Wells.** Domestic wells are used widely in Santa Clara County in conjunction with rural development that also utilize OWTS. The higher concentrations of domestic wells and OWTS tend to be in the valley regions of the South County, e.g., Coyote Valley and portions of the LLagas Sub-basin. Measures to assure protection of existing and new domestic water supply wells from the effects of OWTS include the following:

    - Minimum horizontal setback distances between OWTS and any well;

- Water well testing, review and approval by the DEH and SCVWD for any new development;
- Provision in County Ordinance (Section B11-74) for the Director to require completion of cumulative impact studies for new OWTS proposals in areas of water quality concern (see additional discussion below). This may include areas of high domestic well usage. The DEH anticipates working cooperatively with the SCVWD in the future to identify specific areas of high domestic well usage warranting cumulative impact studies for new OWTS installations.
- Availability of alternative treatment and dispersal technologies to mitigate documented or potential impacts to groundwater in areas of high domestic well usage.

Surface Water Quality Protection

1. **Minimum watercourse/water body setback requirements.** The primary measure for protection of surface water quality is the establishment of safe horizontal setback buffers between OWTS components (treatment tanks and dispersal fields) and various water and landscape features. The requirements contained in the Santa Clara County Onsite Wastewater Ordinance are consistent with current and historical policies and guidelines of the San Francisco Bay and Central Coast Regional Water Quality Control Boards. They address setbacks to drainage swales, springs, watercourses, reservoirs and floodplains.

2. **Alternative treatment and dispersal technologies.** The County's new Ordinance includes alternative treatment and dispersal technologies and revised sizing standards for conventional systems that provide greater flexibility and options for system repairs than have historically been available in Santa Clara County. This will have two positive effects for surface water quality protection: (1) the use of alternative treatment technologies, producing higher quality effluent, can compensate for reduced amount of soil absorption area where the repair system on an older non-conforming development site encroaches within the normal setback buffer; and (2) alternative dispersal methods and revised sizing criteria can reduce the amount of encroachment into the setback area by making more portions of the property (e.g., shallow soil areas) potentially feasible for wastewater dispersal, while also reducing the overall amount of land area needed for the dispersal system.

3. **Erosion control measures.** Depending upon site conditions and system design, construction of an OWTS may pose a threat of soil erosion and impacts on downstream receiving waters from excavations for tanks, trenching for pipelines and dispersal trenches, and associated clearing and grading activities. Historically, erosion control measures for OWTS installations have not been mandated by code in Santa Clara County, nor are they addressed in the SWRCB OWTS Policy. The County's new Ordinance (Section B11-74) requires that erosion control measures be implemented in connection with the installation of OWTS under certain circumstances, based on the

type and size of the system and the prevailing ground slope conditions. The Ordinance provides that final approval of the OWTS installation be contingent upon confirmation that the specified erosion control measures have been implemented.

4. **Flood protection measures.** In addition to prohibiting the installation of OWTS within the 10-yr floodplain, the County's new Ordinance includes provisions for evaluation and incorporation of special design measures for systems located within areas subject to inundation by the 100-year flood. Specifically, the measures require: (a) protection for OWTS supplemental treatment, pressure distribution and/or drip dispersal components from flood damage, such as structural tie-downs and/or elevating critical components above the 100-year flood level; (b) prevention of discharge of wastewater into flooded dispersal areas from pump systems (e.g., using flood-activated float switches to override/disable pump operation during high water conditions); and (c) additional emergency storage capacity for flood periods.

5. **Enhanced protection for Water Supply Watersheds.** Areas of Santa Clara County warranting special concern and enhanced water quality protection are the reservoirs that serve as a local source of supply for drinking water, along with the land uses and activities in the source watershed areas. These include Almaden, Anderson, Calero, Coyote, and Lexington Reservoirs. In accordance with the requirements of SWRCB OWTS Policy, Santa Clara County has adopted increased setback standards for any OWTS located in an area tributary to and within 1,200 feet and within 2,500 feet of a public water supply surface water intake. The provisions for identifying and notifying public water system owners of pending OWTS applications are discussed in **Sections 4** and **5** of this LAMP, along with the applicable requirements for OWTS design when the dispersal system must be located within the prescribed setback buffer, e.g., for a replacement system or pre-existing lot of record.

Impaired surface waters (nitrogen or pathogens).

Several water bodies in Santa Clara County are listed as impaired pursuant to Section 303(d) of the Clean Water Act; however, none are listed as impaired for nitrogen or pathogens due to discharges from OWTS. Therefore, at this time no special provisions related to impaired water bodies have been adopted for OWTS in Santa Clara County.

High Density of OWTS, parcel size and cumulative impacts.

Consideration of OWTS density, parcel size and potential cumulative OWTS impact issues (e.g., groundwater mounding, nitrate loading) is addressed in Santa Clara County primarily through Ordinance requirements under Section B11-74 that call for the completion of cumulative impact assessments for certain types of projects or locations. This code requirement has been in effect since the 1990s. The County's new Ordinance strengthens the existing requirements by providing guidelines for cumulative impact studies, which are contained in the Onsite Systems Manual (Part 2 – Attachment E). The guidelines identify circumstances requiring

cumulative impact studies, minimum qualifications of those conducting the work, typical data needs and assumptions, analytical methods, and evaluation criteria. The Ordinance authorizes the director to apply the requirements to any project of concern, and to amend or expand the guidelines as new information or issues/areas of concern arise. For example the DEH anticipates working cooperatively with the Santa Clara Valley Water District to identify and incorporate in the guidelines areas of special concern due to background nitrate levels in groundwater.

Additionally, the new Ordinance provisions allowing the use of alternative treatment and dispersal technologies provide opportunities to mitigate nitrate loading (e.g., with supplemental treatment systems) and hydraulic mounding (e.g., with pressure distribution or drip dispersal designs).

Lastly, with regard to the creation of new lots (subdivisions), Santa Clara County Ordinance (Section B11-60) requires a minimum lot size of one (1) acre where OWTS are used, which is increased to 2.5 acres for areas located within a reservoir watershed. Also, any subdivision proposal with lot sizes less than 2.5 acres requires cumulative impact assessment, per the guidelines discussed above.

Geographic areas with many older non-conforming OWTS installations and setbacks.

Older, non-conforming OWTS are common in areas of the Santa Cruz Mountains and in some agricultural areas of the South County. The highest concentration of these OWTS is in the Lexington Basin, where properties were originally developed for seasonal/recreational cabins and have converted over the years to year-round residences. Many of the properties are very small (<1/2 acre in size), with OWTS constructed prior to the modern codes. Some systems consist of cesspools, and repairs/replacement systems tend to be very challenging. Non-conformance with adopted setback requirements (e.g., from structures, water features, etc.) are also common.

Measures contained in the County's new Ordinance that will aid significantly in addressing problems of older, non-conforming OWTS in areas such as Lexington Basin are:

1. Availability of alternative treatment and dispersal system designs to provide more effective upgrades and repairs for lots having limited area, soil limitations or other constraints for conventional OWTS; and

2. The new requirements for septic tank pumper inspections, which will aid in identifying and bringing about the correction of existing cesspools, system failures, and impending problems that might otherwise go unnoticed or unattended.

Section 3:
OWTS Siting, Design, and Construction Requirements

Site Evaluations for Onsite Wastewater Treatment Systems

General

Prior to approving the use of an OWTS, a site evaluation is required in all instances to allow proper system design and to determine compliance with the site suitability criteria identified in the Ordinance and Onsite Systems Manual.

For new divisions of land, soil profiles, percolation tests and groundwater determinations are required on every parcel unless the director determines, on a case-by-case basis, that such testing is not necessary due to the availability of sufficient information to demonstrate conformance with applicable siting criteria for all proposed OWTS locations.

Site evaluations shall be conducted by a qualified professional, and evaluations shall be made in accordance with the following requirements and referenced attachments (provided in the Onsite Systems Manual).

For sites where a conventional OWTS is appropriate, the site assessment and soil profile evaluation may be conducted entirely by DEH staff. For more difficult sites (e.g., steeper terrain) and for any site requiring the use of an alternative OWTS, the site evaluation and system design will require the involvement of an OWTS consultant (civil engineer, professional geologist, or registered environmental health specialist), who is retained by the owner. All percolation testing shall be conducted by or under the direct supervision of a qualified OWTS consultant. Where the work is conducted by a consultant, the DEH shall be notified prior to the site evaluation to coordinate with and allow for verification by DEH staff.

Site Assessment

The first step in the site evaluation process is a preliminary review of the physical features of the site by DEH staff, including the slope of the land, proximity to cuts, steep slopes, watercourses and drainage swales, wells, and other features that may limit the available dispersal area.

Prior to conducting the site assessment, a Land Use Service Application form must be completed, along with a preliminary site plan. This form must be signed by the owner of the property, or their authorized agent, in order to gain access to the parcel.

Site features determined by the field inspection and review of available maps and file information include:

(1) Land area available for treatment components and for primary and secondary/reserve dispersal fields.

(2) Ground slope in the primary and secondary/reserve dispersal area(s).

(3) Location of cut banks, fills, or evidence of past grading activities, natural bluffs, sharp changes in slope, soil landscape formations, and unstable land forms within 100 feet of the primary and secondary/reserve dispersal area(s).

(4) Location of wells, watercourses, drainage swales and other bodies of water within 150 feet of the primary and secondary/reserve dispersal area(s).

(5) To the extent possible, the location of any existing OWTS within 100 feet of the primary and secondary/reserve dispersal area(s).

Following the site assessment, a written report will be provided by DEH. The report will briefly describe any limitation to development of the site using an OWTS.

Soil Profiles

After the initial site assessment, soil conditions in the area(s) identified for the dispersal field require evaluation through soil profile observations. A soil profile typically consists of a backhoe excavation or soil boring to a depth extending below the anticipated dispersal trench bottom. For conventional OWTS, the backhoe excavation should extend a minimum of 5 feet below trench bottom; for alternative OWTS this depth may be reduced to 3 feet below trench bottom.

The purpose of the soil profile is to:

- Determine the suitability of the soils for absorption of wastewater in the dispersal trench zone; and

- Verify that there will be adequate vertical separation between the bottom of the dispersal trench and bedrock, groundwater, or impermeable soil strata.

A minimum of one excavation in the primary dispersal field and one in the secondary/reserve area shall be required for this purpose. Additional soil profiles may be required if the initial two profiles show conditions which are dissimilar to the extent that they do not provide sufficient information for design and/or determination of code compliance.

Auger test holes may be an acceptable alternative to backhoe excavations where the DEH determines either that:

(1) the use of a backhoe or similar excavating machinery is impractical because of access or because of the fragile nature of the soils;

(2) it is necessary only to verify conditions expected on the basis of prior soils investigations;

(3) soil profiles are required to be no greater than 3-feet deep (e.g., for mounds or drip dispersal); or

(4) it is done in connection with geologic investigations.

Also, where groundwater separation of more than 5 feet is required (e.g., for conventional OWTS in areas of rapid percolation rates), additional (deeper) subsurface exploration may be required for groundwater determination; and this can be done with an auger boring rather than backhoe excavation.

The following factors should be observed and reported from ground surface to the bottom of soil profile:

- Thickness and coloring of soil layers, soil structure, and texture according to United States Department of Agriculture (USDA) classification;

- Depth to a limiting condition such as hardpan, rock strata, impermeable soil layer, or saturated soil conditions;

- Depth to observed groundwater;

- Depth to and description of soil mottling (redoximorphic features); and

- Other prominent soil features which may affect site suitability, such as coarse fragments, consistence, roots and pores, and moisture content.

Soil profile inspections should follow guidance provided in manuals such as:

(1) USDA, Natural Resources Conservation Service. "Field Book for Describing and Sampling Soils". September 2002.

(2) USEPA "Design Manual – Onsite Wastewater Treatment and Disposal Systems". 1980. (pages 28-38).

Various aids for soil profile observations and logging are provided in the Onsite Systems Manual.

Depth to Groundwater Determination

The anticipated highest level of groundwater in the primary and secondary/reserve area shall be estimated either:

(a) As the highest extent of soil mottling observed in the examination of soil profiles;

or

(b) By direct observation of groundwater levels during the time of year when the highest groundwater conditions are expected or known to occur, i.e., wet weather testing period as defined by the DEH.

Where there is a discrepancy between soil profile indicators (mottling) and direct observations, the direct observations shall govern.

If there are site characteristics or historical documentation indicating that a shallow water table is likely to occur during the rainy season, a wet weather groundwater investigation will be required. This investigation must be conducted during normal wet weather ground water conditions in accordance with DEH policy and procedures (see Part 2 - Attachment B of the Onsite Systems Manual). DEH staff should be contacted early in the site evaluation process to determine if wet weather groundwater observations are likely to be required for a particular site and to coordinate the work.

Percolation Testing

Percolation testing is conducted to confirm the groundwater separation requirement for the proposed site and to determine the size of the dispersal field for the project. The applicant must hire a consultant to conduct the percolation tests. DEH will determine the level of oversight to be provided during the testing. Percolation testing shall be completed in accordance with procedures detailed in Part 2 - Attachment C of the Onsite Systems Manual.

With respect to percolation testing, the applicant is responsible for:

- Contracting with an OWTS contractor or other qualified individual to excavate and set-up the percolation test holes in locations designated by the DEH and/or the applicant's OWTS consultant;
- Contracting with an OWTS design consultant to run the percolation tests;
- Making necessary arrangements to assure that adequate water is available for the required 24-hour pre-soaking and for refilling during testing.

Percolation testing will normally be conducted at the time of or shortly following the soil profile investigation. However, if the soil profile observations indicate the presence of expansive soils with high shrink-swell characteristics, percolation testing during the normal wet weather

season will be required. This is because expansive, high shrink-swell soils may exhibit suitable soil percolation rates during the dry season due to shrinkage cracks in the soil; but, when they become wet, the same soils may swell to the point of providing little or no percolation. Field judgment of the need for wet weather percolation testing will be made based on: (a) visual evidence of soil shrinkage cracks; and/or (b) soils exhibiting high clay content (e.g., exceeding 40 percent) in combination with massive, columnar or angular blocky soil structure.

Geotechnical Report/Slope Stability Analysis

For any site where the ground slope in the proposed dispersal field area exceeds 20%, and for recommended reduction in horizontal setbacks from cuts, embankments, steep slopes or an unstable land mass, additional geotechnical evaluation of slope stability, drainage, and other factors shall be required to verify that the proposed dispersal system will not degrade water quality, create a nuisance, affect soil stability or present a threat to the public health or safety. The requirements pertaining to this additional geotechnical evaluation are further detailed in Part 2 - Attachment D of the Onsite Systems Manual.

