Chollas Watershed
Comprehensive Load Reduction Plan

Submitted by:

FINAL

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With support provided by:

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Executive Summary

This Comprehensive Load Reduction Plan (CLRP) for the Chollas Hydrologic Sub Area (HSA) (Chollas watershed), part of the San Diego Bay watershed, represents an integrated water quality plan combining multiple permit-based and voluntary strategies and best management practices (BMPs) into a comprehensive approach for achieving compliance with the *Revised Total Maximum Daily Loads for Indicator Bacteria, Project 1 – Twenty Beaches and Creeks in the San Diego Region* (Bacteria TMDL) which was approved by the San Diego Regional Water Quality Control Board and took effect April 4, 2011. This CLRP also integrates the Chollas watershed Metals TMDL and Diazinon TMDL. The City of San Diego, City of La Mesa, City of Lemon Grove, County of San Diego (County), Caltrans, and the San Diego Unified Port District (Port of San Diego), as the Responsible Parties (RPs) for the watershed, will use this CLRP to develop watershed implementation programs, evaluate their effectiveness, and make adjustments over the anticipated 20-year implementation period.

This document is in response to the Bacteria TMDL. This CLRP integrates information and data from multiple water quality permit requirements, studies, initiatives, and reports into a single framework. This CLRP represents the TMDL Implementation Plan required in the Bacteria TMDL, along with a schedule for attaining Waste Load Allocations (WLAs). BMPs recommended in the CLRP should be evaluated for implementation over the 20-year period from the effective date of the Bacteria TMDL through 2031, with an associated monitoring plan and periodic evaluations of the CLRP.

The RPs recognize that the program must use adaptive management to employ new information and technologies over time to achieve compliance with the TMDL in a sustainable manner that maximizes cost effectiveness and minimizes impacts to the community. The monitoring and re-evaluation components are intended to ensure that an adaptive management approach is utilized throughout the BMP Implementation Schedule to refine and adapt BMPs, based on monitoring input and other feedback, in a manner best suited to sustainably achieving compliance with the Bacteria TMDL, as well as other applicable water quality permits and standards.

The Chollas watershed is a highly urbanized area with concentrations of commercial and industrial uses and has unique conditions and multiple regulatory drivers that require special consideration in developing this CLRP. In addition to addressing the TMDL reductions, this CLRP specifically addresses the watershed's other regulatory drivers and impairments. Pollutants addressed in this CLRP include Clean Water Act section 303(d)-listed pollutants such as nutrients (nitrogen and phosphorus), trash, and sediment toxicity/benthic community effects. By incorporating a comprehensive approach to all of the pollutants, impairments and concerns, the CLRP framework is intended to improve the efficiency and effectiveness of BMP planning, and as a result, to reduce the overall cost of implementation and compliance monitoring.

The CLRP is structured to present the Chollas watershed's physiography and other key characteristics; review the Clean Water Act section 303(d)-listed pollutants of concern; characterize the location, nature and extent pollutant sources and pollutant generating activities (PGAs) in the watershed; prioritize subwatersheds based on pollutant load estimates and resulting water quality composite scores; evaluate and recommend nonstructural and structural BMPs to address pollutant loads; present a schedule for implementation; and outline the order-of-magnitude estimated costs of BMP implementation to achieve compliance. A monitoring plan and specific implementation steps, notably performing modeling and optimization in a latter phase to help prioritize BMP implementation, are outlined in detail. Costs associated with recommended BMPs are addressed in an appendix to the CLRP.

The CLRP is a compliance plan that includes a suite of recommended nonstructural and structural BMPs. These BMPs were developed and selected based on their applicability to the specific pollutants, impairments and conditions addressed; the specific land use conditions and availability of land in the

Chollas watershed, particularly in areas designated as High Priority Management Areas (HPMAs) in Section 3.

All activities and BMPs in the CLRP were included in order to demonstrate a roadmap of compliance with the Bacteria TMDL. The RPs should implement activities and BMPs as resources are available in the future. The construction and implementation of BMPs and related activities will be prioritized along with all other essential jurisdictional obligations such as, but not limited to: public infrastructure rehabilitation and maintenance, compliance with other government mandated regulations, recreation, and public safety. Implementation of BMPs may require individual economic justifications relative to available funding and perceived holistic benefit to taxpayers and residents.

Nonstructural BMPs selected for the Chollas watershed, as described in Section 4 and Appendix E, were characterized in terms of (1) potential expansions of existing BMPs to reach a greater geographic area or to achieve greater impact in the existing geographic area of the program; (2) potential enhancements or changes to existing programs that could achieve greater load reduction; and (3) new or expanded initiatives needed to address pollutant sources and load reduction goals. Nonstructural BMPs are effectives at reducing pollutant loads before they enter the storm drain system, and are recommended to begin program development in the early stages of the implementation schedule. Opportunities for **Structural BMPs** are described in Section 5 in terms of distributed structural BMPs, which are built in the landscape at the site scale, and large treatment (centralized) structural BMPs, which are regional facilities that receive flows from neighborhoods or larger areas.

The BMP Implementation Schedule in Section 7 reflects a strategic approach to prioritize BMP implementation based on environmental and cost-effectiveness. In the initial nonstructural and structural BMP planning in this CLRP, the relative cost-effectiveness of the various BMPs was key in the phasing of implementation. It is anticipated that initial program activities will focus on implementation in the HPMAs and in areas with greater numbers and concentrations of PGAs, and that geographic implementation will be further refined based on future monitoring and modeling studies.

Centralized BMPs on public land are included in the CLRP and may help facilitate compliance with the Bacteria TMDL. These BMPs will also be considered early in the scheduling of BMP implementation, particularly in the HPMAs. Distributed structural BMPs on public land are less cost effective but must be retained as an option to meet WLAs. Again, early implementation will focus on the development of distributed BMPs in HPMAs, where feasible. Overall, the implementation plan strategy reflected in the BMP Implementation Schedule is for nonstructural BMPs to be developed and implemented principally in years 0–5; planned structural BMPs on public land in years 0–10; centralized and distributed structural BMPs on public land in years 3–15; and structural BMPs on private land in years 15–20.

Once the BMP Implementation Schedule was assembled, preliminary cost estimates were developed for each of the recommended nonstructural BMPs and structural BMPs on public land. These cost estimates are intended to support future planning and securing funds for implementation. Structural BMPs on private land, which may be needed in the later phase of the BMP Implementation Schedule, were not included at this time.

The estimated present value cost in 2012 dollars of implementing the recommended nonstructural BMPs and structural BMPs on public land in the Chollas watershed, are presented in Table ES-1.

Table ES-1. Present value cost of recommended nonstructural and structural BMPs

Watershed implementation categories	Present value cost[a]
Nonstructural BMPs	
Development Review Process	$1,027,545

Enhanced Inspections and Enforcement	$7,265,877
SUSMP and Regulatory Enhancement	$1,289,624
New/Expanded Initiatives	$2,584,488
Landscape Practices	$9,616,489
Education and Outreach	$1,945,485
MS4 Maintenance	$208,700,945
Capital Improvement Projects	$15,388,338
Subtotal	$247,966,539
Structural BMPs	
New Identified Centralized BMPs	$27,560,866
New Identified Distributed BMPs	$58,414,659
Planned/Implement Centralized BMPs	$24,614,826
Planned/Implement Distributed BMPs	$39,100,051
Subtotal	$149,690,402
Total present value cost	**$397,656,941**

Note:
a. These are preliminary estimated costs subject to refinement and improvement as a result of further analyses and assessments performed as part of the CLRP Implementation Program. Implementation of BMPs is subject to available resources.

Establishment of CLRP Implementation Program

The RPs are committed to embarking on a CLRP Implementation Program to attain compliance with the TMDL and facilitate strategic decision-making, assessment, and adaptation of the CLRP. The RPs recognize that no plan to achieve these goals is meaningful without commitment and a mechanism for continued coordination and planning. During development of the CLRP, the RPs worked to present one watershed-based plan both to better manage pollutant loads and to serve as a foundation for decisions regarding future BMP implementation. In the coming years, lessons will be learned from projects implemented, conditions will change, new technologies will emerge, and unanticipated challenges will present themselves. Thus, implementation of the CLRP will require continued evaluation and adaptation.

Implemented over time, the recommended CLRP BMPs are expected to yield significant load reductions for the key PGAs and HPMAs. The RPs will use adaptive management to continue to refine the understanding of the optimal combination and potential need for BMP retrofits on privately owned land.

The CLRP Implementation Program will include an iterative and adaptive framework essential to ensuring that the RPs attain compliance with the Bacteria TMDL. During the periodic program reviews, findings from the activities of the CLRP Program and modifications to BMPs will be included in the BMP Implementation Schedule.

The RPs will prepare periodic Progress Reports to document progress of the CLRP in accordance with the approved schedule included in the applicable regulatory document. Progress Reports will provide status updates of BMP activities and the results of monitoring studies. These reports may also include updates to this CLRP and the BMP Implementation Schedule. The first CLRP update may replace the current Watershed Urban Management Plan for the Chollas watershed.

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1 Introduction

To establish a comprehensive, watershed-based approach to meeting pollutant load reduction targets for the Chollas Hydrologic Sub Area (HSA) (Chollas watershed), the Copermittees in the San Diego Region (called the Responsible Parties or RPs) prepared a Comprehensive Load Reduction Plan (CLRP). The CLRP is a coordinated, consistent, comprehensive, and phased strategy for implementing best management practices (BMPs). It will help the Copermittees comply with the *Revised Total Maximum Daily Loads for Indicator Bacteria, Project 1 – Twenty Beaches and Creeks in the San Diego Region* (Bacteria TMDL), the *Total Maximum Loads for Dissolved Copper, Lead, and Zinc in the Chollas Creek, Tributary to San Diego Bay* (Metals TMDL), and the *Chollas Creek Diazinon Total Maximum Daily Load* (Diazinon TMDL).

The CLRP for the Chollas watershed represents an integrated water quality plan combining multiple permit-based and voluntary strategies and BMPs into a comprehensive approach for achieving compliance with the TMDLs. This CLRP integrates information and data from multiple water quality permit requirements, studies, initiatives, and reports into a single framework. The City of San Diego, County of San Diego, Caltrans, City of La Mesa, City of Lemon Grove, and San Diego Unified Port District (Port of San Diego), as the Responsible Parties (RPs) for the watershed, will use this CLRP to develop watershed implementation programs, evaluate their effectiveness, and make adjustments over the anticipated 20-year implementation period.

The RPs recognize that the program must use adaptive management to employ new information and technologies over time to achieve compliance with the TMDL in a sustainable manner that maximizes cost effectiveness and minimizes impacts to the community. The monitoring and re-evaluation components are intended to ensure that an adaptive management approach is utilized throughout the BMP Implementation Schedule to refine and adapt BMPs, based on monitoring input and other feedback, in a manner best suited to sustainably achieving compliance with these TMDLs, and other applicable water quality permits and standards. The main driver for the CLRP is the Bacteria TMDL, which was approved by the San Diego Regional Water Quality Control Board (SDRWQCB or Regional Board) and took effect April 4, 2011. This CLRP also integrates the Chollas watershed Metals TMDL and Diazinon TMDL.

In addition to addressing the required TMDL reductions, this CLRP specifically addresses the watershed's other regulatory drivers and impairments. Pollutants addressed in this CLRP include Clean Water Act section 303(d)-listed pollutants such as nutrients (nitrogen and phosphorus), trash, and sediment toxicity/benthic community effects. By incorporating a comprehensive approach to all of the pollutants, impairments and concerns, the CLRP framework is intended to improve the efficiency and effectiveness of BMP planning, and as a result, to reduce the overall cost of implementation and compliance monitoring

With extremely dense urban areas and a drainage area that includes much of downtown San Diego before discharging into San Diego Bay, the Chollas watershed (Figure 1-1) has many complex pollutants and issues to consider in creating the CLRP. Thus, this CLRP is specific to the pollutants that have caused waterbody impairments and the watershed's unique conditions and water quality protection needs.

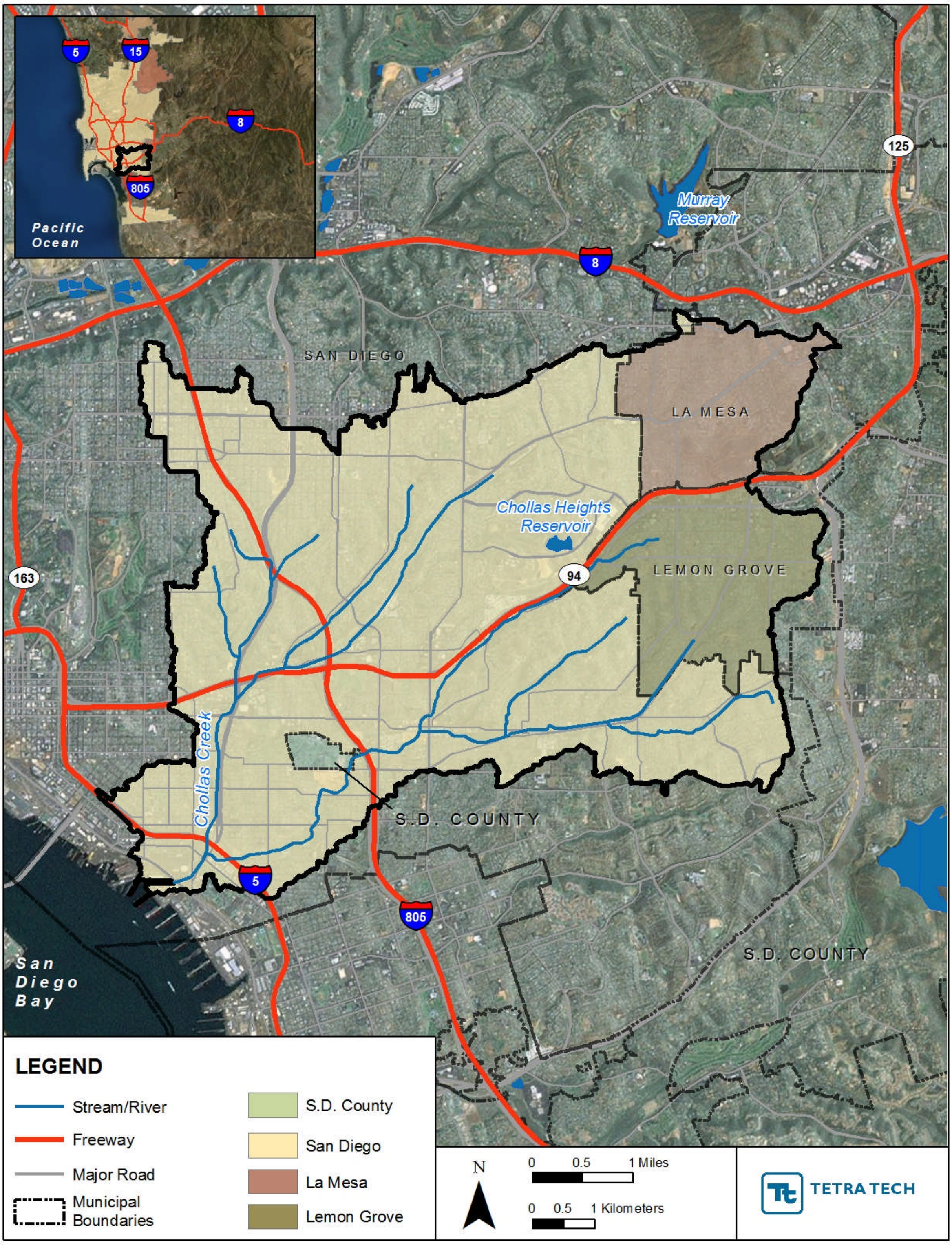

Figure 1-1. Location of the Chollas watershed

The coordinated planning approach in this CLRP recognizes that nonstructural and structural BMPs principally designed to reduce bacteria loading, such as storm water infiltration systems or nonstructural source reduction strategies addressing trash and animal waste, often reduce nutrients, sediment, and other loadings in addition to bacteria, making coordinated planning both practical and effective. Recognizing the efficiencies of coordinating reduction strategies for multiple pollutants, the selection of recommended BMPs and strategies in this CLRP identifies the multiple pollutant reduction benefits of each recommended BMP and provides a strong framework for prioritizing BMPs by type and geographic area to maximize pollutant reduction and cost-efficiency.

Fundamental to the CLRP is the accompanying monitoring plan, which outlines the assessment and reporting procedures that will help the RPs assess progress toward attainment and to adapt the recommended BMPs and schedule to optimize load reduction over time. Development of the Bacteria TMDL began several years ago and focused on the 2002 303(d) impairment listings. Since then, several important monitoring and modeling studies have been conducted in the region that better characterized the extent and magnitude of bacteria impairments, existing and potential sources, and the linkage between sources and receiving water impacts. This CLRP effectively incorporates and builds on these past studies and data, current and future planning efforts, and related water resource activities to target the most cost-effective BMP implementation needs in the watershed.

The following sections discuss the geographic setting of the Chollas watershed (Section 1.1), an overview of the impairments and priority pollutants (Section 1.2), and a discussion on the CLRP guidelines (Section 1.3). The lead CLRP watershed contact is presented in Section 1.4.

1.1 Geographic Setting

The Chollas watershed, is southeast of downtown San Diego, in the San Diego Mesa Hydrologic Area and in the larger Pueblo San Diego Hydrologic Unit (HU) (Figure 1-1). The watershed encompasses an urbanized area of approximately 28.5 square miles and drains to San Diego Bay (SDRWQCB 2007). Land use is predominantly residential, with some commercial/institutional and industrial use.

Figure 1-1 illustrates the jurisdictional boundaries within the Chollas watershed. The City of San Diego occupies most of the watershed area. The cities of La Mesa and Lemon Grove are in the eastern portion or headwaters of the watershed and the County of San Diego has jurisdiction over a small area in the lower-central portion of the watershed. Also, the Port of San Diego is in the watershed along the San Diego Bay shoreline area.

1.1.1 Hydrology and Climate

The Chollas watershed (HSA 908.22) is the largest watershed of the Pueblo San Diego HU. Natural drainage generally flows in a southwestern direction and drains to one of the two main tributaries: North Fork Chollas Creek and South Fork Chollas Creek. These drainages merge approximately 0.8 mile east of the Chollas Creek mouth, near the upper extent of the tidal influence from San Diego Bay (SDRWQCB 2010). The mouth of the creek is along the eastern shoreline of the central portion of San Diego Bay. Much of Chollas Creek has been channelized and concrete lined, but some sections of earthen creek bed remain.

Average annual rainfall for the San Diego region ranges from 9 to 11 inches along the coast to more than 30 inches in the eastern mountains. Three distinct types of weather occur in the region. Summer dry weather occurs from late April to mid-October. During this period, almost no rain falls. The winter season (mid-October through early April) has two types of weather: (1) winter dry weather when rain has not fallen for the preceding 72 hours, and (2) wet weather consisting of storms of 0.2 inch of rainfall and the 72-hour period after the storm. Of the annual rainfall, 85 to 90 percent occurs in the winter season (SDRWQCB 2010; San Diego County Department of Environmental Health 2000). Runoff from these events ultimately reaches the north and south forks of Chollas Creek through discharge points or through natural drainage features, and eventually discharges into San Diego Bay.

1.1.2 Land Cover

Land use composition of a watershed can significantly affect water quality and influence the types of pollutants found in waterbodies. A breakdown of the land uses (SANDAG 2009) in the Chollas watershed is shown in Table 1-1 and illustrated in Figure 1-2. The majority of the watershed is developed with a single largest land use type, low-density residential, covering 36 percent of the watershed. In addition, the combination of low-density residential and high-density residential accounts for nearly 50 percent of the land area. Following residential, transportation land uses (roadways and freeways) cover approximately 25 percent of the watershed. Other land uses, although less significant in coverage, are recreation and open spaces (11 percent), commercial (7 percent), institutional (4 percent), and industrial (3 percent).

The Chollas watershed is entirely urbanized. Higher density residential areas are in the City of San Diego, with lower density found in the cities of La Mesa and Lemon Grove. These population patterns are illustrated in Figure 1-2. Population centers are important to identify because they can be a source of pollutants and dry weather flows (i.e., irrigation overspray) that can cause or contribute to water quality impairments.

Table 1-1. Land uses in the Chollas watershed

Aggregate land use category	Acres	Percent
Agriculture[a]	3	0.02%
Commercial	1,067	6.2%
Freeway[b]	882	5.1%
High-density residential	2,287	13.3%
Industrial	292	1.7%
Institutional	729	4.2%
Low-density residential	6,262	36.4%
Military	48	0.3%
Open space	707	4.1%
Recreation	1,308	7.6%
Road	3,477	20.2%
Rural residential	15	0.1%
Transportation	116	0.7%
Water	23	0.1%
Total	**17,214**	**100.0%**

a. The agriculture area listed above was calculated from the available SANDAG GIS layer. The actual agricultural area is likely less than this based on aerial imagery analysis, which indicates that many of the SANDAG agricultural areas are now open space.

b. The freeway area listed above was calculated from the GIS coverages. The actual Caltrans percentage of land use is 5.62% (1,113 acres).The imperviousness of the Chollas watershed is shown in Figure 1-3. The amount of impervious cover provides an indication of the degree of urbanization and the amount of storm water that can be conveyed directly to the municipal separate storm sewer system (MS4). The least permeable areas are the residential and commercial land uses. Impervious cover is throughout the Chollas watershed with the exception of designated open space and recreation areas where most of the pervious cover of the watershed is found

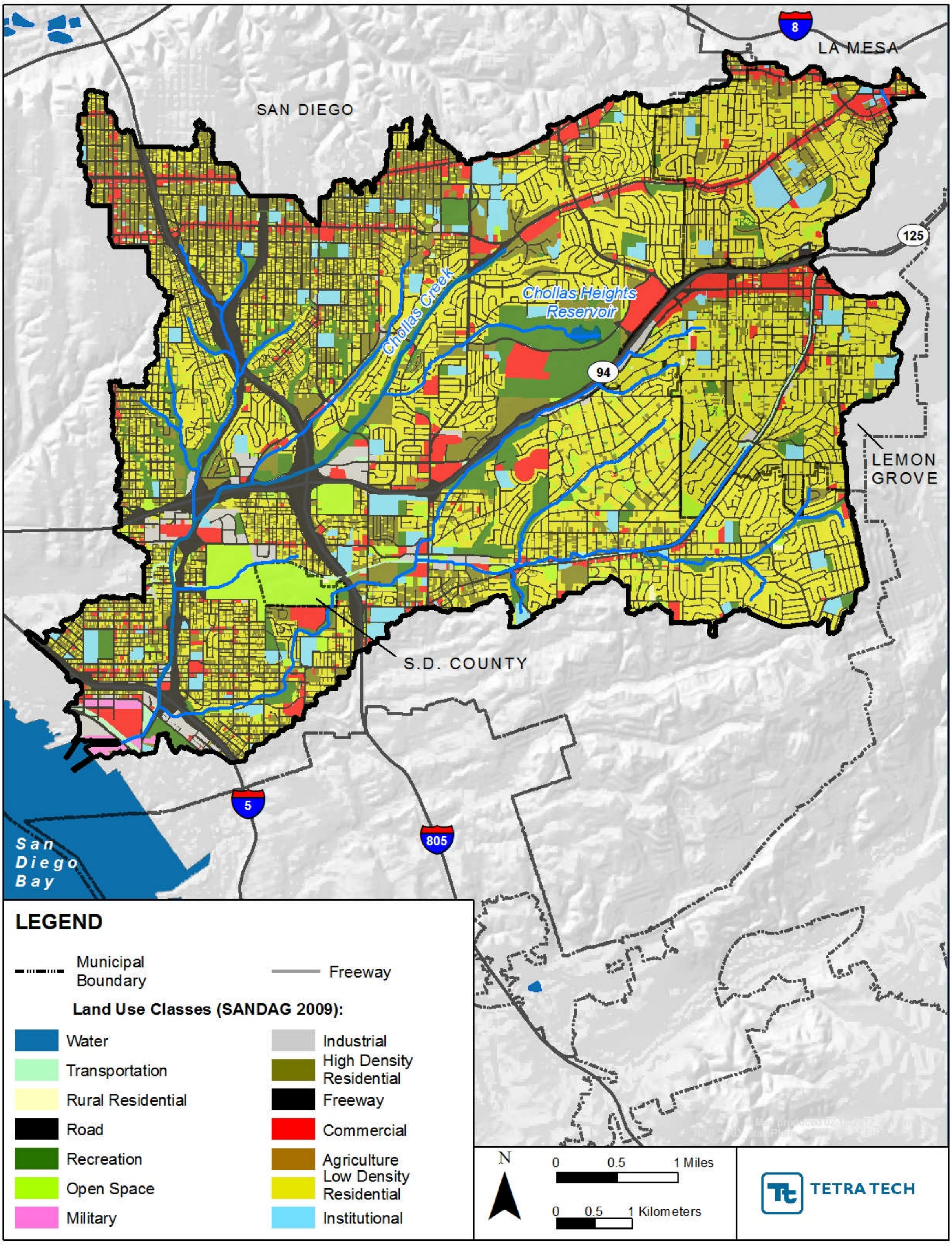

Figure 1-2. Land uses in the Chollas watershed

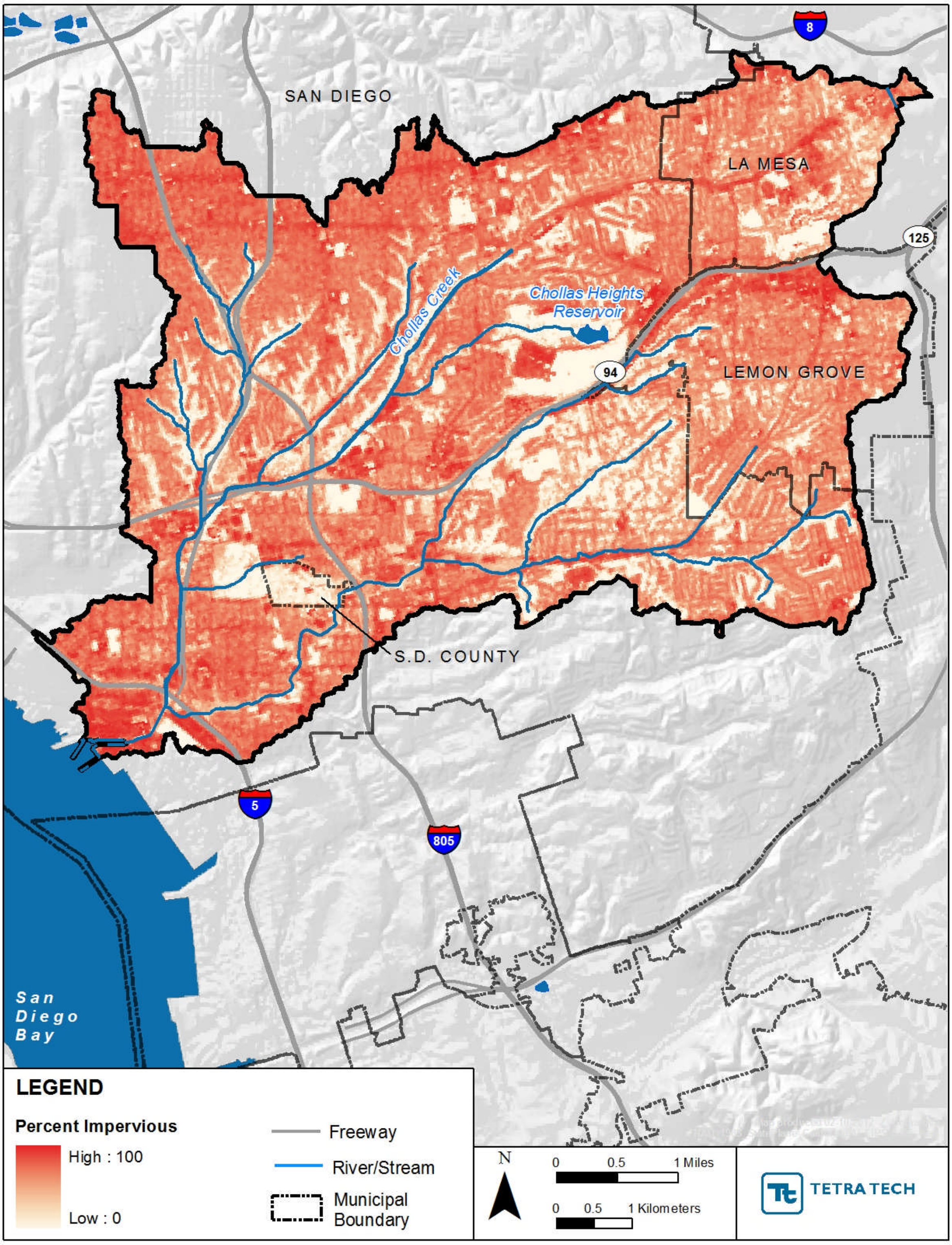

Figure 1-3. Imperviousness in the Chollas watershed

1.2 Impairment Overview

The lower reaches of Chollas Creek are on the 2010 303(d) list as impaired for indicator bacteria (enterococci, fecal coliform, and total coliform), metals (copper, lead, and zinc), nutrients (nitrogen and phosphorus), trash, diazinon, and sediment toxicity/benthic community effects (Table 1-2and Figure 1-4). The stretch of the impaired waterbody is in the jurisdiction of the City of San Diego, while the Port District also has jurisdiction along the impaired shoreline.

Table 1-2. Impairments in the Chollas watershed

Waterbody name	Estimated size affected (mi)	Pollutant	Jurisdiction
Chollas Creek	4.0	Indicator Bacteria (enterococci, fecal coliform, total coliform)	City of San Diego
Chollas Creek	4.0	Copper	City of San Diego
Chollas Creek	4.0	Lead	City of San Diego
Chollas Creek	4.0	Zinc	City of San Diego
Chollas Creek	4.0	Nitrogen	City of San Diego
Chollas Creek	4.0	Phosphorus	City of San Diego
Chollas Creek	4.0	Trash	City of San Diego
Chollas Creek	4.0	Diazinon	City of San Diego
San Diego Bay Shoreline, near Chollas Creek	15.0	Benthic community effects	City of San Diego; Unified Port District
San Diego Bay Shoreline, near Chollas Creek	15.0	Sediment toxicity	City of San Diego; Unified Port District

Source: 2010 U.S. Environmental Protection Agency-approved 303(d) list (SWRCB 2012).

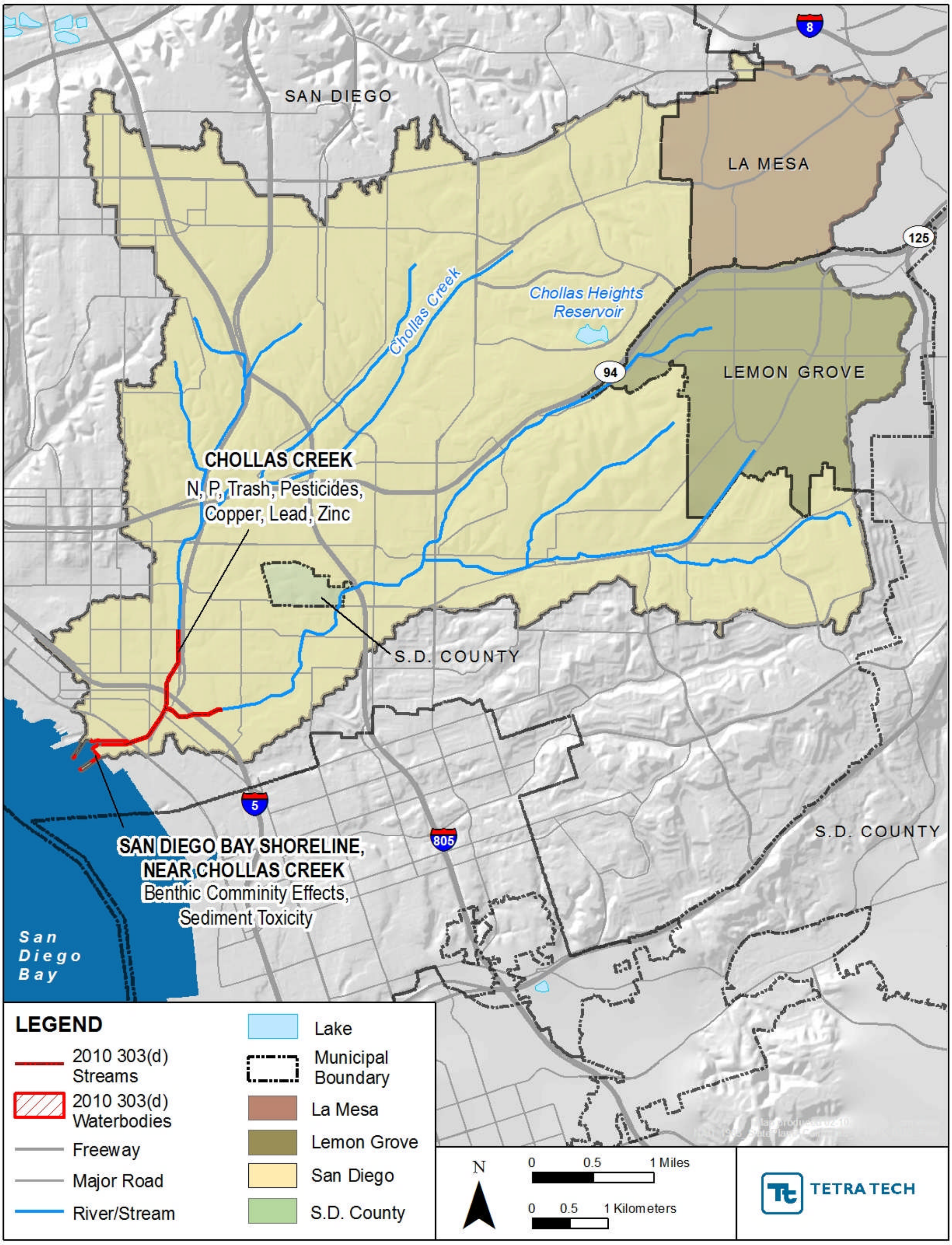

Figure 1-4. Chollas watershed and its 303(d)-listed waterbodies

The CLRP will address the bacteria impairments associated with the Bacteria TMDL (SDRWQCB 2010), the Metals and Diazinon TMDLs, and the other 303(d)-listed pollutants in the watershed: nutrients (total nitrogen and total phosphorous), trash, and sediment toxicity/benthic community effects (associated with polychlorinated biphenyls [PCBs], polycyclic aromatic hydrocarbons [PAHs], and chlordane) (SWRCB 2012). While the CLRP addresses each of these pollutants, detailed source assessment and loading estimates are performed on only a subset of pollutants that can be modeled (Sections 3.2 and 3.3). The other pollutants are represented via modeled surrogates or through management practices expected to reduce municipal storm water sources. The water quality constituents of concern in the Chollas watershed are discussed in detail below; however, it is important to note that other pollutants not summarized below might also be of concern.

1.2.1 Bacteria (Enterococci, Fecal Coliform, and Total Coliform)

Pathogens are microbes that cause diseases. Bacteria such as enterococci, fecal coliform, and total coliform—are used as measures or indicators of human pathogens. Various bacteria indicators have been historically used to detect the possible presences of human pathogens in the water column because these indicators are easier and less costly to measure than the pathogens themselves (SDRWQCB 2010; USEPA 2011a). Total coliform is a group of mostly harmless bacteria that live in soil, water, and the gut of animals. The extent to which total coliforms are present in the source water can indicate the general quality of that water and the likelihood of fecal contamination. A measure of total coliform is an indicator that fecal coliform, *Escherichia coli*, and *Enterococcus* might be present. Fecal coliforms are a subset of total coliform bacteria and are more fecal-specific in origin because they reside in the intestines of warm-blooded animals. *Enterococcus* is a more human-specific identifier of fecal origin. Similar to many pathogens, enterococci have the ability to survive in salt water and are, therefore, a better indicator of health risk (USEPA 2011a).

Bacteria densities in waterbodies of the Chollas watershed have historically exceeded the numeric water quality objectives (WQOs) for total coliform, fecal coliform, or enterococci indicator bacteria as defined in the SDRWQCB’s *Water Quality Control Plan for the San Diego Basin* (Basin Plan; SDRWQCB 1994) or SWRCB’s *Water Quality Control Plan for Ocean Waters for California* (Ocean Plan; SWRCB 2005). These exceedances threaten or impair beneficial uses such as recreational water contact (REC-1) and non-water contact (REC-2), among others. Sources of fecal contamination to surface waters include wastewater treatment plants, on-site septic systems, domestic and wild animal manure, and storm water runoff. The County of San Diego and other MS4 RPs led a source identification review of bacteria to assist with CLRP development. These sources are discussed in more detail in Section 3 and Appendix A.

1.2.2 Nutrients (Nitrogen and Phosphorus)

Nutrients such as nitrogen and phosphorus are natural elements in the environment that are essential for plant and animal growth, reproduction, and maintenance of a natural, healthy aquatic system. These nutrients contaminate and degrade waters when they are present in excessive amounts. Often as a result of human activities, elevated levels of nitrogen and phosphorus accelerate the growth of algae through a process called eutrophication. Algal blooms, as a result of eutrophication, block sunlight from reaching underwater plants and deplete oxygen in the waterbodies when they sink and decompose. Excessive amounts of nutrients from anthropogenic sources cause severe imbalances to the natural aquatic system harming fish, wildlife, and human health (USEPA 2011b).

Nutrient concentrations in waterbodies of the Chollas watershed have exceeded the numeric WQOs as defined in the San Diego Basin Plan. These exceedances potentially threaten or impair recreation and aquatic life beneficial uses because of the production of algae, odor, and other secondary pollutants. Sources of nitrogen and phosphorus to surface waters include wastewater discharges, agricultural operations, atmospheric deposition, and domestic and wild animal manure. Specific sources are identified in Section 3.