Cumulative Impact Assessment

For certain projects, typically non-residential and large flow OWTS, the completion of additional technical studies, termed "cumulative impact assessment", may be required. This is to address the cumulative impact issues (mainly groundwater mounding and nitrogen loading) from OWTS that can result from such factors as the constituent levels in the wastewater (e.g., nitrogen content), the volume of wastewater flow, the density of OWTS discharges in a given area, and/or the sensitivity and beneficial uses of water resources in a particular location (e.g., proximity to vernal pools). These issues are not necessarily addressed by conformance with standard OWTS siting and design criteria.

Cumulative impact assessment is mandatory for any OWTS with wastewater flows of 2,500 gpd or more.

Cumulative impact assessment is not required for normal residential OWTS, regardless of the type of system (conventional or alternative), except as may be designated by the director for certain situations or geographical areas of the county.

The requirements and guidelines pertaining cumulative impact assessments are detailed in detailed in Part 2 - Attachment E of the Onsite Systems Manual.

Reporting

All site evaluation information, including soil profile and percolation test results (and map) for primary and secondary/reserve dispersal areas, wet weather groundwater observations (if required), geotechnical report (if required), and cumulative impact assessment (if required) shall be submitted to the DEH with the OWTS permit application.

Wastewater Flows for OWTS Design

Single Family Residences and Second Units

Wastewater flows used for design of OWTS for single family residences and second units shall be based on a factor of 150 gal/day per bedroom for the first three (3) bedrooms, plus 75 gal/day for each additional bedroom, as indicated in **Table 3-1.** The design flows for a primary residence and secondary dwelling unit shall be determined independently, regardless of whether the flows are treated separately or combined in a single OWTS.

Table 3-1.
Wastewater Design Flows for
Single Family Residences and Second Units

No. of Bedrooms	Design Flow (gal/day)
1	150
2	300
3	450
4	525
5	600
6	675
>6	+ 75 per bedroom

Multiunit Residences and Non-residential Facilities

Wastewater flows used for the design of OWTS for multiunit residences and non-residential projects shall be developed based on full consideration of projected activities, occupancy, and facilities. Guidelines for use in estimating design wastewater flows are provided in the Onsite Systems Manual (Part 3-Table 3-2**).** For facilities/activities not listed in the Onsite Systems Manual, the wastewater design flow shall be estimated based on either: (a) appropriate literature references (e.g., US EPA) for the type of facility proposed; or (b) documented wastewater flow monitoring data for a comparable facility. Additionally, the director may consider adjustment to the criteria listed in the Onsite Systems Manual for specific facilities based upon documented wastewater flow monitoring data. In all cases, the design proposal shall include sufficient technical information to support the proposed design flow estimates. Notwithstanding the above, minimum design flow for any OWTS shall not be less than 150 gpd.

Flow Equalization

Flow equalization may be used for non-residential and mixed use facilities that experience significant, regular and predictable fluctuations in wastewater flows. Examples of applicable facilities include, but are not limited to:

- Churches
- Schools
- Special event venues

Flow equalization is the process of controlling the rate of wastewater flow through an OWTS by providing surge capacity storage and timed-dosing of the incoming flow. Installed following the septic tank, it allows peak surges in wastewater flow (e.g., from a weekend event) to be temporarily stored and metered into the treatment system and/or dispersal field at a relatively even ("average") rate over an extended number of days (e.g., during the subsequent week). This generally aids OWTS performance.

Where flow equalization is proposed to be incorporated in an OWTS the following apply:

- the septic tank capacity shall be sized based on the peak daily flow for the facility;
- the design flow used for sizing supplemental treatment unit(s) and/or the dispersal field may be based on the equalized ("average") flow rate rather than the peak daily flow rate for the facility;
- engineering calculations and specifications must be submitted substantiating the proposed design and operation of the flow equalization system; and
- an operating permit (per OWTS Ordinance section B11-92) will be required.

Materials and Equipment

Materials and equipment used in the construction of OWTS will be reviewed and evaluated by the DEH. A list of approved materials and equipment will be posted on the DEH website, and will be updated from time-to time. New materials and equipment proposed for use will require evaluation and approval by the DEH before they can be added to the posted list.

Conventional OWTS Requirements

Description

Per Santa Clara County OWTS Ordinance, a "Conventional OWTS" is a type of OWTS consisting of a septic tank for primary treatment of sewage followed by a system of drainfield trenches for subsurface dispersal of effluent into the soil. A conventional OWTS may utilize gravity flow or a

pump system to convey effluent from the septic tank to the drainfield.

Siting Criteria

The following minimum siting criteria must be met for approval of any conventional OWTS:

1. **Soil Depth.** Minimum depth of permeable soil beneath the bottom of the proposed dispersal field shall be 5 feet. Permeable soil is defined as having a percolation rate of 120 minutes per inch or faster or having a clay content of less than 60 percent, and shall not include rock formations that contain continuous channels, cracks or fractures.

2. **Soil Fill.** Maximum depth of soil fill covering any portion of the area proposed for installation of a dispersal system shall not exceed twelve inches in depth.

3. **Vertical Groundwater Separation.** Minimum required vertical separation distance between trench bottom and groundwater shall be determined according to the soil percolation rate as follows:

Percolation Rate (Minutes/Inch)	Vertical Distance (feet)
Less than 1	Not Permitted
1-5	20
6-30	8
31-120	5
More than 120	Not Permitted

4. **Areas of Flooding**. OWTS shall not be located in areas subject to flooding as defined by the limits of the 10-yr floodplain, determined or estimated from published floodplain maps or on the basis of historical evidence acceptable to the director. New OWTS that are to be located in areas of special flood hazard, as identified in division C12 of the County Code, must comply with all relevant provisions of division C12.

5. **Ground Slope.** Maximum ground slope in the dispersal field area shall not exceed thirty percent. Additionally, for any site where the ground slope exceeds twenty percent, approval shall be dependent upon completion of a geotechnical report as provided in Ordinance section B11-83. See Part 2 of the Onsite Systems Manual for geotechnical report requirements.

6. **Horizontal Setbacks.** Minimum horizontal setback distances from various site features to OWTS components shall be as listed in **Table 3-2**:

Table 3-2. Minimum Horizontal Setback Distances

Site Feature	Minimum Setback Distance (feet)	
	To Dispersal Field	To Septic Tank
Non-public water supply wells and springs	100	100
Public water supply wells	150	150
Watercourses		
• General (from top of bank)	100	100
• Between 1,200 to 2,500 feet from a public water system intake[1]	200	100
• Within 1,200 feet from a public water system intake[1]	400	100
Reservoirs (from highwater mark)		
• General	200	200
• Within 1,200 feet from a public water supply intake[1]	400	200
Cuts or steep embankments (from top of cut)	4 X h[2,3]	10 feet
Steep slopes (from break of slope)[4]	4 X h[2,3]	10 feet
Unstable land mass	100[3]	100[3]
Drainageway/drainage swale (from edge of flow path)	50	50
Foundation	10	5
Property line	10	10
Septic tanks	6	N/A
Swimming pool	25	25
Road easement, pavement, or driveway	5	5

[1] For areas tributary to and upstream of water supply intake; setback distance measured from high water mark. Exceptions allowed per SWRCB OWTS Policy, as follows: (a) for replacement OWTS, comply to the maximum extent practicable and incorporate supplemental treatment unless director finds no impact or significant threat to water source; (b) for new OWTS on pre-existing lot of record (pre-May 2013), comply to the maximum extent practicable and incorporate supplemental treatment for pathogens per sections 10.8 and 10.10 of SWRCB OWTS Policy.

[2] h equals the height of cut or embankment, in feet. The required setback distance shall not be less than twenty-five feet nor more than one hundred feet.

[3] Setback distance may be reduced in accordance with recommendations provided in a geotechnical report prepared by a civil engineer or professional geologist per section B11-83.

[4] Steep slope is considered to be land with a slope of >50% and distinctly steeper (at least 20% steeper) than the slope of the adjacent tank or dispersal field area.

7. **Additional Setback Considerations**

    a. Site Grading and Drainage. Grading and drainage system drawings will be reviewed by DEH along with OWTS plans to ensure that the drainage system can be installed on the property without adversely affecting any existing or proposed OWTS. In addition to the requirements in **Table 3-2**, the following setback requirements from septic tanks and dispersal trenches will apply to site drainage features:

        - Closed drain pipe or culvert - 10 feet
        - Lined (e.g., concrete, asphalt or equal) drainage ditch – 15 feet
        - Unlined earthen channel or V-ditch, for site drainage only – 25 feet
        - Energy dissipaters – 10 feet downslope and 20 feet to the side

    b. Trees. Refer to the Santa Clara County Ordinance C-16 Tree Preservation and Revision.

8. **Soil Percolation Rate.** The average soil percolation rate in the proposed dispersal field area shall not be faster than one minute per inch (1 mpi) nor slower than one hundred twenty minutes per inch (120 mpi), determined in accordance with procedures prescribed by the director in Part 2 of the Onsite Systems Manual.

9. **Location and Accessibility.** OWTS shall be situated on the same property as the building(s) being served and shall be located to be easily accessible for maintenance and repairs.

Septic Tank Requirements

1. **Minimum Capacity.** Septic tanks must have a minimum capacity of fifteen hundred (1,500) gallons or twice the peak daily wastewater flow for the facility served, whichever is greater. Minimum septic tank capacity for assisted care facilities shall be equal to three times the peak daily wastewater flow.

2. **Two Compartments.** Septic tanks must be of two-compartment construction, with the first compartment equal to two-thirds the total tank volume. The compartments must be separated by a baffle or equivalent arrangement.

3. **Materials and Construction.** Septic tanks must be watertight, properly vented, and constructed of reinforced concrete, heavyweight reinforced concrete blocks, fiberglass or other durable, non-corrodible synthetic materials as approved by the director. Septic tanks shall be designed to withstand any anticipated weight placed above it. All septic

tanks shall be listed and approved by IAPMO or an ANSI accredited testing organization: exception to this requirement may be granted where structural design calculations for the septic tank are provided by a California registered civil engineer.

4. **Access Openings.** Access to each septic tank compartment must be provided by a manhole opening at least twenty inches in diameter.

5. **Access Risers.** A riser must extend from each manhole opening to or above the surface of the ground. The riser must be of a size larger than the manhole opening, be both gas- and water-tight, be constructed of durable material and equipped with a secure cover.

6. **Effluent Filter.** The outlet of the septic tank shall be fitted with an effluent filter capable of screening solids in excess three-sixteenths (3/16) of an inch in diameter and conforming to NSF/ANSI Standard 46 or as otherwise approved by the director.

7. **Tank Connections.** All connections from building to septic tank must conform to construction standards as required by the County building official.

8. **Water-tightness Testing.** All new septic tank installations and modifications to existing septic tanks shall undergo water-tightness testing as follows:

   a. **New Tanks.** For new tank installations, the testing shall be done with the risers in place and the inlet and outlet pipes plugged. The tank shall be filled with water to a level extending a minimum of two (2) inches into the risers, and monitored for a 1-hour period, with no measurable drop in the water level.

   b. **Existing Tanks.** For existing tanks, the tank shall be filled with water to a level even with the invert of the outlet pipe, and monitored for a 1-hour period, with no measurable drop in water level. However, in cases where there the groundwater level is known or estimated to rise above the level of the outlet pipe during any time of the year, the water-tightness test shall be conducted following the procedure for new tank installations; i.e., by filling the tank with water into the risers.

Pipe Requirements

1. **Solid pipe, joints and connections.** Solid (non-perforated) pipe for OWTS must conform to the standards of the most recent edition of the Uniform Plumbing Code, which is adopted by reference into the county's building ordinances. Pipe diameter must be four inches. All solid pipe joints and connections must be glued, cemented or made with an elastomeric seal so as to be watertight.

2. **Tightlines under Residential Driveway.** Tightlines in residential traffic areas must be installed with schedule 40 PVC. An alternative is to sleeve (i.e., double pipe) the thin wall tightline pipe within an outer pipe consisting of schedule 40 PVC, ABS or suitable alternative and rated by the Uniform Plumbing Code.

3. **Distribution pipe.** Perforated pipe for conventional OWTS dispersal systems must conform to the most recent edition of the Uniform Plumbing Code, which is adopted by reference into the county's building ordinances. The pipe diameter must be four inches.

Dispersal System Requirements

1. **Trench Specifications.** A conventional subsurface dispersal system must consist of a series of trenches meeting the specifications in **Table 3-3**.

Table 3-3. Conventional OWTS Dispersal Trench Design

Parameter	Requirement
Trench length	Determined based on design flow and percolation rate; see below
Trench width	18 inches minimum; 36 inches maximum
Trench Depth	3 feet minimum; 8 feet maximum
Minimum cover over rock, in inches*	12 inches
Depth of rock under pipe (minimum) *	12 inches
Depth of rock over pipe (minimum)*	2 inches
Size of rock *	¾ to 2½ inches
Spacing of trenches, center to center, in feet, minimum	2 times the depth of rock below pipe; 6 feet minimum, plus 1-foot additional spacing for every 5% increase in dispersal area ground slope above 20%

* Other materials may be substituted for drain rock in the dispersal trenches if it is determined by the director that the material will serve the same function as drain rock as follows: 1) support the trench sidewalls and maintain the integrity of the infiltrative surface: and 2) provide adequate storage for septic tank effluent surges. The maximum depth and spacing between trenches may not be modified. Materials approved as drainrock substitutes must provide equivalent effective infiltrative surface consistent with trench sizing requirements per paragraph E3 below. Reduction in trench sizing requirements, up to 30%, may be approved by the director for IPMO-certified dispersal systems.

2. **Trench Construction.**

   a. Trenches must be placed in undisturbed earth, in an accessible area, and shall not be covered by paving or other impermeable or compacted surface.

   b. The bottom of a trench must be level, with a variation of no more than 2 inches per

100 lineal feet of trench; trenches shall be aligned parallel to the ground surface contours to the greatest extent practicable.

c. Adjacent trenches on slopes must be connected with a watertight overflow line ("relief line") in a manner that allows each trench to be filled with sewage effluent to the depth of the rock before the sewage flows to the next lower trench. Alternatively, a distribution box (D-box) may be used to equally divide the flow amongst the trenches, provided the proposed D-box is of a design approved and listed by the DEH per Part 3.1.E (Materials and Equipment) of this Manual. For systems located on sites having slopes of less than 5%, a "grid" design may be used in accordance with guidelines provided in the Onsite Systems Manual.

d. Trenches must not be excavated when the soil is so wet that smearing or compaction occurs.

e. In clay soils when glazing occurs, the trench surfaces must be scarified to the depth of the glazing and the loose material removed.

f. Rock material in the trench must be washed and free of fines, and must be covered with an approved filter fabric silt barrier (geotextile) prior to backfilling with natural earth.

g. A capped inspection riser shall be installed within each trench to provide a means of observing the effluent level in the trench.

h. Erosion control measures shall be implemented following installation per requirements of Ordinance Section B11-83(c) for any conventional dispersal system where: (1) ground slope exceeds 20%; (2) above-grade cover fill is added; (3) design flow exceeds 1,000 gpd; or (4) a grading and/or drainage permit is required for project site development per Division C12, Chapter III of the County Code. The plan submittal for the OWTS shall include an erosion control plan in accordance with requirements of Ordinance section B11-83(c).