1.2.3 Metals (copper, lead, and zinc)

Several elements, including some heavy metals, are naturally occurring in surface waters. However, metals such as copper, lead, and zinc can cause adverse effects on water quality, biological species, and human health at elevated and even slightly elevated levels. Dissolved forms of these metals can be directly taken up by bacteria, algae, plants and planktonic and benthic organisms and can be absorbed to particulate matter (SDRWQCB 2007).

Although most metals enter surface waters via natural processes such as the erosion of natural sources and forest fires, anthropogenic sources can also contribute to their elevated presence. Industrial processes and practices and industrial wastes can serve as significant contributors of copper and zinc in the environment (USEPA 2007, 2012a, 2012b, 2012c; Lenntech 2011a, 2011b). Specific industrial activities that often involve these metals include smelting, mining, coal burning, and metal plating among others. Road infrastructures are contributors of certain metals because many metals are often linked to car tires, brake pads, and motor vehicle discharges and emissions. Agricultural activities such as animal feeding operations (AFOs) and certain fertilizers can also contribute trace levels of zinc and other metals. The biggest contributing source of lead, on the other hand, is the corrosion of pipes. Regardless of the source, excessive amounts of metals can cause severe imbalances to the natural aquatic system harming fish, wildlife, and human health. Sources of metals are discussed in more detail in Section 3.

1.2.4 Trash

Trash can be defined as miscellaneous items, litter, or garbage present in surface waters. According to the 1989-2009 California Coastal Clean Up events, the 10 types of trash commonly found in California and west coast waters are cigarette butts, food wrappers/containers, caps/lids, plastic and paper bags, plastic silverware, straws/stirrers, and beverage bottles and cans (California Coastal Commission 2010). Plastics are of great concern. The Southern California Coastal Water Research Project (SCCWRP) and Caltrans identified pre-production plastic pellets, foamed plastics and hard plastics as the most abundant type of trash (Moore et al. 2011). A second study more recently documented foamed plastics (expanded polystyrene) as the most abundant form of plastic in the San Gabriel River (Moore et al. 2011). Trash can also include leaf litter when there is evidence of intentional dumping.

Storm water can wash litter or trash into drainage systems, where it is able to travel via the storm water systems, streams, rivers, lakes and estuaries until it eventually reaches coastal waters (Armitage and Rooseboom 2000; Richmond and Clendenon 2011). A significant contribution from runoff has been shown in recent studies monitoring the density of marine trash before and after storm events. For example, a study off the Southern California coast found that trash increases after a storm event, reflecting inputs from land-based runoff and resuspended matter (Lattin et al. 2004). Another study conducted on the Los Angeles and San Gabriel rivers found the greatest abundance of plastic trash occurred after a light rain (Moore et al. 2011). In addition to storm water runoff, other transportation mechanisms of trash include littering by the general public on or adjacent to waterways; wind-blown trash, also originating from littering, inadequate waste handling or illegal dumping; and direct disposal (overboard disposal or dumping) of trash into waterbodies from vessels involved in commercial, military, fishing or recreational activities.

Upon entering surface waters, trash can threaten mammals, turtles, birds, fish, and crustaceans by ingestion and entanglement (Moore et al. 2011; USEPA 2002) and can severely alter and damage the natural aquatic habitat. Trash in waters of the Chollas watershed has exceeded the narrative WQO as defined in the San Diego Basin Plan, and these exceedances threaten or impair several beneficial uses. Although the origin of trash can be difficult to define once deposited, trash generally originates from land use activity where loose controls have allowed it to travel to nearby waters. Specific sources and the extent of trash present in the Chollas watershed is discussed further in Section 3.

1.2.5 Diazinon

Diazinon is an organophosphate pesticide that was widely used in home, commercial, and agricultural settings before the U.S. Environmental Protection Agency (EPA) started phasing out its use in December 2000. This broad spectrum and moderately persistent pesticide can be washed off lawns and agricultural fields via storm water and irrigation runoff (USEPA 2012d). Because diazinon has been completely phased out, current sources are legacy loads in the sediment (which might not be significant because diazinon has relatively high solubility and tends to move into the liquid phase in a wet environment) and, more importantly, residual (post-phase out) use by residents or businesses that have unused product that has not been disposed of properly. One study suggests that ordinary use could release sufficient diazinon into the environment to account for concentrations and toxicity measured in urban storm water (SDRWQCB 2002).

Although a TMDL for Diazinon in the Chollas watershed was adopted in 2002, diazinon remains a water quality threat. Diazinon, along with other pollutants, is causing acute and chronic toxicity to aquatic life in Chollas Creek (SDRWQCB 2002). However, since implementation of the ban, diazinon concentrations have shown decreasing trends and results at two monitoring stations have been below WLAs since 2007 (AMEC Environment and Infrastructure 2012). Overall, the diazinon phase-out is expected to be the single most significant mechanism of TMDL implementation. Additional TMDL implementation actions will reduce the discharge of diazinon in the Chollas Creek watershed during and after the phase-out by reduced sales, use, and proper disposal.

1.2.6 Sediment toxicity/benthic community effects

As defined by the Basin Plan, toxicity is the adverse response of organisms to chemicals or physical agents. It refers to the substances and concentration of substances that are toxic to or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Sediment toxicity is the measure of sediment quality to assess for adverse biological effects from contaminants. Several variations of sediment toxicity test exist, but they typically measure indicator organisms, species diversity, population density, and growth anomalies (SDRWQCB 1994).

Toxicity can be caused by a combination of sources. Sediments in San Diego Bay near the mouth of Chollas Creek (and several nearby creek mouths) are contaminated with organic pollutants. The sites have a degraded benthic macroinvertebrate community and are toxic to various marine invertebrate species. Therefore, the mouth of Chollas Creek has been listed as impaired for sediment toxicity and benthic community degradation (Table 1-2). Further analysis identified the pollutants in the sediment causing these impairments as PCBs, PAHs, and chlordane (diazinon and other pollutants are also causing acute and chronic toxicity to aquatic life in Chollas Creek).

These organic compounds are found in urban stormwater. Chlordane and PCBs are often found bound to sediment particles, while PAHs are found in the storm water itself or bound to sediment. Original sources of these pollutants vary. Chlordane was primarily used as a pesticide to control subterranean termites in buildings, insects on agricultural crops, residential lawns and gardens (ATSDR 1994). PAH discharges in urban environments are from tailpipe emissions from vehicles, petroleum refineries, coal burning for fuel production, and other industrial activities (Stein et al. 2006; City of San Diego 2010a). PCBs are legacy contaminants that have been introduced into the environment through discharges from point sources and through spills and accidental releases. Point source contributions are now controlled, but nonpoint sources might still exist from historic refuse sites and abandoned facilities (USEPA 2009a). PCBs have also been found in caulking material used in building construction or renovation that occurred between 1950 and 1978 (USEPA 2009b). The SDRWQCB is developing TMDLs to address these pollutants and ultimately restore the aquatic life beneficial uses.

1.3 Guiding Principles for CLRP Development

The overarching goal and guiding principle of this multi-pollutant CLRP for the Chollas watershed is to cost-effectively address the current Bacteria TMDL, Metals TMDL, Diazinon TMDL, and 303(d)-listed pollutants, in addition to future potential TMDLs.

This CLRP provides implementation recommendations and information needed to begin planning for nonstructural and structural BMPs for required load reduction in the Chollas watershed. The high-ranked BMP sites and activities in Sections 4 and 5 of this plan provide an immediate and strong foundation for each RP's CLRP program development.

The RPs will establish a CLRP Implementation Program to provide a watershed-based, adaptive framework for cost-effective implementation and process for refining the strategy over the entire implementation period. One of the first steps in the CLRP Implementation Program will be the quantification and assessment of the optimal balance of centralized and distributed structural BMP types and locations in light of planned nonstructural BMP load reduction activities. This task will include optimization modeling to quantify and evaluate pollutant load reductions, design sizes, and costs, to further evaluate those BMPs identified in the CLRP and determine the extent of additional BMPs necessary to attain the bacteria WLAs. Over the long term, the RPs will take an iterative and adaptive management approach in an effort to take advantage of new information or treatment technologies that could emerge in the future and result in more effective CLRP Implementation Program later phases. Further discussion of the CLRP's implementation schedule and the components of the CLRP Implementation Program is provided in Section 7.

1.4 Lead CLRP Watershed Contact

Identification of the lead CLRP watershed contact is a required CLRP component. The Chollas watershed lead CLRP contact is the City of San Diego.

2 Objectives of a Comprehensive Load Reduction Plan

2.1 Focus of the Plan

This CLRP presents a comprehensive, watershed-based approach. It focuses on all RPs and all existing impairments and other pollutants of concern. The associated management options are within the jurisdiction of all RPs. Some of the proposed nonstructural or programmatic BMPs, such as staff training or education programs, could apply within an RP's jurisdiction in areas outside the Chollas watershed.

The objective of the CLRP is to address the current TMDL for indicator bacteria, in addition to other existing or future potential TMDLs in the Chollas watershed. The additional pollutants of concern include 303(d)-listed pollutants, such as nutrients (total nitrogen and total phosphorous), metals (copper, lead, zinc), trash, diazinon, and sediment toxicity/benthic community effects (associated with PCBs, PAHs, and chlordane). Source characterizations are provided in the plan for the pollutants quantified directly or indirectly (i.e., using a surrogate parameter) by the watershed model (bacteria, nutrients, metals, organics) in addition to trash, whereas the other pollutants are addressed through identifying management activities to reduce municipal storm water loads. This information can support future initiatives for watershed and BMP planning. Existing and potential TMDLs for these impairments are discussed below.

2.1.1 Bacteria TMDL

The SDRWQCB has approved three TMDLs for the Chollas watershed, including one for bacteria. The approved Bacteria TMDL is not reflected in the 2010 303(d) list of impairments summarized in Table 1-2 because the TMDL had not been approved when data were solicited to develop the 2010 303(d) list. Table 2-1 gives a summary of the TMDL, along with TMDL effective dates and implementation plan due dates.

Table 2-1. Approved TMDLs for segments in the Chollas watershed

TMDL parameter group	Dates	Description
Bacteria	TMDL Effective: April 4, 2011 TMDL Implementation Plan Due: October 4, 2012	Chollas Creek of the Chollas HSA was included on California's 2002 303(d) list as impaired because of exceedances of bacteria water quality standards. TMDLs were then developed for multiple bacteria indicators: fecal coliform, total coliform, and enterococci. The Beaches and Creeks TMDL (SDRWQCB 2010) for bacteria has multipart, wet weather, numeric targets based on the bacteria objectives for marine and fresh waters designated for the contact recreation (REC-1) beneficial use. Both single-sample and 30-day geometric mean limits apply to the impaired segments of the Chollas HA for wet and dry weather, respectively. Dry-weather urban runoff and storm water, both conveyed by storm drains, are the primary sources of elevated bacterial indicator densities to the Chollas HSA during dry and wet weather, respectively. No wastewater discharges are permitted in the watershed. In addition, no agriculture-based sources exist.

TMDL parameter group	Dates	Description
Diazinon	TMDL Effective: September 11, 2003	Toxicity in Chollas Creek from diazinon during storm events was the basis for placing Chollas Creek on the 1996 303(d) list as impaired. Results from toxicity identification evaluations (TIEs) indicate that diazinon has in part caused the toxicity in Chollas Creek during storm events. TMDLs were developed to meet the toxicity WQO, ensuring that diazinon supports the aquatic life beneficial uses of the creek (SDRWQCB 2002). Urban storm water flows represent the most significant source of diazinon to the Chollas watershed. No wastewater discharges are permitted in the watershed. In addition, no agriculture-based sources exist. A phase-out of diazinon began in 2001 and is the most important mechanism of TMDL implementation.
Metals	TMDL Effective: October 22, 2008	Chollas Creek has frequently exceeded the chronic and acute water quality criteria for metals established in the California Toxics Rule, resulting in the creek being placed on the 303(d) list of impaired waterbodies in 1996 for several metals. In addition, results from TIEs indicate that zinc and, to a lesser extent, copper have in part caused the toxicity in Chollas Creek during storm events. TMDLs were developed for multiple metals: copper, lead, and zinc (SDRWQCB 2007). Dry-weather urban runoff and storm water, both conveyed by storm drains, are the primary sources of metals to the Chollas HSA. Interim goals are provided in the TMDL to achieve the numeric targets within 20 years of the effective date.

2.1.2 Other adopted TMDLs

In addition to the Bacteria TMDL, the SDRWQCB has approved the Metals TMDLs (copper, lead, and zinc) and Diazinon TMDL (SDRWQCB 2002) in the Chollas watershed. Table 2-1 gives a summary of these TMDLs, along with TMDL effective dates and implementation plan due dates.

2.1.3 TMDLs in Development

TMDLs to address the San Diego Bay and Chollas Estuary sediment toxicity and benthic community impairments (associated with PCBs, PAHs, and chlordane) are being developed. This is a collaborative effort between the SDRWQCB and the RPs. Additional technical work is expected on these TMDLs in the near future so they can be considered for adoption by the SDRWQCB.

2.1.4 Other Pollutants

In addition to the impairments addressed by approved and pending TMDLs, other pollutants of concern in the watershed have been identified on the 2010 303(d) list. These are nutrients (nitrogen and phosphorous) and trash. While no TMDLs exist or are being developed for these impairments, this CLRP is intended to address these impairments using a comprehensive watershed-based approach that considers BMPs that can cost-effectively address multiple pollutants.

2.2 Water Quality Targets

Key factors influencing the level of BMP implementation are the storm water management targets expected to be achieved. For this project, TMDLs (and associated WLAs and LAs) that address storm water runoff and potential TMDLs for other pollutants of concern must be considered a priority for developing the multi-pollutant CLRP. The following provides a summary of applicable wet- and dry-weather TMDL WLAs and LAs and implementation requirements or numeric targets (where a TMDL does not currently exist).

2.2.1 Bacteria

The Bacteria TMDL has multipart, wet- and dry-weather numeric targets based on the updated bacteria objectives for marine and fresh waters designated for contact recreation (REC-1). Both single-sample and 30-day geometric mean limits apply to the Chollas watershed. The bacteria TMDLs are expressed in terms of both concentration and on a mass loading basis. Concentration-based TMDLs are used to determine *compliance* with the TMDLs, whereas allocations were determined using the mass-based TMDLs. Different REC-1 WQOs apply for wet and dry weather because transport mechanisms to receiving waters differ during these two conditions. Wet-weather conditions are episodic and short in duration, therefore the single sample maximum WQOs apply as the wet-weather numeric targets. Alternatively, the geometric mean WQOs apply during dry weather when runoff is more uniform and slower (making die-off and amplification processes more important) than during storm flows. Full compliance with the TMDL requires that both the geometric mean and single-sample maximum WQOs are met during both wet and dry weather. Applicable bacteria objectives used in the TMDL calculations are presented in Table 2-2.

Table 2-2. WQOs for bacteria

WQOs	Numeric target (MPN/100mL)	Allowable exceedance frequency
Single sample maximum (wet weather)		
Fecal coliform	400	22%
Enterococci	61*	22%
Total coliform	10,000	22%
Geometric mean (dry weather)		
Fecal coliform	200	0%
Enterococci	33	0%
Total coliform	1,000	0%

* More stringent WQO associated with the *designated beach* usage frequency. If the usage frequency is lowered through a Basin Plan amendment, enterococci single sample maximum WQO of 104 MPN/100mL will apply during wet weather.

The Basin Plan provides different enterococci WQOs that are dependent on the type (freshwater or saltwater) and usage frequency (designated beach, moderately or lightly used area, or infrequently used area) of the waterbody. All waterbodies in the San Diego region designated with REC-1 beneficial use are assumed to have a *designated beach* usage frequency, which has the lowest and most stringent REC-1 WQOs. The freshwater WQOs are more stringent than the saltwater WQOs. The Chollas Creek impairment is a freshwater listing, and it assumes that the downstream beach has a *designated beach* usage frequency; therefore, the more stringent freshwater single sample maximum WQO applies for wet weather (Table 2-2).

If the Basin Plan is amended in the future to assign a lower usage frequency (i.e., *moderately to lightly used area*), the less stringent enterococci saltwater single sample maximum WQO may be applied to the freshwater creek (to be protective of the downstream beach). Alternative TMDLs are included in the Bacteria TMDL and will apply only if the usage frequency is modified in the Basin Plan.

The Bacteria TMDL includes WLAs and LAs for both wet and dry weather, expressed as the number of bacteria (in billion MPN per year for wet weather and billion MPN per month for dry weather). The wet-weather allocations include a 22 percent allowable exceedance frequency of the REC-1 single sample maximum WQOs based on the reference system and antidegradation approach (RSAA), while the dry-weather allocations include a zero percent allowable exceedance frequency of the REC-1 geometric mean WQOs.

The bacteria TMDLs are expressed in terms of both concentration and on a mass loading basis. Concentration-based TMDLs are used to determine compliance with the TMDLs, whereas allocations were determined using the mass-based TMDLs. These values identify the loads that need to be reduced for the concentration-based TMDLs to be met in the receiving waters. The concentration-based TMDLs are expressed as the numeric objectives and allowable exceedance frequencies (Table 2-2). These same numeric targets were used to calculate the mass-based TMDLs under critical conditions. The mass-based wet- and dry-weather WLAs and LAs are presented below.

2.2.1.1 Wet-Weather Bacteria Allocations

To implement the single-sample bacteria objectives for waters designated REC-1 and to set wet-weather allocations using the single-sample targets, TMDL targets were set equal to the WQO (Table 2-2). In addition, the RSAA was applied, which allows for a 22 percent exceedance frequency according to analyses performed on data associated with Leo Carillo Beach, just north of Los Angeles. This 22 percent exceedance frequency was applied to the number of wet days in the critical year to determine the number of allowable exceedance days. The *total allowable load* associated with the TMDL is the allowable load based on the WQOs plus the modeled load associated with the allowable exceedance days during the critical wet year. The WLAs and LAs are then parsed out of this total allowable load according to the modeled relative land use contributions in the watershed. These contributions take both land use area and land use-specific modeled bacteria loading rates into consideration, among other factors that impact the model. The resulting WLAs and LAs by source are presented in Table 2-3.

Table 2-3. Wet-weather bacteria WLAs and LAs to the impaired segments of the Chollas watershed

WLA/LA	Associated source	Bacteria type	Allocation (billion MPN/year)	Allocation (reduction required)
WLA	Municipal MS4	Fecal coliform	252,479	24.84%
		Total coliform	9,880,784	17.82%
		Enterococci	802,918	21.46%
		Enterococci*	803,871	21.36%
WLA	Caltrans	Fecal coliform	892	0.00%
		Total coliform	46,652	0.00%
		Enterococci	2,062	0.00%
		Enterococci*	2,062	0.00%
LA	Agriculture	Fecal coliform	0	0.00%
		Total coliform	0	0.00%
		Enterococci	0	0.00%
		Enterococci*	0	0.00%
LA	Open	Fecal coliform	262,070	0.00%
		Total coliform	3,321,191	0.00%
		Enterococci	347,665	0.00%
		Enterococci*	347,665	0.00%

* Alternative wet-weather enterococci allocations calculated using the WQOs associated with m*oderately to lightly used area* usage frequency. These alternative TMDLs apply only if the Basin Plan is amended to change the usage frequency.

While the mass-based wet-weather allocations provide the loads and load reductions required to achieve the numeric targets during the TMDL critical condition, compliance is determined through comparison with the WQOs. Specifically, at the end of the TMDL compliance schedule, bacteria densities for all wet-weather days cannot exceed the single sample maximum REC-1 WQOs more than the allowable exceedance frequency (Table 2-2). Additionally, the bacteria densities must be less than or equal to the 30-day geometric mean REC-1 WQOs 100 percent of the time (i.e., both dry- and wet-weather days in a 30-day period can be considered collectively and cannot exceed the 30-day geometric mean WQOs presented in Table 2-2 for dry weather).

2.2.1.2 Dry-Weather Bacteria Allocations

Dry-weather WLAs and LAs for the REC-1 waters are also expressed as the number of bacteria; however, the period evaluated is monthly (in billion MPN per month) without any allowable exceedance days. Specifically, to implement the geometric mean bacteria objectives for waters designated REC-1 and to set dry-weather allocations, TMDL targets were set equal to the dry-weather WQO (Table 2-2). The *total allowable load* associated with the TMDL is the allowable load calculated using the WQOs for all dry days during the critical wet year. The WLAs and LAs are then parsed out of this total allowable load according to the land use contributions in the watershed. The resulting allocations by source are presented in Table 2-4.

Table 2-4. Dry-weather bacteria WLAs and LAs to the impaired segments of the Chollas watershed

WLA/LA	Associated source	Bacteria type	Allocation (billion MPN/month)	Allocation (reduction required)
WLA	Municipal MS4	Fecal coliform	398	92.15%
		Total coliform	1,991	92.06%
		Enterococci	66	98.46%
WLA	Caltrans	Fecal coliform	0	0.00%
		Total coliform	0	0.00%
		Enterococci	0	0.00%
LA	Agriculture	Fecal coliform	0	0.00%
		Total coliform	0	0.00%
		Enterococci	0	0.00%
LA	Open	Fecal coliform	0	0.00%
		Total coliform	0	0.00%
		Enterococci	0	0.00%

Similar to the wet-weather allocations, compliance with the dry-weather TMDLs is determined through comparison with the WQOs. Specifically, at the end of the TMDL compliance schedule, bacteria densities for all dry-weather days must be less than or equal to the 30-day geometric mean REC-1 WQOs 100 percent of the time (Table 2-2). Additionally, the bacteria densities must be consistent with the single sample maximum REC-1 WQOs (presented in Table 2-2 for wet weather).

2.2.2 Metals

The Chollas Creek metals TMDL has chronic and acute numeric targets for dissolved copper, lead, and zinc. These are equal to the numeric water quality criteria defined in the California Toxics Rule (CTR). The acute criterion, defined in the CTR as the Criteria Maximum Concentration, equals the highest concentration of a pollutant to which aquatic life can be exposed for a short period without deleterious effects. The chronic criterion, defined in the CTR as the Criteria Continuous Concentration, equals the highest concentration of a pollutant to which aquatic life can be exposed for an extended period (4 days) without deleterious effects.

CTR freshwater aquatic life criteria for certain metals are expressed as a function of hardness because hardness or water quality characteristics that are usually correlated with hardness can reduce or increase the toxicity of some metals. To assess compliance with the standards, metals and hardness should be determined at the same time. Hardness is used as a surrogate for a number of water quality characteristics that affect the toxicity of metals in a variety of ways. Increasing hardness generally has the effect of decreasing the toxicity of metals. Water quality criteria to protect aquatic life may be calculated at different concentrations of hardness measured in milligrams per liter (mg/L) as calcium carbonate ($CaCO_3$). The CTR provides hardness-dependent equations to calculate the freshwater aquatic life metals criteria using site-specific hardness data. These equations represent the numeric targets for each metal (Table 2-5). The equations include a water effect ratio (WER) which considers the bioavailability and toxicity of a specific pollutant. In the absence of an approved, site-specific WER, a default value of 1 is assumed. A site-specific WER has not been approved by the SDRWQCB for Chollas Creek; however, the City of San Diego has completed a WER study to determine site-specific objectives for copper and zinc and submitted the study to the SDRQWCB for approval. The calculated copper WERs are 4 to 5 times higher than the default, while the zinc WER is approximately 1.5 times higher than the default WER value of 1 (AMEC Environment and Infrastructure 2012).

Table 2-5. WQOs for metals

Metal	Acute conditions: Criteria Maximum Concentration	Chronic conditions: Criteria Continuous Concentration
Copper	WER x 0.96 x EXP[(0.9422)(ln(hardness)) – 1.700]	WER x 0.96 x EXP[(0.845)(ln(hardness)) – 1.702]
Lead	WER x [1.46203 – (0.145712)(ln(hardness))] x EXP[(1.273)(ln(hardness)) – 1.460]	WER x [1.46203 – (0.145712)(ln(hardness))] x EXP[(1.273)(ln(hardness)) – 4.705]
Zinc	WER x 0.978 x EXP[(0.8473)(ln(hardness)) + 0.884]	WER x 0.986 x EXP[(0.8473)(ln(hardness)) + 0.884]

WER = Water-Effect Ratio (assumed to be 1)

The metals TMDL is expressed in terms of concentration. An explicit margin of safety of 10 percent was applied; therefore, the allocations are equal to the 90 percent of the concentration calculated from the CTR hardness-dependent equations (Table 2-5).

2.2.3 Diazinon

The diazinon TMDL has chronic and acute numeric targets based on the California Department of Fish and Game freshwater water quality criteria for diazinon. The acute criterion protects aquatic life from short-term exposure while the chronic criterion protects from long-term diazinon exposure (Table 2-6).

Table 2-6. WQOs for diazinon

Exposure duration	Numeric target	Averaging period	Frequency of allowed exceedance
Acute	0.08 µg/L	One-hour average	Once every 3 years on the average
Chronic	0.05 µg/L	Four-day average	Once every 3 years on the average

µg/L = micrograms per liter;

The diazinon TMDL is expressed in terms of concentration. The loading capacity is set at exactly the same concentration as in Table 2-6. The allocations and required reductions are presented in Table 2-7. These allocations apply to dischargers of urban storm water flows to Chollas Creek.

Table 2-7. WQOs for diazinon

Exposure duration	Numeric target	Margin of safety	Wasteload and load allocations	Reduction needed
Acute	0.08 µg/L	0.008 µg/L	0.072 µg/L	84%
Chronic	0.05 µg/L	0.005 µg/L	0.045 µg/L	90%

µg/L = micrograms per liter

2.2.4 Additional Pollutants of Concern

The Chollas watershed has several other impairments included on the 2010 303(d) list (nutrients [nitrogen and phosphorous], trash, and sediment toxicity/benthic community effects). All the impairments have a numeric or narrative WQO included in the Basin Plan. The existing TMDLs do not establish targets, WLAs, or LAs for these pollutants of concern. Applicable WQOs are presented in Table 2-8 and can be used for load reduction estimations.

Table 2-8. WQOs for additional pollutants of concern

Parameter	Numeric WQO	Narrative WQO
Sediment Toxicity	N/A	Aquatic Life – Benthic Community Protection (Part 1 SQOs): Pollutants in sediments shall not be present in quantities that, alone or in combination, are toxic to benthic communities in bays and estuaries of California. This narrative objective shall be implemented using the integration of multiple lines of evidence (MLOE) as described in Section V of Part 1.
Trash	N/A	*Floating Material*: Waters shall not contain floating material, including solids, liquids, foams, and scum in concentrations which cause nuisance or adversely affect beneficial uses. *Suspended and Settleable Solids*: Waters shall not contain suspended and settleable solids in concentrations of solids that cause nuisance or adversely affect beneficial uses.

<table>
<tr><th>Parameter</th><th>Numeric WQO</th><th>Narrative WQO</th></tr>
<tr><td>Nitrogen</td><td>N/A</td><td rowspan="2">Inland surface waters, bays and estuaries and coastal lagoon waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growths cause nuisance or adversely affect beneficial uses.
Concentrations of nitrogen and phosphorus, by themselves or in combination with other nutrients, shall be maintained at levels below those which stimulate algae and emergent plant growth. Threshold total phosphorus (P) concentrations shall not exceed 0.05 mg/l in any stream at the point where it enters any standing body of water, nor 0.025 mg/l in any standing body of water. A desired goal in order to prevent plant nuisance in streams and other flowing water appears to be 0.1 mg/l total P. These values are not to be exceeded more than 10 percent of the time unless studies of the specific waterbody in question clearly show that water quality objective changes are permissible and changes are approved by the Regional Board. Analogous threshold values have not been set for nitrogen compounds; however, natural ratios of nitrogen to phosphorus are to be determined by surveillance and monitoring and upheld. If data are lacking, a ratio of N:P = 10:1, on a weight to weight basis shall be used (SDRWQCB 1994).</td></tr>
<tr><td>Phosphorous</td><td>N/A</td></tr>
</table>

N/A = No applicable numeric WQO is available in the Basin Plan.

2.3 TMDL Implementation Schedule

For the metals TMDL, full implementation of the TMDL is required within 20 years of the effective date (October 22, 2008) and interim goals are incorporated at 10 years from the effective date.

Because several TMDLs are approved for the Chollas watershed, full implementation of the TMDL for indicator bacteria is to be complete within 10 years of the effective date (April 4, 2011) for the dry-weather TMDLs and within 20 years for the wet-weather TMDLs. The bacteria TMDL prioritizes impaired waters for phased compliance on the basis of three factors: level of beach (marine or freshwater) swimmer usage, frequency of exceedances of WQOs, and existing programs designed to reduce bacteria load. Short-term strategies are to achieve a 50 percent reduction in dry-weather and wet-weather exceedances within 5 years for the priority 1 waterbodies, within 6 years for priority 2 waterbodies, and within 7 years for priority 3 waterbodies. The Chollas watershed has only priority 3 waterbodies. The default bacteria TMDL compliance schedule is summarized in Table 2-9. This schedule applies to the bacteria TMDL unless an alternative compliance schedule is approved as a part of the CLRP.

Table 2-9. WLA and LA implementation schedules for Chollas watershed TMDLs

TMDL	Condition	Interim Phased Implementation	Final Compliance
Bacteria	Wet weather	April 4, 2021: 50% exceedance frequency reduction	April 4, 2031: 100% exceedance frequency reduction
	Dry weather	April 4, 2018: 50% exceedance frequency reduction	April 4, 2021: 100% exceedance frequency reduction
Metals	All	October 22, 2018: 20% allowable exceedance of WLA (allowable percentage above)	October 22, 2028: 0% allocable exceedance of WLA (allowable percentage above)
Diazinon	All		

With a plan that meets all requirements of a CLRP, RPs must achieve compliance with the bacteria WLAs and LAs by 2031 (assuming a 20-year implementation schedule is approved as part of this CLRP). With the RPs' commitment to developing a CLRP Implementation Program after CLRP development, this provides additional assurance that the CLRP will meet its intended goals over the implementation period. The proposed comprehensive implementation schedule is presented along with implementation recommendations and the CLRP Implementation Program in Section 7.

2.4 CLRP Organization

The focus of this CLRP report is to recommend a strategy to support implementation of a comprehensive and efficient plan to reduce pollutant loadings in the Chollas watershed. Section 1 describes the Chollas watershed, the pollutants of concern, and the guiding principles of the CLRP; Section 2 provides additional details on the TMDL, numeric targets, and TMDL implementation schedule. The remainder of this plan presents information and analyses performed to support the implementation recommendations (Section 7). These sections are outlined below.

- ***Section 3—Pollutant Source Characterization and Prioritization:*** This section identifies sources of the CLRP pollutants to the Chollas watershed on the basis of monitoring data and literature searches. Existing loads are also quantified using the Loading Simulation in C++ (LSPC) watershed model. Depending on the pollutant of interest, some constituents were modeled directly using LSPC, other constituents are represented by a modeled surrogate (i.e., sediment), and other pollutants are not represented by the watershed loading results (for additional discussion, see Section 3.3). Watershed areas are subsequently prioritized on the basis of the spatial distribution of the existing loads.
- ***Section 4—Developing Nonstructural Solutions:*** Existing and proposed nonstructural solutions that address pollutant sources are discussed in Section 4. These solutions include public information, industrial and commercial facilities control programs, and development and construction programs, among others. This section connects these solutions with pollutant-generating activities (PGAs) identified throughout the watershed.
- ***Section 5— Developing Structural Solutions:*** Structural solutions are also required to achieve significant load reductions. This section presents existing, planned, and new identified opportunities for distributed and centralized structural BMPs. The BMPs were prioritized according to a ranking scheme including high-priority management areas (HPMAs), available area, and slope, among other factors.
- ***Section 6—Identifying Water Resources Plans and Other Planning Objectives:*** This section presents integrated water resources opportunities that consider multiple benefits of water storage and pollutant reduction. In addition, water resources benefits associated with the centralized and distributed BMPs are discussed.
- ***Section 7—Implementation Recommendations:*** Recommended implementation opportunities are presented and are based on a synthesis of the information presented throughout this CLRP. These recommendations include nonstructural solutions, structural BMPs, water resources opportunities, and they consider cost. This section serves as a roadmap for CLRP Implementation Program development to achieve comprehensive load reductions for all pollutants of concern in the Chollas watershed.
- ***Section 8—Monitoring Plans:*** A monitoring plan has been developed to consider data collection needs associated with the CLRP, including compliance and effectiveness monitoring. These data will support evaluation of load reductions.

3 Pollutant Source Characterization and Prioritization

This section identifies and characterizes potential point and nonpoint pollution sources in the Chollas watershed. Discretely characterizing pollutant sources can be a cumbersome task because of the diverse nature of pollutant source types. Existing and selected strategies for pollutant source characterization (PSC) are presented in Pollutant Source Characterization Approach (Section 3.1). For the Chollas CLRP efforts, potential and typical pollutant sources are classified into six categories and discussed in detail in the Pollutant Source Characterization section (Section 3.2). Watershed modeling results with wet- and dry-weather pollutant loadings are presented in the Pollutant Loading Analysis section (Section 3.3). Prioritization of water quality areas based on pollutant loadings is presented in the Water Quality Prioritization Section (Section 3.4). Understanding and characterizing pollutant sources in the watershed will be useful in assessing HPMAs and implementing structural and nonstructural solutions.

3.1 Pollutant Source Characterization Approach

Typical pollutant sources can often contribute multiple pollutants to the environment. Pollutant sources can be as discrete as a point discharge or as indiscrete as landscaping activities. This section focuses on three strategies for pollutant source characterization. The goal of Section 3 is to identify and summarize the primary sources of pollutants and activities in the watershed. Previous efforts have been focused on characterizing and prioritizing bacterial sources through the Bacteria Conceptual Model developed by the San Diego MS4 Copermittees (Appendix A). Alternatively, PGAs have been identified and classified in the *Long-Term Effectiveness Assessment (LTEA) Report* (San Diego County 2011b). For the Chollas CLRP, pollutant sources have been compiled into six broad source categories that are subject to existing programmatic oversight. These six programmatic categories incorporate potential pollutant sources that are recognized as PGAs (Table 3-1) or have been identified in the Bacterial Conceptual Model. These six programmatic categories are National Pollutant Discharge Elimination System (NPDES) discharges, road infrastructure, atmospheric deposition, waste sites, wastewater, and agricultural operations (Section 3.2). The three strategies to characterize pollutant sources are further described below.

Bacteria Conceptual Model

To characterize bacteria sources, the San Diego MS4 Copermittees recently developed a conceptual model to identify bacteria sources and transport pathways in regional watersheds. This conceptual model considers both intermittent and continual sources of bacteria under both wet- and dry-weather conditions. The development of this model is accompanied by a literature review, which identifies and summarizes studies that quantify sources and sinks for bacterial constituents in urban watersheds internationally. Findings in the literature review were used in developing the Bacterial Conceptual Model. A prioritization process was also incorporated into the conceptual model using available information in each watershed and potential bacterial sources. The prioritization is ultimately based on five themes that have different weighting factors: human health risk, magnitude, geographical distribution, frequency and controllability. Controllability is used as a secondary factor to support source scoring (Appendix A).

Sources of bacteria presented in the conceptual model are broken into three categories to differentiate the source relationship to human activity (Appendix A). The three categories of bacterial sources are (1) human origin; (2) non-human origin: anthropogenic; and (3) non-human origin: non-anthropogenic/natural origin. Sources of human origin identify bacteria from the human body. These sources are related to sewage infrastructure, wastewater treatment plants, mobile sources, reusing wastewater and biosolids, garbage, and non-storm water discharges. Sources of anthropogenic, non-human origin identify bacteria resulting from human activities but not the human body. These sources are related to domestic animals, manure reuse (nonagricultural activities), landscaping, solid/liquid waste, agricultural activities, commercial/industrial processes, secondary wildlife (birds and rodents), reclaimed water, and biofilm/regrowth in MS4 infrastructure. Last, sources of non-anthropogenic origin identify bacteria independent of human activity and naturally occurring such as wildlife, wrackline (flies and decaying plants), plants, algae and soil. Sources in these three main source type categories have a potential pathway into an MS4 or receiving water (creek, river, lagoon, or ocean) during both wet- and dry-weather conditions. Depictions of these three bacterial sources and further discussion on the conceptual model are presented in Appendix A.

LTEA Pollutant-Generating Activities (PGAs)

PGAs are presented in the 2011 LTEA (San Diego County 2011b). PGAs are activities or land uses from which the discharge of pollutants or substances of concern to water quality reasonably can be expected because of the nature of the associated operations and actions, and that, thus, might need supplemental practices, controls, site enhancements or other measures to prevent the discharge of pollutants. PGAs are specific in nature because they identify nearly every potential activity that can have a source loading potential. These specific activities are important to identify because they can be specifically targeted through the use of many nonstructural BMPs (for a more detailed discussion on PGAs and their use in the CLRP, see Section 4).

CLRP Approach

To comprehensively characterize pollutant sources in the Chollas watershed, the PGAs were collectively assessed and categorized into the six programmatic pollutant source categories. The relationship between categorical PGAs and the six programmatic pollutant source categories is presented in Table 3-1. The PGA categories in Table 3-1 are a consolidation of the original PGA categories and include the addition of homeless encampments and equestrian properties and horse-related uses (Section 4). Specifically, for this table, the 37 predefined categories of PGAs presented in the 2011 LTEA have been consolidated where there was significant overlap of PGAs. As shown in Table 3-1, the six programmatic pollutant source categories encompass all the PGA activities and in many cases PGA activities fall within several categories.

Table 3-1 also demonstrates that the three bacteria source categories founded in the Bacteria Conceptual Model (Appendix A) fall within at least one of the six programmatic pollutant source categories. The six source categories used in the CLRP efforts and discussed in the following sections cover a range of PGAs, bacteria sources, and address other pollutants not necessarily generated in the watershed such as those from atmospheric deposition. These six categories present point and nonpoint sources that can be controlled under implementation measures and are subject to programmatic oversight.