3. Trench Sizing.

a. **Design Flow.** Design wastewater flow used for determining the required square footage and length of dispersal trench shall be determined in accordance with the criteria specified in the Onsite Systems Manual.

b. **Wastewater Application Rates.** The wastewater application rate(s) used for determining the required infiltrative surface area and overall trench length shall be based upon representative percolation test results for the soil zone corresponding with trench bottom depth, and the criteria in **Table 3-4**.

Table 3-4
Wastewater Application Rates for Conventional Dispersal Trench Sizing[1]

Percolation Rate (MPI)	Wastewater Application Rate (gpd/ft^2)
1-5	1.2
10	0.80
24	0.60
30	0.56
45	0.45
60	0.35
90	0.20
91-120	0.20

[1] Interpolate between reference values for other percolation rates; see Onsite Systems Manual for expanded listing of interpolated values.

c. **Effective Infiltrative Area.**

1) **Standard Requirement.** For trench sizing, the "effective infiltrative area" shall be limited to four (4) square feet per lineal foot of trench length, which may include any combination of trench bottom area and trench sidewall area below the invert of the perforated distribution pipe. For example, this may be comprised of: (a) 1.5-ft wide bottom area plus two sidewalls of 1.25 feet each; (b) 2-ft wide bottom area plus two sidewalls of 1 foot each; and so on.

2) **Deep Trench Exception.** Under certain (favorable) soil and site conditions where deeper dispersal trench (e.g., up to 8-feet deep) construction is acceptable, the effective infiltrative surface may be increased up to a maximum of eight (8) square feet per lineal foot. This exception is applicable to individual residential OWTS, where the dispersal site meets all conventional OWTS siting criteria, and further limited to sites where: (a) ground slope is <20%; and (b) soil percolation rate is in the range of 5 to 60 mpi.

d. **Trench Length Calculation.** Required trench length for 100% capacity dispersal field shall be calculated as follows:

Trench Length, $L = Q / (R*A)$

Where:

Q = Design wastewater flow, gpd

R = Wastewater application rate, in gpd/ft^2

A = Total infiltrative area per lineal foot of trench, in ft^2 ($4\ ft^2$ standard)

e. **Dual System Requirement.** Total dispersal trench capacity shall be provided for (2) 100% fields (primary and secondary) each sized per (d) above. Both primary and secondary fields shall be installed, and shall be equipped with an approved

(manually operated) diversion device to allow alternating use of the two fields, typically switching between fields every 6 to 12 months.

f. **Grid Design Option.** For dispersal areas where the slope is near level (defined as less than 5%), the dispersal trenches may be designed and installed as a grid system, in accordance with the procedures:

1) For grid designs, the site plan must include the following:

- Contour lines at 2-foot intervals to verify that the slope is less than 5%.
- A cross-section of the entire disposal field area must be shown to verify trench depths. Trench depths must comply with requirements for conventional dispersal trenches as listed in **Table 3-2**, between a minimum of 2.5-feet deep and a maximum of 8-feet deep.
- Drainfield trench bottoms must be installed level, with a tolerance of 0 to 2 inches maximum per 100 lineal feet.

2) For each crossover connection (at the ends of the grid and in the middle of drainlines longer than 100 lineal feet), four (4) lineal feet will be counted towards the required lineal footage of drainlines due to the loss of absorption area in the corners of the grids. For example, with a 10-foot separation between drain lines, only six (6) lineal feet would be counted.

3) Any drainfield proposed in areas where the slope is 5% or more shall utilize relief lines ("popovers") or an approved D-box. This may result in a drainfield design that utilizes both grid and popover (or D-Box) systems on the same side of the diversion valve.

4) All percolation tests must be conducted at the level of the deepest trench depth proposed in the drainfield design. An alternative method would be to allow the percolation test holes to be at a depth midway between the shallowest trench depth proposed and the maximum trench depth proposed, providing the soil is of a consistent type throughout the trench depth range.

5) The area proposed for a grid system may not be graded to achieve a slope of less than 5%. Slope calculations will be based on the original, natural slope.

Alternative OWTS Requirements

General

"Alternative System" means a type of OWTS that utilizes either a method of wastewater treatment other than a conventional septic tank and/or a method of wastewater dispersal other

than a conventional drainfield trench, and is used for the purpose of producing a higher quality wastewater effluent and improved performance of and siting options for effluent dispersal.

The use of alternative systems in Santa Clara County will be guided by the following principles and general requirements:

- Alternative systems may be permitted by the Director of Environmental Health for the repair or upgrading of any existing on-site system and for new construction on any legally created parcel where: (a) it is determined that sewage cannot be disposed of in a sanitary manner by a conventional septic tank–disposal field system; or (b) the Director determines that an alternative system would provide equal or greater protection to public health and the environment than a conventional septic tank-disposal field system.

- Santa Clara County Code does not permit the use of alternative OWTS as the basis for new lot creation (subdivisions).

- Types of alternative systems permitted are limited to those identified in the Ordinance and Onsite Systems Manual for which siting and design standards have been adopted. The Ordinance allows for future inclusion of other types of alternative treatment and dispersal systems, subject to the systems being reviewed and accepted by the Environmental Health Director and both Regional Water Quality Control Boards.

- All alternative systems must be designed by a registered professional (RCE, REHS or PG) and installed by a contractor duly licensed by the Contractors State License Board of the State of California to install OWTS (A, C-42 or C-36).

- All alternative systems require the issuance of a renewable operating permit, which is in addition to the construction permit issued for system installation. Operating permits are intended to serve as the basis for ensuring on-going maintenance; work is required to be performed by a qualified professional or onsite wastewater maintenance provider.

- Monitoring and reporting requirements to verify adequate performance of alternative systems are implemented as conditions of the operating permit and vary according to the type of system.

Types of Alternative OWTS Permitted

1. **Alternative Treatment Systems.** Alternative treatment systems may be used to produce higher quality of wastewater effluent beyond that provided by a conventional septic tank and improve the performance of and siting options for the dispersal system. The following alternative treatment systems (also termed “supplemental” treatment) may be approved for use in Santa Clara County subject to compliance with the siting and design

criteria specified in the Onsite Systems Manual:

(a) Intermittent and recirculating sand filters;
(b) Proprietary treatment units that provide secondary or better effluent quality; or
(c) Other alternative treatment systems approved by the director and the appropriate California Regional Water Quality Control Board(s).

2. **Alternative Dispersal Systems.** The following alternative dispersal systems may be proposed for use in Santa Clara County subject to compliance with the siting and design criteria in the Onsite Systems Manual:

(a) Shallow pressure distribution trench;
(b) Mound;
(c) At-grade;
(d) Pressure-dosed sand trench;
(e) Raised sand filter bed;
(f) Subsurface drip dispersal; or,
(g) Other alternative dispersal systems approved by the director and appropriate California Regional Water Quality Control Board(s).

Siting Criteria

All requirements specified in Section B11-67 of Santa Clara County Code (Section 3.3.b of this LAMP) for conventional OWTS also apply to alternative OWTS, with the following clarifications and exceptions:

1. **Horizontal Setbacks.** Horizontal setback requirements for alternative treatment systems are the same as those specified for septic tanks. Horizontal setback requirements for alternative dispersal systems are the same as those specified in for conventional dispersal systems.

2. **Areas of Flooding.** Alternative OWTS shall not be located in areas subject to flooding as defined by the limits of the 10-yr floodplain, determined or estimated from published floodplain maps or on the basis of historical evidence acceptable to the director. Alternative OWTS shall be located and designed to avoid contamination of or damage from inundation by floodwaters during a 100-year flood event. As appropriate, such measures shall include: 1) protecting OWTS supplemental treatment, pressure distribution and/or drip dispersal components from flood damage using structural tie-downs and/or elevating critical components above the 100-year flood level; 2) preventing discharge of wastewater into flooded dispersal areas from pump systems (e.g., using flood-activated float switches to override/disable pump operation during high water conditions); and 3) providing additional emergency storage capacity for flood periods.

3. **Ground Slope.** Maximum ground slope for different types of alternative wastewater dispersal systems are listed in **Table 3-5.**

Table 3-5
Maximum Ground Slope for Alternative Wastewater Dispersal Systems[1]

Type of Disposal System	20%	30%	40%	50%
• Mound, • At-Grade	X			
• Raised Sand Filter Bed		X		
• Shallow Pressure Distribution • Pressure-dosed Sand Trench			X	
• Subsurface Drip Dispersal				X

[1]Related Requirements: Any disposal system located on a slope greater than 20 percent shall require the completion and approval of a geotechnical report per Code section B11-83.

4. **Vertical Separation to Groundwater.** Where alternative OWTS are used, minimum vertical separation distance to groundwater, measured from the bottom of the dispersal system to the seasonal high water table, may be reduced from the requirements that apply to conventional OWTS, as specified in the **Table 3-6.** See specific requirements provided in the Onsite Systems Manual for the type of alternative OWTS for additional restrictions on groundwater separation distances that may apply based on system size (i.e., volume of wastewater flow) or for particular site conditions or geographic areas.

5. **Soil Depth.** Minimum depth of permeable soil beneath the bottom of the dispersal field shall be as specified in **Table 3-7** below for different types of alternative OWTS. Permeable soil is defined as having a percolation rate of 120 minutes per inch or faster or having a clay content of less than 60 percent, and shall not include solid rock formations or those that contain continuous channels, cracks or fractures. Design requirements for alternative OWTS prescribed in the Onsite Systems Manual may impose additional soil depth requirements based on system size (i.e., volume of wastewater flow) or for particular site conditions or geographic locations.

Site Evaluation, Design and Construction Requirements

Site evaluation, engineering plans, operation and maintenance guidelines, and other permitting requirements for alternative systems shall conform to all requirements for conventional OWTS as well as any additional requirements specified in the Onsite Systems Manual for the type of alternative system proposed. Design and construction of alternative OWTS shall be in conformance with requirements in the Onsite Systems Manual.

Table 3-6.
Minimum Vertical Separation Distance to Ground Water for Alternative OWTS (feet)[1]

Type of OWTS	Percolation Rate (MPI)	Vertical Separation to Groundwater (feet)[1]			
		2'	3'	5'	8'
• Conventional Trench w/ Supplemental Treatment	1-5 6-30 31-120		 X	X	X
• Shallow Pressure Distribution (PD) • At-Grade	1-5 6-120		 X	X	
• Shallow PD w/Supplemental Treatment • At-Grade w/Supplemental Treatment • Mound • Pressure-dosed Sand Trench (PDST) • Raised Sand Filter Bed • Subsurface Drip Dispersal w/Supplemental Treatment	1-5 6-120	 X	X		
• Raised Sand Filter Bed, w/Supplemental Treatment & Drip Dispersal	1-5 6-120	X X			

[1] Measured from the bottom of the dispersal system to the seasonal high water table.

Table 3-7
Minimum Soil Depth Beneath Alternative OWTS (feet)[1]

Type of OWTS	Minimum Soil Depth (feet)[1]	
	2'	3'
• Conventional Trench w/ Supplemental Treatment • Shallow Pressure Distribution Trench (PD) • At-Grade		X
• Shallow PD w/Supplemental Treatment • At-Grade w/Supplemental Treatment • Mound • Raised Sand Filter Bed (Open Bottom Sand Filter) • Subsurface Drip Disposal w/Supplemental Treatment • Raised Sand Filter Bed, w/Supplemental Treatment & Drip Dispersal	X	

1 Measured from the bottom of the dispersal trench, bed or piping (drip dispersal only).

Section 4:
Special OWTS Management Issues

The following describe the provisions contained in the Santa Clara County LAMP corresponding with special OWTS management issues listed in sections 9.2.1 through 9.2.12 of the SWRCB OWTS Policy.

OWTS Inspection, Monitoring, Maintenance and Repair

Santa Clara County Ordinance requirements pertaining to operational inspections, monitoring, maintenance and repair of OWTS are summarized in **Table 4-1** below.

Table 4-1. Summary of Santa Clara County Provisions for OWTS Inspection, Monitoring, Maintenance and Repairs

Activity	Code Section	Inspections	Monitoring	Maintenance & Repairs*
Building Additions & Remodels	B11-84	OWTS performance inspection required at time of application for building addition or remodel; procedures specified in Onsite Manual, Part 5.	May involve water sampling, dye testing or other monitoring	Maintenance and/or repair work may be required as a result of inspection findings.
Septic Tank Pumper Inspections	B11-89	Basic walk-through inspection of OWTS conducted by septic tank pumper in conjunction w/ pump-out of any septic tank.	N/A	Maintenance and/or repair work may be recommended or required as a result of inspection findings.
Operating Permits	B11-92 B11-93	Regular inspections of OWTS according to terms of operating permit for (a) alternative systems; (b) large flow OWTS, >2,500 gpd; (c) holding tanks; and (d) other OWTS at Director's discretion.	Monitoring of OWTS under terms of operating permit, including flows, water levels, pump-out volumes, and water quality sampling, as applicable	Maintenance and/or repair work may be required from time-to-time based on observations during routine inspections or as part of normal system servicing.
Property Transactions (Voluntary)	B11-100	Basic walk-through inspection of OWTS conducted by DEH staff (upon request) in conjunction with sale of a property or re-financing.	May involve water sampling, dye testing or other monitoring	Maintenance and/or repair work may be recommended or required as a result of inspection findings.
Complaint Investigations (Abatement)	B11-85	Inspections of OWTS by DEH staff in response to complaints or observed violation(s).	May involve water sampling, dye testing or other monitoring	Maintenance and/or repair work may be required as a result of inspection findings.

*Code Section B11-67 stipulates that "No person may construct, add to, repair or alter any existing OWTS without first submitting plans to the director for approval and obtaining a permit pursuant to the requirements of this chapter."

OWTS Near Impaired Water Bodies

Several water bodies in Santa Clara County are listed as impaired pursuant to Section 303(d) of the Clean Water Act; however, none are listed as impaired for nitrogen or pathogens due to discharges from OWTS. Therefore, no special provisions related to impaired water bodies have been adopted for OWTS in Santa Clara County.

The Pajaro River watershed, encompassing the Llagas Creek and Uvas Creek drainage basins in Santa Clara County, is impaired due to nitrogen and pathogens. Studies by the Central Coast RWQCB determined : (a) the primary cause of nitrogen impairment to be croplands; and (b) the causes of pathogen impairment to be urban storm drains, animal waste runoff, and sanitary sewer spills and leakage. The RWQCB studies found OWTS to not be a contributor to either the nitrogen or pathogen impairment and proposed no implementation measures for OWTS. The above information is contained in the following documents:

- "Final Project Report – Pajaro River and Llagas Creek Total Maximum Daily Load for Nitrate", November 2005. Central Coast Regional Water Quality Control Board.

- "Final TMDL Project Report – Total Maximum Daily Loads for Fecal Coliform in the Pajaro River Watershed. March 2009. Central Coast Regional Water Quality Control Board.

Variances and Exceptions

Provisions for variances and exceptions to OWTS Ordinance requirements are summarized below:

A. New installations

(1) Dispersal systems may be located on slopes over 20% with a variance if supported by a geotechnical assessment and report in accordance with the requirements of Section B11-83.

(2) Dispersal systems may be located closer than 100 feet from an unstable land mass with a variance if supported by a geotechnical assessment and report in accordance with the requirements of Section B11-83.

(3) Holding tanks are prohibited by code, but they may be permitted as an exception for a publicly-owned non–residential facility under certain conditions as specified in Section B11-76.

(4) A variance to specified OWTS horizontal setbacks (per Section B11-67) from public water wells and public water supply intakes may be permitted for lots created prior to the effective date of the SWRCB OWTS Policy (May 13, 2013) subject to meeting the following requirements:

- The dispersal field shall be sited to comply with the setback requirements to maximum extent practicable;
- OWTS shall incorporate supplemental treatment, including pathogen removal;
- Pathogen removal is defined as achieving an effluent fecal coliform bacteria concentration less than or equal to 200 Most Probable Number (MPN) per 100 milliliters;
- Minimum vertical separation to groundwater shall be three(3) feet below the bottom of the dispersal field;
- The minimum dispersal field soil cover shall be 12 inches;
- Completion of a cumulative impact analysis regarding nitrate loading effects (per Ordinance Section B11-74) if the setback issue involves a public water well; and
- Other measures as specified by the director.

On a case-by-case basis, the director may establish alternative OWTS siting and operational requirements to those listed above where it is determined by the director that the alternate requirements will provide a similar level of protection against adverse impact to the public water source.

B. Repair/replacement systems

(1) Section B11-85 (Abatement) specifies that repair/replacement systems for failing OWTS shall comply with all code requirements to the extent possible.

(2) A holding tank may be permitted as an exception for repair/replacement systems if necessary to abate a nuisance or health hazard caused by a failing OWTS.

(3) A variance to specified OWTS horizontal setbacks (per Section B11-67) from public water wells and public water supply intakes may be permitted for repair/replacement of an existing OWTS subject to meeting the following requirements:

- The dispersal field shall be sited to comply with the setback requirements to maximum extent practicable;

- The OWTS shall incorporate supplemental treatment or other mitigation measures specified by the director, unless he/she finds no evidence of an existing or potential threat of impact to the public water source by the OWTS based on topography, soil depth and groundwater conditions.

C. Prohibitions. No variances or exceptions are permitted to prohibitions 1 through 9 listed in **Section 5** of this LAMP.

D. Appeals. Section B11-88 of the Ordinance allows an applicant to appeal the decision of the director to the Office of the County Hearing Officer in accordance with procedures set forth in Division A28 of Title A of the County Code. This may include issues related to variances or exceptions to Ordinance requirements.

Professional, Contractor and Maintenance Provider Qualifications

Santa Clara County Ordinance requirements pertaining to qualifications for OWTS professionals, contractors and maintenance providers are summarized in **Table 4-2**.

The qualification notations and terminology in **Table 4-2** have the following meanings:

- RCE: Registered Civil Engineer
- REHS: Registered Environmental Health Specialist
- PG: Professional Geologist
- CEG: Certified Engineering Geologist
- Registered Septic Tank Pumper: Registered with Santa Clara County in accordance with Ordinance Code Division B11, beginning with Section B11-210 (Liquid Waste Pumpers).
- Onsite Wastewater Maintenance Provider: An individual registered with the Department of Environmental Health and having experience in the construction and/or operation of OWTS as evidenced by the either of the following:
  - Possession of a valid contractor's license (A, C-36 or C-42)
  - Completion of an onsite wastewater certification training course by a third-party entity, such as the California Onsite Wastewater Association (COWA), National Association of Waste Transporters (NAWT), National Sanitation Foundation (NSF), or other acceptable training program as determined by the Director.

  Registration shall entail: (a) documentation of required qualifications; (b) participation in annual training/review conducted by the director; and (c) payment of an annual fee.

Table 4-2. Qualifications for OWTS Practitioners

OWTS Activity	Required Work	Code Section	Minimum Qualifications
Site Evaluation	Conduct field studies and evaluation of geology, soils, percolation, groundwater, slopes and other factors for design and use of OWTS	B11-67 (Manual)	RCE, REHS, PG
System Design	Prepare plans and supporting design analysis required for permitting and installation of OWTS	B11-67 B11-91	RCE, REHS, PG
System Installation	Install OWTS in accordance with approved plans and permit conditions issued by DEH	B11-70	General Engineering Contractor License: • Class A • Class C-42 • Class -36 Exception: Homeowner may install a conventional OWTS on their own property.
Cumulative Impact Assessment	Assess nitrate loading, groundwater mounding or other cumulative impacts of OWTS for flows >2,500 gpd or as otherwise required by director	B11-74 (Manual)	RCE, REHS, PG
Geotechnical Assessment	Assess slope stability, drainage and other geotechnical issues for OWTS located on slopes over 20%	B11- 83 (Manual)	RCE or PG with CEG certificate or equivalent experience
Performance Evaluation	Conduct performance evaluation of OWTS in connection with building addition/remodel project, failure investigation or as otherwise required by DEH	B11-84 (Manual)	RCE, REHS, PG or Onsite Wastewater Maintenance Provider
Septic Tank Pumping, Inspection & Reporting	Pump and haul septage; inspect OWTS at time of tank pumping; complete and submit inspection report to DEH	B11-89	Registered Septic Tank Pumper
Alternative System Inspection and Monitoring	Perform inspection, monitoring and reporting of alternative OWTS in accordance with conditions of operating permit issued by DEH	B11-93 (Manual)	RCE, REHS, PG or Onsite Wastewater Maintenance Provider

Education and Outreach

Santa Clara County's LAMP includes the following provisions for education and outreach regarding OWTS:

A. Onsite Systems Manual. As part of the 2013 updating of the Onsite Wastewater Ordinance, Santa Clara County created a new "*Onsite Systems Manual*" (Manual) that provides the policy, procedural and technical details for implementation of the Ordinance. The Manual replaces and incorporates information included in the former Bulletin A, which was a compendium of Ordinance provisions and various implementing policies that explained and provided technical guidance to homeowners, designers and installers of OWTS. The manual is divided into five parts as follows:

- Part 1 – Policies and Administrative Procedures
- Part 2 – Site Evaluation Methods and Investigative Procedures
- Part 3 – General and Conventional OWTS Requirements
- Part 4 – Guidelines for Alternative Systems
- Part 5 - Operation, Monitoring and Maintenance

The Manual is greatly expanded over Bulletin A, and is a key component of Santa Clara County's LAMP. The Manual will be maintained and updated from time-to-time by the DEH, subject to review and approval by the director and the RWQCB. The Ordinance requires that any revisions or updates to the Manual include a reasonable process for seeking input from the affected public and OWTS practitioners in the county.

B. OWTS Operation and Maintenance Guidelines. Santa Clara County Onsite Wastewater Ordinance (Section B11-82) requires operation and maintenance guidelines to be provided to the OWTS owner (and DEH) for each new or replacement OWTS by either the system designer or installer. This applies to both conventional and alternative OWTS. Final approval of system installation is contingent upon confirmation that the required operation and maintenance guidelines have been provided.

C. Alternative Systems Operating Permits. Owners of alternative OWTS will be issued an ongoing operating permit that specifies ongoing inspection, monitoring and reporting requirements for the system. Although the work will be conducted substantially by qualified maintenance providers, the system owner is ultimately responsible for compliance under the operating permit, which will indirectly promote an improved level of education and understanding of the OWTS operational requirements.

D. Septic Tank Pumper Inspection and Reporting Requirements. The new Ordinance provisions (Section B11-89) requiring completion of a basic operational inspection and report at the time of septic tank pumping will improve the level of homeowner knowledge about their OWTS, maintenance requirements and operational issues. The owner will be provided a copy of the completed inspection form following septic tank pumping, rather than simply a receipt documenting the cost and volume of septage removed from the septic tank.

Septage Management

Septage receiving facilities in Santa Clara County occurs at the following publicly owned treatment plants (POTWs), with estimated annual capacity indicated in parentheses.

North County

- San Jose/Santa Clara Regional Water Pollution Control Plant (1.4 M gal.)
- Sunnyvale Water Pollution Control Plant (1.0 M gal.)
- Palo Alto Sewage Treatment Plant (1.0 M gal.)

South County

- South County Regional Waste Water Authority, Gilroy (8.0 M gal.)

Based on an average pumping frequency of once every five (5) years and a pump-out volume of 1,500 gallons per tank, the estimated annual volumes of septage generated by OWTS in Santa Clara County are summarized in **Table 4-3**, showing estimates for existing development and projected 30-year build-out levels in the North County, South County and County-wide.

Table 4-3. Estimated Annual Septage Generation in Santa Clara County

	North County	**South County**	**Total**
Existing Development			
Estimated Number of OWTS*	7,174	5,369	12,543
Estimated Annual Septage Volume (M gal.)	2.15	1.61	3.76
Projected Build-out (30 years)			
Estimated Number of OWTS*	9,071	7,176	16,247
Estimated Annual Septage Volume (M gal.)	2.72	2.15	4.87
Annual Septage Capacity at POTWs (M gal)	3.4	8.0	11.4

*Source: "*Growth Projections and Cumulative Wastewater Loading from Implementation of Santa Clara County Wastewater Ordinance Changes*", July 2013. Questa Engineering Corporation.

The available capacities at septage receiving facilities in Santa Clara County are adequate for the estimated annual septage generation rates, present and projected in both the North County and South County areas.

Onsite Maintenance Districts

Presently there are no onsite wastewater maintenance districts in Santa Clara County and none are currently under consideration. Some of the key functions of an onsite wastewater management district are already covered on a county-wide basis by requirements and activities under the newly adopted Onsite Wastewater Ordinance and within the provisions of this LAMP, including: (a) operating permits for alternative OWTS and certain other OWTS based on system size or other factors; (b) septic tank pumper inspection/reporting requirements; and (c) requirements for water quality assessment and reporting to the RWQCB. In the future, should a need arise for additional focused OWTS management activities or community-type wastewater solutions in given geographical areas of the County, it is anticipated that feasibility studies would include (as a project alternative) consideration of the formation of an onsite wastewater maintenance district ("zone"), in accordance with the provisions of Health and Safety Code (Sections 6950-6982).

Regional Salt and Nutrient Management Plans

Estimates have been made of wastewater discharge volumes, nitrate loading and salt loading contributions to groundwater from the approximately 12,500 existing OWTS in Santa Clara County and are provided in **Appendix B**. Estimates have been developed for each of the major watershed sub-basins in the county and further organized and presented according to the respective RWQVB jurisdictional boundaries – North County, Region 2; and South County, Region 3. These estimates of nitrogen and salt loading have been provided as input to the Regional Salt and Nutrient Management Planning effort currently underway and headed up by the Santa Clara Valley Water District (www.valleywater.org). The DEH is a participant in this planning effort and will make itself available to address any questions and data needs regarding OWTS. In the future DEH plans to provide periodic updates of the nitrate and salt loading estimates in response to new information and additional development and OWTS usage in the county.

Watershed Management Coordination

Santa Clara County DEH works closely with the Santa Clara Valley Water District in regard to both groundwater and watershed management issues, and participates as a stakeholder on various programs and initiatives. The Water District is also represented on the Wastewater Advisory Group assembled by the DEH for review of various OWTS regulations, policies and management issues.

The Water District is the primary water resources agency for Santa Clara County and has as its mission, 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. The Water District has developed a Comprehensive Water Resources Management Plan (http://www.valleywater.org/Programs/CWRMP.aspx) which outlines the key water resources issues facing Santa Clara County and provides a framework for community understanding of District policies related to water supply, natural flood protection and water resources stewardship.

As part of watershed management activities, the District evaluates septic systems and waste disposal facilities. When problems are identified, the District works with the DEH and the homeowners to resolve the problem. Additionally, under the provisions of the newly formulated LAMP, the DEH anticipates increased collaboration with the Water District in compiling and assessing relevant water quality data as part of the required OWTS water quality assessment that will be conducted and reported to the San Francisco Bay RWQCB every five years.

Evaluating Proximity to Public Sewers

Evaluating the proximity to public sewers for new and replacement OWTS is accomplished by the following:

(1) OWTS permit instructions advise applicants of the code requirement (Section B11-62) for connection to public sanitary sewer where the property is within 300 feet of an available sewer.

(2) Permit application form to be completed and filed by the system designer and/or contractor includes an entry related to sewer line proximity.

(3) DEH permit review includes sewer proximity as a checklist item.

(4) Building review process for new construction in all areas of the county, except the remote eastern regions, includes additional planning submittals and design review, providing an additional check on public sewer proximity prior to development approval.

OWTS Notification to Public Water System Owner(s)

Under Santa Clara County Onsite Wastewater Ordinance (Section B11-67) special horizontal setback requirements apply to OWTS located in the proximity of public water supply wells and public water system surface water intakes. Providing adequate notification to the owner(s) of public water systems about OWTS installations near their facilities will be accomplished by the following procedures:

(1) The DEH will rely upon information provided by the California Department of Public Health, Santa Clara Valley Water District or water purveyors in Santa Clara County to determine the locations and respective owner(s) of water wells and public water system surface water intake locations in Santa Clara County.

(2) At the time of permit application for any new or replacement OWTS, DEH staff will review the location of the proposed OWTS in relation to known public water wells and surface water intakes.

(3) Where DEH staff determines the proposed OWTS dispersal system is closer than 150 feet to a public water well, or closer than 1,200 feet to a public water system surface water intake in a location tributary to the intake, notification of the proposed OWTS application will be sent to the water system owner(s). The notification will be accompanied by a copy of the permit application and supporting OWTS design information, including documented soils, topography, groundwater and percolation data.

(4) The owner(s) receiving notification of proposed OWTS installations per (c) above will be afforded a 15-day period in which to submit comments on the proposed OWTS application.

(5) Prior to issuing an OWTS installation permit for any system per (c) above, the Director will review and consider any comments and recommendations submitted by affected water system owner(s) per (d) above.

(6) Upon issuance and/or denial of an OWTS installation permit per (c) above, the Director will provide notification to the affected water system owner(s) of the action taken.