Table 3-1. PSC linkages

Existing categories	PSC categories					
	NPDES sources	Road infrastructure	Atmospheric deposition	Waste sites	Wastewater sources	Agricultural operations
PGA categories						
Residential Uses	✓		✓	✓	✓	✓
Development & Redevelopment	✓		✓			
MS4	✓				✓	
Maintenance & Storage yards	✓			✓		

Existing categories	PSC categories					
	NPDES sources	Road infrastructure	Atmospheric deposition	Waste sites	Wastewater sources	Agricultural operations
Park & Rec Facilities Incl. Golf Courses	✓				✓	✓
Auto body or repair shops	✓		✓	✓		
Equipment Maintenance & Repair	✓		✓	✓		
Mobile Vehicle Washing or Repair	✓		✓	✓	✓	
Mobile Power Washing	✓		✓		✓	
Parking Lots	✓	✓	✓	✓		
Retail or Wholesale Fueling	✓		✓	✓		
Pest Control Services	✓		✓			✓
Eating & Drinking Establishments	✓			✓	✓	
Mobile Cleaning	✓		✓		✓	
General Contractors	✓		✓			
Zoos, Gardens, Nurseries & Greenhouses	✓		✓		✓	✓
Mobile Landscaping	✓		✓			✓
Marinas	✓		✓	✓	✓	
Animal Kennels & Facilities	✓				✓	
Outdoor Storage & Building Materials Facilities	✓			✓		
Equestrian properties & horse related uses	✓				✓	✓
Homeless Encampments	✓				✓	
Surface transportation System	✓	✓	✓	✓		
Bacteria conceptual model source categories						
Human origin	✓			✓	✓	
Anthropogenic, non-human origin	✓			✓		✓
Non-anthropogenic origin	✓					

3.2 Pollutant Source Characterization

For the Chollas CLRP, the characterization of pollutant sources in the watershed is critical in assessing areas of multi-pollutant concern or HPMAs (Section 3.4). These efforts are then applied and used in identifying and prioritizing BMP efforts discussed in Sections 4 and 5. To comprehensively characterize pollutant sources in the Chollas watershed, pollutant sources have been broken into six programmatic categories: NPDES discharges, road infrastructure, atmospheric deposition, waste sites, wastewater, and agricultural operations. The extent of these point and nonpoint sources present in the Chollas watershed is based on information gathered from several water quality monitoring programs and special studies conducted in the Chollas watershed.

For this watershed, most of the water quality monitoring is generally conducted under several countywide, regulatory monitoring programs. These monitoring programs are the MS4 monitoring program, Stormwater Monitoring Coalition (SMC) Regional Bioassessment, Jurisdictional Dry Weather Monitoring Programs (JURMPs), and the Mass Loading Station (MLS) and Temporary Watershed Assessment Stations (TWAS) Ambient and Storm Monitoring Program. The results of these programs are presented in the *San Diego County Copermittees Annual Urban Runoff Monitoring Report* and the *2005-2010 San Diego Stormwater Copermittees LTEA Report*. In addition, several special studies have been conducted in the Chollas watershed to support TMDL development, especially for source assessment and land use-specific source characterizations. These studies were also helpful to characterize sources for the CLRP pollutants of concern.

Monitoring locations for many of the aforementioned programs are illustrated in Figure 3-1. Specifically for Chollas, the monitoring stations in Figure 3-1 refer to MS4 monitoring programs (dry-weather monitoring, outfall monitoring, NPDES receiving water), special studies, and bioassessment monitoring efforts.

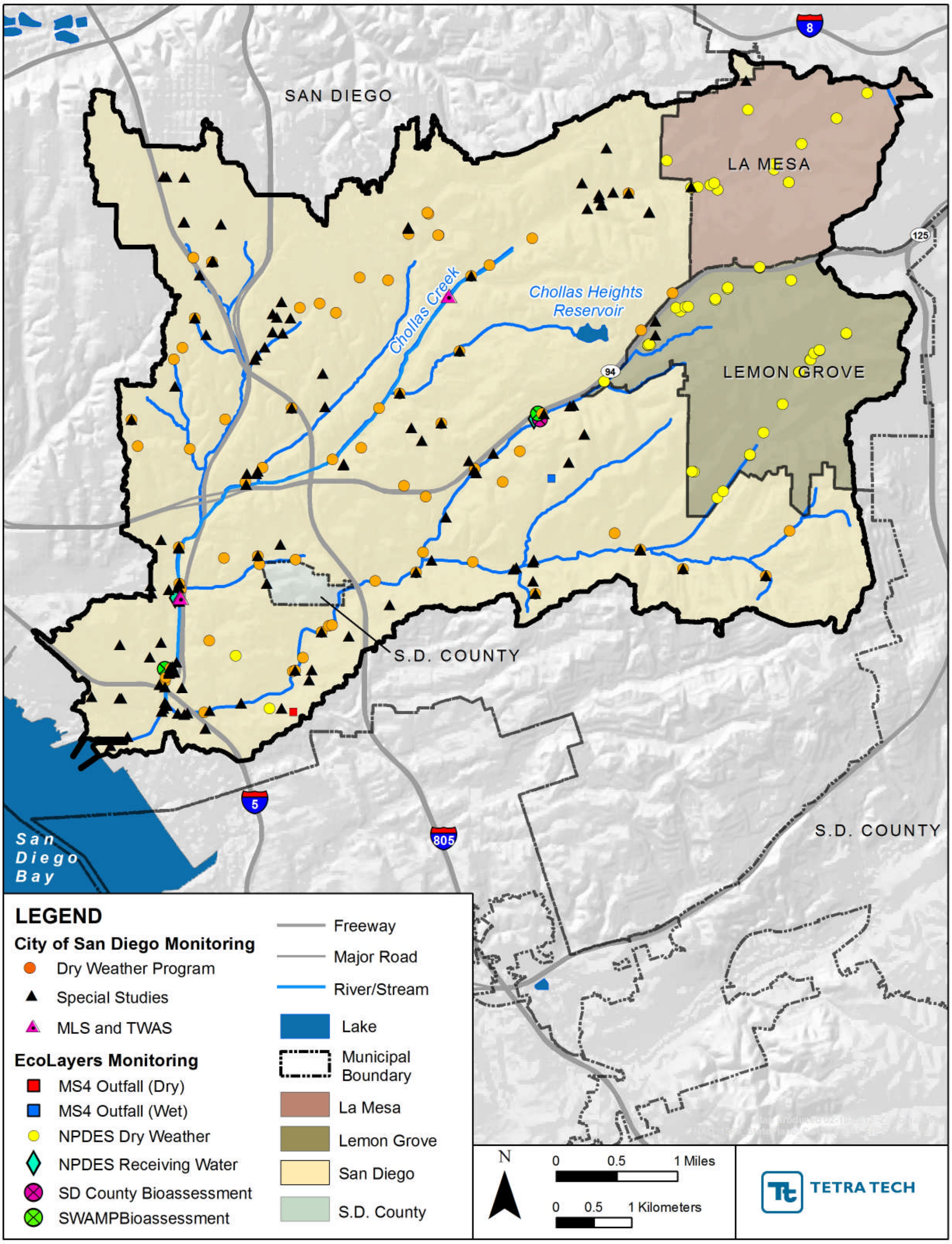

Figure 3-1. Monitoring locations in the Chollas watershed

Storm water pollutants present in the Chollas watershed that will be quantified in the CLRP pollutant loading analysis (Section 3.3) are bacteria (enterococci, fecal coliform, and total coliform), nutrients (total nitrogen and total phosphorous), and metals (copper, lead, and zinc). Typical sources for these pollutants (along with organics and trash) are summarized in Table 3-2. Other pollutants are not represented by the watershed loading results (diazinon, trash, and organic compounds related to the sediment toxicity/benthic community effects impairments), as described in Section 3.3; however, recommended management activities to address sediment and other modeled pollutants will also likely reduce loadings associated with these pollutants. In some cases, pollutants not included in the impairment list are described in the PSC because these pollutants (i.e., organic pollutants) could be related to existing impairments such as toxicity.

Table 3-2. Typical sources of pollutants

	Pollutant						
Potential source	Bacteria	Nutrients	Metals	Organics	Trash	TSS/ turbidity	Key references
Section 3.2.1: NPDES sources							
Residential land areas	•	•			•	•	Regional Source Identification Monitoring Program (San Diego County 2011a); SDRWQCB 2010; City of San Diego 2009c, 2010a; Gregorio and Moore 2004; LARWQCB 2002; Lattin et al. 2004
Agricultural activities (i.e., animal operations, land applications)	•	•		•		•	County of Los Angeles 2010; City of San Diego 2010a; USEPA 2011d; Appendix A
Metallurgical industries/activities			•				County of Los Angeles 2010; San Diego County 2011c
Construction activities			•			•	County of Los Angeles 2010; USEPA 2011d
Industrial/municipal activities	•		•	•	•		Gregorio and Moore 2004; Tiefenthaler et al. 2007; Lattin et. al 2004; Appendix A
POTW Discharges			•				Sabin et al. 2004
Landscaping, fertilizers (residential and agricultural applications)		•		•			County of Los Angeles 2010; USEPA 2011d
Homeless encampments	•				•		City of San Diego 2009a; Appendix A
Pet waste	•	•					USEPA 2011d; Appendix A
Wildlife	•						County of Los Angeles 2010; LARWQCB 2002; Appendix A
Native geology		•	•				County of Los Angeles 2010; LARWQCB 2002
Land surface erosion			•	•		•	County of Los Angeles 2010
Detergents		•					USEPA 2011d
Car washing						•	County of Los Angeles 2010; USEPA

Potential source	Pollutant: Bacteria	Nutrients	Metals	Organics	Trash	TSS/ turbidity	Key references
							2011d
Section 3.2.2: Road infrastructure							
Transportation sources (i.e., copper brake pads, tire wear)			•	•			County of Los Angeles 2010; USEPA 2011d; Schueler and Holland 2000; Stein et al. 2006
Pavement erosion			•			•	County of Los Angeles 2010; Caltrans 2003a
Section 3.2.2.3: Atmospheric deposition							
Metallurgical industries/activities (i.e., mining, smelting, refining, iron/steel industry)			•	•			County of Los Angeles 2010; San Diego County 2011c; Sabin et al. 2005, 2006a
Construction activities			•				County of Los Angeles 2010; USEPA 2011d
Roofing			•	•			County of Los Angeles 2010
Resuspension of historic emissions in road dusts and soil particles			•	•			Sabin and Schiff 2007; Sabin et al. 2005
Land surface erosion		•		•			Sutula et al. 2004
Section 3.2.4: Waste sites							
Land surface erosion	•		•			•	County of Los Angeles 2010; City of San Diego 1938, 2010c; Appendix A
Vermin	•						City of San Diego 1938; Appendix A
Section 3.2.5: Wastewater discharges							
Sewer Leaks, sanitary sewer overflows (SSOs), illicit discharges, septic systems	•	•				•	County of Los Angeles 2010; SDRWQCB 2010; SWRCB 2011d; Stein and Tiefenthaler 2005; Appendix A
POTW discharges		•	•				Sabin et al. 2004
Section 3.2.6: Agricultural operations							
Wildlife	•						County of Los Angeles 2010; LARWQCB 2002; Appendix A
Agricultural activities (i.e., animal operations, land applications)	•	•		•		•	County of Los Angeles 2010; City of San Diego 2010c; USEPA 2011d; Appendix A
Fertilizers (residential and agricultural)	•	•		•			County of Los Angeles 2010; USEPA 2011d; Appendix A
Land surface erosion			•	•		•	County of Los Angeles 2010

3.2.1 NPDES Sources

A point source, according to the regulations at Title 40 of the *Code of Federal Regulations* section 122.3, is any discernible, confined, and discrete conveyance, including any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated AFO, landfill leachate collection system, and vessel or other floating craft from which pollutants are or can be discharged. The NPDES program, established under Clean Water Act sections 318, 402, and 405, requires permits for the discharge of pollutants from point sources. Point sources also include storm water that is regulated through the NPDES program.

Storm water runoff in the Chollas watershed is regulated through several types of permits including MS4 permits, a statewide storm water permit for Caltrans; a statewide Construction Activities Storm Water General Permit; and a statewide Industrial Activities Storm Water General Permit. In addition, major and minor NPDES permits are issued for industrial and manufacturing activities. Other minor permits are issued to residential and apartment communities, medical facilities, laboratories, and other various agencies. NPDES permits in the Chollas watershed are summarized in Table 3-3 and shown in Figure 3-2.

According to the Storm Water Multiple Application and Report Tracking System (SMARTS; SWRCB 2011a, 2011b), 45 NPDES dischargers are in the Chollas watershed (Table 3-3). This includes the Caltrans statewide storm water discharge permit, which authorizes storm water discharges from Caltrans properties and facilities, such as the state highway system, park and ride facilities, and maintenance yards. Most of these discharges eventually run to a city storm drain. The NPDES statewide industrial general permit regulates storm water discharges and authorized non-storm water discharges from ten categories of industrial facilities, including manufacturing facilities, oil and gas mining facilities, landfills, and transportation facilities. In the Chollas watershed there are 26 industrial permits. In addition, there is a NPDES statewide construction permit that regulates storm water discharges from construction sites that resulted in land disturbances equal to or greater than one acre. Thirteen construction permits are in the watershed. Note that construction permits are temporary in nature; however, including them in this evaluation is an important component for understanding historical monitoring data (total suspended solids [TSS] for example) and serves as an indicator of the overall land disturbance that can occur in certain areas of the watershed. The permits overlap in time and space; therefore, as an aggregate, they represent a more continuous source. In addition, sediment that leaves a site can remain in the drainage system for some time.

The other four NPDES permits are associated with shipping activities and the Helix Water District. Locations of these NPDES permits are illustrated in Figure 3-2. Municipal storm water, regulated by the MS4 permit (Table 3-3), is a more general permit category because it considers loading associated with various sources and activities (i.e., generally land-use based).

Table 3-3. NPDES permits in the Chollas watershed

Permit type	Chollas watershed
POTWs	0
Municipal storm water	1
Industrial storm water	26
Construction storm water	13
Caltrans storm water	1
Other NPDES discharges	4
Total NPDES discharges	**45**

Sources: SWRCB 2011a, 2011b

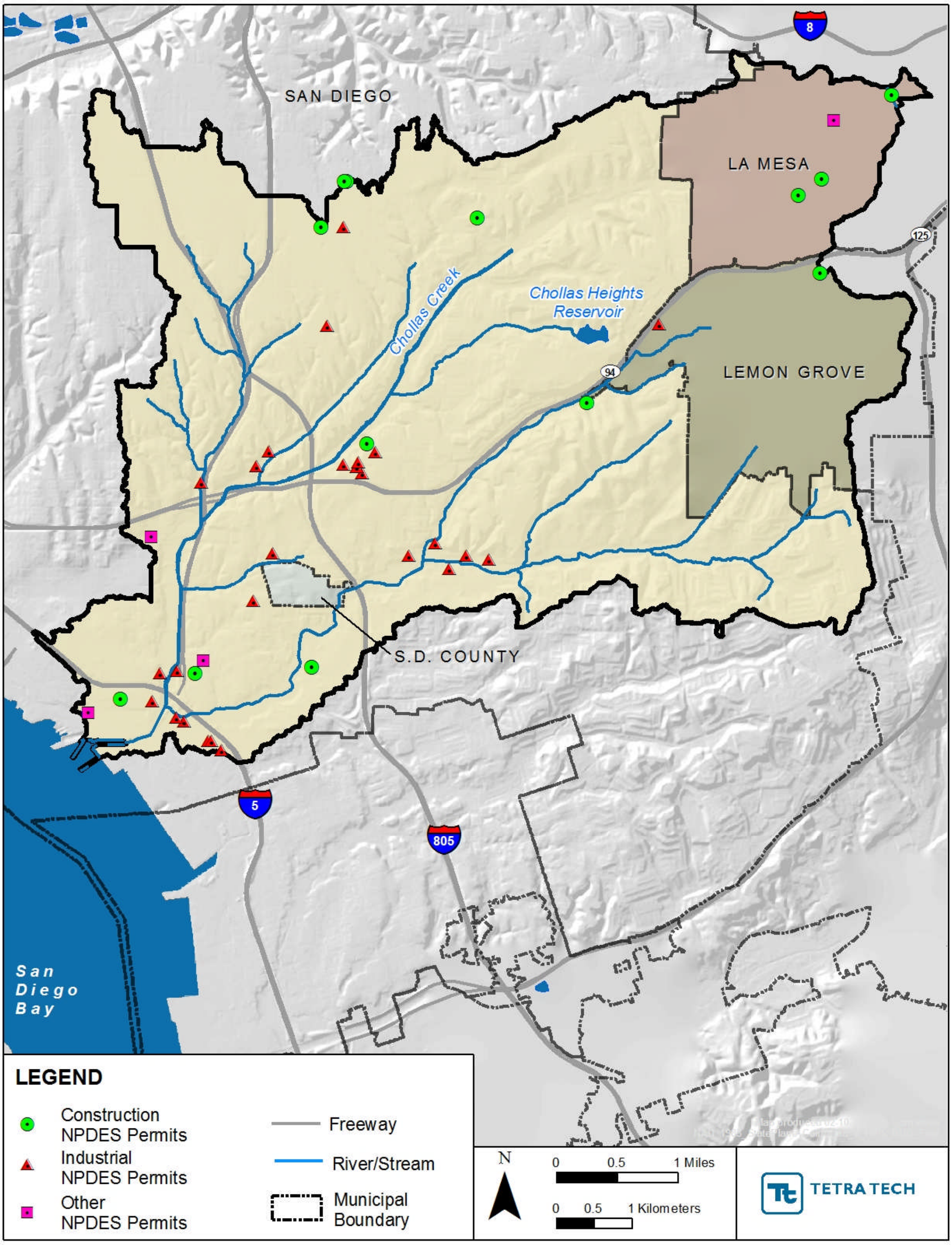

Figure 3-2. NPDES permits in the Chollas watershed

Storm water outfalls are point sources of storm water runoff into receiving waterbodies and are regulated by the MS4 permit described above. The location and density of these outfalls can serve as a general indicator of the significance of storm water-based sources in the drainage area. The locations of storm water outfalls in the Chollas watershed are shown in Figure 3-3 (note: culverts within the County of San Diego are mapped in addition to outfalls.). Many outfalls are throughout the entire watershed. Typically, the *first flush* of a storm discharges greater concentrations or mass in the early part of the storm event (Caltrans 2005) and therefore, understanding the drainage areas of storm water outfalls would be useful in identifying potential pollutant sources. The imperviousness of a drainage area (Figure 1-3) also provides an indication of the degree of urbanization and the amount of storm water that can be conveyed directly to the MS4 and released into receiving waters. Because the entire watershed is developed, storm drain effluent throughout the watershed will contain storm water pollutants derived from residential and transportation land use activities such as landscaping, car washing, pet waste, and vehicle wear.

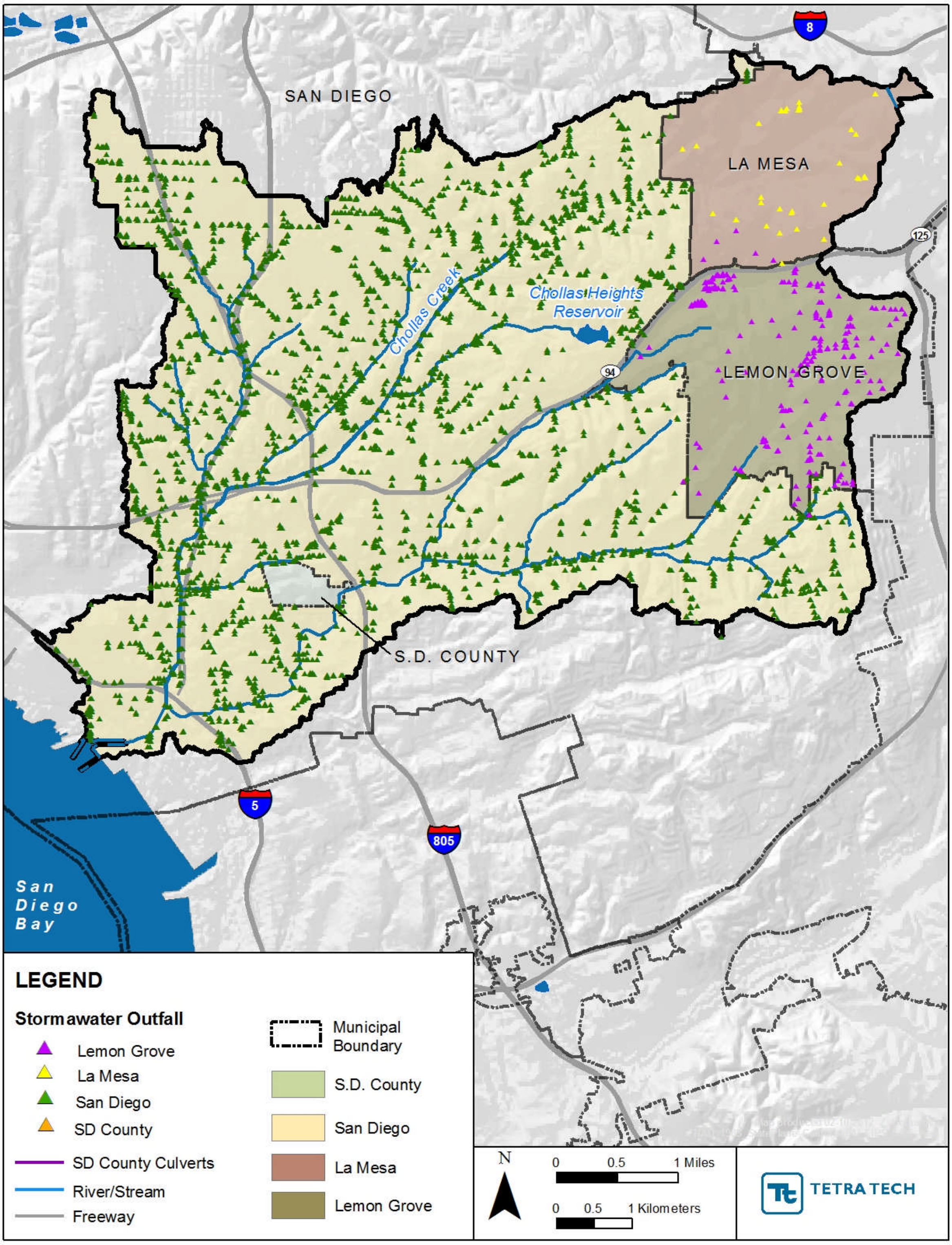

Figure 3-3. Storm water outfalls in the Chollas watershed

Discharges from residential, commercial, transportation, and industrial areas can be a significant source of pollutant loads. The following provides additional discussion regarding the presence of pollutants in storm water runoff and other permitted discharges, their extent, and their potential sources in the Chollas watershed. Storm water pollutants present in the Chollas watershed that will be addressed in this PSC are indicator bacteria (enterococci, fecal coliform, and total coliform), nutrients (total nitrogen and total phosphorous), metals (copper, lead, and zinc), toxics (including diazinon), and trash.

3.2.1.1 Bacteria

Bacterial contamination is generated throughout the watershed and then transported through the storm drain system regulated under the MS4 permit (SDRWQCB 2010; Griffith and Ferguson 2011). Specific sources of bacteria are associated with all three categories (human sources, anthropogenic sources, and non-anthropogenic sources) presented in the bacteria conceptual model (Appendix A). Storm drain system discharges can have elevated levels of bacterial indicators from sanitary sewer leaks and spills; illicit connections of sanitary lines to the storm drain system; runoff from homeless encampments; pet waste; organic debris from gardens, landscaping and parks; food waste; and illegal discharges from recreational vehicle holding tanks, among others (Gregario and Moore 2004; Stein and Tiefenthaler 2005; LARWQCB 2006; Stein and Yoon 2007; SDRWQCB 2010). A bacterial source study of Mission Bay determined that bacterial loadings from storm water discharges are most significant during the San Diego Region wet season (December through March) (Schiff and Kinney 2001). Dry-weather bacteria loadings from storm drains contribute substantial concentrations of bacteria and metals, which can be attributed to illicit discharges, permitted periodic discharges of industrial or construction-related effluent, and inherent variability in storm drain discharges (Stein and Tiefenthaler 2005). The bacteria indicators used to assess water quality are not specific to human sewage; therefore, natural influences of fecal matter from animals and birds can also be a source of elevated levels of bacteria (LARWQCB 2002; Stein and Yoon 2007). Additionally, vegetation and food waste can be a source of elevated levels of total coliform bacteria (LARWQCB 2006). These potential point and nonpoint sources of bacteria are summarized in Table 3-2.

As part of the San Diego Regional MS4 permit, the Pueblo San Diego HU was recently assessed in the *2009-2010 Receiving Waters and Urban Runoff Monitoring Report* (San Diego County 2011a). This assessment included an MLS in the Chollas watershed. Using data collected at this station, enterococci and fecal coliform have been identified as a medium and high priority during dry and wet weather, respectively, in the MLS drainage area. Throughout the watershed, MS4 outfall monitoring data identified enterococci and fecal coliform as a high priority and medium priority, respectively, during dry-weather conditions (San Diego County 2011a).

An evaluation of bacteria source loading in the Chollas watershed identified potential sources of bacteria throughout the watershed with concentrated densities in the upper watershed reaches and near the base of the watershed during three wet weather sampling events in fiscal year 2005/2006 (City of San Diego 2006). In addition, a bacterial source tracking study was recently conducted with the objective to identify potential sources of bacteria during dry weather at the mouth of Chollas Creek (City of San Diego 2009c). The study determined that there was no hydrologic connection between the mouth of Chollas Creek and the upstream drainage area and so, bacteria concentrations measured at the mouth of Chollas Creek during dry weather were limited to sources that drain directly to the mouth. Storm drains are the most likely source of flow and, therefore, bacteria to the mouth. In total, 17 storm drains terminate in the mouth of Chollas Creek. While all the storm drains had significant levels of bacteria, two storm drains near the National Avenue Bridge had the highest concentrations of bacteria. The primary sources of flow and bacteria for these two storm drains were irrigation runoff of landscaping at a strip mall and a freshwater slough adjacent to the freeway off ramp. Scour ponds associated with storm drains were also identified as a point of inoculation for bacteria concentrations, and likely serve as a source of bacteria (City of San Diego 2009c).

Across the watershed, residential land uses compose nearly half of all land in the watershed; therefore, it is likely that land use practices associated with residential lands contribute significantly to bacteria loads across the watershed (Gregorio and Moore 2004; SDRWQCB 2010; San Diego County 2011a). Residential sources of bacteria could include intermittent illicit discharges and sanitary sewer overflows (SSOs) and more widespread contributions from pet waste and trash storage areas that contain or promote bacterial growth. Further, a bacterial source tracking study conducted in San Diego County identified enterococci strains associated with plants and soils (*E. casseliflavus*) and strains capable of attaching and growing on concrete surfaces of the MS4. Results from this study suggest that natural reservoirs of enterococci could contain high densities of enterococci from the bacteria's ability to grow in the environment (Griffith and Ferguson 2011).

3.2.1.2 Nutrients (Nitrogen, Phosphorous)

Potential sources of nutrients across the watershed are fertilizer used for lawns and landscaping; organic debris from gardens, landscaping, and parks; phosphorus in detergents used to wash cars or driveways; trash such as food wastes; domestic animal waste; and human waste from areas inhabited by the homeless. Nutrients from land-use activities and those that are atmospherically deposited build up, particularly on impervious surfaces, and are washed into waterways through storm drains. Nutrient loading is often associated with specific land use practices. For example, high nitrogen and phosphorus loadings are associated with urban wet-weather runoff from residential, commercial, and industrial land uses (LARWQCB 2003; USEPA 2003a; Sutula et al. 2004; SCCWRP 2010). A summary of potential point and nonpoint sources of nutrients is shown in Table 3-2.

Monitoring at the Chollas Creek MLS has identified total phosphorus as a high-priority pollutant and total nitrogen as a medium-priority pollutant in the MS4 outfalls during dry weather (San Diego County 2011a). Of concern, evaluation of historical data at the MLS shows increasing concerns associated with total Kjeldahl nitrogen and nitrates (San Diego County 2011a). Because residential land uses cover nearly 50 percent of the watershed, it is likely that land use practices (i.e., use of fertilizer, landscape debris, detergents, trash) associated with residential lands account for the majority of nutrients washed into the MS4 and eventually receiving waters.

3.2.1.3 Metals (Copper, Lead, and Zinc)

Although naturally occurring, concentrations of these metals can be of concern in urban environments because of potential industrial and urban discharges. A variety of industrial uses could contribute to concentrations of these metals including automotive scrap yards, repair shops, and recycling facilities (Tiefenthaler et al. 2007). Land use sources, including the general wear and tear of automotive parts, can be a significant source of metals in urban areas with a high density of roadway infrastructure. For example, brake wear can release copper, lead, and zinc into the environment, and tire wear can contribute to concentrations of copper and lead in urban runoff (Sansalone and Buchberger 1997). Motor oil and automotive coolants spills are another potential land use source of metals. Pesticides, algaecides, wood preservatives, galvanized metals, and paints used across the watershed can also contain these metals. A summary of point and nonpoint sources of metals is presented in Table 3-2.

Concerns have been associated with elevated concentrations of copper, lead and zinc in the Chollas watershed. Specifically, dissolved copper, dissolved lead, and dissolved zinc were each identified as a high priority in receiving waters during wet weather, and trends evaluated at the Chollas Creek MLS showed increasing concerns associated with total copper and total zinc (San Diego County 2011a).

A TMDL has been developed to address concentrations of copper, lead, and zinc found in the bottom 1.2 miles of Chollas Creek above the tidal prism (SDRWQCB 2007). According to that TMDL, which also includes areas upstream of the specific study area, urban runoff discharged from the MS4 is the leading cause of receiving water quality impairments because (at the time of TMDL development) no other direct point sources of metals were in the Chollas watershed (SDRWQCB 2007). To calculate metal loadings, a watershed model was developed using historical hydrology and land use. This process was able to identify areas, and the top 10 contributing subwatersheds, with relatively high loadings. The subwatershed draining directly to the mouth of Chollas Creek was identified as the greatest source of copper, lead, and zinc relative to all other subwatersheds (SDRWQCB 2007). Specific sources of these metals identified by the TMDL consist of land uses (freeways and commercial/institutional land), atmospheric deposition, sediment, groundwater, water supply (e.g., treatment plants and infrastructure), and the closed South Chollas landfill (SDRWQCB 2007).

In the Chollas watershed, dissolved copper, lead and zinc were found to be elevated in the north fork of Chollas Creek and greatest during the first flush storm event of the season (City of San Diego 2006; Weston Solutions 2010). An analysis of copper, lead, and zinc loading found relatively high concentrations of these pollutants generated in the La Mesa area and select locations in the City of San Diego (City of San Diego 2006). Further sampling conducted since TMDL development has identified aerial deposition (see also Section 3.2.2.3) as a significant source of metals to the MS4. Specifically, it found that aerial deposition of copper, lead, and zinc accounts for 100, 29 and 74 percent, respectively, of the average load discharged via storm water runoff (City of San Diego 2009b). In addition, sampling identified 10 specific areas contributing dissolved copper, lead, or zinc loadings. One identified area captured 100 percent of flow from Interstate 805 and contained high concentrations of metals and TSS, likely associated with brake pad dust (copper), tires (zinc), and erosion from the adjacent vegetated medians (Weston Solutions 2010). This finding indicates that transportation is a significant source of metals near this Interstate, and it alludes to the potential loading from transportation (roadways and freeways) throughout the remainder of the watershed.

In addition to transportation sources, concentrations of copper, lead, and zinc were found to be higher in commercial and industrial land uses relative to residential land uses with concentrations of total and dissolved copper correlating with higher percent impervious surface areas (City of San Diego 2009b). Modeling efforts conducted under the Chollas Creek TMDL for metals indicate that freeways and commercial/institutional land uses account for over 75 percent of the predicted metal loadings with potential metal sources generally clustered along commercial streets (City of San Diego 2006). Caltrans is responsible for the California Highway system which, according to subsequent revisions to the Chollas Creek model, contributes 3.8, 2.7, and 7.1 percent of the total watershed loads of copper, lead, and zinc, respectively (RBF Consulting 2009). For commercial/institutional land uses the revised model identified copper, lead, and zinc loads to be 10.3 percent, 14.8 percent, and 14.9 percent, respectively. This study found that high- and low-density residential areas had the highest combined the loads for copper, lead, and zinc (72.6, 79.1, and 69.4 percent, respectively). These revised load distributions were estimated from the average annual loads of metals for the 2000 to 2006 period.

3.2.1.4 Toxics (PAHs, PCBs, chlordane, diazinon)

A TMDL is being developed to address toxic sediments and degraded benthic communities at the mouth of Chollas Creek. Toxic parameters identified as contributing to these impairments include PAHs, PCBs and chlordane (in addition, the presence of specific metals has also contributed to these impairments). Studies conducted to assist with the TMDL development for the mouth of Chollas Creek TMDL found total PCBs, select PAHs and total chlordane consistently above the prediction limit, which was developed based on a regression with sediment grain size to help evaluate impairments (Brown and Bay 2005).

Previous studies identified Chlordane concentrations in some areas (SCCWRP and SPAWAR 2005). Chlordane was primarily used as a pesticide to control subterranean termites in buildings, insects on agricultural crops, residential lawns and gardens (ATSDR 1994). The most likely route for chlordane to enter the water is from urban and agricultural soils because its tendency is to adsorb to particulates before entering a body of water (ATSDR 1994). Therefore, the most likely source of chlordane in the Chollas watershed is storm water runoff carrying chlordane adsorbed to eroded sediment particles.

PAH discharges in urban environments are high from numerous concentrated sources including tailpipe emissions from vehicles, petroleum refineries, coal burning for fuel production, and other industrial activities (Stein et al. 2006; City of San Diego 2010a). These discharges result in high PAH levels in the atmosphere, which enter receiving waters through wet and dry deposition. In arid urban environments, the long antecedent periods without rain enhance the dry deposition of PAHs to urban landscapes from these atmospheric sources (Stein et al. 2006). Zeng and Vista (1997) identified a prevalence of combustion sources of PAHs and, in San Diego Bay and other arid regions, long antecedent periods without rain have been found to potentially enhance dry deposition of PAHs to urban landscapes from atmospheric sources such as vehicles (Stein et al. 2006). For these reasons, it can be assumed that the primary source of PAHs to the Chollas watershed is urban storm water runoff where airborne PAHs are deposited on the land (e.g., through precipitation or indirect atmospheric deposition) and are transported to receiving waters through storm water runoff. Supportive of this and indicative of pyrogenic sources (combustion of fossil fuels/organic matter), high molecular weight PAH concentrations during both dry- and wet-weather monitoring have been shown to be elevated in the Chollas watershed, and mean PAH concentrations were almost twice as high (if not higher) during dry weather in the storm drain sites compared to the non-storm drain sites (City of San Diego 2010a).

At the mouth of Chollas Creek are the Navy pier facilities and NASSCO, a shipyard that is required to be a zero storm water discharge facility. Although not at the mouth of Chollas Creek, other industrial/commercial shipping facilities are in the San Diego region. These local and regional commercial/industrial shipping facilities, in conjunction with elevated railroad and truck freight activity, might contribute to the elevated PAH concentrations detected in the area.

Historically, PCBs have been introduced into the environment through discharges from point sources and through spills and accidental releases. Although point source contributions are now controlled, nonpoint sources might still exist; for example, refuse sites and abandoned facilities could still contribute PCBs to the environment through leakage or poor containment (USEPA 2009a). PCBs have also been found in caulking material used in building construction or renovation that occurred between 1950 and 1978 (USEPA 2009b). These sources can wash into the MS4 and ultimately, waterways, during runoff events. Once in a waterbody, PCBs bind to solid particles and eventually deposit and settle in the sediment (USEPA 2002). Recent monitoring data collected within the watershed showed non-detection values for PCBs (City of San Diego 2010a). Concentrations near the mouth of Chollas Creek were most elevated during dry weather periods, although PCB levels were relatively low compared to other organic constituents. Elevated concentrations were found near industrial shipping and freight areas that indicates a likely significant source.

While PBCs, PAHs, and chlordane are associated with sediment toxicity at the mouth of Chollas Creek, diazinon and other pollutants may be causing acute and chronic toxicity to aquatic life in Chollas Creek itself. A toxicity identification evaluation (TIE) was conducted in 1999 to determine the cause of toxicity in Chollas Creek storm water flows. Results of the TIE indicated that water flea toxicity was caused by diazinon, which was found in concentrations from 0.32 to 0.54 µg/L (SDRWQCB 2002). Runoff, either as storm water or nuisance water runoff (e.g., from landscape irrigation), may be a source of diazinon entering Chollas Creek.

3.2.1.5 Trash

Sources and pathways of trash include littering by the general public on or adjacent to waterways; wind-blown trash, also originating from littering, inadequate waste handling or illegal dumping; and direct disposal (overboard disposal or dumping) of trash into waterbodies from vessels involved in commercial, military, fishing or recreational activities. Because the Chollas watershed is completely urbanized, sources of trash can be diffuse in origin but arise from a number of land use activities throughout the watershed. For example, improperly stored trash on residential, commercial, institutional, and industrial land uses can be blown away and contribute significantly to unsightly conditions. In addition, recreation and open spaces account for over 11 percent of lands across the watershed; improperly discarded trash on these land uses can also contribute to litter that is washed into the MS4 or receiving waters.

In the Chollas watershed a recent trash assessment evaluated 105 monitoring locations. The relative amount of trash recorded at each site was determined by trash ratings, because each rating has a quantitative component (e.g., less than 10 pieces for the *optimal* rating). Of the Chollas Creek locations, 21 were found to be optimal, 45 were rated as suboptimal, 32 marginal, one submarginal, and 6 were found to be poor because of the presence of trash. No threat to human health was identified, but trash was found to be a threat to aquatic health at 13 sites monitored (San Diego County 2011a).

Because no discrete origins of trash exist, the presence of trash is monitored and most visibly in the MS4 and receiving waters. Currently, there is limited monitoring and study on the presence and transport of trash to provide any indicative trends during wet- and dry-weather conditions. Despite limited study, trash is a prevalent pollutant in surface waters that significantly contributes to storm water runoff, among other transportation pathways.