Procedures for Dispersal Field Located Within Public Well/Intake Setback

New OWTS

In cases where a new OWTS is proposed on a lot created prior to the effective date of the SWRCB OWTS Policy (May 13, 2013), and the dispersal field does not meet the specified OWTS horizontal setbacks (per Section B11-67) from public water wells and public water supply intakes, the OWTS may be permitted subject to complying with the following requirements to address possible water source impacts:

(1) The dispersal field shall be sited to comply with the setback requirements to the maximum extent practicable;
(2) The OWTS shall incorporate supplemental treatment, including pathogen removal;

(3) Pathogen removal is defined as achieving an effluent fecal coliform bacteria concentration less than or equal to 200 Most Probable Number (MPN) per 100 milliliters;
(4) Minimum vertical separation to groundwater shall be three(3) feet below the bottom of the dispersal field;
(5) The minimum dispersal field soil cover shall be 12 inches;
(6) Completion of a cumulative impact analysis regarding nitrate loading effects (per Ordinance Section B11-74) if the setback issue involves a public water well; and
(7) Other measures as specified by the director.

On a case by case basis, the director may establish alternative OWTS siting and operational requirements to those listed above where it is determined by the director that the alternate requirements will provide a similar level of protection against adverse impact to the public water source.

Repair/Replacement OWTS

For repair or replacement of an existing OWTS where the dispersal field does not meet the specified OWTS horizontal setbacks (per Section B11-67) from public water wells and public water supply intakes, the OWTs may be permitted subject to complying with the following requirements to address possible water source impacts:

(1) The dispersal field shall be sited to comply with the setback requirements to the maximum extent practicable;

(2) The OWTS shall incorporate supplemental treatment or other mitigation measures specified by the director, unless he/she finds no evidence of an existing or potential threat of impact to the public water source by the OWTS based on topography, soil depth and groundwater conditions.

Phase-Out of Cesspool Usage

The use of cesspools for sewage disposal is not authorized under Santa Clara County Onsite Wastewater Ordinance (Section B11-75). However, due to the age of many homes in the County (50 to 80+ years old) especially in the Santa Cruz Mountains and agricultural areas, a number of cesspools still exist and continue to be discovered from time-to-time. Historically, discovery and abandonment of existing cesspools has come about: (a) voluntarily by the property owner; (b) in response to complaints; or (c) through OWTS inspections associated with property transfers or building addition or remodeling projects.

Under the County's new Ordinance, the institution of the septic tank pumper inspection and reporting requirements (Section B11-89) will provide an additional means for discovery and phase-out of cesspools. Under these requirements any time a pumping contractor is called to

pump/service a septic tank, if the system is found to be a cesspool the pumper will be obligated to report this condition, which will trigger follow-up abatement proceedings by the DEH. The septic tank pumper inspection program is patterned after the highly successful program instituted by Santa Barbara County in 1999, which was aimed initially at locating and abandoning hollow seepage pits that had historically been permitted in their county. In Santa Clara County the septic tank pump inspection activities, along with the expanded range of alternatives for system repairs/replacement, is expected to accelerate the gradual phase-out of the remaining cesspools in the county.

Section 5: Prohibitions

The following describe the provisions contained in the Santa Clara County LAMP corresponding with the required prohibitions set forth in section 9.4 of the SWRCB OWTS Policy.

1. ***Cesspools.*** The use of cesspools for sewage disposal is not authorized under Santa Clara County Onsite Wastewater Ordinance (Section B11-75).

2. ***OWTS over 10,000 gpd capacity.*** Santa Clara County Onsite Wastewater Ordinance applies to any OWTS where the maximum daily flow volume of waste produced is 10,000 gpd or less (Section B11-60). If the amount of waste produced is more than 10,000 gpd or where a community system serving multiple discharges under separate ownership is proposed, the method of treatment and dispersal must be approved by either the San Francisco Bay RWQCB or the Central Coast RWQCB, as applicable.

3. ***OWTS with surface discharge.*** Surface discharge of wastewater from an OWTS is not authorized under Santa Clara County Onsite Wastewater Ordinance. Code section B11-67(a) requires that OWTS "…shall, at a minimum, consist of a septic tank and subsurface dispersal system for absorption and leaching of the effluent into the soil." (emphasis added)

4. ***OWTS on steep slopes without slope stability report.*** Santa Clara County Onsite Wastewater Ordinance section B11-83 requires that any OWTS dispersal field located on slopes greater 20% shall require an assessment and report addressing slope stability, drainage and other pertinent geotechnical factors affecting the operation and and/or impacts from the construction and use of the proposed OWTS.

5. ***Sizing reductions for IAPMO certified dispersal systems.*** Santa Clara County Onsite Wastewater Ordinance (Section B11-80) permits the use of chamber designs (IAPMO certified) for dispersal systems, subject to requirements established by the Director and contained in the Onsite Systems Manual. The requirements do not allow the use of a dispersal system sizing multiplier of less than 0.70; i.e., no more than 30% reduction in dispersal system sizing is permitted based on the substitution of a chamber design for normal use of gravel filter material.

6. ***Supplemental treatment systems without monitoring.*** Under the Santa Clara County Onsite Wastewater Ordinance supplemental treatment is defined as an alternative system and, as such, is required to be inspected and monitored in accordance with an operating permit issued by the DEH per Code Section B11-92 and B11-93.

7. ***OWTS for RV Dump Stations.*** Santa Clara County Onsite Wastewater Ordinance pertains to the treatment and dispersal of domestic wastewater which, by definition in Section B11-64(i), does not include wastewater from industrial processes or recreational vehicle (RV) dump stations. Domestic wastewater may include incidental RV holding tank discharges, e.g., at the owner's residence/storage location. Any proposals for RV Dump Stations will be referred to the appropriate RWQCB for permitting. This limitation does not apply to full hook-up sewer connections similar to those used at a recreational vehicle park.

8. ***Groundwater separation less than two (2) feet, or less than 10 feet for seepage pits.*** Santa Clara County Onsite Wastewater Ordinance sets forth minimum siting requirements for OWTS dispersal fields in Section B11-67 for conventional OWTS, and in Section B11-95 for Alternative OWTS. Neither section authorizes the installation of any OWTS dispersal system where the vertical separation to groundwater below the dispersal field is less than two (2) feet. Santa Clara County Onsite Wastewater Ordinance does not authorize the use of seepage pits for the dispersal of wastewater effluent (Section B11-80).

9. ***Where public sewer connection is available.*** For any property where the installation of a new, expanded or replacement OWTS is proposed, Santa Clara County Onsite Wastewater Ordinance (Section B11-62) requires connection to an available public sewer where the property line of the building served is within 300 feet of the sewer line, subject to approval by the sewer authority and the Santa Clara County Local Agency Formation Commission.

10. ***Proximity to public water system wells and surface water intakes.*** Santa Clara County Onsite Wastewater Ordinance (Section B11-67) sets forth minimum horizontal setback requirements for OWTS that include the following restrictions for OWTS dispersal systems located in the proximity of public water supply wells and public water system surface water intakes.

    A. Public water well:
    - 150 feet setback for any dispersal system no greater than 8-feet deep
    - Sewer wells, seepage pits, cesspools, and dispersal systems deeper than 8 feet are not authorized (Sections B11-75 and B11-80)

    B. Public water system surface water intake:
    - 400 feet setback from edge of watercourse/water body where OWTS dispersal field is <1,200 feet to water supply intake
    - 200 feet setback from edge of watercourse/water body where OWTS dispersal field is >1,200 feet to water supply intake

    C. Exceptions for replacement OWTS. For replacement OWTS unable to meet the horizontal setback requirements of (a) or (b) above, the replacement dispersal field shall meet the setback requirements to the greatest extent practicable. Additionally, the Director will require the replacement OWTS to incorporate

supplemental treatment and other measures, as appropriate, unless he/she finds no evidence of an existing or potential threat of impact to the public water source by the OWTS based on topography, soil depth and groundwater conditions.

D. Exceptions for new OWTS. For new OWTS on parcels created prior to May 13, 2013, that are unable to meet the horizontal setback requirements of (a) or (b) above, the new dispersal field shall meet the setback requirements to the greatest extent practicable. Additionally, the Director will require the new OWTS to incorporate supplemental treatment, including pathogen removal, plus other requirements noted below. In accordance with SWRCB OWTS Policy, pathogen removal in this case is defined as achieving an effluent fecal coliform bacteria concentration less than or equal to 200 Most Probable Number (MPN) per 100 milliliters. Other requirements include:

(1) providing a minimum vertical separation to groundwater of three(3) feet below the bottom of the dispersal field;
(2) providing a minimum dispersal field soil cover of 12 inches;
(3) completion of a cumulative impact analysis regarding nitrate loading effects (per Ordinance Section B11-74) if the setback issue involves a public water well; and
(4) other measures as specified by the director.

On a case-by-case basis, the director may establish alternative OWTS siting and operational requirements to those listed above where it is determined by the director that the alternate requirements will provide a similar level of protection against adverse impact to the public water source.

Section 6:
Program Administration

OWTS Permitting Records

The DEH will retain permanent records of OWTS permitting actions and will make those records available within 10 working days upon written request for review by either the San Francisco Bay or Central Coast RWQCB. This includes:

- Installation permits issued for new, repair and replacement OWTS;
- OWTS variances and/or exemptions issued, including number, location and description;
- Operating permits issued for alternative systems, OWTS with flows >2,500 gpd, or other OWTS where the Director has determined the need for an operating permit.

Water Quality Assessment Program

Objectives

The DEH will maintain an OWTS water quality assessment program having three primary objectives: (1) to determine the general operational status of OWTS in the county; (2) assess possible impacts of OWTS on groundwater and surface water quality, and their associated beneficial uses; and (3) identify areas for changes to existing OWTS management practices.

Watershed Approach

It is anticipated that the OWTS-water quality assessment will be organized according to the various watershed sub-basins delineated and used in the environmental studies prepared in conjunction with the recent updates to the County Onsite Wastewater Ordinance. This will allow the existing GIS-based mapping, OWTS inventories, and nitrate and salt loading analyses to be utilized and built-upon. Other localized focus areas within each watershed sub-basin may be delineated in the future if warranted.

Operational Status of OWTS

The general operational status of OWTS will be assessed through compilation and review of the following types of information:

(1) Septic tank pumper inspection reports;
(2) Complaints and abatement activities for failing OWTS;
(3) Variances issued for new and/or repair OWTS;
(4) Performance inspections of existing OWTS in connection with building additions/remodel projects, or property transactions;

(5) Monitoring reports for alternative systems or other OWTS having an operating permit.

The data review and assessment will focus on both positive and negative findings, apparent trends, and areas for changes in practices. The assessment will maintain and update the existing inventory of OWTS in the county.

Water Quality Assessment

The water quality assessment will include the following:

(1) **Water Quality Parameters of Concern.** The initial focus of the water quality assessment program will be on three key water quality parameters – pathogens, nitrate-nitrogen, and total dissolved solids (TDS). Other parameters of concern may be added if warranted.

(2) **Wastewater Discharge Volumes.** Estimates of annual wastewater discharge estimates from OWTS will be updated based upon the running inventory of OWTS per (c) above.

(3) **Nitrate and TDS Loading.** Nitrate and TDS loading estimates (by watershed sub-basin) will be maintained and updated based on the running inventory of OWTS in the county.

(4) **Water Quality Data Sources**. Relevant water quality monitoring data for (pathogens, nitrate-nitrogen and TDS) will be compiled from available sources, anticipated to include:

- Receiving water quality monitoring data reported under alternative systems operating permits;
- Water quality data from cumulative impact studies;
- SCVWD Annual Groundwater Reports;
- Domestic water wells sampling from new wells or other;
- Public water system raw water quality data monitoring reports;
- Reservoir or stream water quality sampling data from SCVWD or other watershed special studies;
- Receiving water sampling performed as part of an NPDES permit;
- Groundwater sampling performed as part of Waste Discharge Requirements;
- Data from the California Water Quality Assessment Database; and
- Groundwater data collected as part of the Groundwater Ambient Monitoring and Assessment Program available in the Geotracker Database.

(5) **Assessment.** In addition to periodically updating the OWTS nitrate and TDS loading estimates for the county, it is anticipated that assessment of the data will include a review to: (a) determine relevance of the various data to OWTS; (b) identification of any obvious water quality degradation attributable to OWTS warranting follow-up investigation or action; (c) identification of any water quality degradation where OWTS may be implicated as a possible source; and (d) identification of water quality data/areas indicating no apparent issues of concern related to OWTS.

Reporting to RWQCBs

Annual Report

An annual report pertaining to OWTS activities in Santa Clara County for submission to the San Francisco Bay Regional Water Quality Control Board by February 1st of each year, with a copy also sent to the Central Coast Regional Water Quality Control Board. The annual report will, at a minimum, include the following information, organized in a tabular spreadsheet format:

(1) Number and location of complaints pertaining to OWTS operation and maintenance, and identification of those which were investigated and how they were resolved;

(2) Number, location and description of permits issued for new and replacement OWTS, including any variances and/or exemptions issued;

(3) Number, location and results of septic tank pumper inspection reports received per Section B11-89 of the County's Onsite Wastewater Ordinance;

(4) List of applications and registrations issued as part of the local septic tank pumper registration program pursuant to Section 117400 et seq. of the California Health and Safety Code;

The report will include: (a) a summary of whether any further actions related to OWTS are warranted to protect water quality or public health; and (b) any other information deemed appropriate by the Director of Environmental Health.

5-Yr Water Quality Assessment Report to RWQCB

Every five (5) years the annual report to the RWQCB will be accompanied by a Water Quality Assessment Report that summarizes the information and findings from the DEH Water Quality Assessment Program described under heading 2 above. The report will present an overall assessment regarding any evidence of water quality impact from OWTS along with any recommended changes in the LAMP to address the identified impacts. Additionally, any groundwater water quality data generated by the DEH from monitoring activities will be submitted in EDF format for inclusion in Geotracker, and any surface water quality data will be submitted to CEDEN in A SWAMP comparable format.

Appendix A

Supporting Rationale for
Santa Clara County OWTS Siting and Design Criteria

Appendix A

Supporting Rationale for Santa Clara County OWTS Siting and Design Criteria

Following is a discussion of the supporting rationale (including literature references) for the various siting and design requirements for OWTS contained in Santa Clara County's LAMP for those items that differ from the Tier 1 requirements of the SWRCB OWTS Policy. The topic areas addressed include: (1) groundwater separation requirements beneath dispersal systems; (2) dispersal trench sizing; (3) horizontal setbacks; and (4) allowable OWTS densities (lot size) for new subdivisions. Additionally, highlighted at the end are the various requirements and management practices contained in Santa Clara County's LAMP that constitute a higher level of water quality and environmental protection relative to OWTS than provided in the Tier 1 requirements.

1. Pathogen Removal and Groundwater Separation Requirements

Bacteria, viruses, and other pathogens are present in great numbers in sewage and represent an ongoing threat to public health. Preventing the transmission of disease is the foremost concern associated with the treatment and dispersal of sewage and is the basis for many of the established standards that dictate how, where and when wastewater treatment and dispersal can occur. Ground waters and surface waters are afforded protection from OWTS contamination through the establishment of specific criteria pertaining to the soil properties, vertical separation (i.e., the distance from the bottom of the dispersal trench to the seasonal high groundwater below), and horizontal (surface water) setback requirements. The level of wastewater treatment (prior to dispersal) and the design of the dispersal system can also play a role in pathogen removal. The soil is critical, but the factors are complex, and there is no simple rule for proper design and operation. Attenuation and removal of pathogens in the soil is accomplished through such mechanisms as microbial predation, filtration, adsorption, and die-off.[2] Related factors include the depth, texture, and structure of the soil, hydraulic loading rate, and other physicochemical properties such as moisture, temperature, oxygen and pH.

[2] "microbial predation" refers to consumption by other soil microbes; "filtration" refers to physical trapping between soil particles; "adsorption" refers to attachment to the surfaces of soil particles; "die-off" refers to degradation or inactivation due to the inability of the pathogen to sustain itself in the soil environment.

It is well known that soils have a tremendous capacity to remove bacteria from percolating wastewater. The retention and die-off of most, if not all, pathogenic bacteria occur within 2 to 3 feet of the soil infiltrative surface in a properly functioning OWTS (Anderson et al, 1994; Washington Dept. of Health, 1990). Viruses can also be retained and eliminated within a few feet, depending on the soil conditions; but it is generally accepted that they can persist longer and travel farther in the soil than bacteria (Anderson, et al, 1991; Ayres and Associates, 1993). Unlike bacteria, viruses are not always present in individual residential OWTS discharges, since it depends on the health status of the residents. Viruses are more likely to be consistently present at some level in commercial and community wastewater systems, which accept wastes from a broader segment of the population. Once reaching the water table, bacteria and viruses have been found to survive and travel significant distances with the groundwater (potentially hundreds of feet), depending on the rate of groundwater movement. Survival time in soil and groundwater is typically on the order of days to weeks for bacteria, and weeks to months for viruses.

Consistent with current knowledge and practices for preventing pathogen impacts from OWTS, the Santa Clara County LAMP includes a combination of siting and design requirements including: soil depth and percolation characteristics, minimum vertical separation to groundwater, minimum horizontal setbacks to various water/landscape features, dispersal field design/sizing criteria based on percolation rates, and, for some situations, options for use of alternative treatment and dispersal designs. Horizontal setbacks are the same for all OWTS (conventional and alternative) and are consistent with long-standing criteria contained in the guidelines of the SF Bay and Central Coast Regional Water Quality Control Boards. The setback requirements also include more restrictive requirements for public water wells and public water system surface water intakes per the 2012 SWRCB OWTS Policy.

The key issue related to potential pathogen impacts from OWTS is the vertical separation below the dispersal trench to the seasonally high groundwater level (i.e., water table). **Table A-1** lists the depth to groundwater requirements for conventional OWTS in Santa Clara County, along with the corresponding groundwater separation requirements contained in the historical guidelines of the San Francisco Bay and Central Coast RWQCB and the Tier 1 requirements in the SWRCB OWTS Policy. As indicated, the adopted approach varies the depth to groundwater requirement according to the soil percolation rate and the shows the County requirements for conventional OWTS matches the Tier 1 requirements.

Table A-1
Comparison of Depth to Groundwater Requirements for Conventional OWTS
(feet, below trench bottom)

Percolation Rate (min per inch)	Santa Clara County	SF Bay RWQCB Guidelines	Central Coast RWQCB Guidelines	SWRCB OWTS Policy Tier 1 Requirements
1-5	20	20	20	20
6-30	8	3	8	8
31-120	5	3	5	5

Under the LAMP the County will allow reduced groundwater separation distances for different types of alternative treatment and dispersal systems as shown in **Table A-2**, also including the requirements for conventional OWTS for comparison.

Table A-2
Santa Clara County Depth to Groundwater Requirements
for Conventional and Alternative OWTS

Type of OWTS	Percolation Rate (MPI)	Min. Depth to Groundwater (feet[1])				
		2	3	5	8	20
Conventional Septic Tank & Dispersal Trench[2]	1-5					X
	6-30				X	
	31-120			X		
Conventional Trench w/ Supplemental Treatment	1-5				X	
	6-30			X		
	31-120		X			
Shallow Pressure Distribution (PD) Trench	1-5			X		
At-Grade	6-120		X			
Shallow PD w/Supplemental Treatment At-Grade w/Supplemental Treatment Mound Pressure-dosed Sand Trench Raised Sand Filter Bed Drip Dispersal w/Supplemental Treatment	1-5 6-120	X	X			
Raised Sand Filter Bed, w/Supplemental Treatment	1-5	X				
& Drip Dispersal	6-120	X				

[1] Measured from the bottom of the dispersal system
[2] Compliance with conventional OWTS requirements continues to apply for all new subdivisions, since alternative OWTS are not permitted to be used as the basis for new lot creation.

The supporting rationale for the reduced vertical separation requirement for the various alternative OWTS designs is derived from research studies done over the past 30 to 40 years, largely funded by the USEPA and referenced in the *On-site Wastewater Treatment Systems Manual* (US EPA, 2002). These studies have documented how various alternative treatment and dispersal methods can improve the operation and treatment effectiveness of OWTS as compared with conventional septic tank-gravity dispersal trench designs. A major focus of the research efforts has been on finding methods to augment or improve the natural pollutant removal processes in the soil (especially related to pathogens) to help overcome limited soil depth and high groundwater conditions, which are a common constraint virtually everywhere OWTS are used. The following is a review of some of the key findings and principles that have emerged from the research and have supported changes in OWTS siting and design criteria.

a. **Pressure Distribution.** There is strong evidence and agreement in the professional literature that pressure distribution improves the performance of any soil absorption system as compared with conventional gravity distribution, and should be the distribution method of choice (US EPA, 2002). This is due to two main factors: (1) pressure distribution disperses the wastewater flow uniformly over the entire available soil infiltrative surface, which allows the maximum absorption potential to be realized for any given soil condition; and (2) creation of wetting and draining cycles (via effluent dosing) promotes the maintenance of aerobic soil conditions at the infiltrative surface, which improves biodegradation and reduces the potential for soil clogging caused by the buildup of organic matter. The professional literature also notes that uniform spreading of the effluent discharge to the soil with the use of pressure distribution (or drip dispersal), ideally with timed-dosing, is critical to assure effective pathogen reduction in situations where the vertical separation is reduced.

b. **Supplemental Treatment.** Pathogen removal efficiencies can vary greatly amongst the different types of supplemental treatment systems that would be permitted and used under the County Ordinance. The greatest removal efficiencies are generally attributed to intermittent sand filters. Crites and Tchobanoglous (1998) present data showing fecal coliform removal efficiencies of 97.9 percent to 99.9 percent for intermittent sand filters. Leverenz, et al (2002) estimate intermittent sand filters as having the ability to produce effluent with fecal coliform concentrations <800 MPN/100 ml. For comparison, the fecal coliform concentration in effluent from a conventional septic tank is similar to that in raw sewage, and typically ranges from about 10,000 to 100,000 MPN/100 ml. (Crites and Tchbanoglous, 1998). Additionally, however, an important purpose of the supplemental treatment unit in combination with the dispersal system design is to establish and maintain aerobic/unsaturated conditions in the soil absorption field. Maintenance of aerobic soil conditions is conducive to pathogen removal and an

improvement over the operational conditions of conventional gravity dispersal fields, which are designed to allow a saturated (anaerobic) soil-infiltrative surface. Research has demonstrated that aerobic effluent: (a) promotes the growth of aerobic soil microflora that can have antagonistic effects on viruses; and (b) reduces the amount of organic compounds that compete for adsorption sites with viruses and bacteria (Potts, 2003).

c. **Pathogen Removal in Soils.** The retention and die-off of most, if not all, pathogenic bacteria occur within 2 to 3 feet of the soil infiltrative surface in a properly functioning OWTS (Anderson et al, 1994; Washington State DOH, 1990). Viruses can also be retained and eliminated within a few feet, depending on the soil conditions; but it is generally accepted that they can persist longer and travel farther in the soil than bacteria (Anderson et al, 1991; Ayres Associates, 1993). Studies have shown that vertical separation distances to groundwater of 12 to 18 inches are sufficient to achieve good fecal coliform removal where the wastewater receives supplemental treatment prior to soil application along with pressure distribution or drip dispersal methods (Converse and Tyler, 1998; Duncan et al, 1994). Additionally, most of the research studies of OWTS pathogen removal have focused on sandy soil types; and the results of these studies have formed the basis for the soil depth criteria, such as those contained in the EPA Design Manual (2 to 4 feet unsaturated soil depth). Consequently, the soil depth criteria are already oriented toward the "worst case" conditions (sandy, permeable soils), and there is a built-in safety factor, with respect to pathogen removal, for finer textured soils with higher silt and clay fractions.

As previously noted, while there is no simple rule or absolute formula for OWTS-groundwater separation, the Santa Clara County depth to groundwater criteria related to type of OWTS and percolation rates are similar to standards adopted and followed in many other counties in Northern California over the past 10 to 20+ years (for example, Marin, Sonoma, Napa, Contra Costa, Mendocino, Placer, Nevada, among others). In several counties these criteria have been applied to new subdivisions as well as for existing lots of record. The Santa Clara County LAMP only allows the use of alternative OWTS and reduced groundwater separation requirements for existing and future legal lots of record and for repair/replacement of existing OWTS; they are not permitted to be used as the basis of new lot creation.

Additionally, an important aspect of siting and design of OWTS under these criteria is the process for determining seasonally high groundwater levels in the dispersal field area. The requirements in Santa Clara County specify field observation methods for groundwater determination consistent with best industry practices. These requirements have been in effect for a number of years and will continue under the County LAMP.

Finally, the LAMP includes the establishment of an operating permit program for all alternative OWTS that will ensure ongoing inspection and monitoring of OWTS for verification of proper performance.

Based on the above considerations, the criteria relative to the depth to groundwater requirements and use of alternative treatment and dispersal methods are consistent with the current state of knowledge and best management practices and would provide suitable protection against pathogen impacts from onsite wastewater treatment systems.

2. Dispersal Trench Sizing

Dispersal trench sizing (i.e., length) is commonly based on three factors: (a) design wastewater flow; (b) trench infiltrative surface dimensions (width and depth); and (c) wastewater application rates (gpd/ft^2) related to percolation rate or soil type. Santa Clara County requirements differ in some respects from the SWRCB Tier 1 criteria, but overall provide a more conservative (safe) design approach, as follows:

a. Santa Clara County specifies the use of peak daily wastewater flow for dispersal system sizing; Tier 1 specifies the use of average daily wastewater flow (8.1.3). As a rule of thumb, average daily flow is typically about 50% of peak wastewater flow, resulting in 100% greater sizing/safety factor in the Santa Clara County design approach.

b. The standard allowance for infiltrative surface in Santa Clara County requirements is 4 ft^2 per lineal foot of trench, which agrees with the Tier 1 requirement (8.1.6). Santa Clara County also includes allowance for a deep trench design using 8 ft^2 infiltrative area per lineal foot of trench, which applies only in limited areas (<20% slope, deep soils and 5-60 mpi percolation rates). Where this is used it would double the amount of wastewater loading per lineal foot of trench, taking away the safety factor noted in (1) above. The overall loading rate per lineal foot of trench would be consistent with that calculated by the Tier 1 standard.

c. **Table A-3** below shows a comparison of the wastewater application rate criteria based on percolation rate for a range of values, including Santa Clara County requirements, Tier 1 criteria, US EPA and other SF Bay Area Counties, and the historical guidelines of the SF Bay and Central Coast RWQCB. As can be seen, there are similarities and differences among all of the criteria. Santa Clara County requirements are patterned after US EPA guidelines, which have been followed in several other SF Bay Area counties for the past 20+ years. Santa Clara County requirements agree with Tier 1 in the lower (faster) percolation range, but differ for slower percolation rates. However, the difference in using peak flow rather than average flow (noted above) compensates for the difference in applications rate factor.

Table A-3
Wastewater Application Rates for OWTS Dispersal Field Sizing
(gpd/ft^2)

Percolation Rate (mpi)	Santa Clara County LAMP	SWRCB OWTS Policy Tier 1	USEPA Design Manual & SF Bay Counties	SF Bay RWQCB Guidelines	Central Coast RWQCB Guidelines
1-5	1.20	1.20	1.20 – 1.086	1.58 – 0.82	0.80
10	0.80	0.80	0.80	0.64	0.80
24	0.60	0.60	0.60	0.39	0.60
30	0.56	0.533	0.56	0.30	0.25
45	0.45	0.367	0.45	0.25	0.25
60	0.35	0.2	0.35	0.22	0.25
90	0.20	0.1	0.20	0.22	0.1
91-120	0.20	0.1	0.20	0.22	0.1

Additionally, it should be noted that Santa Clara County requires the installation of dual (200%) dispersal fields, whereas Tier 1 requires 100% installation plus a set-a-side 100% reserve area for future replacement. A dual system installation gives a significant built-in safety factor for public health and water quality protection not provided by the Tier 1 approach.

3. Horizontal Setbacks

Santa Clara County's OWTS Ordinance includes horizontal setback distances that equal or exceed the SWRCB Tier 1 requirements in all respects except for Tier 1 item 7.5.5 which specifies a 200-ft setback from "… vernal pools, wetlands, lakes, ponds, or other surface waters…". Santa Clara County requirements treat these water bodies the same as "watercourses", with a 100-ft horizontal setback requirement, which is consistent with RWQCB guidelines and requirements found in all other jurisdictions reviewed. The SWRCB's rationale for the 200-ft setback distance is not known.

The County's 100-ft setback distance is meant to protect beneficial uses of both watercourses and water bodies, which primarily include contact and non-contact recreation and aquatic resources. Consistent with the SWRCB OWTS Policy, Santa Clara County includes a 200-ft to 400-ft setback for surface waters in proximity to public water supply intakes – a beneficial use of water warranting a higher level of protection from waste sources.

The Tier 1 200-ft setback in 7.5.5 appears to be without substantial merit and at odds with other setback requirements – e.g., 100-ft setback from a domestic water supply well. The possible justification for a 200-ft setback from stock watering ponds, golf course lakes, and wetlands that may or may not have any surface water features is not known.

Additionally, a mandatory setback of 200-ft from vernal pools may be meaningless when many vernal pools have very small hydrologic catchment areas extending much less than 200 feet. However, to avoid possible impacts on vernal pools Santa Clara County's Onsite Systems Manual includes the added requirement for completion of a cumulative impact assessment for any OWTS proposed to be located within 200 feet of a vernal pool. This would mainly focus on hydrologic/groundwater mounding analysis, due the high sensitivity of vernal pools to hydrological changes.