3.2.2 Road Infrastructure

To support large residential areas, there is often a complementary amount of roadways, freeways and transportation land uses. Runoff from highways and roads carries a significant load of pollutants to nearby waterways. Typical contaminants associated with highways, roads, vehicles, and roadside landscapes include sediment, heavy metals, oils and grease, debris, fertilizers, and pesticides, among others (Caltrans 2003c). In general, pollutant loads generated from highways and roads are regulated under either the Caltrans or MS4 permits because most of the runoff eventually flows to a municipal storm drain. Caltrans actively implements storm water controls including sweeping, storm drain inlet maintenance, and a full suite of activities provided in its NPDES permit to address the transport of pollutants from roadway sources (Caltrans 2003a, 2003c).

Table 3-4 shows common sources of contaminants in runoff from roads and highways. For the Chollas watershed, typical roadway pollutants of concern are copper, lead, zinc, and toxic organics such as PAHs, PCBs, and chlordane, indicated by the shading in Table 3-4. Most of the contaminants in the table are associated with sediment delivered from the roadways. These contaminants from roadway runoff remain either bounded to sediment or are dissolved. Cadmium, chromium, copper, lead, and zinc are generally particulate-bound, while higher molecular weight PAHs are generally more associated with suspended solids (Shinya et al. 2000). Road density can be used to indicate the extent of traffic volume and consequential pollutant generation. Road density is defined as the total area of the impervious road pavement. A calculation of road density percentile distribution suggests that a cutoff for road density of 20 percent could delineate high density using an inflection point in the data; low and medium road density categories were further subdivided. Therefore, the following three categories of road network density are defined:

- High Road Density: Road density is greater than 20 percent.
- Medium Road Density: Road density is between 10 and 20 percent.
- Low Road Density: Road density is less than or equal to 10 percent.

Most of the Chollas watershed has medium and high road densities as shown in Figure 3-4. The high-density areas are primarily in the western portion of the watershed, near Interstates 5 and 805 in densely developed areas of downtown San Diego.

Table 3-4. Common sources of roadway pollutants

Source	Cadmium	Chromium	Copper	Iron	Nickel	Lead	Zinc	PAHs	Nutrients	Synthetic organic chemicals
Gasoline	•		•			•	•			
Exhaust					•	•		•		•
Motor oil and grease				•	•	•	•	•		
Antifreeze	•	•	•	•		•	•	•		
Undercoating						•	•			
Brake linings			•	•	•	•	•			
Tires	•		•			•	•	•		
Asphalt	•		•		•		•	•		
Concrete			•		•		•			
Diesel oil	•	•				•	•			•
Engine wear				•	•	•	•			
Fertilizers, pesticides, and herbicides	•		•	•	•		•		•	•

Sources: Adapted from Nixon and Saphores 2007; Lau et al. 2009; Stein and Ackerman 2007; Davis et al. 2001; Schueler and Holland 2000
Note: Shaded cells indicate roadway pollutants of concern for this watershed.

The remainder of this section identifies roadway sources of nutrients, metals, and toxics loading to the Chollas watershed. A summary of pollutants from road infrastructure and other sources is presented in Table 3-2.

3.2.2.1 Nutrients (Nitrogen, Phosphorous)

Road infrastructure can be a potential source of nutrients where there are significant areas of agricultural activity. Because about 0.02 percent of agricultural land areas are in the Chollas watershed (Table 1-1), roadways are not likely to be a significant source of nutrients.

3.2.2.2 Metals (copper, lead, and zinc)

The use and wear of cars is the most prevalent source of roadway pollutants. A California study found that cars are the leading source of metal loads in storm water, producing over 50 percent of the copper, cadmium, and zinc loads (Schueler and Holland 2000). Wear from brake pads, tires, and engine parts are also a significant source of metal pollutants. For example, almost 50 percent of the copper loads in roadway storm water originates from brake pads (Davis et al. 2001), and tire wear accounts for over 50 percent of the total cadmium and zinc loads delivered to the San Francisco Bay each year (Santa Clara Valley Nonpoint Source Control Program 1992).

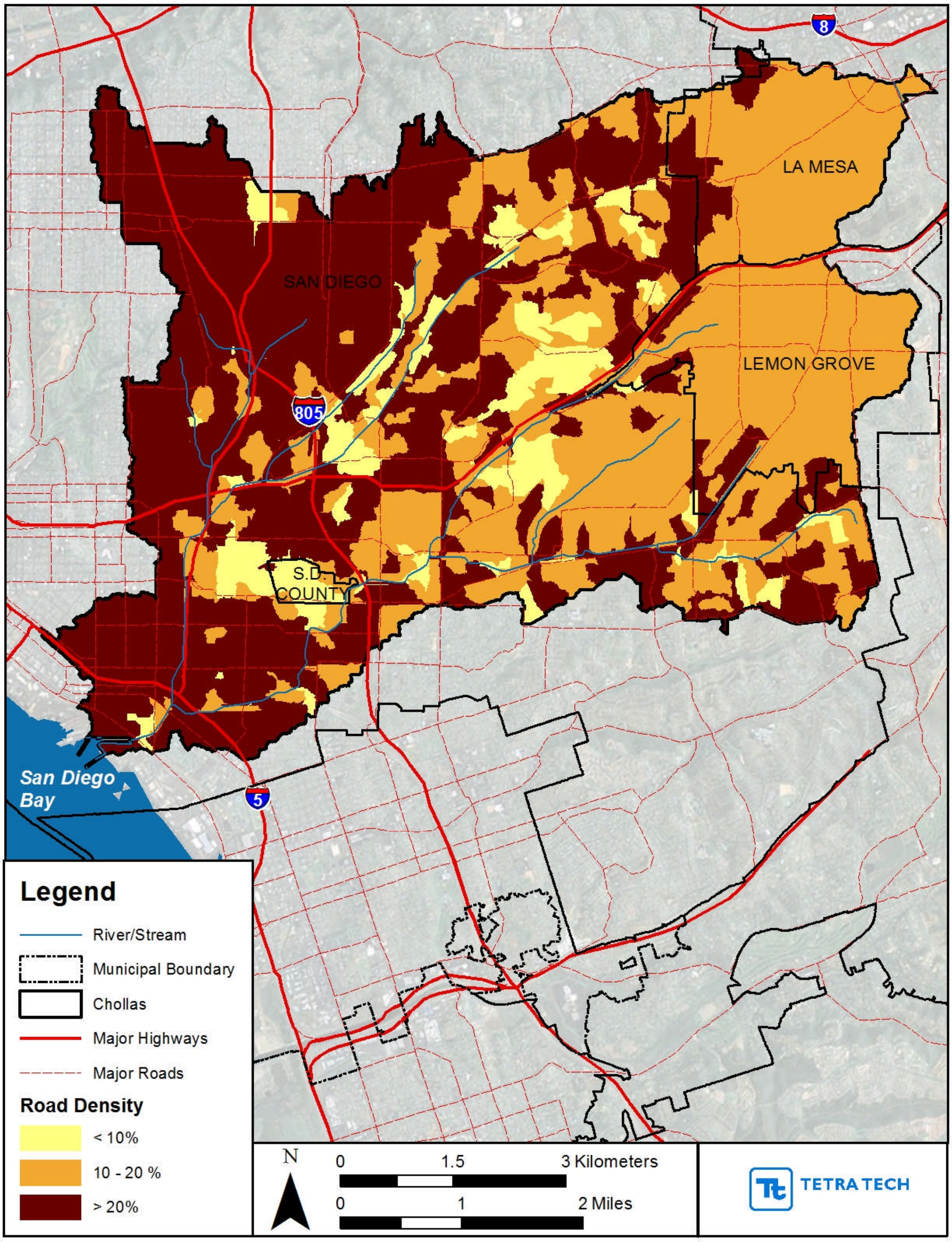

Figure 3-4. Road density in the Chollas watershed

3.2.2.3 Toxics (PAHs)

Organic toxics, PAHs, are considered a roadway pollutant because it is a product of petroleum products (petrogenic sources) or combustion of fossil fuels/organic matter (pyrogenic sources) (Stein et al. 2006). Fueling stations and vehicles are direct sources of PAHs because they carry petroleum products and burn fossil fuels. Urban areas that are highly trafficked or have high-density road infrastructures have high PAH discharges from the numerous, concentrated sources of fueling stations and tailpipe emissions from vehicles. Tailpipe emissions discharge significant levels of PAHs to the atmosphere, which enter receiving waters through wet and dry deposition (Section 3.2.2.3) (Stein et al. 2006).

3.2.3 Atmospheric Deposition

Atmospheric deposition is the direct and indirect transfer of pollutants from the air to surface waters. Typical pollutants associated with atmospheric deposition are metals, PAHs, PCBs, and, to a lesser extent, nutrients. These pollutants enter the atmosphere from point sources (i.e., industrial emissions) and nonpoint sources (i.e., mobile and area-wide emission sources). These sources are not quantified directly in the CLRP, but are implicitly included in the Pollutant Loading Analysis (Section 3.3). The discussion below provides information on potential atmospheric sources that may contribute to impairments and their relative contributions; however, additional, quantitative analyses would be required to specify loadings (and required reductions) associated with atmospheric sources.

Although toxic air contaminant emissions from stationary sources in San Diego County have been reduced by approximately 85.5 percent since 1989, large amounts of toxic compounds are still emitted into the air from a wide variety of sources including motor vehicles, industrial facilities, household products, area sources, and natural processes (San Diego County 2011c). Besides the industrial emissions, the major source of atmospheric lead in California is the resuspension of lead from historic emissions that have accumulated over many years in road dust and soil particles of urban areas (Sabin et al. 2005; Sabin and Schiff 2007). Nutrients, alternatively, are atmospherically deposited during the wet season when nutrient-rich sediment is deposited. These particulate nutrients can then be remobilized as dissolved inorganic nutrients to the surface waters (Sutula et al. 2004).

Atmospheric deposition of pollutants either directly to a waterbody surface or indirectly to the watershed land surface can be a source of contamination to surface waters. Dry deposition is the fallout of pollutants from the atmosphere to the land and surface waters of the watershed. Dry deposition rates are significantly higher in areas close to urban centers and busy roadways (Sabin et al. 2005; Sabin and Schiff 2007). As much as 50–100 percent of trace metals in storm water runoff in highly impervious, urban catchments of Southern California comes from dry deposition (SCCWRP 2008). In a study to better understand the role of roadways as a source of localized metal deposition, Sabin et al. (2006b) determined that dry deposition fluxes and atmospheric concentrations of chromium, copper, lead, nickel, and zinc were highest at the site closest to freeways. These metal concentrations reduced to approximately urban background concentrations between 10 and 150 meters downwind of the freeway. Through the use of shoulders, slopes, swales, and other features, Caltrans actively implements mitigation measures to retain metal deposition within the right of way and from proceeding to adjacent waters (Caltrans 2003a, 2003b). Wet deposition is the transfer of atmospheric pollutants to the watershed via rain or snowfall. In California, wet deposition is not a significant source of pollutants in comparison to dry depositions because there are so few rain events (Lu et al. 2003; Sabin et al. 2005, 2006a).

Although the atmospheric deposition of lead has decreased over the past 30 years, atmospheric deposition of copper and zinc has increased along the coast near the San Diego Bay (SCCWRP 2008). An aerial deposition study in Santa Monica Bay indicated that zinc, followed by copper and lead, are the greatest metal pollutant loadings from aerial deposition (Stolzenbach 2006). This study also suggests that contribution of atmospheric deposition can be as high as 99 percent, in the case of lead, when compared to other sources such as sewage treatment plants, industrial sources, and power plants. A comparison of trace metal contributions from aerial deposition, sewage treatment plants, industrial activities, and power plants is shown in Table 3-5. The aerial deposition of lead was 2.3 metric tons/year (99 percent) out of the total 2.32 metric tons/year.

Table 3-5. Comparison of source annual loadings to Santa Monica Bay (metric tons/year)

Toxic air contaminant	Total load	Aerial deposition	Non-aerial sources		
			Sewage treatment plants	Industrial	Power plants
Chromium	1.26	0.5	0.6	0.02	0.14
Copper	18.84	2.8	16	0.03	0.01
Lead	2.32	2.3	< 0.01	0.02	< 0.01
Nickel	0.45	0.45	5.1	0.13	0.01
Zinc	12.1	12.1	21	0.16	2.4

Source: Stolzenbach 2006

In 2009 an aerial deposition study in Chollas Creek evaluated the source emissions of copper, lead, and zinc. Although findings from this study are most relevant to the Chollas watershed, the findings can be used to evaluate aerial deposition throughout the San Diego Region. Copper, lead, and zinc were the focus of the study because they account for 100, 29, and 74 percent, respectively, of the average annual load discharged via storm water runoff in the Chollas watershed (City of San Diego 2009b). Concentrations of these pollutants in storm water runoff were also higher in commercial and industrial land uses compared to residential land uses. This finding can be attributed to the types of activities and atmospheric emission sources that are concentrated and common in commercial and industrial land uses. The process characterized to emit the most copper and zinc is applying paints and protective coverings on surfaces of ships because some areas of a vessel require specifically formulated coatings. The second largest source of copper is facilities conducting abrasive activities where material is steamed against a surface to clean or prepare it. The second largest emission source of zinc is facilities where brazing is performed to join metals by heating and the use of a filler. The greatest source emissions for lead is abrasive activities and exhaust from diesel engines. These types of activities performed by industries in any watershed can contribute to atmospheric pollutant loadings and ultimately affect the water quality of a watershed. In California, these types of industries are regulated under the California Air Resources Board (CARB) to maintain and attain healthy air quality and protect the public from toxic air exposure.

In the 2010 *Air Toxics "Hot Spots" Program Report* for San Diego County, industrial source emissions were estimated for approximately 3,130 facilities in the county including 1,750 diesel engine facilities, 368 auto body shops, 683 gasoline stations, and 117 dry cleaners (San Diego County 2011c). Estimated toxic air contaminant emissions for copper, lead, and zinc are presented in Table 3-6. The table also presents estimates of mobile, area, and natural source emissions obtained from the CARB 2008 California Toxics Inventory (CTI) (CARB 2008). Mobile sources include on- and off-road vehicles, trains, mobile equipment, and utility equipment. Area sources include residential and commercial nonpoint sources such as fuel combustion, road dust, waste burning, solvent use, pesticide application, and construction practices. Natural sources include wildfires and windblown dust from agricultural operations and unpaved areas. Although industrial emissions of air contaminants pale in comparison to emissions from mobile, area, and natural sources, the total annual emissions are significant because they can be deposited in local watersheds in San Diego County.

Table 3-6. Estimated toxic air contaminant emissions

Toxic air contaminant	Point sources: Emissions from industrial sources estimated for 2006–2009 (lbs/yr)	Nonpoint sources: Mobile emissions from CARB (lbs/yr)	Nonpoint sources: Area-wide emissions from CARB (lbs/yr)	Nonpoint sources: Natural emissions from CARB (lbs/yr)	Total San Diego County emissions (lbs/yr)
Copper	3,123	11,965	17,400	201	32,690
Lead	78	7,186	34,151	466	41,880
Zinc	3,512	12,816	92,449	20,272	129,050

Source: Adapted from San Diego County 2011c.

Note: Values presented are county-wide and not just for the Chollas Creek watershed.

EPA's Toxics Release Inventory (TRI) program collects information on waste management activities and disposal of more than 650 chemicals from industrial sources nationwide. The atmospheric releases based on TRI for copper, lead, zinc, and PAH in and near the Chollas watershed are shown in Figure 3-5 through Figure 3-8. Although few origins of the emissions are in the Chollas watershed, TRI for sites outside the watershed are also relevant because atmospheric transport occurs across watershed boundaries. The TRI data shows only a portion of air pollutants that could be deposited in the Chollas watershed. Many metals and chemicals are regularly deposited hundreds of miles away from their original source (Bozó 1991; Daggupaty et al. 2006).

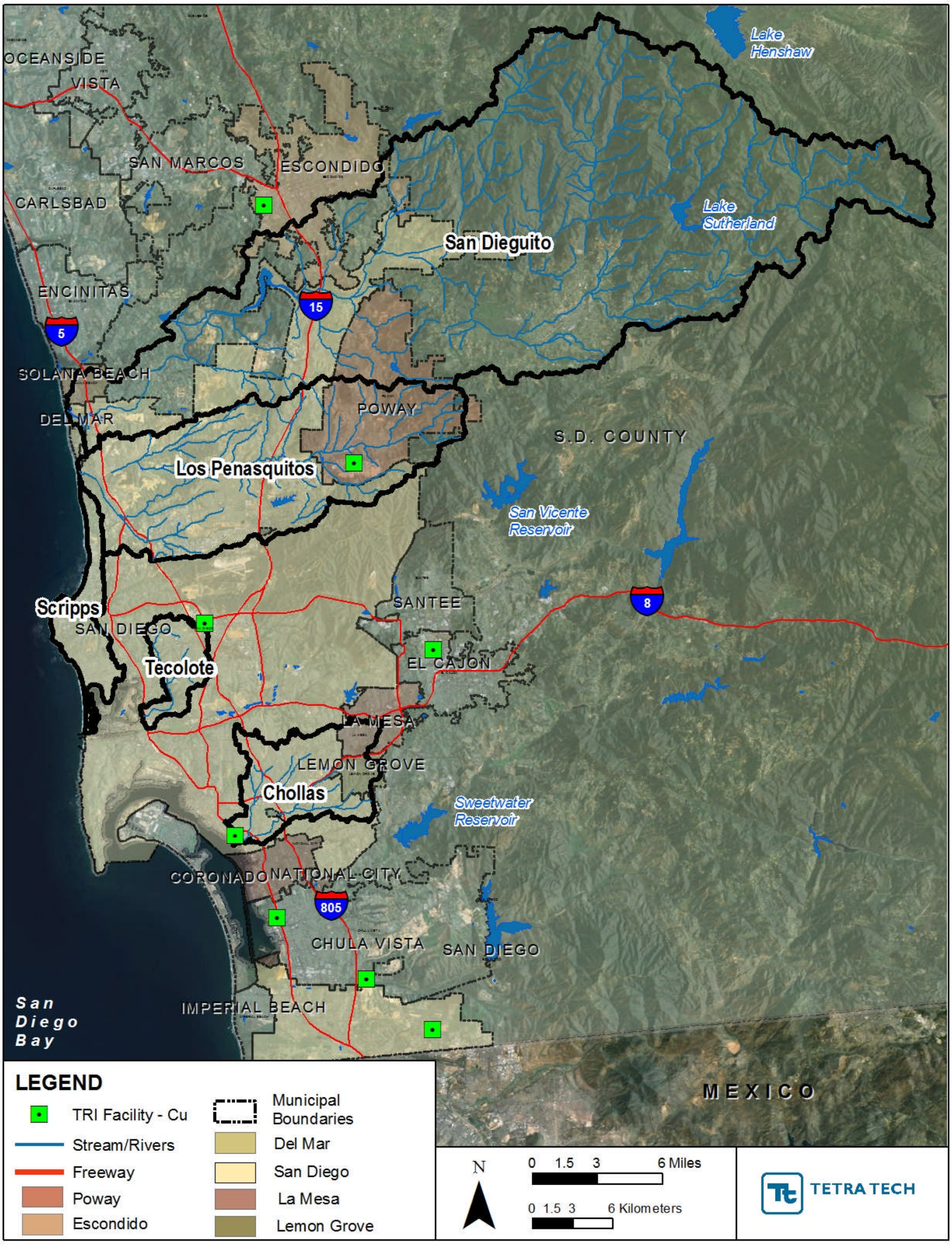

Figure 3-5. TRI atmospheric releases in the San Diego region – copper

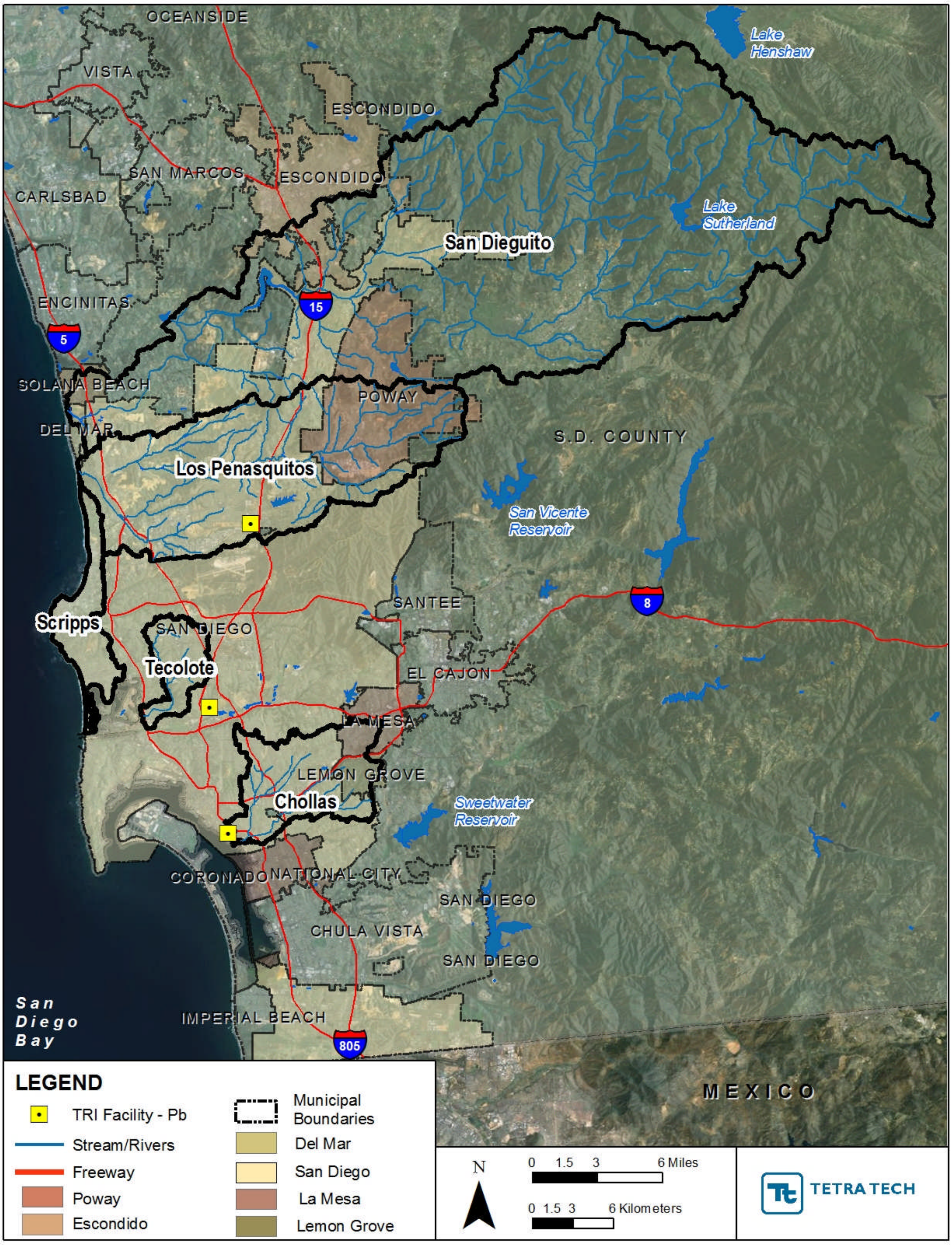

Figure 3-6. TRI atmospheric releases in the San Diego region – lead

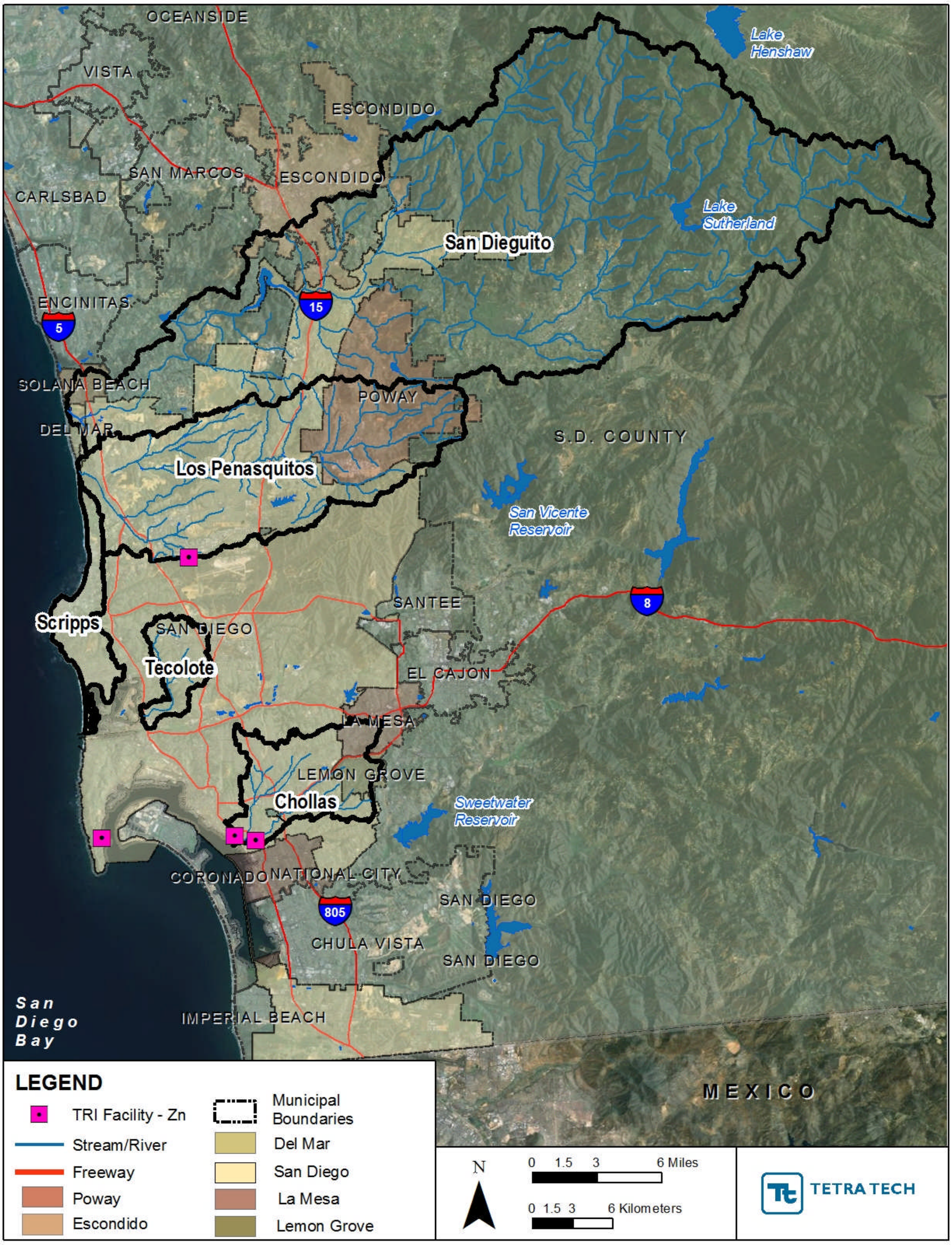

Figure 3-7. TRI atmospheric releases in the San Diego region – zinc

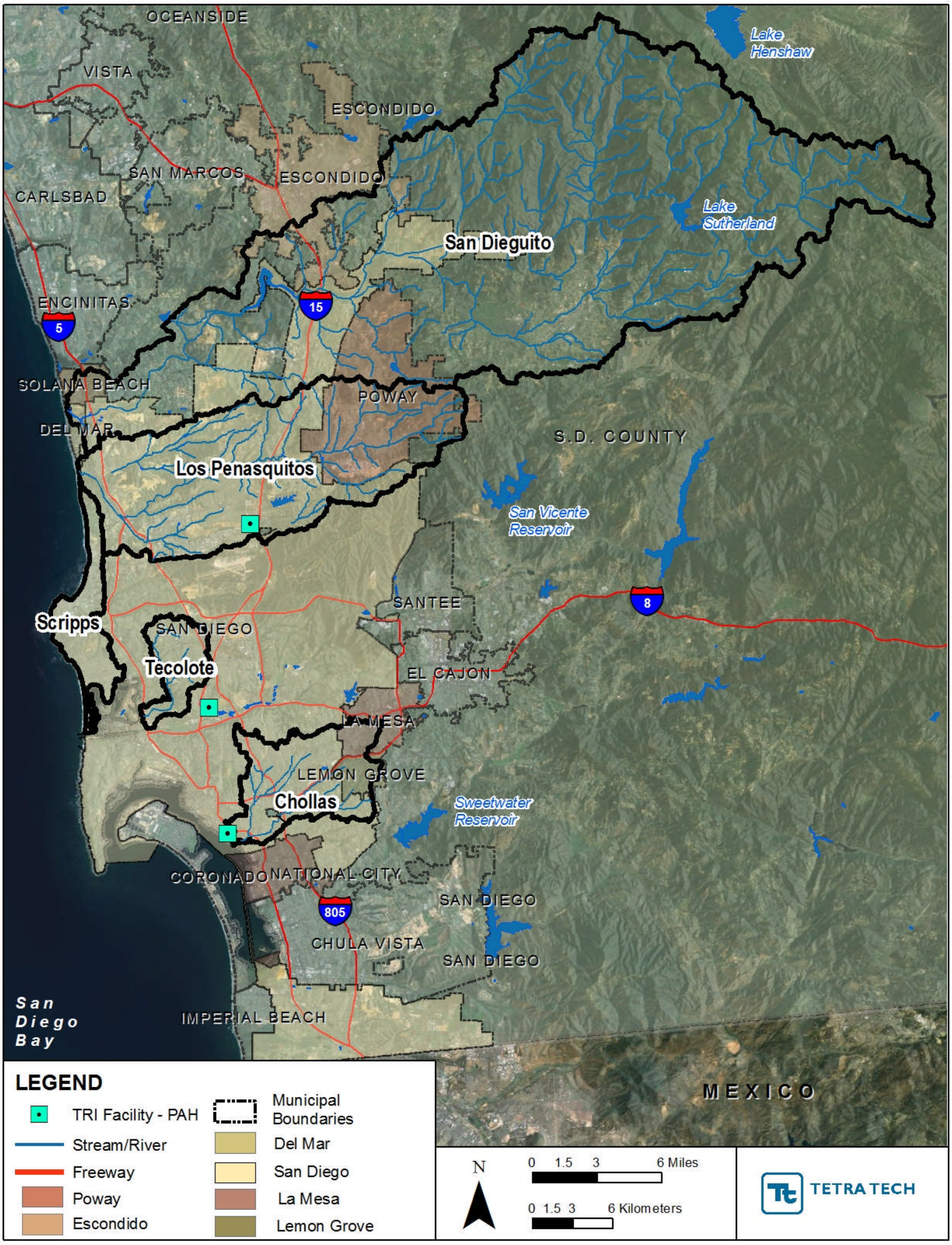

Figure 3-8. TRI atmospheric releases in the San Diego region – PAH

Atmospheric deposition is a potential source of heavy metals and organics in surface waters. Nutrients can also be found in atmospheric deposition; however, ammonia and nitrate compound loading from TRI sites in San Diego County were zero. Therefore, these loadings are not discussed further. For the Chollas watershed, the pollutants of concern associated with atmospheric deposition are copper, lead, zinc, and organic toxics. Table 3-2 presents a summary of sources for these pollutants, including atmospheric deposition.

3.2.3.1 Metals (copper, lead, and zinc)

Potential atmospheric sources of copper, lead, and zinc can be derived from point emission sources (i.e., industrial emissions) or from nonpoint emissions (i.e., mobile/vehicular, area-wide, natural). As shown in Table 3-6, the *2010 Air Toxics "Hot Spots" Program Report for San Diego County* identified that nonpoint emissions of copper, lead, and zinc outweigh point emissions, making up 90, 99, and 97 percent, respectively, of total emissions estimated. The CTI results that estimate nonpoint emissions show that mobile and area-wide sources make up 37 and 53 percent of total copper emissions, respectively. This study also indicates that mobile, area-wide, and natural sources make up 17, 82 and 1 percent of total lead emissions, respectively, and 10, 72, and 16 percent of total zinc emissions, respectively (review of CTI results in *2010 Air Toxics "Hot Spots" Program Report*) (San Diego County 2011c). On the basis of these results, the greatest contribution of atmospheric metals comes from area-wide and mobile sources that do not have specific locations and are spread out over large areas.

3.2.3.2 Toxics (PAHs)

Organic toxics, PAHs, are considered a roadway pollutant because it is a product of petroleum products (petrogenic sources) or combustion of fossil fuels/organic matter (pyrogenic sources) (Stein et al. 2006). Fueling stations and vehicles are direct sources of PAHs since they carry petroleum products and burn fossil fuels. Urban areas that are highly trafficked or have high density road infrastructures have high atmospheric PAH discharges from the numerous, concentrated sources of fueling stations and tailpipe emissions from vehicles. Fueling stations and tailpipe emissions discharge significant levels of PAHs to the atmosphere, which enter receiving waters through wet and dry deposition (Stein et al. 2006).

3.2.4 Waste Sites

The Resource Conservation and Recovery Act (RCRA) was added to the Solid Waste Disposal Act (1965) in 1976 to regulate the disposal of municipal, industrial, and hazardous waste. It controls the generation, transportation, treatment, storage, and disposal of hazardous and non-hazardous wastes. The term *RCRA site* generally refers to a site of waste storage or disposal. RCRA sets specific criteria for containment at these sites; however, a site in violation can emit pollutants into the environment (USEPA 2008).

Superfund sites, which are hazardous-waste sites that have been inactive or abandoned, are not regulated under RCRA. Such hazardous waste areas and areas of accidental pollutant release (i.e., spills) are controlled under the 1980 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Those areas are called Superfund sites because they receive federal funding to assist with removal and cleanup processes. Only severely contaminated sites qualify for Superfund and are placed on the National Priorities List to receive funding. Many data sets are generated from the Superfund site, including data to establish the site on the National Priorities List, monitor progress of cleanup efforts, and long-term monitoring to ensure success of the cleanup.

RCRA and Superfund sites in Southern California were researched using the California EnviroStor public database. For both data sets, the facility name associated with each site is provided along with the facility address, coordinates, and permit numbers. RCRA data also describe the state of the cleanup efforts (e.g., active, completed, no action required, backlog) and the type of cleanup (voluntary, hazardous waste permit, state response, school cleanup, and such).

No Superfund sites and 12 RCRA sites are in the Chollas watershed. Most sites are in an *active cleanup* status or have already been completed. *School sites* and *voluntary cleanup sites* make up the majority of RCRA listings. A complete breakdown of cleanup types and status are shown in Table 3-7 and Table 3-8. A map of RCRA sites in the Chollas watershed is presented in Figure 3-9.

Table 3-7. RCRA sites in the Chollas watershed – cleanup type

Site type	Number of sites in the watershed
Corrective action	2
Tiered Permit	2
School cleanup	5
Voluntary cleanup sites	3

Table 3-8. RCRA sites in the Chollas watershed – cleanup status

State of action	Number of sites in the watershed
Inactive	1
Certified	3
Certified with Land-use Restrictions	1
Inactive - action required	1
Inactive - needs evaluation	3
No further action	3
Referred	0

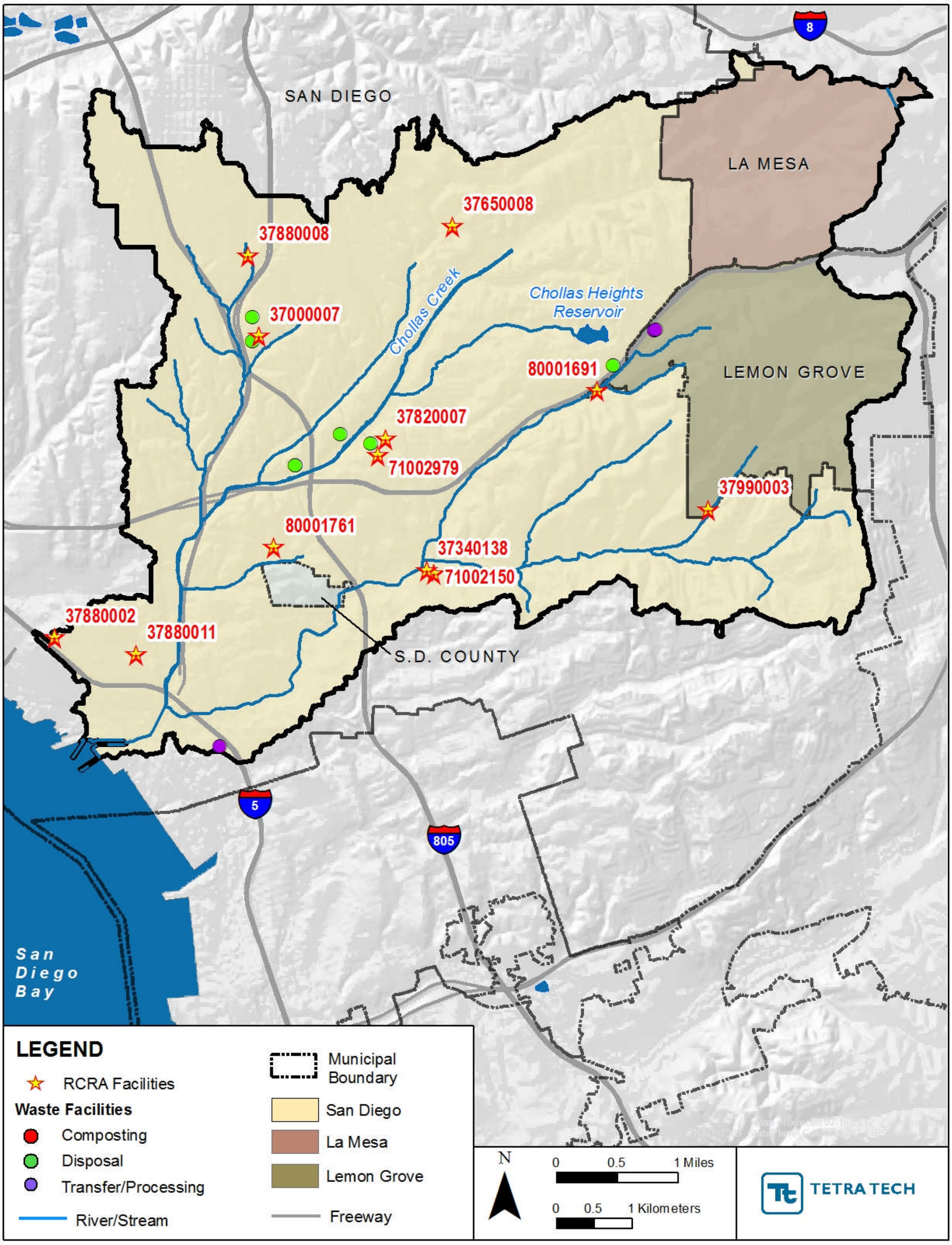

Figure 3-9. Waste sites in the Chollas watershed

Typical contaminants that can migrate from Superfund and RCRA sites to the environment are widespread. The top 10 pollutants on CERCLA's National Priority List, which are also applicable to RCRA sites, are arsenic, lead, mercury, vinyl chloride, PCBs, benzene, PAHs, cadmium, benzo(A)pyrene, and benzo(B)fluoranthene. Dense and light non-aqueous phase liquids—which include chlorinated solvents, petroleum components, PCBs, and PAHs—are some of the worst contaminants found in hazardous waste sites because they can travel long distances in groundwater, are slow to degrade, and are toxic at very low concentrations. Superfund and RCRA sites are potential sources of metals and organics in watersheds (Table 3-2). For the Chollas watershed, RCRA sites could be a source for metals and toxics (no Superfund sites are in the watershed).