4. Allowable Densities for New Subdivisions

Tier 1 (section 7.8) specifies that average development density (i.e., acres per dwelling unit/OWTS) be based on a sliding scale (0.5 to 2.5 acres) related to average rainfall. Santa Clara County requirements are more conservative (safe) in that they specify: (a) a minimum lot size of 1 acre, countywide; (b) a minimum lot size of 2.5 acres in any reservoir watershed area; and (3) cumulative impact assessment of nitrate loading effects for any subdivision with less than 2.5 acre lot size density.

5. More Protective Aspects of Santa Clara County LAMP

The following highlight the more protective aspects of the Santa Clara County LAMP as compared with the Tier 1 requirements of the SWRCB OWTS Policy.

- **Alternative OWTS.** Establishes requirements for alternative OWTS, providing better options, design guidance and a managed system for dealing with repairs/replacement for the approximately 12,500 existing OWTS in the county.

- **Operating Permits.** Establishes operating permit program for alternative OWTS and some other OWTS (e.g, over 2,500 gpd flow) to ensure a higher level of performance monitoring and regular reporting to the County.

- **Cumulative Impact Assessments.** Includes requirements and guidelines for conducting cumulative impact assessments related to nitrate loading, groundwater mounding or other issues or locations of concern; mandatory for flows over 2,500 gpd. Tier 1 allows OWTS designs up to 3,500 gpd with no comparable requirements.

- **Septic Tank Pumper Inspection & Reporting Requirements.** Institutes a program for basic inspection of OWTS at the time of septic tank servicing, and reporting of results to the County.

- **Dual (200%) Dispersal System.** Requires installation of dual (200%) dispersal fields rather than 100% installed, 100% reserve.
- **Seepage Pits.** Prohibits the use of seepage pits; Tier 1 identifies seepage pits as an alternative for OWTS repairs (8.1.6).
- **Pump Systems.** Onsite Systems Manual includes design guidance and requirements for pump systems.
- **Pressure Distribution Systems.** Treats pressure distribution systems as an "alternative" OWTS, including requirements for operating permit and performance monitoring/reporting. Tier 1 (8.1.4) recognizes pressure distribution as a conventional trench design option.
- **Cut Banks and Steep Slopes.** Includes horizontal setback requirement for cut banks and steep slopes, which represent potential avenues for effluent seepage.
- **Maximum Trench Depth.** Specifies maximum depth of 8 feet for dispersal trench, compared with 10 feet allowed by Tier 1.
- **Peak vs Average Flow.** Dispersal system design based on peak, rather than average wastewater flow as provided in Tier 1.
- **Erosion Control.** Includes requirements for OWTS installations for certain slopes, type and size of project.
- **Floodplains.** Includes setback and design requirements related to floodplains.
- **Performance Evaluation Guidelines.** Provides procedures and criteria to guide performance evaluations of OWTS in connection with building remodel projects, property transfers, abatement investigations, etc.

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Appendix B

Cumulative Nitrate and Salt Loading from OWTS in Santa Clara County

APPENDIX B

Cumulative Nitrate and Salt Loading From OWTS in Santa Clara County July 2014

Part 1 - OWTS Usage Estimates

The following describes the process used to develop estimates of the total number and distribution of OWTS in Santa Clara County. The analysis was completed by Questa Engineering using GIS data supplied by County of Santa Clara. Questa delineated watershed sub-basin boundaries and merged that data with soil/GIS mapping to organize all parcels for subsequent analysis and presentation.

Geographic Study Area

The geographic area covered in the analysis included the unincorporated area of Santa Clara County, plus those portions of the City of San Jose and Town of Los Altos Hills which do not have municipal sewer service and instead rely on the use of OWTS. The portions of San Jose served by OWTS are: (a) areas on the east side of the City in the foothills along the base of Mt. Hamilton; and (b) areas in the southern end of the City in the vicinity of Almaden and Calero Reservoirs. In Los Altos Hill about half of the Town is on public sewers and the other half is served by OWTS. Throughout the remaining incorporated areas of Santa Clara County there are a number of individual lots and small pockets of development not connected to municipal sewers. These lots were not included in the study, as they tend to be widely scattered and represent a small fraction of the total OWTS in the County. Additionally, from the standpoint of growth implications, the location of these scattered parcels within an existing urban services area (with availability of public sewers) was judged to have more significance than the requirements applicable to OWTS.

Parcel Development Status

The next step in the analysis was to identify and create an inventory of the non-sewered parcels in the County along with their development status (i.e., developed or vacant). It was found that this information is not readily available from any County department. Therefore, this was done according to the following process using the County GIS data base:

1. **Identify Non-sewered Parcels.**

- First, city and sanitary district boundaries were applied to the County-wide data base to exclude parcels located within areas served by public sewers. This included mainly incorporated lands, but it also included unincorporated areas of Lake Canyon and Lions Gate, which are served by their own community wastewater facilities. “Islands” of unincorporated lands falling within city boundaries were also excluded during this step.

- Next, properties in the City of San Jose and the Town of Los Altos Hills known (from city-supplied data) to be outside of established sewer system boundaries and served by OWTS were added back into the inventory of "non-sewered" parcels.

2. Exclude "Non-development" Areas.

- Using County-supplied shape-file data, public lands were removed from the non-sewered inventory, including such things as parks, public facilities, rights-of-way, and open space.

- Other private open space areas and easements (not classified as public lands) identified on maps supplied by the Santa Clara Open Space Authority were removed by best fit analysis.

- From the above analysis, the total number of non-sewered parcels in the County (excluding non-development areas) was determined to be approximately 17,625.

3. Determine Development Status.

- County Assessor's information and other GIS data were reviewed and found not to have any designation of whether or not a particular property is developed or vacant; "improvement value" for each property was judged to be the most reasonable indicator.

- An iterative process was followed to determine the "improvement value" most indicative of a developed vs vacant property. Starting with a $20,000+ improvement value, properties were spot-checked against air photos to determine the presence/absence of buildings and other property features indicative of existing development for habitation. This was repeated sequentially for assessed improvement values of $15,000, $10,000, $5,000, $4,000, $3,000, $2,000 and finally $1,000. By air photo inspection, properties with <$1,000 assessed improvement value were shown consistently to be vacant, and therefore this value was selected as the developed vs. vacant indicator.

- The $1,000 assessed improvement value indicator as derived above was then assigned to the County-wide GIS inventory of non-sewered parcels, with the following findings:

    - Developed Parcels: 12,543
    - Vacant Parcels: 5,082
    - Total Parcels 17,625

Table B-1. North County - RWQCB Region 1

OWTS Usage Estimates by Watershed*

Watershed Name	Non-sewered Area (acres)	Existing Parcel Status (<1 Acre)			Existing Parcel Status (> 1 Acre)		
		Total Parcels	Developed	Vacant	Total Parcels	Developed	Vacant
San Francisquito Creek	100	2	0	2	5	4	1
Adobe Creek	3,936	270	180	90	964	833	131
Permanente Creek	7,715	1,302	1,188	113	737	625	112
Calabazas Creek	711	2	1	1	15	9	6
San Tomas Creek	2,857	18	9	9	218	143	75
Guadalupe River	3,817	368	323	45	260	191	69
Lexington Basin	9,480	1,289	777	512	880	587	293
Upper Los Gatos Creek	4,042	2	0	2	70	38	32
Alamitos Creek	5,636	274	209	65	561	429	132
Coyote Creek	91,180	467	342	125	1,568	1,052	516
Calaveras Reservoir	50,820	31	13	18	292	111	181
Northeast County	78,712	1	0	1	393	110	283
TOTAL	226,348	4,026	3,042	984	5,963	4,132	1,831

Table B-2. South County - RWQCB Region 3

OWTS Usage Estimates by Watershed*

Watershed Name	Non-sewered Area (acres)	Existing Parcel Status (< 1 Acre)			Existing Parcel Status (> 1 Acre)		
		Total Parcels	Developed	Vacant	Total Parcels	Developed	Vacant
Upper Llagas Creek	7,694	13	4	9	153	82	71
Llagas Morgan Hill	8,804	283	164	119	1,162	927	235
Llagas San Martin	11,397	530	409	121	1,809	1,487	322
Llagas East Gilroy	9,744	11	6	5	313	198	115
Llagas Gilroy	17,679	219	125	94	1,356	1,073	283
Uvas Creek	41,458	126	48	78	1,349	788	561
Pacheco Creek	75,546	14	1	13	282	55	227
Pescadero Creek	6,049	1	0	1	15	2	13
TOTAL	178,371	1,197	757	440	6,439	4,612	1,827

Part 2 - Cumulative Wastewater Volume, Nitrate and Salt Loading Projections

Based on the estimated number of existing developed properties using OWTS determined from the Part 1 analysis, this section presents estimates of the associated cumulative wastewater loading and distribution throughout different geographical and hydrological regions of the County.

Cumulative wastewater loading estimates were compiled for the 20 watershed sub-basins defined in Part 1. Wastewater loading estimates focused on three parameters: (1) total wastewater volumes discharged via OWTS dispersal fields to the environment; (2) resultant total nitrate-nitrogen loading to the groundwater within each watershed sub-basin; and (3) resultant total dissolved solids (salt) loading to the groundwater within each watershed sub-basin.

Wastewater Volumes

Design Wastewater Flow. Individual OWTS are normally designed on the basis of the estimated maximum daily sewage flow from the residence or building(s) served. Under the former Santa Clara County Onsite Wastewater Ordinance, the standard design factor was 150 gallons per day (gpd) per bedroom, with a minimum size of 450 gpd for any system serving up to a 3-bedroom residence. Under the new Ordinance, the 150 gpd/bedroom factor is retained, but the 450 gpd minimum is eliminated in favor of requiring the design to be matched to the actual number of bedrooms in the residence.

Actual Wastewater Flow. The design sewage flow is purposely set with a margin of safety above the actual wastewater flows, in order to accommodate maximum usage of an individual system. The factor of 150 gpd/bedroom is based on the assumption of occupancy of two persons per bedroom and a sewage generation rate of 75 gpd per capita. The 450 gpd minimum design flow in Santa Clara County equates to a household occupancy of 6 persons. According to the 2010 Census, the average occupancy in Santa Clara County is approximately 2.9 persons per household. Also, based on information from the US EPA OWTS Manual (2002) the actual residential sewage generation rates are found to be in the range of 45 to 70 gpd/per capita. Using these figures, the actual average wastewater flow from a group of residential OWTS would be in the range of about 130 to 200 gpd per residence. For comparison, wastewater flow monitoring of the Lake Canyon Community Wastewater System (51 connections) over the past 15 years indicates average wastewater flows in the range of 65 to 120 gpd/residence. Lake Canyon would be considered representative of a group of generally older residences; new homes of typically larger size would likely generate greater wastewater volumes. Considering all of these data, an average wastewater flow on the order of 150 gpd per residential OWTS is considered a reasonable estimate for Santa Clara County as a whole.

Watershed Sub-basin Estimates. Using the unit flow rate of 150 gpd per residential OWTS, **Tables B-3** and **B-4** present the estimated volume of wastewater generated for each of the 20 watershed sub-basins for existing development conditions. Estimated wastewater volumes are shown in gallons per day (gpd) and million gallons per year (Mgal/yr). Additionally, the average annual wastewater loadings, in gallons per acre, are calculated and presented based on the total acreage of non-sewered area within each watershed sub-basin.

As indicated in far right-hand column of **Table 3**, in the North County estimated annual wastewater loading rates range from lows of a few hundred gallons per acre per year in the more remote northeastern areas, to the highest rates on the order of about 7,000 to 14,000 gal/ac-yr in the Adobe Creek and Permanente Creek sub-basins. The higher rates in these sub-basins are influenced by the large number of OWTS located in the Town of Los Altos Hills. The Lexington Basin has the next highest wastewater loading rates, 4,600 gal/ac-yr, followed by Guadalupe River and Alamitos Creek sub-basins.

In the South County, per **Table 4**, the projected annual wastewater loadings range from lows of less than 200 gal/ac-yr in the remote southeast and southwest corners of the County, to the highest in the Morgan Hill and San Martin areas of the Llagas Creek watershed, with loading rates currently in the range of about 6,000 to 8,000 gal/ac-yr.

Table B-3. Estimated Wastewater Loading Volumes

North County - RWQCB 2

Watershed Sub-basin	Non-sewered Area (acres)	Existing Conditions			
		Developed Parcels	Discharge Volume (gpd)	Discharge Volume (Mgal/yr)	WW Loading gal/ac-yr
San Francisquito Crk	100	4	600	0.22	2,190
Adobe Creeek	3,909	1,013	151,950	55.46	14,188
Permanente Creeek	13,948	1,813	271,950	99.26	7,117
Calabazas Creek	855	10	1,500	0.55	640
San Tomas Creek	6,985	152	22,800	8.32	1,191
Guadalupe River	10,649	514	77,100	28.14	2,643
Lexington Basin	16,333	1,364	204,600	74.68	4,572
Upper Los Gatos Crk	6,549	38	5,700	2.08	318
Alamitos Creek	16,202	638	95,700	34.93	2,156
Coyote Creek	145,642	1,394	209,100	76.32	524
Calaveras Reservoir	73,040	124	18,600	6.79	93
Northeast County	81,343	110	16,500	6.02	74
TOTAL	316,227	7,174	1,076,100	393	1,242

Table B-4 Estimated Wastewater Loading Volumes

South County - RWQCB 3

Watershed Sub-basin	Non-sewered Area (acres)	Existing Conditions			
		Developed Parcels	Discharge Volume (gpd)	Discharge Volume (Mgal/yr)	WW Loading gal/ac-yr
Upper Llagas	8,840	86	12,900	4.71	533
Llagas Morgan Hill	9,685	1,091	163,650	59.73	6,168
Llagas San Martin	12,842	1,896	284,400	103.81	8,083
Llagas East Gilroy	10,108	209	30,600	11.17	1,105
Llagas Gilroy	18,192	1,198	179,700	65.59	3,605
Uvas Creek	47,522	836	125,400	45.77	963
Pacheco Creek	97,454	56	8,400	3.07	31
Pescadero	6,049	2	300	0.11	18
TOTAL	210,692	5,369	805,350	294	1,395

Nitrate-Nitrogen Loading

Nitrate-nitrogen loading from OWTS can potentially degrade groundwater quality and contribute to nutrient enrichment of surface waters. Nitrogen occurs in high concentrations in domestic sewage, typically in the range of 50 to 90 mg-N/L. It occurs mostly as ammonia and organic forms, and is removed only partially through conventional septic tank treatment. Upon entering the unsaturated soil environment, these forms of nitrogen undergo transformation to nitrate. Nitrate is highly soluble in water and moves readily through the soil and groundwater with limited removal by the soil under most circumstances. High levels of nitrate in water supplies can cause methemoglobinemia (blue baby syndrome) in infants and pregnant women. The drinking water standard (MCL) for nitrate-nitrogen is 10 mg/L (as nitrogen, N), which is equivalent to 45 mg/L as nitrate, NO_3.