Many other waste sites (landfills, recycling areas, battery reclamation sites, incinerators, unauthorized dumping grounds) could be pollutant sources that are not listed under RCRA or CERCLA. Solid waste facilities and transfer and processing facilities present in the Chollas watershed are shown in Table 3-9 and Figure 3-9. Solid waste facilities store everyday items such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint and batteries. Typically before reaching a solid waste facility or other treatment or disposal facility, solid waste is unloaded from collection vehicles and briefly held at transfer and processing facilities while it is reloaded onto larger, long-distance transport vehicles for shipment. These facilities, particularly solid waste sites, have liner systems, surface water controls, and other safeguards in place to prevent pollution of local water resources. Typical surface water impacts from solid waste sites include leachate seeps and excessive erosion (GeoSyntec Consultants 2004).

Table 3-9. Current waste sites in the Chollas watershed

Facility name	Facility type	Facility status	Jurisdiction
EDCO Transfer Station	Transfer/Processing Facility	Active	City of San Diego
Home Avenue Dump	Solid Waste Disposal Site	Closed	City of San Diego
Home Avenue Dump	Solid Waste Disposal Site	Closed	City of San Diego
Decker Dump	Solid Waste Disposal Site	Closed	City of San Diego
Noah Webster Elementary School	Solid Waste Disposal Site	Closed	City of San Diego
South Chollas Sanitary Landfill	Solid Waste Disposal Site	Closed	City of San Diego
38th and Quince Street Burnash Site	Solid Waste Disposal Site	Closed	City of San Diego
EDCO Recycling	Transfer/Processing Facility	Active	City of Lemon Grove
SANCO Resource Recovery	Transfer/Processing Facility	Active	City of Lemon Grove
Quince Street, a.k.a. 38th & Redwood site	Solid Waste Disposal Site	Closed	City of San Diego

Source: Solid Waste Information System (SWIS) available at http://www.calrecycle.ca.gov/SWFacilities/Directory/

Historically, waste sites or *dumps* were prevalent throughout the City of San Diego in varying conditions. A 1938 City Planning Commission report identified two types of dumps, totaling 52 dumps in the city (Note: these are throughout the City of San Diego area and might not be specifically in this watershed) (*Report on Refuse Dumps*; City of San Diego 1938). One type of dump had an attendant, who sorted through the material to be salvaged or burned. The other, more prevalent, type of dump site was the haphazard dumping of waste material such as cans, paper, boxes, wrecked automobiles, bodies, tree trimmings, spoiled food, and such. Many of the dumps identified noted the presence of vermin, dumping of automobiles, the practice of burning, and several potential fire hazards. A review of historic dumps demonstrates that the disposal of rubbish was not being handled in a manner consistent with San Diego's best interests because there were too many places in the City where refuse was being dumped, many of which were not suitable dumping grounds (City of San Diego 1938). Landfills and dumps are potential sources of bacteria, metals, and toxic compounds.

3.2.4.1 Bacteria

Landfills and dumps are known to contain vermin and various types of waste. Both the vermin and certain types of waste can be sources of bacteria in the Chollas watershed (consistent with some of the anthropogenic, non-human sources of bacteria identified in Appendix A).

3.2.4.2 Metals (copper, lead, and zinc)

Metals of concern in the Chollas watershed are copper, lead, and zinc. As indicated above, lead is one of the top 10 pollutants of the National Priority List. Actual discharges of lead from the waste sites are unknown.

3.2.4.3 Toxics (PAHs, PCBs, chlordane)

PAHs and PCBs are two pollutants in the top 10 pollutants of the National Priority List. These are two of the toxic compounds of concern in the Chollas watershed. Actual discharges of these pollutants from the waste sites are unknown.

3.2.5 Wastewater Sources

Wastewater is treated either through centralized sanitary sewer systems or decentralized septic systems. Properly designed, operated, and maintained sanitary sewer systems are meant to collect and transport all the sewage that flows into them to a publicly owned treatment works (POTW) (USEPA 2011c). Aging systems in need of repair or replacement, severe weather, improper system operation and maintenance (O&M), clogs, and root growth can contribute to sanitary sewer leaks and overflows. SSOs are any overflow, spill, release, discharge or diversion of untreated or partially treated wastewater from a sanitary sewer system. Septic systems, on the other hand, treat wastewater on-site by collecting, treating, and dispersing wastewater from individual dwellings, businesses or small communities (USEPA 2003b). Wastewater discharges via sanitary sewer systems or septic systems invariably release pollutants such as bacteria and nutrients to nearby waters (Table 3-2).

According to the California Integrated Water Quality System (CIWQS), 14 SSOs were in the Chollas watershed in 2011 (SWRCB 2011c). As illustrated in Figure 3-10, these occurred throughout the watershed and ranged in volume from 25 to 18,000 gallons.

When sanitary sewers overflow or leak, they can release raw sewage into the environment, which can contain pollutants such as suspended solids, pathogenic organisms, toxic pollutants, nutrients, oil, and grease (SWRCB 2011d). Wastewater constituents such as bacteria and nutrients are also released into the environment through septic systems. Sanitary sewers systems and septic systems are potential sources of two contaminants of concern to the Chollas watershed—bacteria and nutrients.

3.2.5.1 Bacteria

By nature, raw sewage and wastewater contain high concentrations of bacteria. Bacteria are released into the environment when sanitary systems leak, spill, or overflow or when illicit connections from sanitary sewers are made to the storm drain system (LARWQCB 2006; SDRWQCB 2010; USEPA 2011d). As identified in the bacterial source conceptual model (Appendix A), bacteria from wastewater sources are categorized as an anthropogenic non-human source. Continuous sources of bacteria arise from septic tanks that are poorly maintained or faulty. Septic systems can back up into homes or release wastewater onto the ground surface. Untreated wastewater discharges from sanitary system leaks, SSOs and septic systems can contribute significant bacteria loadings to receiving waters and the environment. Wastewater discharge sources of bacteria and others are presented in Table 3-2 and are associated with the human sources presented in Appendix A.

3.2.5.2 Nutrients

High levels of nutrients are also in raw sewage and wastewater. Organic matter, commonly present in high concentrations in wastewater, contains nutrients (nitrogen and phosphorus) in its composition. Nutrient-rich wastewater is released into the environment when sanitary systems leak, spill, or overflow or when illicit connections from sanitary sewers are made to the storm drain system (LARWQCB 2006; SDRWQCB 2010; USEPA 2011d). Septic tanks can serve as a potential continuous source of nutrients when they are poorly maintained or faulty. Septic systems can back up into homes or release wastewater onto the ground surface. Untreated wastewater discharges from sanitary system leaks, SSOs and septic systems can contribute significant nutrient loadings to receiving waters and the environment. Nutrients from wastewater discharge sources and others are presented in Table 3-2.

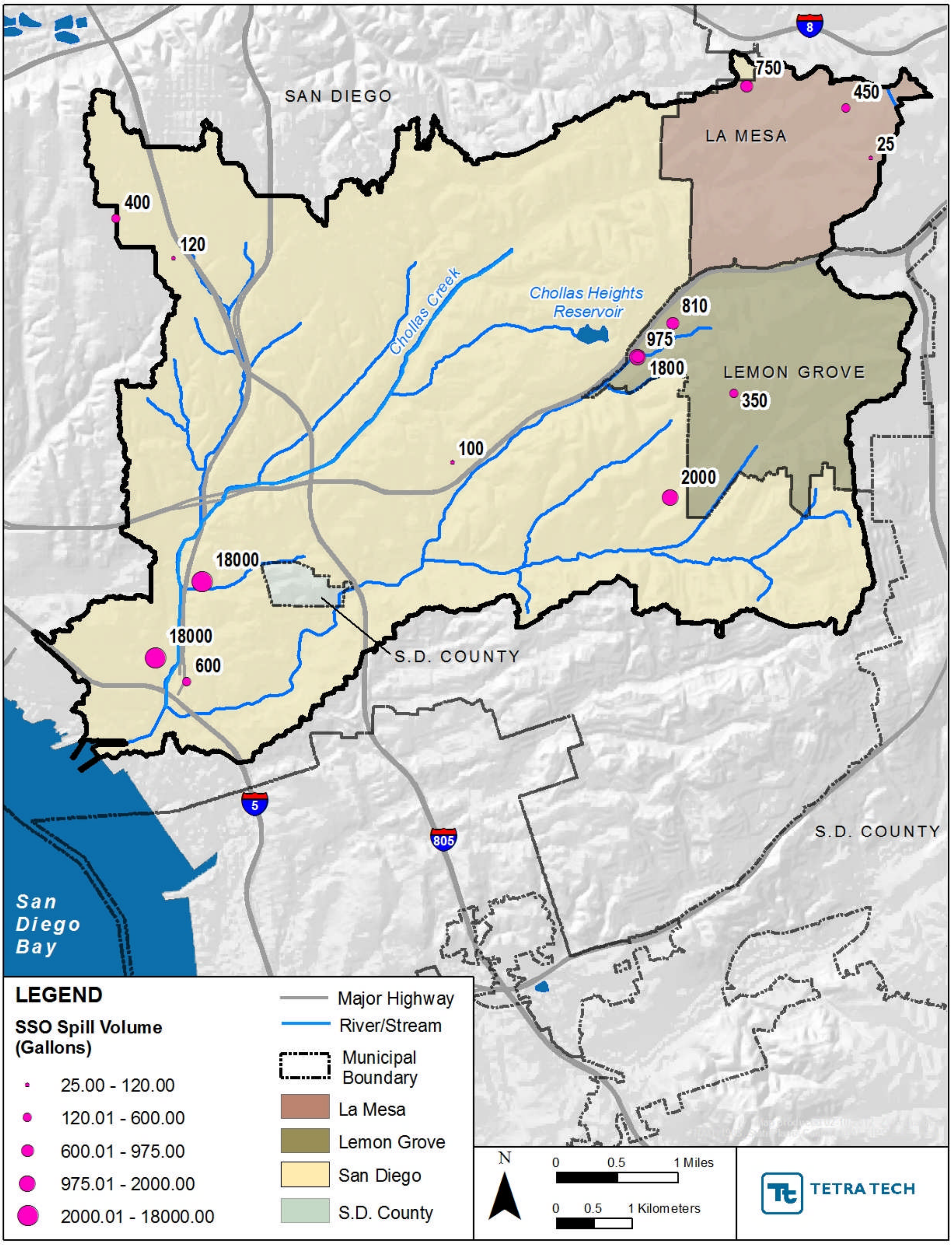

Figure 3-10. SSOs in the Chollas watershed in 2011

3.2.6 Agricultural Operations

Agricultural operations can serve as either point or nonpoint sources of pollution. Typical point sources of pollution from agriculture include AFOs, animal waste storage/treatment lagoons, and the storage, handling, mixing, and cleaning areas for pesticides, fertilizers, and petroleum (City of San Diego 2010a). AFOs are agricultural operations where animals are raised in confined situations and feed is brought to the animal rather than the animals grazing in pastures. Some nonpoint sources of pollutants from agricultural operations are land application of manure wastes and grazing by livestock. Primary pollutants associated with these point and nonpoint sources of agricultural operations include nutrients, bacteria/pathogens, pesticides, organic matter, salts, solids, and volatile and odorous compounds (City of San Diego 2010a). These pollutants enter the waterways via natural infiltration or storm water runoff. A summary of pollutants from agricultural operations and other sources is presented in Table 3-2.

As shown in Figure 3-11, no active agricultural operations are in the Chollas watershed; however, several nurseries are sparsely located throughout the watershed. Similarly to agricultural operations, nursery locations are potential sources of sediment and nutrient loadings. Poor handling and runoff from these locations likely contribute sediment and nutrients to nearby storm water collection systems.

Because of the developed nature of the Chollas watershed, agricultural operations are not a significant source of nutrients. However, nurseries are a potential source of nutrient loading to the watershed.

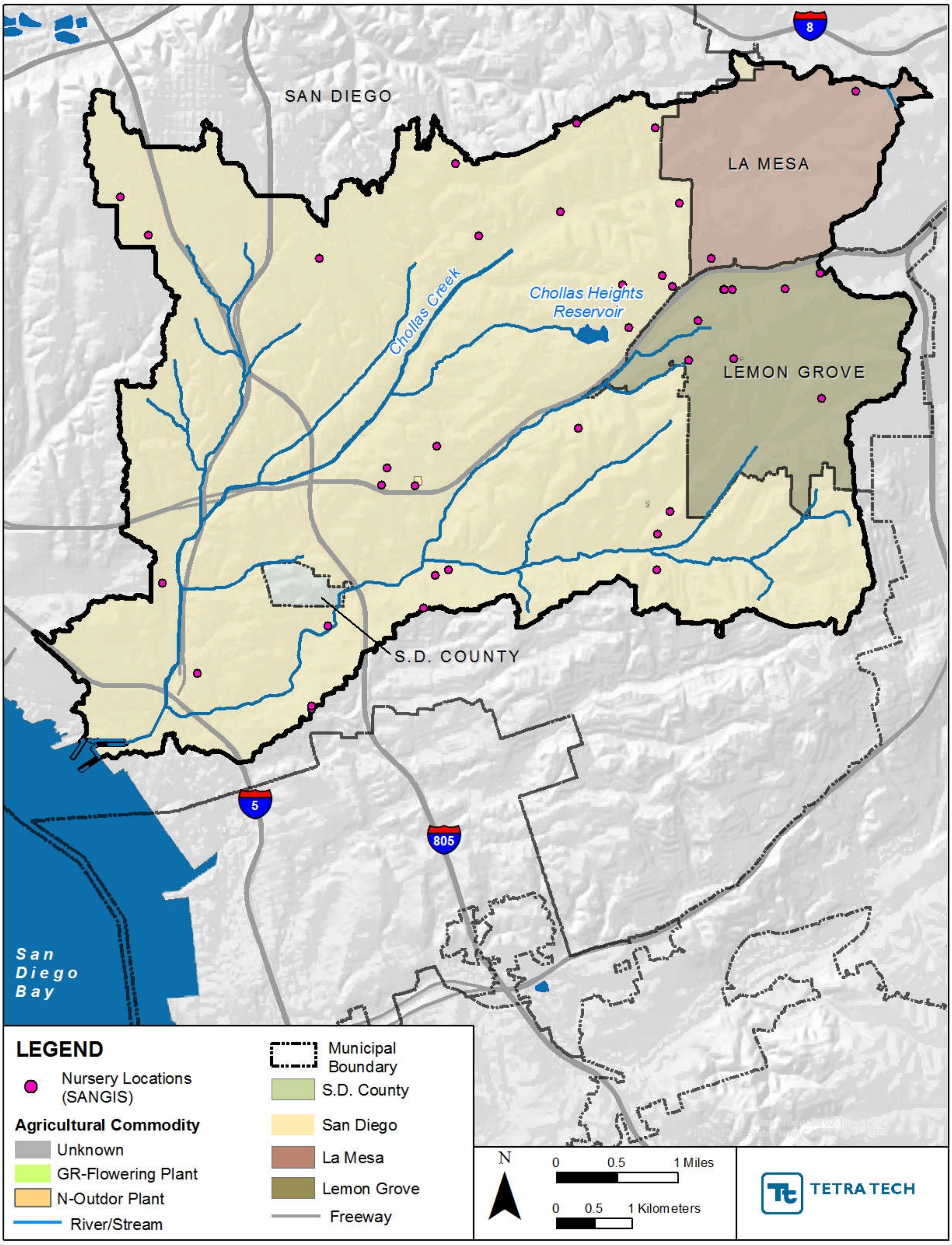

Figure 3-11. Agricultural operations in the Chollas watershed

3.2.6.1 Nutrients

Plant and flower nurseries daily handle significant amounts of fertilizers, herbicides, pesticides, and soil. Fertilizers, herbicides, and pesticides mainly consist of nitrogen and phosphorus elements among other chemicals. Soils laden with fertilizers, herbicides, and pesticides become nutrient rich as nitrogen and phosphorus become bound to the soil particles. Improper care of these materials and exposure of these soils to rainfall events introduce nutrients to local storm water collection systems and eventually receiving waterbodies. Table 3-2 presents a summary of nutrient sources including those related to agricultural operations.

3.3 Pollutant-Loading Analysis

Loadings from the pollutant sources identified in Section 3.2 have been quantified by modeling the Chollas watershed. These loadings were subsequently analyzed to identify HPMAs throughout the watershed (Section 3.4). The Chollas watershed was simulated using the LSPC model. This watershed model primarily uses local information representing soil characteristics, land use distribution, topography, weather data, and the stream network to simulate hydrology and pollutant transport and loading (for additional information on the modeling see Appendix B).

LSPC (Tetra Tech and USEPA 2002; USEPA 2003c; Shen et al. 2004) is a watershed modeling system that includes streamlined Hydrologic Simulation Program Fortran (HSPF) (Bicknell et al. 1997) algorithms for simulating hydrology, sediment, and general water quality on land, and a simplified stream fate and transport model. Since its original public release, LSPC has been expanded to include additional GQUAL components for sorption/desorption of selected water quality constituents with sediment, enhanced temperature simulation, and the HSPF RQUAL module for simulating dissolved oxygen, nutrients, and algae. LSPC has also been customized to address simulation of other pollutants such as indicator bacteria and metals.

The hydrologic (water budget) process in LSPC is complex and interconnected. Rain falls on various constructed landscapes, vegetation, and bare soil areas in a watershed. Water flows overland and through the soil matrix. The land representation in the LSPC model environment considers three flow paths: surface, interflow, and groundwater outflow. LSPC can simulate flow, sediment, metals, nutrients, pesticides, and other conventional pollutants for pervious and impervious lands and waterbodies. The remainder of this section presents an overview of model configuration, calibration, validation, and watershed loading results for the pollutants of interest.

3.3.1 Watershed Model Development, Calibration, and Validation

The development of the LSPC model for the Chollas watershed is consistent with the process used for other watershed models in Southern California. The LSPC model has been successfully applied and calibrated in Southern California for many watersheds including the Los Angeles River, San Gabriel River, San Jacinto River, Lake Mathews, Chollas Creek, Los Peñasquitos, B Street/Downtown Anchorage, and multiple watersheds draining to impaired beaches of the San Diego region (City of San Diego 2010b; USEPA 2011e). Modeling reports associated with these models provide detailed information regarding model configuration, calibration, and validation using the LSPC model. To support CLRP development, modeling for the Chollas watershed and companion CLRP watersheds was conducted as part of a comprehensive, uniform set of models that improves on the previous work and is calibrated using a regionalized approach, making refinements where appropriate.

The Chollas watershed modeling effort followed a similar process using local data and information, where possible (City of San Diego 2010b; Tetra Tech, Inc. 2011; USEPA 2011e). Small modeling catchments in the watershed were delineated using available high-resolution elevation data and storm water infrastructure data.

The models rely on high-resolution spatial representation of meteorological patterns throughout the watersheds and a robust, physically based, and systematically consistent characterization of Hydrologic Response Units (HRUs). HRUs define the combination of land use, soil hydrologic group, and slope present in a watershed, facilitating a well-organized representation of landscape features that most affect hydrology and pollutant transport. The incorporation and use of HRUs in a watershed model allows for the enhanced simulation of hydrologic and contaminant transport processes in a watershed that might have diverse landscape features (County of Los Angeles 2008). In urban areas, it is important to estimate the division of land use into pervious and impervious components. Alternatively, in rural areas where vegetative cover is more important, undeveloped and agricultural land use should be well represented. For watersheds where soil hydrologic groups are not homogenous, further divisions of pervious land cover by soil hydrologic group allows better representation of infiltration processes. Furthermore, representation of slopes in watersheds where steep slopes are prevalent is critical because high slopes also influence runoff and moisture-storage processes. In addition to HRUs, the model incorporates urban irrigation for areas that rely on lawn and landscape watering.

In watershed modeling, it is essential that the hydrology of the system be accurately characterized to provide a firm foundation for simulating water quality conditions. Simulations of contaminant fate and transport processes are dependent on an accurate representation of runoff and water movement. To simulate the hydrology and contaminant transport processes in the watershed, calibration and validation of model hydrology and water quality for the current effort builds on the previous models (City of San Diego 2010d; USEPA 2011e). The primary basis for model hydrology parameterization was derived from the recent Los Peñasquitos watershed modeling to support sediment TMDL development (City of San Diego 2010d). Model hydrology was calibrated and validated for Los Peñasquitos using flow monitoring data from 1990 to 2010. The model performed well on the basis of comparisons of observed and simulated peak and base flows and the total cumulative volume.

A regionalized approach was implemented for water quality calibration as well. The models simulate pollutant generation and accumulation on surfaces, and resulting pollutant runoff and delivery to receiving waterbodies. Delivery of pollutants through subsurface pathways (i.e., interflow and groundwater) is also represented. Water quality parameters were determined to adequately represent the loading generation capabilities for the different modeled HRUs for a wide range of storm intensities and base flows. Initial water quality parameterization was taken from the other models developed in the region and refined where appropriate to optimize the fit of simulated to observed concentrations and loads for all modeled pollutants.

In summary, the models used in developing the original Bacteria TMDL were significantly improved during CLRP development. These improvements provided more accurate assessment of pollutant sources and the prioritization of areas for BMP implementation in the CLRP. Notable refinements include improved spatial resolution of imperviousness/perviousness and land cover, simulation of dry-weather flows stemming from irrigation runoff (dry-weather flows were not included in the original model), recalibrating land-use-specific water quality modeling parameters on the basis of more monitoring data, and greater discretization of subwatershed boundaries for better prediction of spatially variable pollutant loadings and ability to prioritize needs for BMP implementation. A summary of these model improvements is provided in Appendix B.

3.3.2 Watershed Loading Results

The model includes flows and loading from all known sources in the watershed including NPDES permitted sources, road infrastructure, atmospheric deposition, waste sites, wastewater sources and agricultural operations, as described in Section 3.2. Pollutant loading estimates were developed for the modeled constituents including bacteria (enterococci, fecal coliform, and total coliform), nutrients (nitrogen and phosphorus), metals (copper, lead, and zinc), and sediment. Pollutants were represented with different technical approaches depending on their mechanism for transport or availability of data for calibration. Specifically, some constituents were modeled directly using LSPC, other constituents are represented by a modeled surrogate (i.e., sediment), and other pollutants are not represented by the watershed loading results (Table 3-10).

Table 3-10. Technical approach for pollutant representation

Pollutant	Loads estimated directly from LSPC	Loads estimated from LSPC using a surrogate pollutant	Not represented by watershed model
Fecal coliform	✓		
Enterococci	✓		
Total coliform	✓		
Nitrogen	✓		
Phosphorous	✓		
Copper	✓		
Lead	✓		
Zinc	✓		
Diazinon			✓
Trash			✓
Benthic community effects		✓	
Sediment toxicity		✓	

The model results, presented as long-term average annual loads (in number, tons, or pounds) per acre, quantify loading from upland areas. Loads associated with wet and dry conditions are shown separately for each modeled pollutant and are apportioned according to wet and dry days. Specifically, annual loading from wet conditions are represented by the sum of the loading for all wet days in a year and then results for all modeled years were averaged. Wet days were defined as days with 0.2 inch[1] of rainfall or more and the following three days. All other days were designated as dry days and were used to calculate average annual dry-weather loads. Irrigation return flow serves as an important source contributing to dry-weather loads. Other potential sources might include leaking sewer lines (and septic systems where applicable), illicit storm water discharges, and natural background sources from groundwater. Modeled loading results for each pollutant and seasonal condition are described in the remainder of this section.

3.3.2.1 Bacteria (enterococci, fecal, and total coliform)

Bacteria loading in the Chollas watershed was modeled for enterococci, fecal coliform, and total coliform bacteria. Wet-weather and dry-weather loading of enterococci bacteria are presented in Figure 3-12 and Figure 3-13, respectively, the wet- and dry-weather results are presented for fecal coliform and total coliform in Figure 3-14 through Figure 3-17. As expected, the dry-weather bacteria loading rates are several orders of magnitude below the wet-weather loading rates in the same subwatershed for all bacteria types. In addition, dry-weather loading is reasonably constant throughout the Chollas watershed. In the enterococci wet-weather loading maps, the subwatershed with the highest loading rate is in the upper reaches of the watershed, which correspond with low-density residential and commercial land uses. Total and fecal coliform loading rates are high throughout.

[1] Note that in the draft *NPDES Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4)*, 0.1 inch of rainfall is proposed for storm designation, which could affect the CLRP strategy (SDRWQCB 2012).

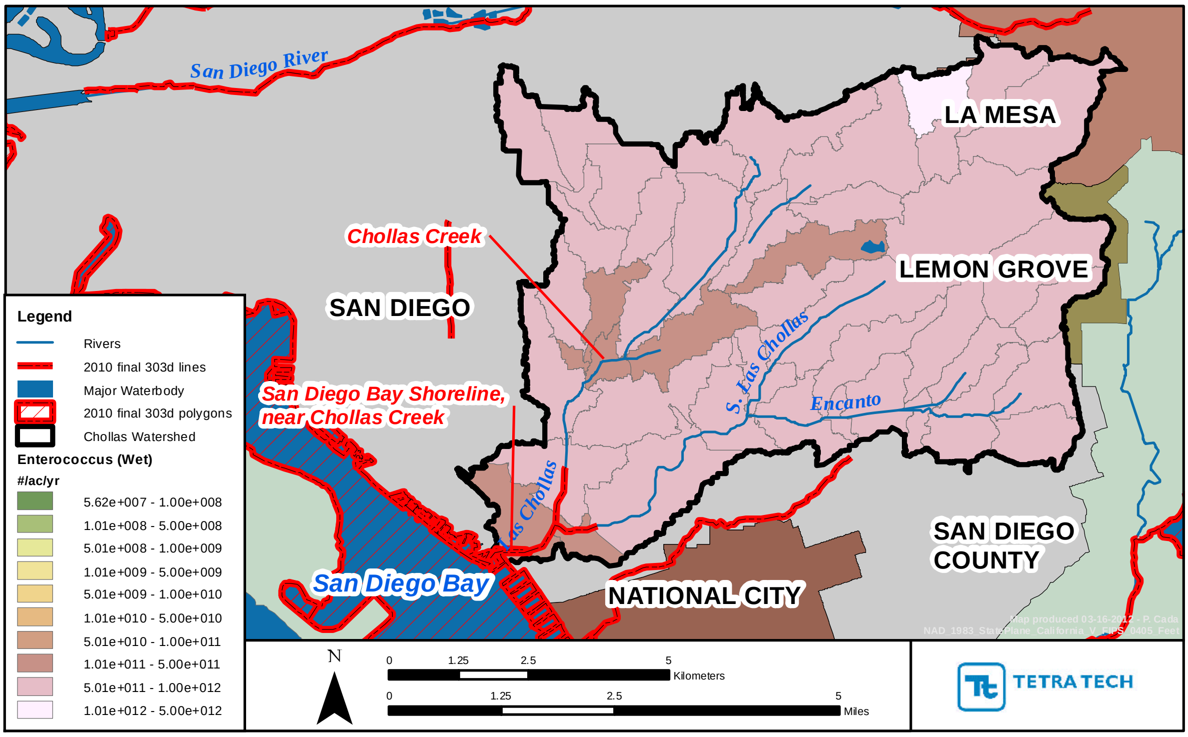

Figure 3-12. Wet-weather enterococci bacteria loading in the Chollas watershed

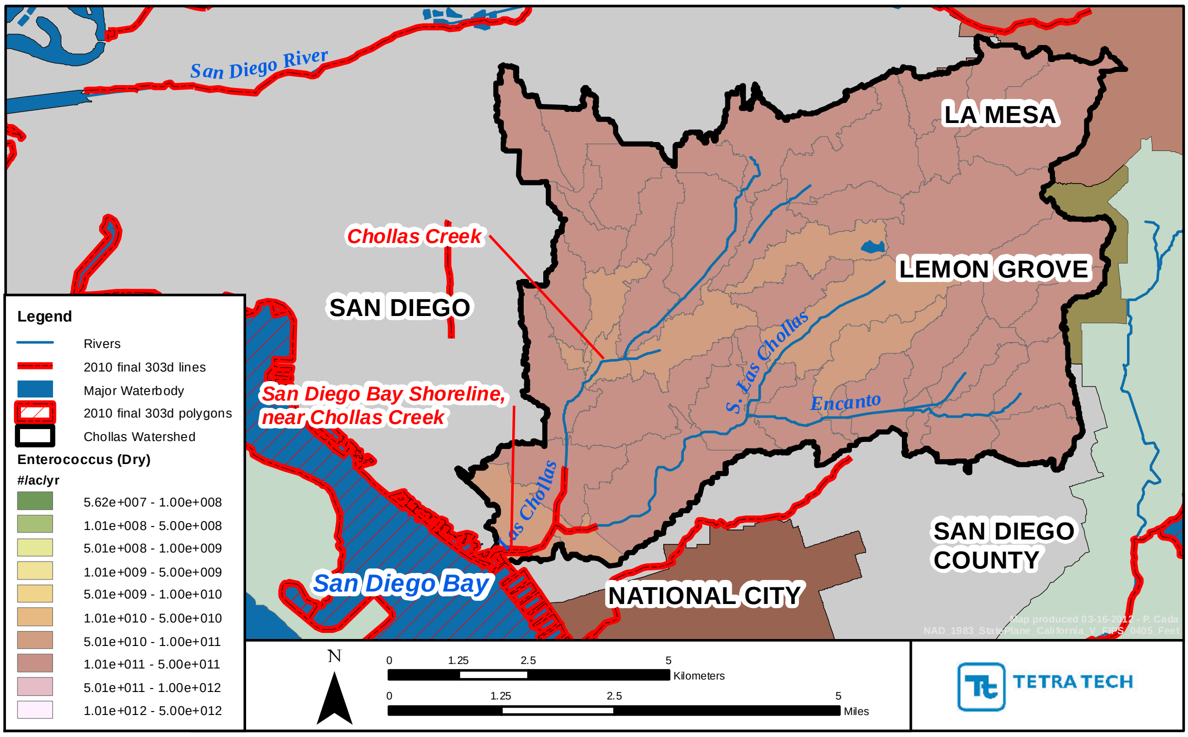

Figure 3-13. Dry-weather enterococci bacteria loading in the Chollas watershed

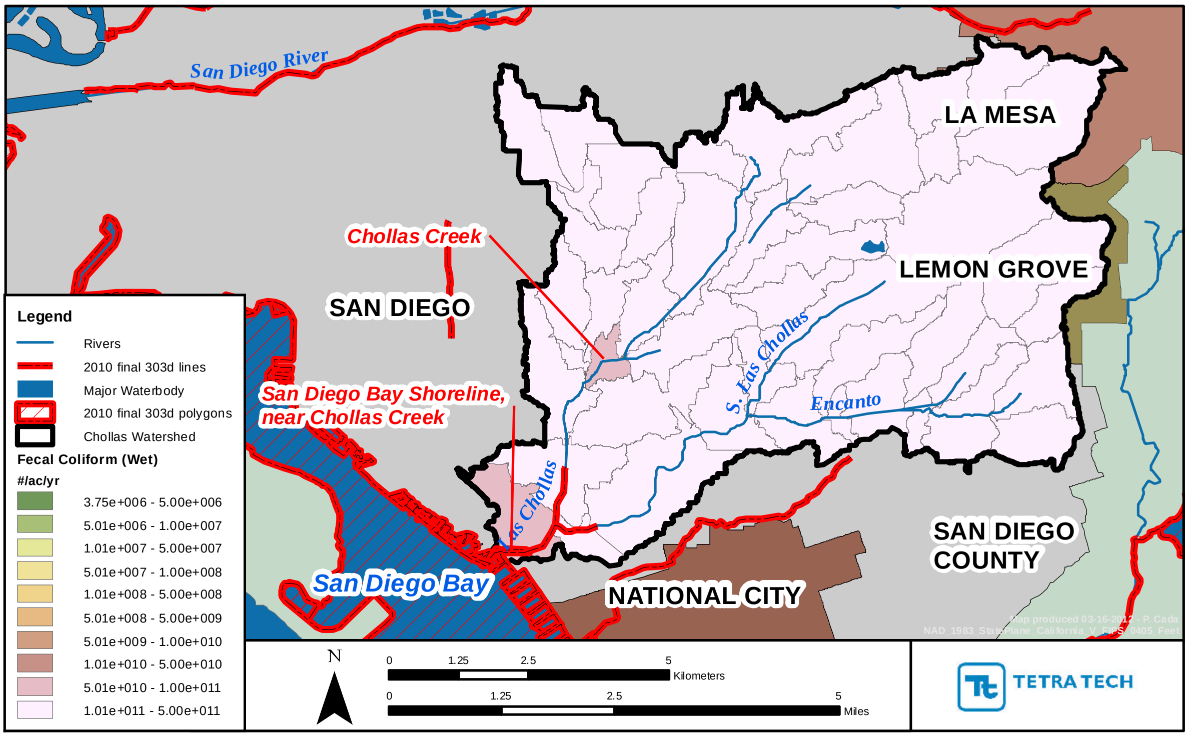

Figure 3-14. Wet-weather fecal coliform bacteria loading in the Chollas watershed

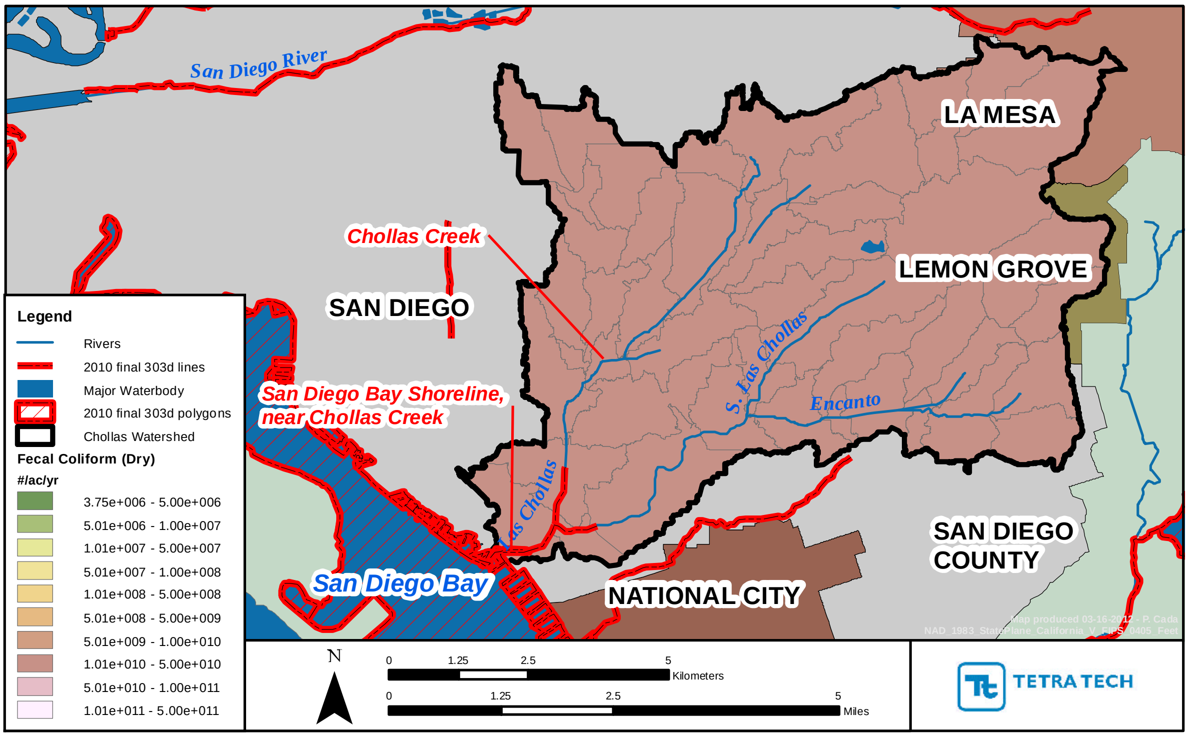

Figure 3-15. Dry-weather fecal coliform bacteria loading in the Chollas watershed