Nitrate loading is normally not an issue for individual residential OWTS, but can become a "cumulative impact" concern for large concentrations of OWTS in a given area or for larger commercial or community-type OWTS. Per the SCVWD 2010 Groundwater Quality Report (June 2011), elevated levels of nitrate, above the drinking water MCL, have been found in water wells located in two principal areas of Santa Clara County: (1) Coyote Valley, two (2) wells with nitrate above the MCL (9% of wells sampled); and (2) Llagas Sub-basin, 14% of wells sampled in the principal aquifer zone (wells screened at greater than 150 feet below grade) and about 50% of wells screened in the shallow aquifer zone. Additionally, Llagas Creek and Pajaro River have been designated as impaired water bodies per Section 303(d) of the Clean Water Act due to high nitrate concentrations. Agricultural fertilizers have been identified by the Central Coast RWQCB as the primary nitrate-nitrogen source and cause of impairment in these two water bodies. Nevertheless, OWTS contribute to the overall nitrate loading to the various watersheds and groundwater basins in Santa Clara County; and the contributions will likely increase with future development using OWTS.

Using the estimates of existing OWTS densities and wastewater loading volumes (per above), calculations have been made to estimate the existing contribution in groundwater-nitrate concentrations due to residential OWTS in the County. The estimated nitrate concentration contributions per this analysis are in addition to other sources of nitrate that might occur in each sub-basin, such as leaching of agricultural fertilizers, confined animal wastes, municipal wastewater discharges, etc.

Methodology

The nitrate loading analysis was completed using an annual chemical-water balance analysis. The methodology followed is described in the publication "Predicting Groundwater Nitrate-Nitrogen Impacts" (Hantzsche and Finnemore, *Groundwater*, Vol. 30, No. 4, July-August 1992). According to this methodology, the long-term concentration of nitrate as nitrogen (NO_3-N or nitrate-nitrogen) in the upper saturated groundwater zone can be closely approximated by the quality of percolating recharge waters. Considering only the contributions from OWTS and natural sources picked up by rainfall leaching of soil and vegetation, the average concentration of nitrate-nitrogen in recharge water, n_r, is estimated using the following equation:

$$n_r = \frac{Wn_w(1-d) + Rn_b}{(W+R)}$$

where: n_r = resultant average concentration of NO_3-N in recharge water, mg-N/l

W = average annual volume of wastewater entering the soil, acre-ft/yr (AFY)

n_w = total nitrogen concentration of wastewater, mg-N/l

d = fraction of NO_3-N loss due to denitrification in the soil

R = average annual volume of rainfall recharge in sub-basin area, AFY

n_b = background NO_3-N concentration of rainfall recharge at the water table, exclusive of wastewater, agriculture or other development influences, mg-N/l

Data and Assumptions

Per the equation presented above, resultant nitrate concentration in the groundwater is estimated to be the weighted average or combined concentration due to wastewater loading and recharge of rainfall ("deep percolation") contributed from the watershed sub-basin within the area of concern. For this analysis, calculations were made for each of the 20 watershed sub-basins covering the non-sewered areas of Santa Clara County. The analysis includes nitrate-nitrogen contributions from the existing OWTS plus a factor representing background nitrate concentrations associated with percolating rainfall in the open space areas. The following summarize the various assumptions.

- **Recharge Area.** The recharge area for each sub-basin includes the total estimated acreage of non-sewered land within each sub-basin, as listed in **Tables B-3** and **B-4**. The acreage includes the parcels currently developed with OWTS, vacant developable parcels, as well as the public lands and open space easement areas. Land areas served by public sewers are excluded from the "recharge area".

- **Wastewater Flows.** The nitrate loading analysis was completed for the existing estimated annual wastewater volumes presented in **Tables B-3** and **B-4**, which are based on an average wastewater flow assumption of 150 gpd per residential OWTS (3 persons per residence at approximately 50 gpd per person).

- **Wastewater Nitrogen Concentrations.** Total nitrogen concentration in wastewater effluent was assumed to be 70 mg/L, which is typical for domestic wastewater discharges from conventional septic tank – dispersal trench systems, based on a per capita wastewater volume of 50 gpd/capita (Crites and Tchobanoglous, 1998). This value is appropriate for calculations of nitrate loading from existing development which use

predominantly conventional septic tank – leachfield systems. In the future, it is anticipated that the use of alternative treatment and dispersal methods will increase, and these types of systems will provide greater nitrogen removal, potentially up to 50% or more of that coming from conventional OWTS.

- **Background Nitrogen Concentration.** Limited water quality sampling data for local wells in non-agricultural areas indicate low to non-detectable levels of nitrate-nitrogen. Therefore, a nominal value of 0.5 mg-N/L was assumed as the background concentration associated with percolating rainfall.

- **Soil Denitrification.** Total nitrogen removal in the upper soil zones (via denitrification) was estimated to be 15 percent of the total nitrogen in the percolating OWTS effluent, which is on the low (conservative, safe) end of the common range of values (10% to 25%) normally attributed to soil denitrification. This value was selected based on the relatively permeable soil conditions in most parts of Santa Clara County.

- **Rainfall Recharge (Deep Percolation).** Deep percolation was estimated through completion of a water balance analysis, which takes into account rainfall, runoff, and evapotranspiration losses. Water balance calculations were made for four different geographic and climatic regions of the County: (1) Santa Cruz Mountains; (2) South Santa Clara Valley; (3) Diablo Range; and (4) Southeastern Diablo Range. Key data sources used in the water balance and the resulting estimates of annual recharge (inches per year) were as shown in **Table B-5**; calculation sheets are attached at the end of this memorandum.

Table B-5. Water Balance Data Source and Estimates

Geographic Area	Rainfall Station	Reference Evapotranspiration Zone (ETo)*	Estimated Annual Recharge	
			inches/yr	ac-ft/yr-ac
Santa Cruz Mountains	Los Gatos	3 – Coastal Valleys/Mountains	10.89	0.91
South Santa Clara Valley	Gilroy	8 – Inland SF Bay	8.16	0.68
Diablo Range	Mt. Hamilton	14 – Mid-Central Valley	7.22	0.60
Southeast Diablo Range	Gilroy	14 – Mid-Central Valley	2.93	0.24

*per California Irrigation Management Information System (CIMIS)

Results

The results of the nitrate loading calculations analysis are summarized in **Tables B-6** and **B-7**, respectively, for the North County and South County watershed sub-basins. The estimated groundwater-nitrate concentration impacts from OWTS are presented for existing development conditions.

The estimated nitrate contribution in the areas of highest OWTS densities range from about 1.5 to 3.2 mg-N/L, well below the drinking water limit of 10 mg-N/L.

The following should be recognized in regard to these results:

- The results are generalized over each sub-basin area and represent the average, integrated effect of all OWTS and rainfall-recharge contributions;

- The analysis and results do not account for the nitrogen contributions from other possible sources, such as agricultural and landscape fertilizer use, animal wastes, and wastewater discharges other than OWTS.

- Localized results for a specific parcel or group of parcels (e.g., neighborhood) within each sub-basin would most probably differ from the generalize results presented due to site specific conditions such as:, parcel size(s) and configuration, local rainfall, site development and landscape features, runoff rates, and wastewater system flows and design.

Table B-6. Estimated Groundwater-Nitrate Contribution from OWTS
North County – SF Bay RWQCB 2

Watershed Sub-basin	Non-sewered Area (acres)	Estimated Groundwater-Nitrate Contribution from OWTS, mg-N/L
San Francisquito Creek	100	0.93
Adobe Creek	3,936	3.20
Permanente Creek	7,715	1.89
Calabazas Creek	711	0.63
San Tomas Creek	2,857	0.74
Guadalupe River	3,817	1.02
Lexington Basin	9,480	1.40
Upper Los Gatos Creek	4,042	0.56
Alamitos Creek	5,636	0.93
Coyote Creek	91,180	0.66
Calaveras Reservoir	50,820	0.53
Northeast County	78,712	0.52

Table B-7. Estimated Groundwater-Nitrate Contribution from OWTS
South County – Central Coast RWQCB 3

Watershed Sub-basin	Non-sewered Area (acres)	Estimated Groundwater-Nitrate Contribution from OWTS, mg-N/L
Upper Llagas Creek	8,840	0.61
Llagas Morgan Hill	9,685	2.10
Llagas San Martin	12,842	2.58
Llagas East Gilroy	10,108	0.79
Llagas Gilroy	18,192	1.44
Uvas Creek	47,522	0.69
Pacheco Creek	97,454	0.52
Pescadero	6,049	0.50

Salt Loading

With the exception of distilled water, all water contains dissolved solids, which include various salts and other minerals such as calcium, chloride, magnesium, potassium, and sodium. Domestic wastes can increase the concentration of total dissolved solids (TDS) in the wastewater (as compared with the water supply) by as much as 200 to 400 mg/L, based on average per capita sewage flow of about 50 gallons per day (Crites and Tchobanoglous, 1998). This includes the contribution from water softeners, which can make up a substantial portion of the added TDS loading. Dissolved solids are not removed to any appreciable degree through onsite treatment systems (septic tanks) or by passage through the soil. Therefore, the use of an OWTS would contribute to some incremental increase in the TDS levels in the groundwater beneath and down-gradient of OWTS dispersal fields.

To estimate the cumulative effect of TDS loading from OWTS on groundwater in Santa Clara County, an analysis was completed similar to the previously described nitrate-nitrogen analysis. The analysis was conducted watershed-by-watershed and includes calculations for existing conditions.

Methodology

The salt loading analysis was completed using an annual chemical-water balance analysis, following the same approach as used for the nitrate-nitrogen loading analysis above. Under this approach, the long-term concentration of total dissolved solids in the upper in the upper saturated groundwater zone can be closely approximated by the quality of percolating recharge waters. Considering only the contributions from OWTS and natural sources picked up by rainfall

leaching of minerals from the soil and formations, the average long-term concentration of TDS in recharge water, s_r, is estimated using the following equation:

$$s_r = \frac{W(s_s + s_w) + RS_b}{(W + R)}$$

where: s_r = resultant average concentration of TDS in recharge water, mg/l

W = average annual volume of wastewater entering the soil, acre-ft/yr (AFY)

S_s = total dissolved solids concentration of water supply, mg/l

s_w = total dissolved solids concentration of wastewater, mg/l

R = average annual volume of rainfall recharge in sub-basin area, AFY

S_b = background TDS concentration of rainfall recharge due to mineral pick-up through percolation, exclusive of wastewater, agriculture or other development influences, mg/L

Data and Assumptions

Per the equation presented above, resultant TDS concentration in the groundwater is estimated to be the weighted average or combined concentration due to wastewater loading and recharge of rainfall ("deep percolation") contributed from the watershed sub-basin within the area of concern. For this analysis, calculations were made for each of the 20 watershed sub-basins covering the non-sewered areas of Santa Clara County. The analysis includes TDS contributions from the existing OWTS plus a factor representing background TDS concentrations associated with natural mineral pick-up by percolating rainfall. The following summarize the various assumptions.

- **Recharge Area.** The recharge area for each sub-basin includes the total estimated acreage of non-sewered land within each sub-basin, as listed in **Tables B-3** and B-**4**. The acreage includes the parcels currently and potentially developable with OWTS, as well as the public lands and open space easement areas. Land areas served by public sewers are excluded from the "recharge area".

- **Wastewater Flows.** The TDS loading analysis was completed for the estimated existing annual wastewater volumes presented in **Tables B-3** and B-**4**, which are based on an average wastewater flow assumption of 150 gpd per residential OWTS (3 persons per residence at approximately 50 gpd per person).

- **Wastewater TDS Concentrations.** Total dissolved solids concentration in wastewater effluent was assumed to be equal to the concentration in the domestic supply plus an average of 300 mg/L due to waste additions.

    - **Domestic Supplies**. Review of published water supply data available from the SCVWD and other water suppliers in Santa Clara County (e.g., San Jose Water, California Water Service Company) indicate TDS concentrations for water supplies in the North County than in the South County areas. While values fluctuate from amongst different sources of supply, TDS values of 270 mg/L and 340 mg/l, respectively, were used for the North and South County watershed areas for this analysis.

    - **Wastewater TDS Addition**. Based on Crites and Tchobanoglous (1998), an average TDS addition of 300 mg/L was assumed to reflect the salt loading from residential sewage in an OWTS; this is for an average wastewater flow rate of 50 gal/capita/day. It includes the effects of the periodic backwash of brine from water softeners.

- **Background TDS Concentration.** Estimates of background TDS concentrations were made by reviewing groundwater data from SCVWD (2011) and from other well water sources to determine the typical minimum reported concentrations. This was taken as the best approximation of the natural accumulation of TDS in groundwater as a result of leaching from soils and geologic materials by percolating rainfall. Typical values of 200 mg/L in the North County watershed areas, and 270 mg/L in the South County were selected based on inspection of these data.

- **Rainfall Recharge (Deep Percolation).** Deep percolation values were the same as those previously presented and used for the nitrate loading analysis.

Results

The results of the TDS loading calculations analysis are summarized in **Tables B-8** and B-**9**, respectively, for the North County and South County watershed sub-basins. The estimated groundwater-TDS contributions from OWTS are presented for existing development conditions.

Table B-8. Estimated Groundwater-TDS Contribution from OWTS
North County – SF Bay RWQCB 2
(mg/L Total Dissolved Solids, TDS)

Watershed Sub-basin	Typical Source Water Quality*	Estimated Background Groundwater Quality**	TDS Contribution from OWTS (mg/L)
San Francisquito Crk	270	200	2.7
Adobe Creek	270	200	16.9
Permanente Creek	270	200	8.7
Calabazas Creek	270	200	0.8
San Tomas Creek	270	200	1.5
Guadalupe River	270	200	3.3
Lexington Basin	270	200	5.6
Upper Los Gatos	270	200	0.4
Alamitos Creek	270	200	2.7
Coyote Creek	270	200	1.0
Calaveras Reservoir	270	200	0.2
Northeast County	270	200	0.2
Average	270	200	1.8

* TDS concentration of drinking water at properties served by OWTS

**TDS concentration due to mineral pickup through soil and geologic strata.

Table B-9. Estimated Groundwater-TDS Contribution from OWTS
South County – Central Coast RWQCB 3
(mg/L Total Dissolved Solids, TDS)

Watershed Sub-basin	Typical Source Water Quality*	Estimated Background Groundwater Quality**	Existing Conditions
			TDS from OWTS (mg/L)
Upper Llagas Creek	340	270	0.7
Llagas Morgan Hill	340	270	10.0
Llagas San Martin	340	270	13.0
Llagas East Gilroy	340	270	1.8
Llagas Gilroy	340	270	5.9
Uvas Creek	340	270	1.2
Pacheco Creek	340	270	0.2
Pescadero	340	270	0.02
Average	340	270	2.9

* TDS concentration of drinking water at properties served by OWTS

**TDS concentration due to mineral pickup through soil and geologic strata.

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