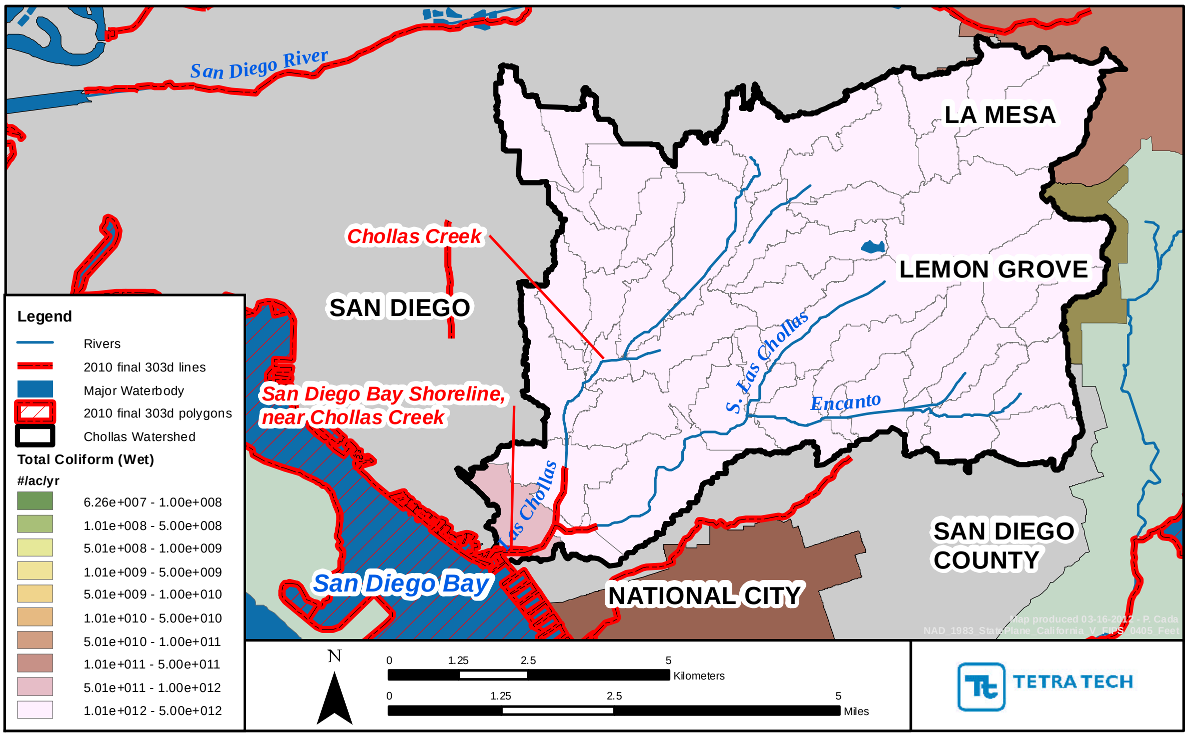

Figure 3-16. Wet-weather total coliform bacteria loading in the Chollas watershed

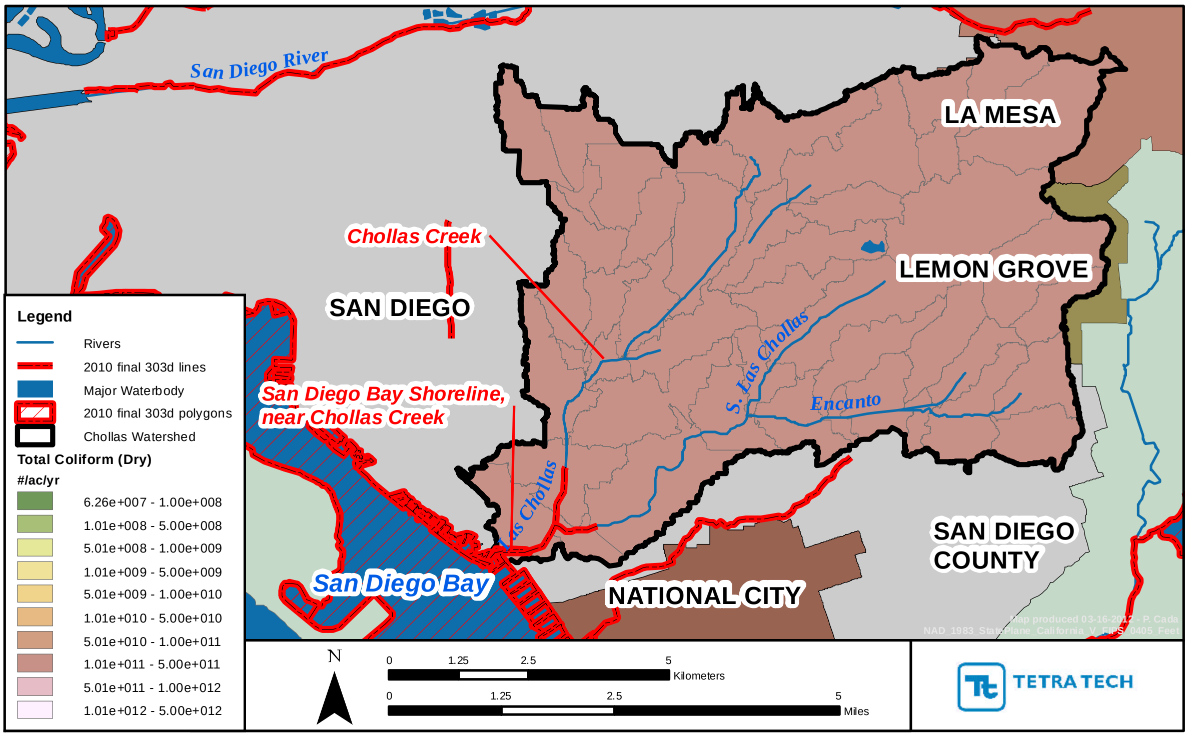

Figure 3-17. Dry-weather total coliform bacteria loading in the Chollas watershed

3.3.2.2 Nutrients (nitrogen and phosphorus)

Total nitrogen and total phosphorous were simulated to represent nutrient loading in the Chollas watershed. Figure 3-18 and Figure 3-19 illustrate the wet-weather and dry-weather loading of nitrogen, respectively; the wet-weather and dry-weather phosphorus loading are presented in Figure 3-20 and Figure 3-21, respectively. For both nutrient species, the dry-weather loading is significantly less than the wet-weather load (approximately an order of magnitude less). In addition, the areas of highest wet-weather loading are along the northern edge of the Chollas watershed. Low-density residential, commercial, and institutional land uses dominate these areas. The loading associated with the drainage to the north fork of Chollas Creek appears to be higher than the loading to the south fork.

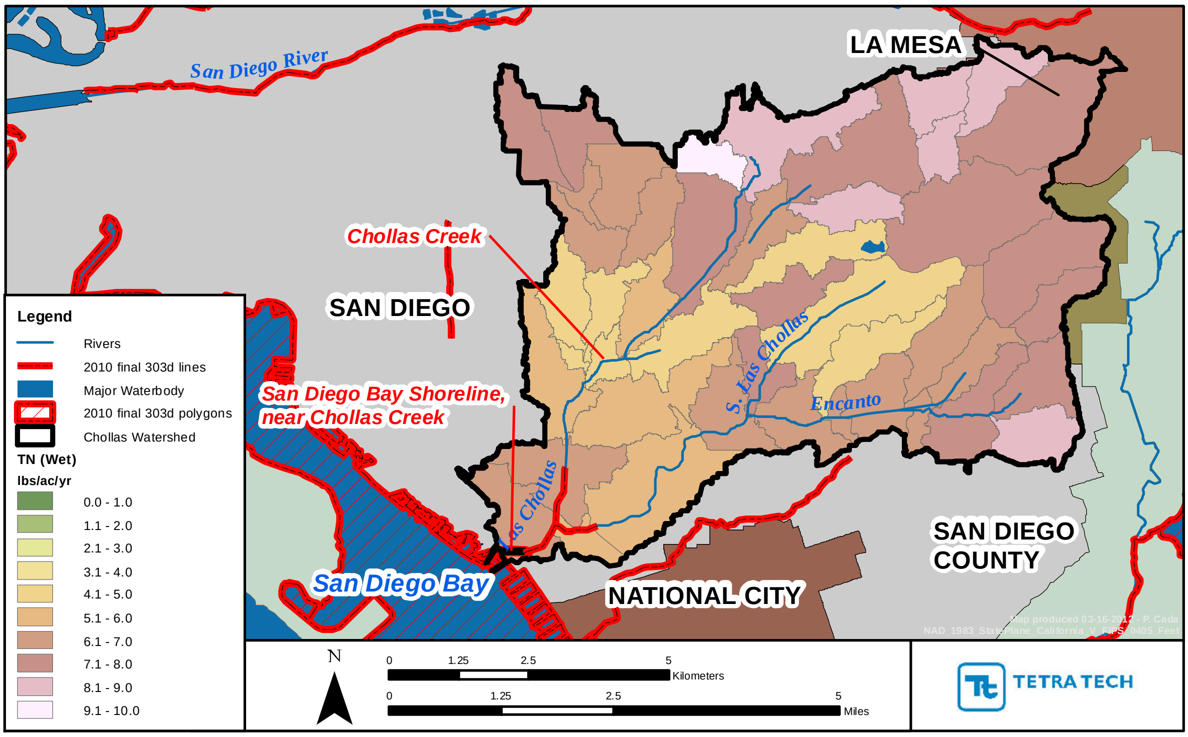

Figure 3-18. Wet-weather nitrogen loading in the Chollas watershed

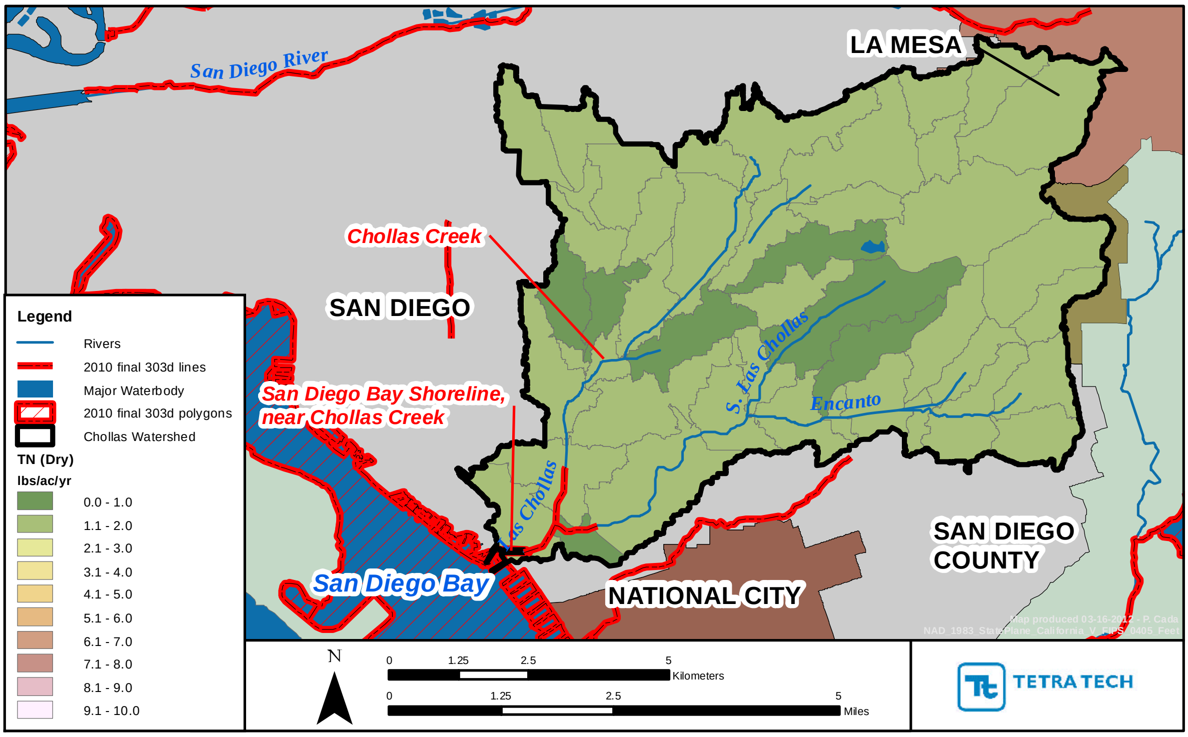

Figure 3-19. Dry-weather nitrogen loading in the Chollas watershed

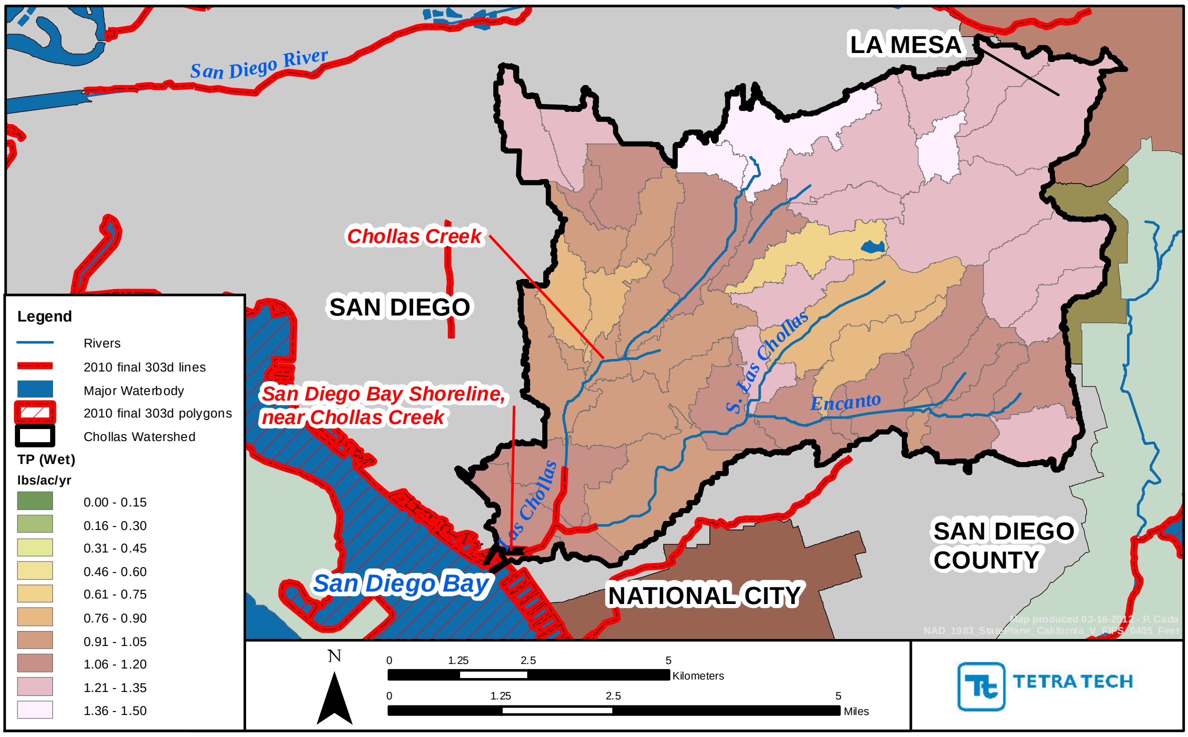

Figure 3-20. Wet-weather phosphorus loading in the Chollas watershed

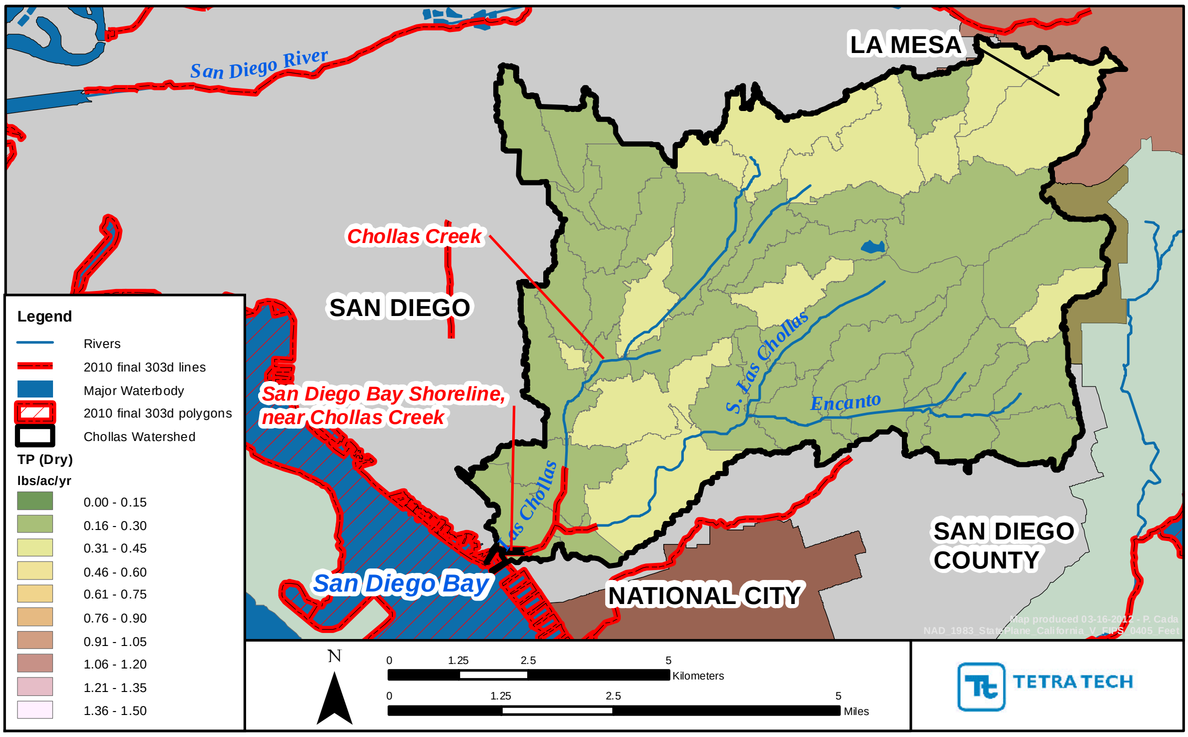

Figure 3-21. Dry-weather phosphorus loading in the Chollas watershed

3.3.2.3 Metals (copper, lead, and zinc)

Metals loading in the Chollas watershed was quantified for copper, lead, and zinc. Wet-weather and dry-weather loading of the three metals are presented in Figure 3-22 through Figure 3-27. Loading results for the three metals generally have the same spatial distribution during wet weather, with the highest loading in the northern and northeastern portions of the watershed. (Note: these areas are dominated by freeway and transportation land uses and commercial and residential areas.) In addition, the subwatershed near the mouth of the south fork of Chollas Creek has some of the highest wet-weather zinc loading. Similar to the results previously presented, the dry-weather results are significantly lower than wet-weather results (although generally less than an order of magnitude).

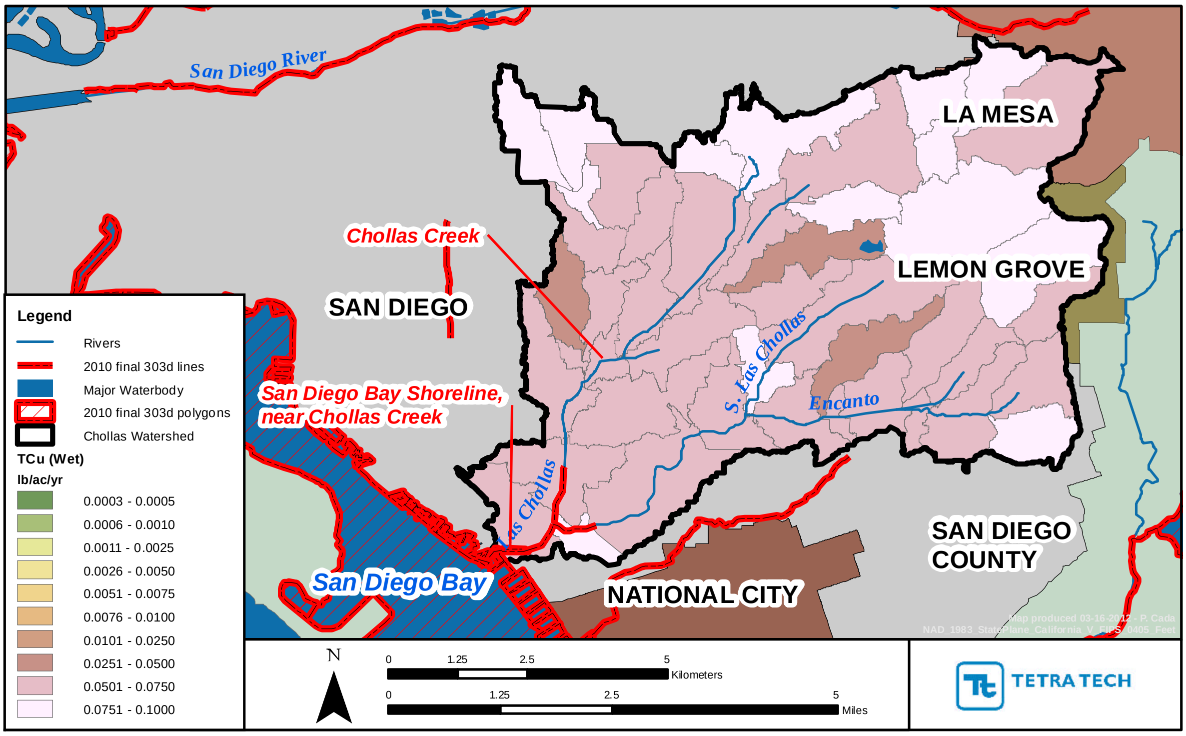

Figure 3-22. Wet-weather copper loading in the Chollas watershed

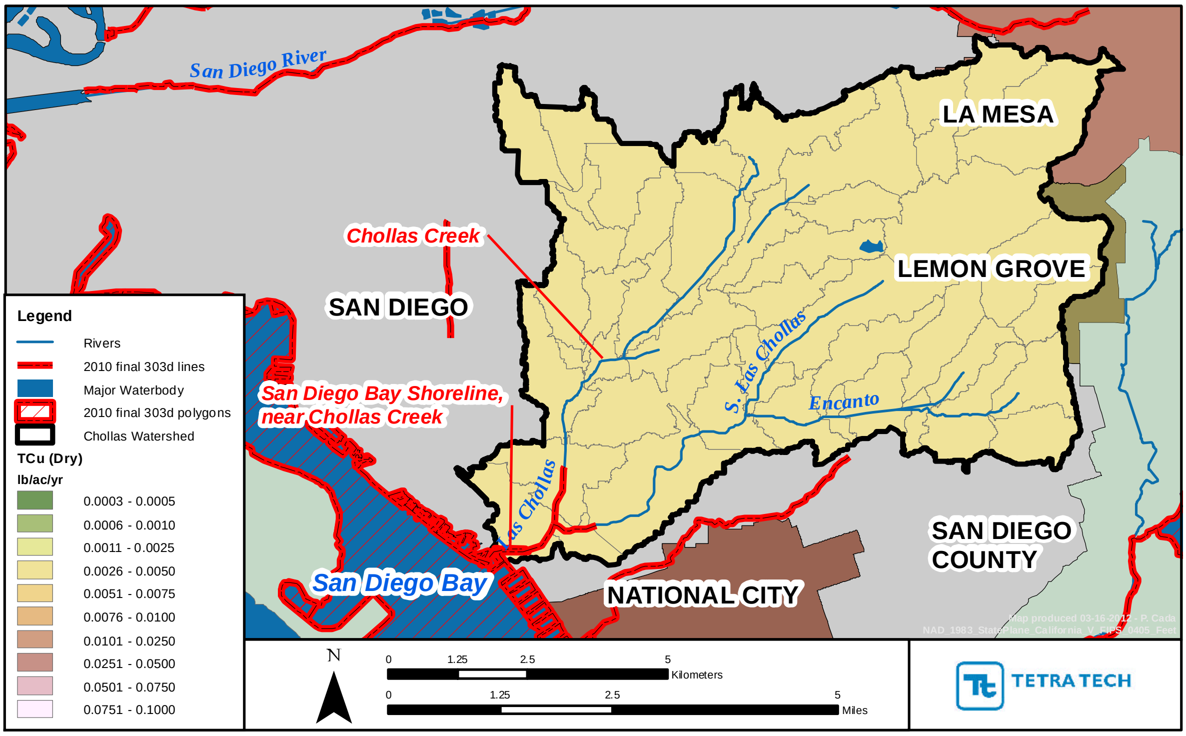

Figure 3-23. Dry-weather copper loading in the Chollas watershed

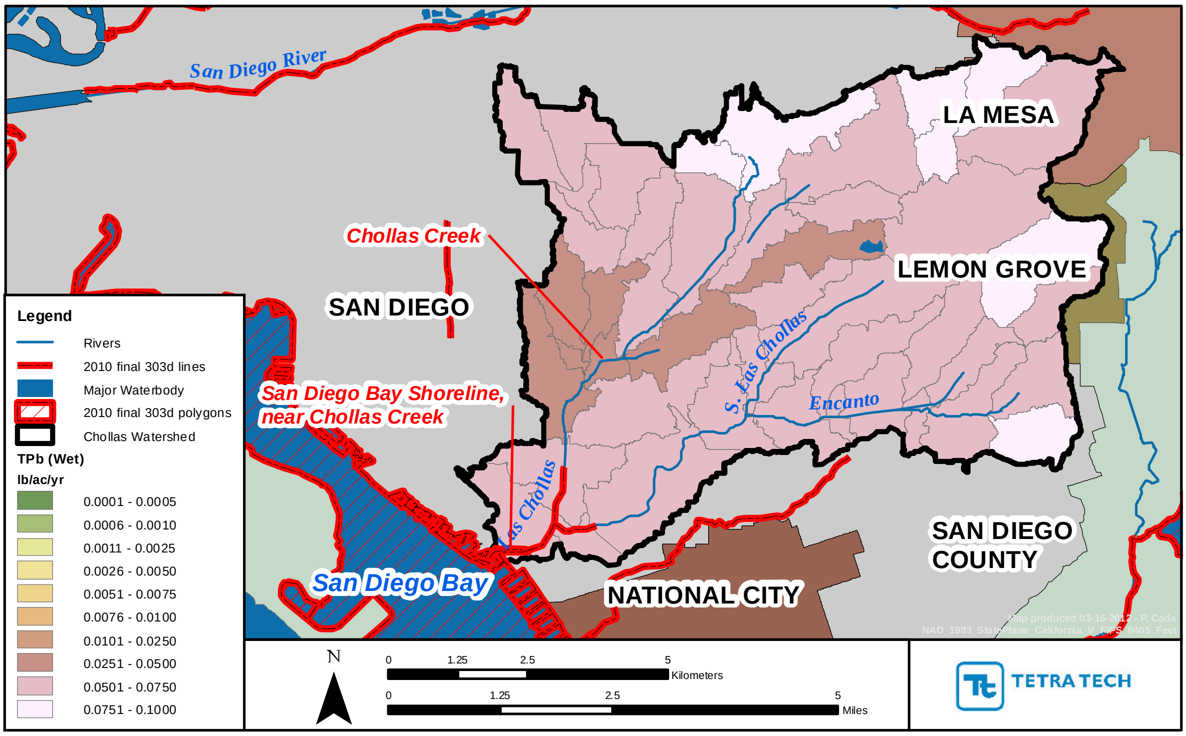

Figure 3-24. Wet-weather lead loading in the Chollas watershed

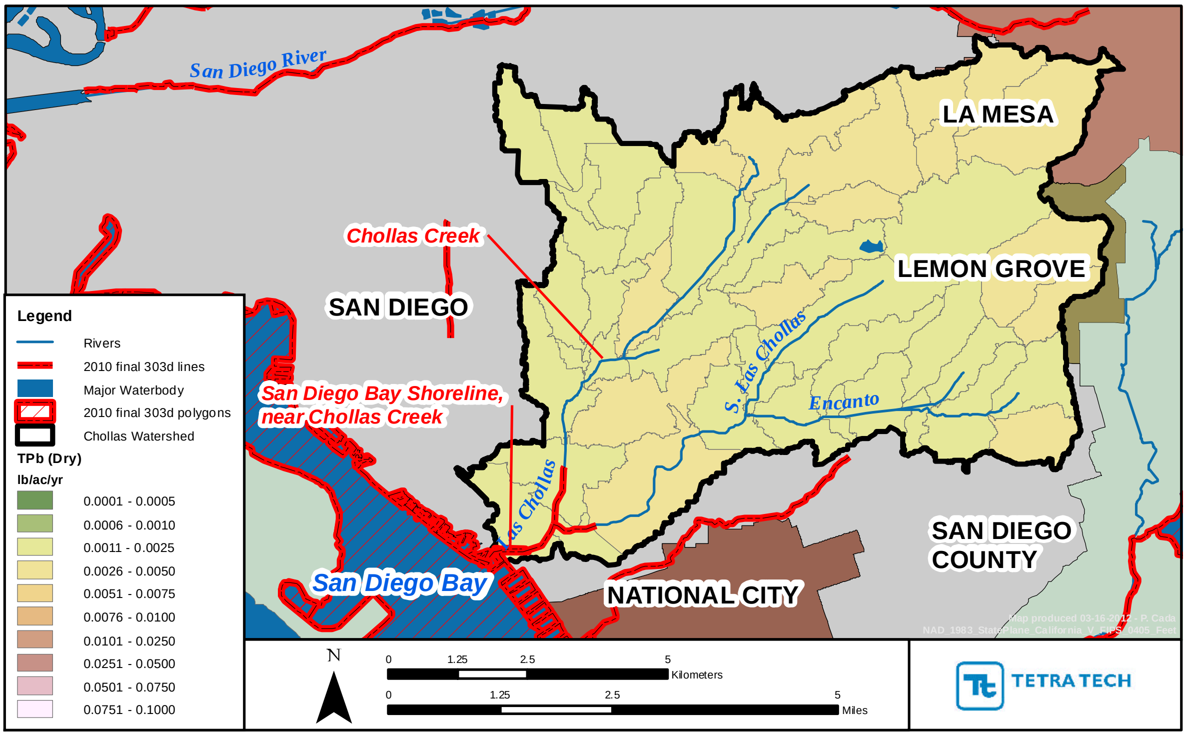

Figure 3-25. Dry-weather lead loading in the Chollas watershed

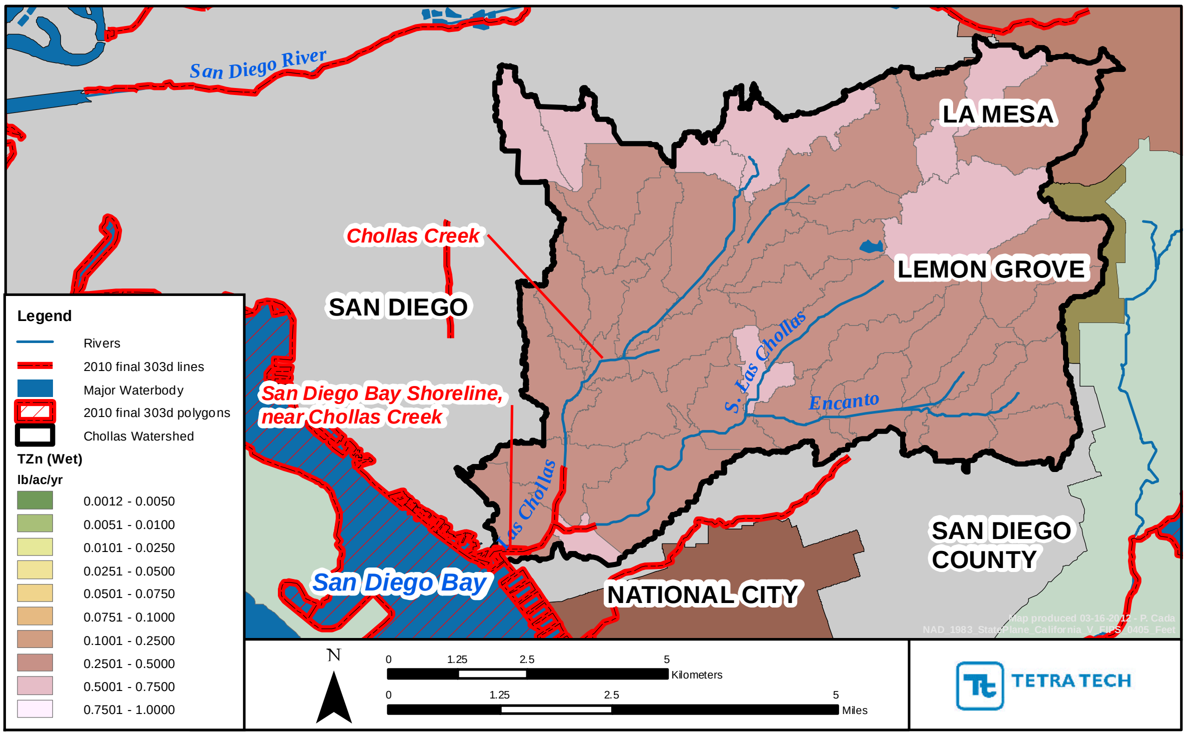

Figure 3-26. Wet-weather zinc loading in the Chollas watershed

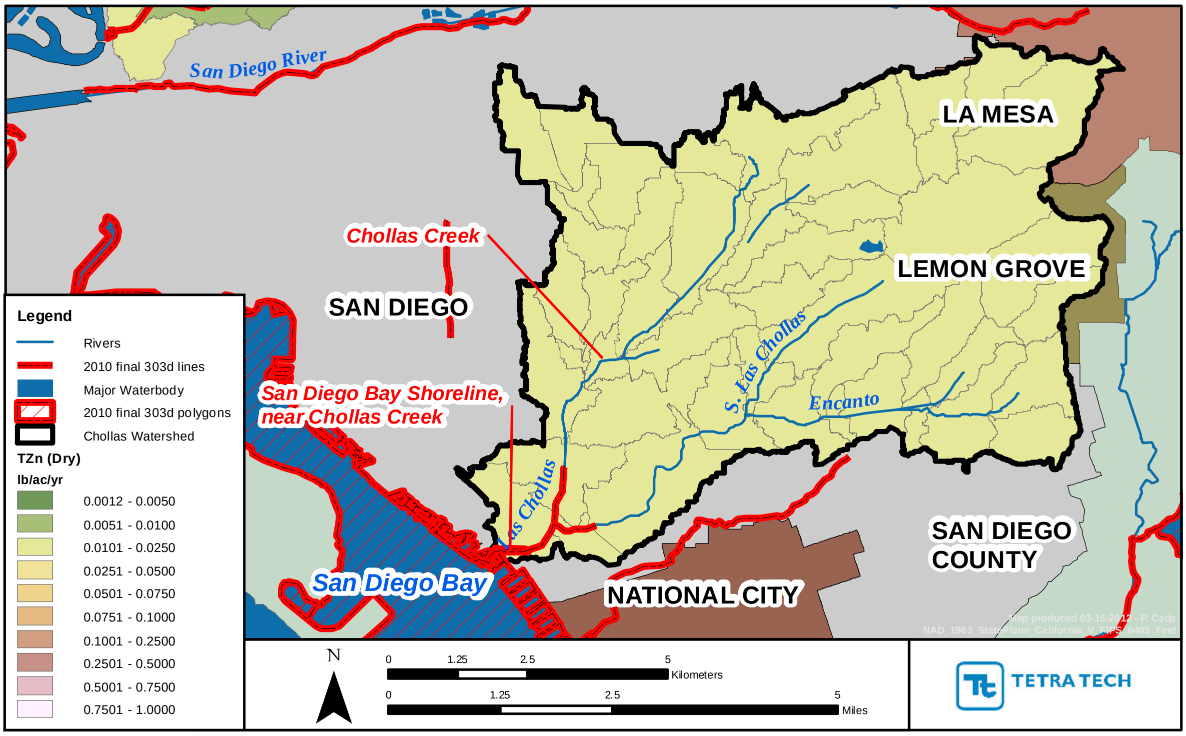

Figure 3-27. Dry-weather zinc loading in the Chollas watershed

3.3.2.4 Additional Impairments

In addition to impairments from bacteria, nutrients, and metals, several waterbodies in the Chollas watershed are impaired from non-modeled pollutants including benthic community effects/sediment toxicity (associated with PAHs, PCBs, and chlordane), diazinon, and trash. Trash has not been historically modeled. Although monitoring for trash in storm water has increased in recent years, it is difficult to quantify this pollutant across an entire watershed. (Note: other sections of the CLRP document identify BMPs that can be used to reduce the loading of trash.) The diazinon impairment is already addressed through a TMDL. Diazinon is no longer available; therefore, BMPs and implementation recommendations in that TMDL address the most significant sources. PAHs, PCBs, and chlordane are organic pollutants associated with the benthic community effects/sediment toxicity impairments. These pollutants generally have a high affinity to soil and sediment particles (Shinya et al. 2000; USEPA 2002). Because these hydrophyllic contaminants are likely to be found in storm water runoff adsorbed to eroded sediment particles, their loadings are relatively proportional to sediment loadings in the Chollas watershed. Wet- and dry-weather sediment loads are presented in Figure 3-28 and Figure 3-29, respectively. As expected, the sediment load during dry weather is minimal when compared to the wet-weather results. The areas of highest sediment loading are in the eastern portion of the watershed (predominantly freeway, commercial, and low-density residential land uses) with other areas of moderate, sporadic loading throughout the drainage area. Management practices to reduce sediment are likely to reduce the sediment-associated organic pollutants and diazinon.

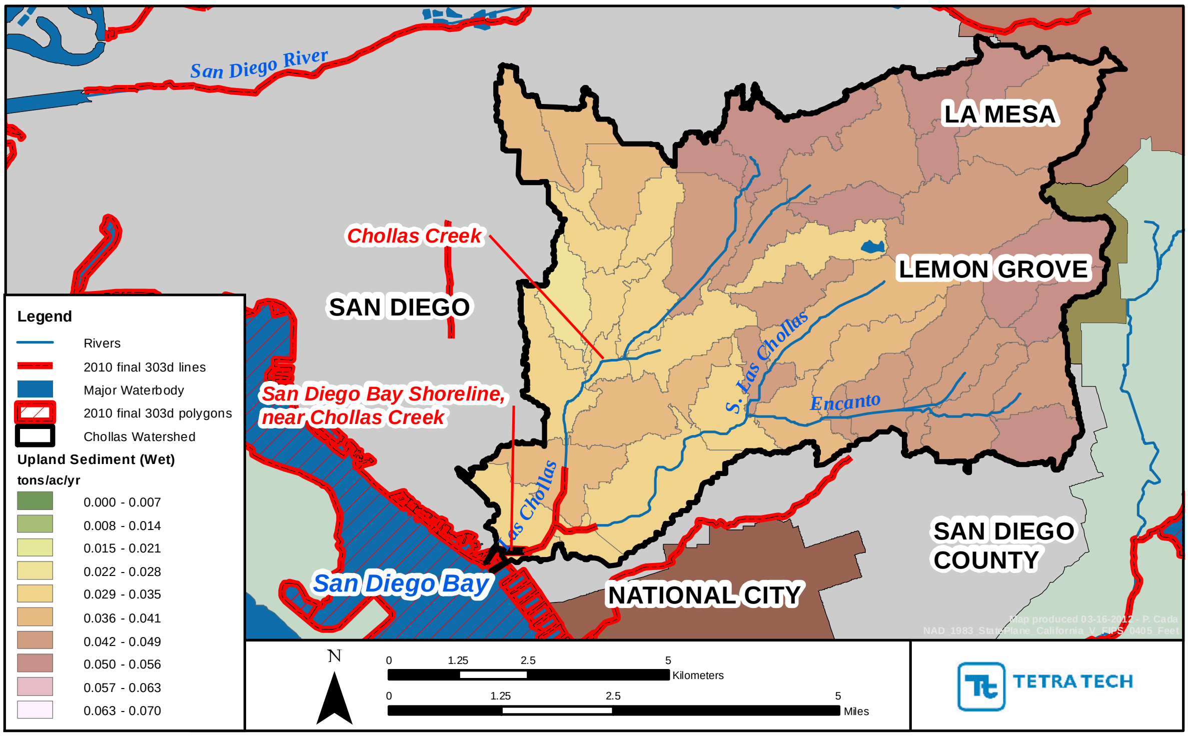

Figure 3-28. Wet-weather sediment loading in the Chollas watershed

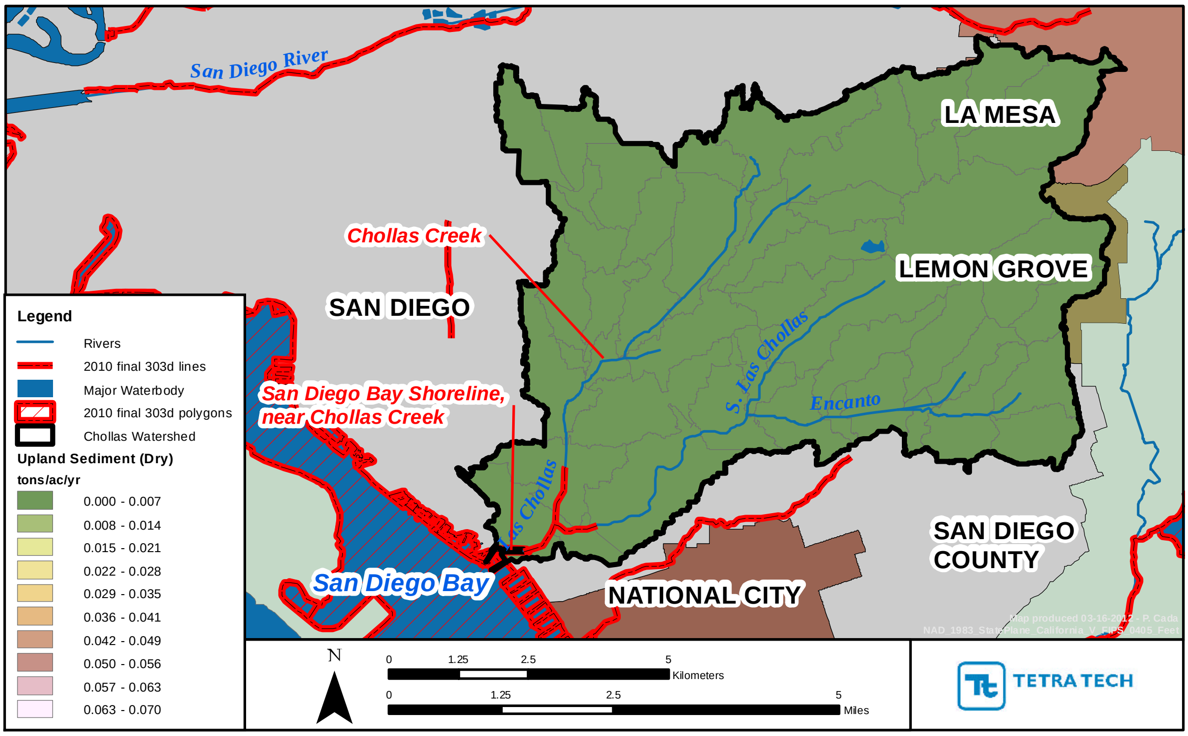

Figure 3-29. Dry-weather sediment loading in the Chollas watershed

3.4 Pollutant Source Prioritization

3.4.1 Prioritization Methodology

To prioritize subwatersheds on the basis of water quality and to guide BMP recommendations, each modeled pollutant loading for every subwatershed was classified into quintiles. Bacteria and metals were selected because TMDLs are developed, and are therefore the focus for BMP recommendations in the CLRP (recognizing that other pollutants will also benefit through implementation of most of these BMPs). Sediment was also included because it serves as a surrogate for estimating associate loads of organic pollutants that tend to be bound to the sediments, Because the critical conditions for the Bacteria TMDL include both wet and dry conditions, bacteria were included in the scoring for each condition. However, wet weather has been identified as the main critical condition for delivery of metals and sediment to Chollas Creek and its mouth; therefore, metals and sediment are included in only the wet-weather scoring system.

A score of 5 indicates that the subwatershed pollutant loading was in the top 20th percentile (high pollutant loading); whereas a score of 1 represents a subwatershed loading in the bottom 20th percentile (low pollutant loading). Quintiles were established for each subwatershed and given to each pollutant for both wet-weather and dry-weather analyses. For bacteria, the individual quintiles scores (1–5) for enterococci, fecal coliform, and total coliform were averaged for a dry composite bacteria score and for a wet composite bacteria score.

For each subwatershed, the dry composite score is the dry composite bacteria score or the average of the individual quintiles scores (1–5) for enterococci, fecal coliform, and total coliform. The wet composite score is the average of the wet composite bacteria score, wet sediment score, and the wet metals score. The wet metals score is the average of each copper, lead, and zinc score. The overall composite water quality score is the sum of the dry composite score and wet composite score. This scoring methodology is summarized in Table 3-11. To prioritize the subwatershed on a wet-weather or dry-weather approach, the wet-weather quintile scores (1–5) were averaged for an overall wet-weather score; the dry-weather quintile scores for bacteria were averaged for an overall dry-weather score.

Table 3-11. Water quality prioritization for Chollas watershed

TMDL pollutant	Dry composite score (1-5)*	Wet Composite score (1-5)*	Composite water quality score
Bacteria, Sediment, Metals (Cu, Pb, Zn)	Bacteria $_{dry**}$	AVERAGE [Bacteria $_{wet**}$, Sediment $_{wet}$, Metals $_{wet}$***]	Dry Composite Score + Wet Composite Score

* The 1–5 score represents the area loading's quintile as determined by the modeling results. A score of 5 indicates that the areal loading was in the top 20 percent; whereas, a score of 1 represents an area loading in the bottom 20 percent. Quintiles were established for each watershed.

** Bacteria$_{dry/wet}$ is the average of the dry enterococci, fecal coliform and total coliform scores.

*** Metals$_{wet}$ is the average of the wet copper, lead and zinc scores.

3.4.2 Prioritization Results

The dry-weather composite scores and the wet-weather composite scores for each subwatershed are illustrated in Figure 3-30 and Figure **3-31**, respectively. The overall water quality composite scores are illustrated in Figure 3-32. The water quality prioritization results demonstrate that the highest loadings take place in the upper portion or headwaters of the Chollas watershed. Subwatersheds 42–46 in the northeast portion of the watershed (Appendix C) have a composite water quality score of 10 indicating that pollutant loadings are the greatest under both wet- and dry-weather conditions. Areas that have a composite water quality score of 9 or 10 are considered HPMAs because they have the highest pollutant loadings in both weather conditions. As shown in Figure 3-32, these areas are in the headwaters of the Chollas watershed (Appendix C provides additional detail on the water quality composite scores). The pollutant loading ranges for quintile scores for bacteria and other pollutants are shown in Table 3-12 and Table 3-13, respectively.

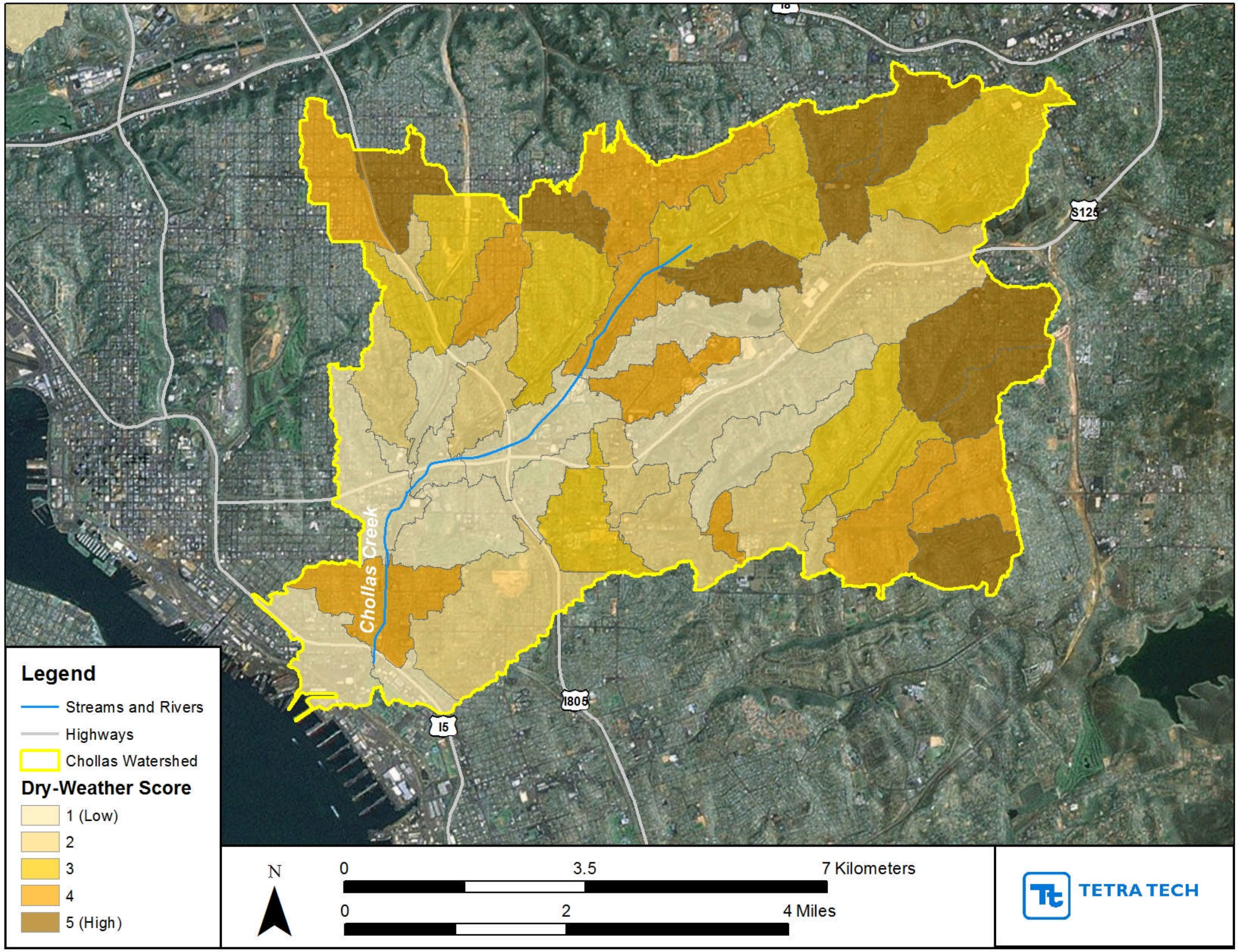

Figure 3-30. Dry-weather composite score (bacteria, metals, and sediment)

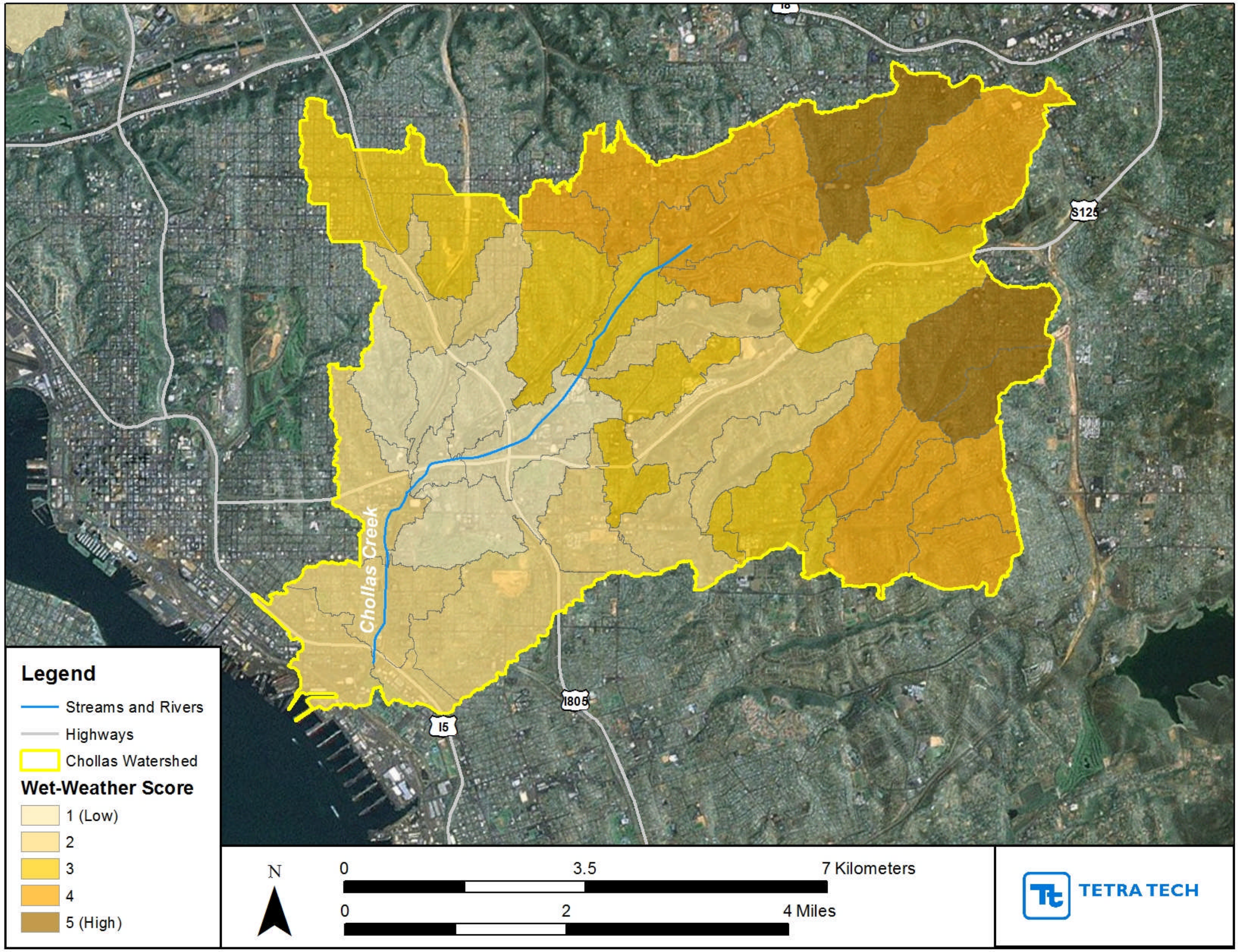

Figure 3-31. Wet-weather composite score (bacteria, metals, and sediment)

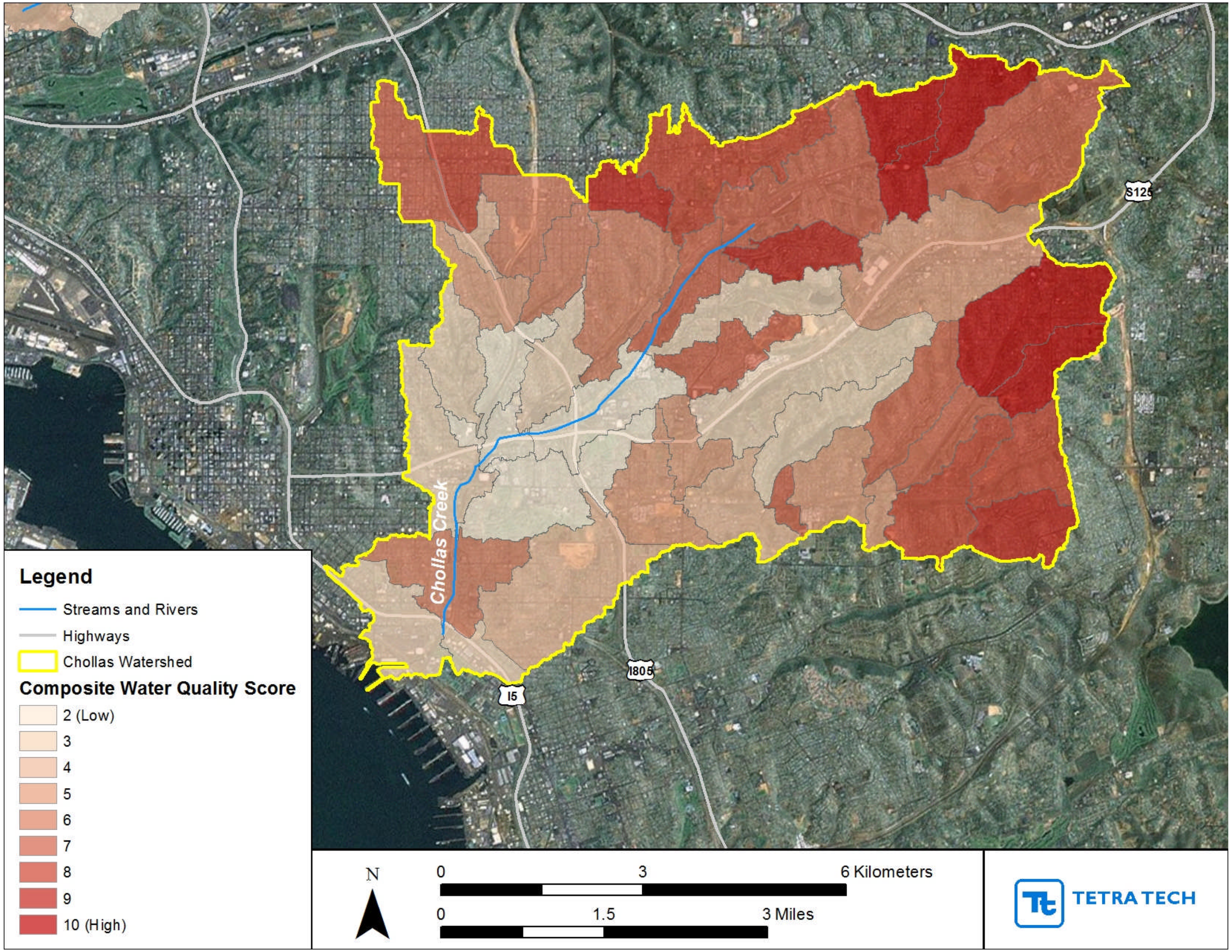

Figure 3-32. Water quality composite score (bacteria, metals, and sediment)

Table 3-12. Pollutant loading scores and associated ranges for bacteria

Water quality score	Bacteria range (billions/ac/yr)					
	Fecal coliform wet	Fecal coliform dry	Total coliform wet	Total coliform dry	Enterococci wet	Enterococci dry
1	0–139	0–23	0–1,392	0–266	0–523	0–101
2	139–175	23–27	1,392–1,670	266–306	523–676	101–118
3	175–199	27–32	1,670–1,890	306–341	676–741	118–135
4	199–230	32–35	1,890–2,159	341–376	741–837	135–15
5	230 +	35 +	2,159 +	376 +	837 +	145 +

Table 3-13. Pollutant loading scores and associated ranges for other pollutants

Water quality score	Sediment wet (tons/ac/yr)	Sediment dry (tons/ac/yr)	Total copper wet (lbs/ac/yr)	Total copper dry (lbs/ac/yr)	Total lead wet (lbs/ac/yr)	Total lead dry (lbs/ac/yr)	Total zinc wet (lbs/ac/yr)	Total zinc dry (lbs/ac/yr)
1	0–0.034	0–0.0024	0–0.0593	0–0.0034	0–0.0508	0–0.0022	0–0.3834	0–0.0145
2	0.0341–0.0363	0.0024–0.0028	0.0593–0.0693	0.0034–0.0037	0.0508–0.0577	0.0022–0.0023	0.3834–0.4239	0.0145–0.0159
3	0.0364–0.045	0.0028–0.0031	0.0696–0.0728	0.0037–0.0038	0.0577–0.0657	0.0023–0.0024	0.4239–0.4584	0.0159–0.0168
4	0.0451–0.0482	0.0031–0.0032	0.0728–0.0801	0.0038–0.0041	0.0657–0.0683	0.0024–0.0027	0.4584–0.4982	0.0168–0.0175
5	0.0483 +	0.0032 +	0.0801 +	0.0041 +	0.0683 +	0.0027 +	0.4982 +	0.0175 +

4 Developing Nonstructural Solutions

4.1 Introduction and Approach

To be fully comprehensive, a CLRP must identify nonstructural program opportunities and solutions that complement proposed structural solutions to achieve overall attainment of WLAs. This section describes strategies and opportunities for achieving load reduction targets in the Chollas watershed by applying nonstructural BMPs identified by the watershed's RPs: Caltrans, the City of San Diego, the County of San Diego, the City of La Mesa, the City of Lemon Grove, and the Port of San Diego.

This section first presents a review of the actions the RPs have already taken to reduce pollutant loads, as reported in the Caltrans Statewide Stormwater Management Program Annual Report (Caltrans 2012), available RP JURMP Annual Reports (City of Lemon Grove 2010; City of San Diego 2010c; County of San Diego 2011a; City of La Mesa 2011a; Port of San Diego 2011), and the *Watershed Urban Runoff Management Program Annual Report* (WURMP) for San Diego Bay, which covers the Chollas watershed (San Diego Bay Copermittees 2011). Second, this section discusses options for enhancements and expansions of existing and selected new, nonstructural BMPs, programs and activities that could result in reduced pollutant loads. Finally, this CLRP presents recommended BMPs that are planned, scheduled, and budgeted for each jurisdiction for the RPs but that can be prioritized and applied in the Chollas watershed to address the specific PGAs, land use sources, and conditions in the watershed, using the mapping and HPMA designations. Each BMP is associated with a prospective 5-year implementation and phasing schedule, with cost estimates for each year, and associated budgeting according to the level of staff effort or materials and outside services estimated to be required to implement the BMP, as discussed in Section 7.

4.1.1 Approach

The sheer number of actions that the RPs perform in the course of their regular operations that can be considered *nonstructural BMPs* makes it especially challenging to organize them according to which ones, under what circumstances, and in what locations, could lead to the measurable load reductions required in the watershed. Thus, the CLRP focuses on three priorities:

1. Establishing a baseline for existing nonstructural actions relative to existing loads, principally on the basis of JURMP- and WURMP-reported activities as required in the MS4 permit
2. Identifying additional load reductions from planned, programmed, or ongoing activities that exceed basic permit requirements, or from enhancements or expansion of existing programs (e.g., the City of San Diego's rainwater harvesting rebate, La Mesa's outreach and engagement with mobile businesses, the Port of San Diego's trash enclosure retrofits and turf conversion program)
3. Identifying potential changes to existing programs, including the adoption of best practices from other jurisdictions or watersheds that are transferable to the Chollas watershed, and new actions or initiatives, that would result in additional load reductions

After identifying the list of potential nonstructural BMPs, many of which were recommended as future BMPs in the WURMP, the CLRP analysis must determine where these BMPs might be applied to be most effective, the amount of pollutant load reduction that could be reasonably expected, and the potential costs of implementing the BMPs.

4.1.2 Defining Nonstructural BMPs

In contrast to the engineering practices of designing and building structural treatment and control facilities to improve water quality, both water resources-based and nonstructural BMPs can involve a wide range of actions. For example, some nonstructural BMPs include adopting laws or regulations banning the use of pollutants, and conducting general public outreach and education.

In many cases, a single nonstructural program or Watershed Activity will incorporate several components, such as enforcement, education, and pollution-preventing retrofits such as covering outdoor trash enclosures. For these reasons, it is important to define the universe of practices that will be included in the CLRP as *nonstructural* BMPs.

For purposes of this CLRP, nonstructural reduction strategies are defined as ***those actions and activities intended to reduce storm water pollution that do not involve construction of a physical component or structure to filter and treat storm water***. Nonstructural reduction strategies also may include erosion repairs, stream buffer plantings and enhancement, constructing water resource mitigation sites in conjunction with capital projects (particularly transportation system projects that affect wetland areas), and implementing landscape-based measures such as turf conversion that involve construction and earth moving, but whose constructed functions are not exclusively limited to storm water filtration or treatment.

With a clear understanding of the scope of nonstructural BMPs, it is possible to characterize and define the types of BMPs in place or potentially available to the RPs. To do so, current nonstructural BMPs were identified, and then three options were evaluated for additional load reduction: (1) potential expansions of existing BMPs to reach a greater geographic area or to achieve greater impact in the existing geographic area of the program; (2) potential enhancements or changes to existing programs that could achieve greater load reduction; and (3) new or expanded initiatives needed to address PGAs or sources identified. These are organized into eight categories listed in Table 4-1. The categories provide an organizational structure for discussion of BMP types, pollutant removal effectiveness, and additional load reduction strategies.

In an effort to provide consistency in nonstructural BMP categorization between this CLRP and other regional efforts, Table 4-1 shows the relationship between the BMP descriptions used in this CLRP, and the BMP "families" described in a set of fact sheets developed separately and used in other regional efforts (Appendix D). This Table is intended to provide continuity and a cross-reference for the two approaches to describing nonstructural BMPs.

Table 4-1. BMP terminology

Chollas CLRP	BMP fact sheet *families*
Development Review Process SUSMP and Regulatory Enhancement	Policy Development
Enhanced Inspections and Enforcement	Code Enforcement
	Inspections
Enhanced Inspections and Enforcement SUSMP and Regulatory Enhancement	Trash Management
	Animal Waste Management
MS4 Maintenance	MS4 Cleaning
	Street Sweeping
	Channel and Slope Stabilization
New/Expanded Practices or Capital Improvement Projects	Sanitary Sewerage Management
Capital Improvement Projects	Elimination of Groundwater Inflow
Landscape Practices	*Smart Gardening*
Education and Outreach	Education and Outreach

4.2 Methodology

To determine which of the many BMP options could be expected to be most effective at reducing pollutant loads, several factors must be considered:

- The pollutants and conditions of concern within the Chollas watershed
- Locations and land use types in subwatersheds with the highest *water quality composite* scores, as illustrated in Figure 3-32
- The extent to which existing nonstructural solutions address each pollutant or condition of concern as reported in the JURMP and WURMP reports
- The extent to which each new or enhanced BMP option addresses gaps or weaknesses in the RPs' nonstructural program in the most targeted and cost-effective manner possible

The combination of existing efforts and recommended efforts determine the final, expected load reduction (Figure 4-1). Fundamentally, BMPs were chosen on the basis of their expected effectiveness at reducing pollutant sources and targeting PGAs of concern in the Chollas watershed and their suitability for and potential to be implemented by the RPs. Selected BMPs were then assigned ranking criteria to help prioritize among various options, as addressed in Section 7.

Figure 4-1. Determining total load reduction from nonstructural practices

4.3 Nonstructural BMP Development

An evaluation was performed covering all aspects of the RPs' nonstructural BMP programs, which provided the necessary background on existing nonstructural solutions and suggested areas where enhanced or restructured activities might be more successful. The information obtained during these evaluations, along with independent research on pollutant sources, potential reduction strategies, and local conditions, formed the basis for the nonstructural BMP recommendations in this section.. More specifically, the BMP selection process followed the steps outlined below.

1. Review and characterize existing nonstructural programs for their reported effectiveness, and identify opportunities for enhancement or expansion, using the RPs' JURMP reports, applicable portions of the WURMP report, other relevant planning documents and development standards, and, as applicable, TMDL implementation plans and other plans (Section 4.3.1).
2. Identify new nonstructural programs for implementation, including best practices currently implemented elsewhere (Section 4.3.2).
3. Evaluate reduction effectiveness by examining the relationships among available nonstructural BMPs, pollutant sources, and PGAs to identify BMPs that address the pollutants, loads, and sources in the Chollas watershed (Section 4.4.1).
4. Summarize potential BMPs (Section 4.5).

The potential BMPs were then prioritized for implementation, as discussed in Section 7.

4.3.1 Review and Characterization of Existing Nonstructural Programs

The RPs are and have been implementing a variety of nonstructural programs designed to address pollutants and conditions of concern in the Chollas watershed. These existing programs have been documented in the JURMP and WURMP reports. Additionally, the *Stormwater Standards Manual*, also called the *Standard Urban Stormwater Mitigation Plan* or SUSMP (Port of San Diego 2010; County of San Diego 2011b; City of La Mesa 2011b; City of San Diego 2012; City of Lemon Grove Municipal Code Chapter 8.52) and zoning ordinances in each municipality detail provisions relating to BMPs required for new development and redevelopment, and any retrofits required in the watershed. These sources combine to provide a baseline for existing nonstructural program activities.

4.3.1.1 Caltrans and JURMP-Reported Nonstructural Activities

The first component of the existing, baseline level of reduction comes from the nonstructural activities reported in the Caltrans Statewide Stormwater Management Program Annual Report for FY2011-2012 (Caltrans 2012), and the FY2010 JURMPs for the County of San Diego, Port of San Diego, and cities of San Diego, La Mesa, and Lemon Grove (City of San Diego 2010c; City of Lemon Grove 2010; County of San Diego 2011a; Port of San Diego 2011; City of La Mesa 2011b); and Caltrans annual reporting. Table 4-2 summarizes the nonstructural program data for Caltrans, and Table 4-3 summarizes the nonstructural program data from the JURMPs. It is important to note that the JURMP reports present data by jurisdiction, not by watershed or HA; watershed-specific data are presented in Table 4-4.

Table 4-2. Caltrans FY2011-12 nonstructural program data

Activities	Caltrans- District 11 (Fiscal Year 2010- 2011)
Progress on Work Plan (percent completed)[1]	
General Management Practices	
Monitoring activities	100%
Public education and participation	100%
Municipal coordination	83%
Cooperative agreements with local agencies	100%
Construction Stormwater Program	
Pre-construction meetings	46
Active construction sites	92
Active construction sites with a SWPPP[3]	55
Active construction sites with a WPCP[3]	37
Response to enforcement actions	2
Maintenance Stormwater Program	
Drains and Culverts	
Drains-culverts inspections (each)	8,412
Drains-culverts cleaned (each)	6,188
Ditches and channels inspected and cleaned (miles)	7
Total number of drain inlets	24,158
Number of drain inlets/culverts inspected	7,391
Number of drain inlets/culverts cleaned	5,163
Enhanced Drain Inlet Inspection and Cleaning Program	
Total Number of drain inlets	8,104
Number of drain inlets inspected	2,707
Number of drain inlets cleaned	311

Activities	Caltrans- District 11 (Fiscal Year 2010- 2011)
Herbicide Usage Summary	
Total pounds applied	20,824.26
Acres treated	3,712.30
Slope Inspection - District Maintenance Stormwater Coordinators [4]	
Total shoulder miles	3,085
Shoulder miles inspected	569.89
Minor repair needs found	1
Major repair needs found	2
Stormwater Slope Inspections and Erosion Control Activities- Division of Maintenance Field Crews [4]	
Storm Patrol Inspection miles	94,133
Minor Slope repairs	145
Minor slide/slipout work orders	33
Minor bare slopes repair work orders	2
Route sites cleared due to storms	183
Major storm work orders	1
Storm related public complaint investigations	1
Illicit Connections/Illegal Discharge Summary	
Incidents	40
Resolved from prior fiscal years	13
Resolved during fiscal year 2010-2011	16
Regional Board referrals	5
Training	
Division of Planning and Design Employer Training Activities[5]	728
Division of Construction Employee Training Activities[6]	2,930
Maintenance Stormwater BMP Tailgate Meetings	897
Public Education	
Adopt-A-Highway Program	
Total Shoulder Miles	1,975
Miles Adopted	944
Materials removed (cubic yards)	942
Public Education Efforts	
"Don't trash California" - anti-litter campaign	x
Adopt- a highway program - anti-litter campaign	see details above
County Fairs	x
School events, activities, festivals	x

Activities	Caltrans- District 11 (Fiscal Year 2010- 2011)
[1] The District completed a majority of the planned TMDL activities, and coordinated with TMDL stakeholders to achieve the percentage completed. [2] Planned TMDL work for the fiscal year was completed and includes; water quality monitoring, municipal/stakeholder coordination, modeling, TMDL implementation, and structural and non-structural BMP implementation. [3] A SWPPP and WPCP (Stormwater Pollution Protection Plan and Water Pollution Control Plan) were implemented at all construction sites when required. [4] District Maintenance Stormwater Coordinators lead effort for storm damage repairs under the SWMP mandated program. In addition, Division of Maintenance conducts storm patrols, which assess needed erosion control/storm damage repairs for slopes. [5] Training courses included: Design-Erosion prediction, Stormwater, Construction Site Water Pollution Control, Water Quality Sampling and Analysis, SWPPP/WPCP Review, Storm Water Data Report Workshop, and Advanced Concepts in Sustainable Erosion Control. [6] Training courses included: Water Quality Sampling and Analysis, Construction Stormwater Refresher, Key Concepts of Sustainable Erosion Control, Reporting Requirement Training, 4-Hour SWPPP Crash Course, Spill Identification and Emergency Response, SWPPP New General Construction Permit, New Construction General Permit (CGP), Lake Tahoe Stormwater Training, Stormwater Data Report Workshop, Construction Stormwater NPDES Meetings, Registered Engineer Meeting Stormwater Update and Regional Board Presentation, Stormwater Management New Employee Training, and Stormwater Management Refresher Training.	

Table 4-3. JURMP-reported nonstructural program data

	Chollas watershed RP				
Inspection activities	**City of San Diego (FY 2010)**	**County of San Diego (FY 2010)**	**Lemon Grove**	**La Mesa (FY 2010)**	**Port of San Diego (FY 2010)**
Construction					
Violations cited[1]	23	62	0	8	6
MS4 Cleaning					
Total number of catch basin inlets	31,997 and 3,055 storm drain facilities	18,873	190	400	968
Number inspected[2]	33,189 and 12,000 storm drains	7,575	190	400	681
Number cleaned	15,092	5,104	68 and 7 conveyances	400	200
Material removed[3]	6,236 tons and 444 tons from storm drain facilities	770 cy	1,860 lbs	175.25 cy	13.41 tons
Distance of pipes	901 mi	2,384 mi	75 mi		20 mi
Distance inspected[4]	Not formally tracked	7,415 mi	See above comments		Not listed
Distance cleaned	2.55 mi	6,964 mi	See above comments		411 ft
Material removed	6,674 tons	27,437 cy	See above comments	14.25 cy	Included in 13.41 tons above
Distance of open channels	50 mi	4 mi	2.5 mi		
Length inspected	100 mi - inspected twice	4 mi	See above comments	4,930 ft	

Inspection activities	Chollas watershed RP				
	City of San Diego (FY 2010)	County of San Diego (FY 2010)	Lemon Grove	La Mesa (FY 2010)	Port of San Diego (FY 2010)
Length cleaned	8 mi	3.5 mi	See above comments	4,930 ft	
Material removed	20,591 tons and 40,500 tons removed from Tijuana River and Smuggler's Gulch Channels	687 cy and 328 cy from road station parking lots	See above comments	74 cy	
Street Sweeping					
Length of high-material streets	1,384 mi	168 mi	65.5 mi	10.6 mi	1643 mi
Length of medium-material streets	313 mi and 5 operation yards	81 mi	See above comments	9 mi	Included above
Length of low-volume streets	3,540 mi and 390 municipal parking lots	3,500 mi	See above comments	140 mi	Included above
Total miles swept	101,048 mi	20,686 mi	80 mi	8,285 mi	
Number of municipal parking lots swept[5]		10	1	Included in total miles swept	44
Sweeping frequency	High volume - weekly, medium volume - monthly, low volume - every other month, 5 operation yards - once a month, parking lots - once a year	High priority - twice monthly, moderate - monthly, low priority streets - annually, and road station parking lots - monthly	Major arterial curbed streets - weekly, all other curbed streets - biweekly, non-curbed streets - monthly, center island and medians - monthly, major parking lots and alleys - weekly, all other parking lots and alleys - monthly	High volume - every two weeks, medium volume - monthly, low volume - as needed or annually, municipal parking lots - weekly, parking lots (at parks) - weekly, Public Works Operation Center - weekly, or twice weekly	Weekly or as needed
Materials collected	6,668 tons	3,513 tons	175 tons	577 tons	27 tons
Sites requiring inspection	127	275	14		26
Number inspected[6]	124	1,270	14		24
Frequency[7]		See comment	Once per year		Annually
Violations[8]	0	83	0		1
Industrial and Commercial					
Number of commercial facilities inspected	5,306 site visits - 3,137 required full inspections	806	34	120.5	81- includes both commercial and industrial facilities

Inspection activities	Chollas watershed RP				
	City of San Diego (FY 2010)	**County of San Diego (FY 2010)**	**Lemon Grove**	**La Mesa (FY 2010)**	**Port of San Diego (FY 2010)**
Number of industrial facilities inspected[9]	1,087 site visits, 582 required full inspections	83	19	See above	See number inspected of commercial facilities comment
Additional inspections[10]	3,159 - City's Food Establishment Wastewater Discharge Program 48 - Industrial Wastewater Control Program			170	
Total Inspections	6,926 full inspections				
Citations issued	17	7	0	0	
Violations issued	57	73	0	19	0
Verbal warnings issued[11]		21	0	0	19
Mobile businesses	1,915			981	58
Mobile business Investigations	22			1	44
Citations issued[12]	5			0	0
Notice of violation issued	9			0	0
Residential					
Pounds/tons of household hazardous waste collected	464 tons	314,349 lbs	Data not yet calculated	134,782 lbs	Residential areas not permitted on the Port
Number of investigations[13]	640			54	
NOVs issued[14]	171	Hazardous waste violations not separated from other violations	0	4	
Citations issued	119	Same as above	0	2	
Verbal warnings issued[15]	See Comment	Same as above	8	1	

[1] *County of San Diego*- Total of 243 sites, 44 administrative warnings, 0 written warnings, 197 correction notices, 0 notices of violation, and 62 administrative citations. [1] *City of La Mesa*- 1 verbal warning, 7 written warnings, and 8 notices of violations. [2] *Port of San Diego*- This is the number of MS4 structures inspected. 95% of high priority MS4 components and 50% of total MS4 inventory. [3] *City of San Diego*- This number includes removal from catch basins, inlets, cleanouts, and the MS4 (not calculated separately). [3] *Lemon Grove*- This includes trash and debris from the catch basins, conveyances, and roads. In addition, 1,500 lbs of green debris from invasive plant growth was removed from the conveyances. [4] *County of San Diego*-

<table>
<tr><th rowspan="2">Inspection activities</th><th colspan="5">Chollas watershed RP</th></tr>
<tr><th>City of San Diego (FY 2010)</th><th>County of San Diego (FY 2010)</th><th>Lemon Grove</th><th>La Mesa (FY 2010)</th><th>Port of San Diego (FY 2010)</th></tr>
<tr><td colspan="6">Miles inspected includes road drainage, curbed streets, gutters, ditches, man-made channels, drains, closed pipes, and open channels. [5] County of San Diego- Included in Road Station Elements. [6] County of San Diego- Totals: 144 landfill inspections, 72 burn sites, 16 transfer stations, 228 self-inspections of wastewater facilities, 276 self-inspections of road stations, 216 for fleet facilities, 108 for fueling facilities, 36 for airports, 96 for parks, 15 high priority office buildings, and 63 medium priority office buildings. [7] County of San Diego- Landfills - monthly, burn sites - monthly, transfer stations - quarterly, wastewater facilities - monthly self-inspection, road station facilities -monthly self-inspection, fleet facility - monthly self-inspect, fueling facilities - monthly self-inspect, airports - monthly self-inspect during 8 mo. rainy season and once during dry season, parks - self-inspect quarterly, high priority office - self-inspect quarterly, medium priority office - bi-annually self-inspect [8] County of San Diego- Totals: 13 WPP facilities were cited for WPO deficiencies, 6 wastewater facilities were cited for WPO deficiencies (out of 16 audited facilities), 10 citations for road stations (out of 19 audited facilities), 4 for fleet maintenance and fueling facilities (out of 27 audits), 4 citations for airports (out of 4 audits), 21 citations for parks and rec (out of 71 audits), and 25 citations for office buildings (out of 45 audits). [8] Port of San Diego- Includes one administrative warning. [9] County of San Diego- All high priority sites and 25% of total inventory require inspection. [9] City of San Diego- The Pollution Prevention Division conducted the 1087 site visits. Of those 582 were found to need full inspections (505 of those were found to have moved, be duplicates, or incorrectly classified). One industrial facility was found to be a mobile business. [10] City of La Mesa- Additional inspections include restaurant FOG (fats, oil, and grease). [11] Port of San Diego- Totals: 19 sites required corrective action but no violations reported. 14 written warnings were reported during the year resulting from the 19 corrective actions. [12] City of San Diego- Two Civil Penalties, and education provided for 5. [13] City of San Diego and City of La Mesa- Investigations due to Storm Water Hotline and observations by Code enforcement. [14] County of San Diego- From complaints, which include: sediment, manure, sewage, trash/debris, auto fluids, aqueous, paints, solvents, chemicals, and other. Of these, there are 25 verbal warnings, 13 notices of violation, and 2 citation warnings. [15] City of San Diego- Totals: 1 civil penalty, 91 education material, 93 letters, 15 referred to another department, and 5 TBD. Others were blank data, exempt, no action taken, or not visited.</td></tr>
</table>

4.3.1.2 WURMP-Reported Activities

The second component of the existing, baseline level of reduction comes from the nonstructural activities reported in the FY2010 WURMP annual report for the San Diego Bay watershed, which covers the Chollas watershed (San Diego Bay Copermittees 2011). Table 4-4 summarizes the nonstructural program data for the RPs in aggregate. It is important to note that as with JURMP reported data, the WURMP reports present data for the entire San Diego Bay watershed, which includes the Chollas watershed. The data presented in Table 4-4 have been selected to eliminate those WURMP activities that were not applicable to the Chollas watershed.

As part of developing the recommended nonstructural solutions in the CLRP, the WURMP-reported activities were evaluated carefully and discussed with the RPs to evaluate the level of effort currently being applied, and to identify those Watershed Activities and maintenance operations that are most likely to achieve greater load reductions, if the activity were either expanded in its current format, or enhanced or modified to better target pollutants. The column at the right in Table 4-44 indicates whether the activity is recommended in the CLRP to be continued in its present form, expanded (i.e., more resources and greater geographic coverage) in its present form, or modified/enhanced at similar or slightly expanded resource levels to accomplish greater load reduction. The decision-making process for this column is described in detail in Section 4.3.1.4.

Table 4-4. WURMP-reported nonstructural program data (908.2 San Diego Mesa Hydrologic Area)

Watershed Activity reported	FY2011		Comparable BMP within Chollas Creek CLRP (Table 4-6)	CLRP recommended action: continue current, enhance, or expand
	Inspected	Total		
Construction	29	257	Enhanced Inspections & Enforcement: (7) Property-Based Inspections SUSMP & Regulatory Enhancement: (10) Animal-related facilities (9) Trash areas; (12) Nurseries & garden centers	Enhance (new regulatory standards & enhanced inspection/enforcement program)
Municipal	289	378		
Agriculture	2	7		
Animal related	19	68		
Automotive	337	858		
Boat maintenance and repair	3	3		
Contractor	98	628		
Food establishments	975	2,275		
Equipment	21	45		
Fueling	31	63		
General industrial	70	134		
General retail	19	86		
Golf	1	2		
Health services	4	13		
Institutional	28	51		
Manufacturing	22	96		
Marina	7	7		
Metal	11	37		
Nursery	5	12		
Stone	16	35		
Storage and warehousing	147	894		
	Tons collected:			
Street sweeping	1,189		MS4 Maintenance: (36-38) Increased/optimized sweeping; upgraded sweeping equipment; median sweeping on high-volume roadways	Enhance, expand
Catch basin inlets and ditches	3,431		MS4 Maintenance: (33) Optimized/enhanced catch basin cleaning; (35) increased channel cleaning & scour pond repair	Enhance, expand
Caltrans – maintenance station inspection	Enhanced inspections & enforcement: (7) property based inspections			Enhance
Caltrans – enhanced street	MS4 maintenance: (38) upgraded sweeping			Continue

Watershed Activity reported	FY2011	Comparable BMP within Chollas Creek CLRP (Table 4-6)	CLRP recommended action: continue current, enhance, or expand
sweeping	equipment		
Caltrans – homeless encampment management	New/Expanded initiatives: (16) partnerships to address bacteria and trash impacts of homelessness		Continue
Caltrans – Brake Pad Partnership (other SD Bay Responsible Parties involved as well)	New/expanded initiatives: (20) support for Brake Pad Partnership		Continue
Caltrans – Don't Trash California (through Groundwork San Diego)	Education & outreach: (27) enhanced and expanded trash cleanup programs		Expand
Caltrans – Ornamental Roadside Vegetated Treatment Sites (ORVTS) pilot study	Landscape practices: (26) xeriscaping, turf conversion and other irrigation, pesticide and fertilizer reduction		Expand
SDB-001 Pet waste bag programs	Education & outreach: (32) refocused or enhanced education & outreach to target audiences		Continue
SDB-004 Collaborative cleanup activities	Education & outreach: (27) Enhanced and expanded trash cleanup programs		Enhance
SDB-045 ILACSD high school watershed presentations	Education & outreach: (32) refocused or enhanced education & outreach to target audiences		Enhance & expand
SDB-062 Residential rain barrel subsidies and distributions	Landscape practices: (22) landscape BMP incentives, rebates and training, residential properties		Expand
SDB-067 Intergenerational games	Education & outreach: (32) refocused or enhanced education & outreach to target audiences		Enhance & expand

4.3.1.3 Review of Development and Redevelopment Provisions

Provisions related to BMPs required for new development or redevelopment and retrofits required in the watershed appear in the zoning ordinances and applicable SUSMP documents. For the Chollas watershed, the SUSMPs for the City of San Diego, County of San Diego, Port of San Diego, La Mesa, and Lemon Grove were reviewed (City of Lemon Grove 2011; Port of San Diego 2010; County of San Diego 2011b; City of La Mesa 2011; City of San Diego 2012). In addition, the City of San Diego Municipal Code (City of San Diego Municipal Code, Chapters 11 through 15) and zoning provisions from each other RP that conducts development review (i.e., excluding Caltrans) were reviewed briefly, and discussed with relevant program staff, to identify existing BMP requirements and potential barriers to implementing low impact development (LID).

Discussions with RP officials regarding LID were focused around specific potential barriers identified in a FY2011 City of San Diego report on its evaluation of code and ordinance-based barriers to LID implementation (City of San Diego 2011), and EPA guidance on identifying key barriers to LID implementation in zoning codes and municipal ordinances. While a detailed review of municipal ordinances is beyond the scope of the CLRP, the most notable findings relevant to the Chollas watershed concern the opportunities to increase the use of landscaped areas for LID storm water controls in common settings found in this watershed, such as medium-density residential and commercial areas, opportunities to improve site design requirements for high-risk uses such as auto-related uses (which are widespread in the Chollas watershed), and opportunities to require supplemental measures through the SUSMP requirements, notably related to trash enclosures and animal related facilities.

4.3.1.4 Internal Program Evaluations

The degree of actual load reduction achieved by any BMP, whether structural or nonstructural, is a function of the BMP's design, the level of effort and resources applied, and the extent of its application (whether geographic, directed to a specific PGA or pollutant-generating land use, or to a target audience). Evaluating the potential reduction value of different BMPs thus requires not only an assessment of pollutant removal expectations on the basis of engineering and scientific data, but also of the timing, extent, and level of effort that reasonably could be applied, all of which can be determined by the RPs as programs are implemented.

To address this, the RPs conducted a series of evaluations to assess current programs and possible changes, and identify BMPs that may address identified load reduction opportunities. These evaluations were held for different aspects of watershed management, storm water pollution prevention, maintenance, and planning. This process provided essential information on the depth, focus, and practical impact of nonstructural programs that are not fully captured in the WURMP and JURMP reports. Moreover, data collected during the evaluations informed the identification of possible new nonstructural BMPs and best practices.

Evaluations primarily focused on areas or practices that could represent greater load reduction if existing programs were either expanded, enhanced, or the resources refocused toward a specific objective or to incorporate improved practices. Most pilot programs, such as street sweeping and catch basin inlet cleaning pilot evaluations conducted by the City of San Diego in the Chollas watershed, are obvious candidates for expansion, but the feasibility of any program expansion depends on the availability of financial, staff, and equipment resources .

However, in some cases (such as shifting from required commercial and industrial inspections to a property-based approach focused on PGAs) and in some jurisdictions, it appears that there are opportunities for greater load reduction by refocusing the existing level of effort on the most likely pollution sources and practices. In cases such as this, where feasible, refocusing the existing program (and, in some cases, also expanding the available resources) is recommended. Street sweeping, catch basin cleaning, and the industrial and commercial inspection program, represent approaches where enhancement and optimization changes to the existing programs—not simple expansion or increase—may be recommended to achieve greater load reductions over the current baseline. These are particularly important in the Chollas watershed where metals, which are addressed through catch basin cleaning and sweeping, represent a significant area of concern for load reduction.

Evaluations also identified current programs that are successful and believed to be resulting in load reductions, but the extent to which expansion or additional resources would achieve additional load reduction is subject to further study and could represent diminishing or no returns. As an example, the City of San Diego has achieved a high level of program development and geographic and target audience coverage with programs such as the regional education partnership, providing opportunities for household hazardous-waste reduction, special event permitting, installing pet waste bag dispensers in parks and public areas, illicit discharge detection and elimination, municipal site management, municipal staff training, and dealing with non-firefighting flows. These areas are assumed to continue roughly at current program levels reported in the JURMP or WURMP, or as represented in applicable ordinances, standards, and requirements.

Finally, best practices received special attention in developing recommended new initiatives for the RPs to consider. Best practices refer to model or innovative nonstructural efforts in place in one or more of the neighboring jurisdictions in the San Diego region that, if transferred and adopted by the RPs, could reduce pollutant loading without major new initiatives or expenditures. Many of these best practices (e.g., the

City of Del Mar's door hangers for over-irrigation [Kelly Barker, Mikhail Ogawa Engineering, Personal Communication, November 7, 2011], Escondido's mobile business training during licensing [Cheryl Filar, City of Escondido, Personal Communication, November 17, 2011] operate within regular, existing municipal program activities and can represent readily adapted strategies for load reductions if the RPs begin adopting these management practices.

4.3.1.5 Existing Programs Recommended for Enhancement, Expansion, or Restructuring

Combining information from the JURMP- and WURMP-reported activities with the RPs' internal program evaluations and information obtained from additional research yields a list of existing programs that, if enhanced, expanded, or restructured, could improve BMP efficacy. Table 4-5 presents the list of BMPs recommended for enhancement or expansion, along with a reference to the existing program or best practice, a qualitative summary of the potential load reduction anticipated, and the actions required for implementation, which are reflected in the cost estimates in Section 7.

Table 4-5. Existing programs with recommendations for expansion or enhancement

BMP category/RP	Existing program	Potential load reduction impact of expansion/enhancement	Action required for expansion/enhancement
Development Review Process			
Caltrans	n/a – not responsible for development review		
City of San Diego	Current codes and ordinances	Improved implementation of LID, greater source control in new development and redevelopment	Legislative and policy adoption, implementation, enforcement
County of San Diego			
La Mesa			
Lemon Grove			
Port of San Diego	n/a – not responsible for development review		
Enhanced Inspections and Enforcement			
Caltrans	Current IC/ID program	Enhanced effectiveness through supplemental staff training on IC/ID	Resources for development and implementation of enhanced training
City of San Diego	Current inspection and enforcement program	Greater effectiveness preventing and reducing pollutant discharges from high-risk PGAs and sites	Code adoption, regulatory support for modified programs, funding for additional staff for enforcement
County of San Diego			
La Mesa	Current program; affidavits for mobile businesses to adhere to BMPs & power washing identification/outreach		
Lemon Grove	Current inspection and enforcement program		
Port of San Diego			
SUSMP and Regulatory Enhancement			
Caltrans	n/a – not responsible for development review		
City of San Diego	Current SUSMP/Storm Water Standards	Retrofit of PGAs; and prevention pollutant loading from new development and redevelopment	Adopting amended standards, funding for additional staff for
County of San Diego			

BMP category/RP	Existing program	Potential load reduction impact of expansion/enhancement	Action required for expansion/enhancement
La Mesa			enforcement
Lemon Grove			
Port of San Diego	Existing requirements including retrofit requirements for trash enclosure areas	Continued pollution prevention & source reduction as new development/redevelopment proceed	Continue existing program
Landscape Practices			
Caltrans	Existing programs to reduce irrigation and pesticide use in ROW	Continued dry-weather flow and pesticide runoff reductions & expanded geographic coverage	Continued funding for program to support additional irrigation retrofits & staff training
City of San Diego	Recently adopted San Diego Public Utilities rebate programs; MWD programs; enhanced enforcement of over-irrigation pursuant to City ordinances	Greater geographic coverage and greater number of sites using LID and water-conserving landscape practices reducing dry-weather flows and wet-weather pollutant loads; greater connection and support with regional programs	Funding for additional rebates; funding for additional enforcement staff on over-irrigation
County of San Diego	Rain barrel programs (periodic); IRWMP sustainable landscape program	Greater geographic coverage and greater number of sites using LID and water-conserving landscape practices reducing dry-weather flows and wet-weather pollutant loads; greater connection and support with MWD rebate programs	Funding & staff allowance to work with regional water providers on incentive programs; funding for rebate or rain barrel programs
La Mesa	Initial discussions with Helix Water District regarding incentives; initial education & outreach		
Lemon Grove			
Port of San Diego	Strong turf conversion and irrigation reduction program in place	Greater geographic cover and greater number of sites using LID and water-conserving landscape practices reducing dry-weather flows and wet-weather pollutant loads.	Funding to continue & expand program
Education and Outreach			
Caltrans	Don't Trash California and Adopt-A-Highway programs	Expanded schools coverage through Don't Trash California and expanded geographic coverage through additional Adopt-A-Highway sponsorships	Funding for staff for Don't Trash California; private sponsorship sign-ups for expanded Adopt-A-Highway
City of San Diego	Current ThinkBlue and regional watershed education programs; existing website	Improved targeting to audiences by watershed and specific high-risk behaviors; improved public education on regulations and enforcement	Reworking existing programs and website; funding for enhanced programs; promoting education & trash cleanups through local and nonprofit organizations
County of San Diego	Current regional & local programs		
La Mesa			
Lemon Grove			
Port of San Diego	Support for Groundworks Chollas community-based		

BMP category/RP	Existing program	Potential load reduction impact of expansion/enhancement	Action required for expansion/enhancement
	organization to lead trash cleanups		
MS4 Maintenance and Repair			
Caltrans[2]	Current JURMP-reported maintenance, slope & erosion stabilization, and capital upgrade programs	Continued retrofits to improve MS4, additional slope stabilization preventing sediment loads	Continued funding for operation/maintenance and storm water upgrades associated with capital projects
City of San Diego	Current JURMP-reported system maintenance	Proactive maintenance and replacement of MS4 components; enhanced and optimized cleaning and street sweeping	Reworking and optimizing current cleaning and sweeping programs; funding for additional and expanded maintenance, replacement
County of San Diego	Current JURMP-reported system maintenance	Additional load reduction through enhanced and optimized sweeping, cleaning ; upgraded equipment	Funding for ongoing program, enhanced equipment
La Mesa		*Additional load reduction through enhanced and optimized sweeping, cleaning; upgraded equipment; expanded areas on private land required to be swept for greater load reduction	Authority for private sweeping requirement; additional funding for operation/maintenance and upgraded equipment
Lemon Grove		Additional load reduction through enhanced & optimized sweeping, cleaning	Funding for ongoing program, enhanced equipment
Port of San Diego	Current maintenance program	Continued system maintenance	Continued funding

4.3.2 Identifying New Nonstructural BMPs and Best Practices

In addition to identifying opportunities for improving or expanding existing programs, the CLRP analysis must identify new nonstructural BMPs that could effectively reduce pollutant loads in the Chollas watershed if implemented. New nonstructural BMPs may be developed where there are gaps in the present level of program implementation or to address sources or land uses that have not been the focus of existing programs.

Substantial research and evaluations were conducted to assess activities underway in the watershed that the RPs have not initiated, funded or managed, but that could provide opportunities for the RPs to engage in partnerships that provide load reduction. Information and options for partnerships were especially important in developing some of the BMPs that deal with pollutant sources, such as homeless or migrant camps or multifamily residential complexes, whose management purview lies well beyond the authority of storm water and public works departments.

The CLRP also identifies strategies not underway in the watershed but that address an area not emphasized in the WURMP and JURMP that could provide additional load reduction. These actions might require the RPs' individual or regional collective actions, community partnerships, or collaborate

[2] Caltrans is adding LID features and additional source control over and above the permit as part of capital porojects, and these are captured under Caltrans BMP #34 (proactive MS4 repair and replacement) and #45 (mitigation and conservation initiatives) in Table 4-6.

with other organizations and providers. In several cases, prospective BMPs could be initiated through partnership with another agency, service provider, or nonprofit organization rather than requiring new action or activity by the RPs. Strategies for dealing with homelessness are an example of focus for the CLRP.

Finally, there are instances where a new initiative, partnership or investment would address a pollutant load pathway. New initiatives could range from studies and assessments to pilot programs, to financial support for regional activities, to entirely new Watershed Activities. Initiating any new activity would be subject to the availability of resources, whether for funds, approval to direct additional staff resources to an issue, or approval of a partnership agreement with an outside organization.

4.4 Potential Nonstructural BMPs

The final list of potential nonstructural BMPs consists of the existing JURMP- and WURMP-reported initiatives, the programs identified for enhancement, expansion, or restructuring, and the possible new initiatives. This consolidated list of potential BMPs addresses the pollutants and conditions of concern, and the specific PSC land uses and PGAs in the Chollas watershed. This section describes how the BMPs on the final consolidated list relate to the PGAs, PSC land uses, and conditions and pollutants of concern. Appendix E presents more detailed descriptions of the BMPs in the Table.

The specific timing and focus of each BMP will be tailored to address the pollutants of concern, PGAs and PSC land uses, as described below. The specific implementation by the RPs could take a number of different forms as programs are developed in detail; however, the analysis in the CLRP has informed the selection of BMPs and initial planning for resource allocation and phasing over the implementation period. Required levels of effort, phasing, and costs for the selected nonstructural BMPs are addressed in Section 7.

Table 4-6 summarizes the initiatives for the watershed by RP. Appendix E describes each BMP, including discussion of any model program(s) on which the initiative is based, and the resources and decision making required for implementation. The pollutants, land uses and PGAs in the watershed that are addressed by the BMPs are described in Table 4-7 through Table 4-11. Table 4-6 indicates with an X where an RP would address load reduction through an enhanced or expanded version of a current BMP, as described in Table 4-5 above, or through participation in or development of a new or expanded BMP either on its own, or through a regional initiative, as is determined to be most cost-effective and efficient as the specific program is developed. The costs of those BMPs are the basis for the nonstructural program costs in Section 7.

It is important to note that the absence of a symbol in a cell does not indicate necessarily that the RP has not addressed the issue of concern. The absence of a symbol indicates that after consideration of its program development process and local conditions, the RP has not included the BMP in its strategy for load reduction during the CLRP implementation period. In some cases, aggressive local efforts are already in place and the effort would not, if expanded, lead to further reductions. In other cases, the RPs have determined that new actions or investments are not warranted. Finally, a “C” in the cell indicates that the RP has undertaken and completed the applicable BMP, and further action is not deemed necessary.

Table 4-6. Potential nonstructural BMPs[3]

BMP		Caltrans	City of San Diego	County of San Diego	La Mesa	Lemon Grove	Port of San Diego
Development Review Process							
1	Amend zoning and other development regulations to facilitate LID implementation	n/a	X	n/a[4]	X	X	
3	Train staff and boards to facilitate LID implementation and source control		X		X	X	
Enhanced Inspections and Enforcement							
4	Training or certification requirements for mobile businesses	n/a	X		X	X	
5	Inspection/enforcement of power washing discharges		X		X		
6	Enhanced IC/ID reporting and enforcement[5]	X	n/a		n/a		
7	Property-based inspections	X	X		X	X	
8	Supplemental inspection standards for PGAs of concern (jurisdiction-specific to Lemon Grove)	n/a			n/a	X	n/a
SUSMP and Regulatory Enhancement							
Amend SUSMP, other code and zoning requirements, including the addition of retrofit requirements, to reduce pollutants from:							
9	Trash enclosure and storage areas	n/a	X		X	X	C
10	Animal-related facilities		X		X		
12	Nurseries and garden centers		X		X		
13	Auto-related uses		X		X		
15	Update minimum BMPs		X				
New/Expanded Initiatives							
16	Partnerships to address bacteria and trash impacts of homelessness	X[6]	X		X		

[3] The numbering of BMPs is, in some cases, not sequential. The San Diego Region RPs have prepared five City-led CLRPs in FY2012, and for management and planning purposes, have created a common, merged list of all BMPs recommended in all City-led CLRPs. The numbering from this master merged list has been used in each of the CLRPs. Where a BMP from the master list has not been recommended or is not applicable to the Chollas watershed, this BMP is missing and the list has not been renumbered.
[4] Lands under the jurisdiction of the County of San Diego within this watershed consist of a cemetery and a YMCA property. Because of this limited land area, no new or expanded non-structural BMPs are recommended for the County within the Chollas Creek watershed.
[5] Caltrans-specific BMP
[6] Caltrans performs encampment removal and reporting within its right-of-way.

BMP		Responsible Parties					
		Caltrans	City of San Diego	County of San Diego	La Mesa	Lemon Grove	Port of San Diego
17	Pilot projects disconnecting impervious surfaces from the MS4 (e.g., rain barrels, downspout disconnection)	n/a[7]	X				n/a[8]
20	Support for Brake Pad Partnership	X	X		X	X	X
Landscape Practices							
Landscape BMP incentives, rebates, and training:							
22	Residential properties	n/a	X		X	X	n/a
23	Homeowners' associations/property managers		X			X	
24	Nonresidential properties		X				
25	Reducing over-irrigation		X		X		
26	Xeriscaping, turf conversion and other irrigation, pesticide and fertilizer reduction (jurisdiction-specific to Port and Caltrans)	X	n/a		n/a		X
Education and Outreach							
27	Enhanced and expanded trash cleanup programs	X	X		X	X	X
28	Improved Web resources promoting reporting of enforceable discharges	n/a	X		X	X	X
Refocused or enhanced education and outreach to target audiences:							
29	Equestrian community	n/a	X				n/a
31	On-site agricultural practices (e.g., chickens, compost)					X	
32	General/other		X		X	X	
MS4 Maintenance							
33	Optimized or enhanced catch basin inlet cleaning and management	X	X		X		
34	Proactive MS4 repair and replacement	X	X		X	X	
35	Increased channel cleaning and scour pond repair to improve MS4 function	X	X				
Street sweeping enhancements and expansion:							
36	Increased sweeping frequency or routes	X	X		X		
37	Sweeping medians on high-volume segments	X	X		X		

[7] Caltrans is actively seeking to implement new treatment BMPs such as porous pavement and modified infiltration trenches as pilot programs to monitor effectiveness and potential for implementation as an approved treatment BMP. Because of the unique nature of Caltrans as an RP, these measures are reflected in BMP #34 and BMP #45.

[8] The Port of San Diego has an active turf conversion program captured under BMP #26.

BMP		Responsible Parties					
		Caltrans	City of San Diego	County of San Diego	La Mesa	Lemon Grove	Port of San Diego
38	Upgraded sweeping equipment	X	X		X		
39	Sweeping of private roads and parking lots		X		X		
Erosion repair and slope stabilization:							
40	Public property and right of way	X	X			X	
41	Enforcement on private properties	n/a	X				
Capital Improvement Projects							
42	Dry-weather flow separation		X				X
43	Sewer pipe replacement				X		
44	Reducing groundwater infiltration				X		
45	Mitigation and conservation initiatives	X					

4.4.1 Expected Load Reductions of Pollutants

The purpose of identifying nonstructural BMPs in the CLRP is to identify and develop a list of recommended BMPs that target the pollutants of concern in the Chollas watershed and that, when implemented, would effectively reduce pollutant loads or address a condition of concern in the Chollas watershed. For example, requiring closed-top trash receptacles at restaurants can prevent wildlife from entering trash areas, prevent storm water from coming into contact with trash and trash areas, and prevent trash from becoming wind- or water-borne, and thereby reduce bacteria loads by preventing pollutants from entering the MS4.

Table 4-7 presents the BMPs recommended for implementation in the Chollas watershed and their primary and secondary pollutant reduction effectiveness relative to the pollutants of concern. The table shows the BMPs' *primary*, *secondary*, and *no* reduction values, which are based on literature review and the RPs' internal program evaluation in 2011, considering the typical design approach, typical land use setting, and common geographic extent of application for the specific BMP. In Table 4-7, the closed circle (●) indicates that the BMP provides primary reduction for the pollutant; the half circle (◗) indicates secondary/incidental reduction; and the open circle (○) indicates that the BMP does not address the pollutant. BMPs have been recommended that have a primary reduction impact (●) on each of the watershed impairments.

Table 4-7. Effectiveness of nonstructural BMP types[9]

BMP		Impairment										
		Bacteria	Metals	Organics	Sediment	Pesticides	Nutrients	Oil and grease	Dissolved minerals	Trash	Flow	Volume reduction
Development Review Process												
1	Amend zoning and other development regulations to facilitate LID implementation	●	◗	◗	●	◗	●	○	◗	●	●	●
3	Train staff and boards to facilitate LID implementation and source control	◗	◗	○	◗	◗	◗	○	◗	◗	◗	◗
Enhanced Inspections and Enforcement[10]												
4	Training or certification requirements for mobile businesses	●	○	●	○	◗	○	●	○	◗	○	○
5	Inspection/enforcement of power washing discharges	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
6	Enhanced IC/ID reporting and enforcement	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
7	Property-based inspections	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
8	Supplemental inspection standards for PGAs of concern	*Varies - see SUSMP requirements below*										
SUSMP and Regulatory Enhancement												
Amend SUSMP, other code and zoning requirements, including the addition of retrofit requirements, to reduce pollutants from:												
9	Trash enclosure and storage areas	●	◗	○	○	○	○	◗	○	●	○	○
10	Animal-related facilities	●	○	○	●	●	●	○	○	○	◗	◗
12	Nurseries and garden centers	◗	○	●	●	●	●	○	○	○	◗	◗
13	Auto-related uses	○	●	◗	○	○	○	●	○	◗	◗	◗
15	Update minimum BMPs	*Varies by SUSMP and Regulatory Enhancement*										
New/Expanded Initiatives												

[9] The numbering of BMPs is, in some cases not sequential. The San Diego Region Copermittees have prepared five city-led CLRPs in FY2012, and for management and planning purposes, have created a common, merged list of all BMPs identified in all five city-led CLRPs. The numbering from this master merged list has been used in each of the CLRPs. Where a BMP from the master list has not been recommended or is not applicable to this watershed, the BMP is not included and the list has not been re-numbered.

[10] The 'secondary' reduction values indicated for pollutants for BMPs 5, 6 and 7 are intended to reflect that an enhanced inspection or enforcement program can address any of these pollutants, depending upon the setting and objectives of the specific RP program. Greater or lower reduction values for any particular pollutant would be dependent upon the specific nature of the program.

BMP		Impairment										
		Bacteria	Metals	Organics	Sediment	Pesticides	Nutrients	Oil and grease	Dissolved minerals	Trash	Flow	Volume reduction
16	Partnerships to address bacteria and trash impacts of homelessness	●	○	○	○	○	◗	○	○	●	○	○
17	Pilot projects disconnecting impervious surfaces from the MS4 (e.g., rain barrels, downspout disconnection)	◗	◗	◗	◗	◗	◗	○	◗	○	●	●
20	Support for Brake Pad Partnership	○	●	○	○	○	○	○	○	○	○	○
Landscape Practices												
Landscape BMP incentives, rebates, and training:												
22	Residential properties	○	○	○	◗	●	◗	○	○	○	◗	◗
23	Homeowners' associations/property managers	○	○	○	◗	●	◗	○	○	○	◗	◗
24	Nonresidential properties	○	○	○	◗	●	◗	○	○	○	◗	◗
25	Reducing over-irrigation	○	○	○	◗	●	◗	○	○	○	●	●
26	Xeriscaping, turf conversion and other irrigation, pesticide and fertilizer reduction	●	◗	◗	●	●	●	○	◗	○	●	●
Education and Outreach												
27	Enhanced and expanded trash cleanup programs	◗	◗	◗	○	◗	○	◗	○	◗	●	○
28	Improved Web resources promoting reporting of enforceable discharges	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
Refocused or enhanced education and outreach to target audiences:												
29	Equestrian community	●	○	○	◗	○	◗	○	○	○	○	○
31	On-site agricultural practices (e.g., chickens, compost)	●	○	○	◗	◗	●	○	○	○	○	○
32	General/other	*Varies by focus*										
MS4 Maintenance												
33	Optimized or enhanced catch basin inlet cleaning and management	◗	●	○	●	○	◗	○	○	○	○	○
34	Proactive MS4 repair and replacement	◗	●	○	●	○	◗	○	○	○	○	○
35	Increased channel cleaning and scour pond repair to improve MS4 function	◗	●	○	●	○	◗	○	○	○	○	○
Street sweeping enhancements and expansion:												

BMP		Impairment										
		Bacteria	Metals	Organics	Sediment	Pesticides	Nutrients	Oil and grease	Dissolved minerals	Trash	Flow	Volume reduction
36	Increased sweeping frequency or routes	◗	●	◗	●	○	●	○	◗	●	○	○
37	Sweeping medians on high-volume segments	◗	●	◗	●	○	●	○	◗	●	○	○
38	Upgraded sweeping equipment	◗	●	◗	●	○	●	○	◗	●	○	○
39	Sweeping of private roads and parking lots	◗	●	◗	●	○	●	○	◗	●	○	○
Erosion repair and slope stabilization:												
40	Public property and right of way	◗	○	○	●	○	◗	○	◗	○	○	○
41	Enforcement on private properties	◗	○	○	●	○	◗	○	◗	○	○	○
Capital Improvement Projects												
42	Dry-weather flow separation	●	◗	○	○	○	◗	◗	○	○	●	●
43	Sewer pipe replacement	●	○	○	○	○	●	○	○	○	○	○
44	Reducing groundwater infiltration	◗	○	○	◗	○	◗	○	○	○	○	○
45	Mitigation and conservation initiatives	◗	○	○	●	◗	◗	○	○	○	○	○

● - provides primary pollutant reduction ◗ - provides secondary pollutant reduction ○ - does not address the pollutant

4.4.2 Pollutant Sources and Pollutant-Generating Activities (PGAs)

In addition to the pollutants of concern in the watershed, BMPs can be identified that address the specific types of pollutant sources (PSC land uses) expected to generate those pollutants, and the specific PGAs in the watershed. Appendix F presents the complete menu of BMPs recommended, and the specific targeted PSC land uses and PGAs in the watershed.

To ensure some cross-referencing capacity between the PSC in this CLRP and the 2011 LTEA (San Diego County 2011), Appendix F relates the expected PGAs with PSC land uses, the full menu of BMPs to PSC land uses to which they apply, and to the PGAs to which they apply. Table 4-8 and Table 4-9 present the extent of land uses and the types and numbers of PGAs in the Chollas watershed.

To ensure some cross-referencing capacity between the PSC in this CLRP and the 2011 LTEA (San Diego Stormwater Copermittees 2011), Appendix E relates the expected PGAs with PSC land uses, the full menu of BMPs to PSC land uses to which they apply, and to the PGAs to which they apply. Table 4-8 and Table 4-9 present the extent of land uses and the types and numbers of PGAs in the Chollas watershed, and the specific BMPs proposed for the watershed (using the numbers in Table 4-6 above) that have been selected on the basis of their applicability to the land use category.

Table 4-8. PSC land uses in the Chollas watershed

Aggregate land use category	Land use components	Acres	Percent	Recommended BMPs
Agriculture[a]	Intensive Agriculture	3.139	0.02%	10, 11, 14, 18, 19, 26, 27, 28, 29, 31, 41
Commercial	Arterial Commercial Automobile Dealership Communications and Utilities Community Shopping Center Hotel/Motel (Low-Rise) Neighborhood Shopping Center Office (High-Rise) Office (Low-Rise) Other Retail Trade and Strip Post Office Regional Shopping Center Religious Facility Service Station	1,066.839	6.20%	1, 2, 3, 5, 6, 7, 9, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 33, 34, 35, 39, 41
Freeway[b]	Freeway	881.747	5.12%	6, 13, 20, 26, 27, 32, 33, 34, 35, 36, 37, 38, 40,
High Density Residential	Military Barracks Mobile Home Park Multi-Family Residential Multi-Family Residential Without Units Other Group Quarters Facility Residential Under Construction Single Family Multiple-Units	2,286.759	13.29%	1, 2, 3, 5, 6, 7, 9, 14, 17, 22, 23, 25, 26, 27, 28, 31, 33, 34, 35, 39, 41
Industrial	Heavy Industry Industrial Park Junkyard/Dump/Landfill Light Industry - General Public Storage Warehousing Wholesale Trade	291.655	1.69%	1, 2, 3, 5, 6, 7, 9, 13, 14, 17, 24, 25, 26, 27, 28, 33, 34, 35, 39, 41
Institutional	Elementary School Fire/Police Station Government Office/Civic Center Hospital - General Junior High School or Middle School Library Other Health Care Other Public Services Other School Other University or College School District Office Senior High School	728.514	4.23%	1, 2, 3, 5, 6, 7, 9, 10, 17, 24, 25, 26, 27, 28, 33, 34, 35, 39, 41
Low Density Residential	Single Family Detached Single Family Residential Without Units	6,261.765	36.39%	1, 2, 3, 6, 12, 13, 14, 17, 19, 2 2, 23, 25, 26, 27, 28, 31, 33, 34, 35, 41
Military	Military Use	48.191	0.28%	6, 10, 13, 14, 24, 25, 26, 27, 33, 34, 35, 39
Open Space	Cemetery Landscape Open Space Vacant and Undeveloped Land	707.496	4.11%	9, 11, 18, 19, 25, 26, 27, 28, 29, 31, 40

Aggregate land use category	Land use components	Acres	Percent	Recommended BMPs
Recreation	Golf Course Golf Course Clubhouse Open Space Park or Preserve Other Recreation - High Park - Active Residential Recreation	1,307.562	7.60%	1, 2, 3, 5, 6, 7, 9, 11, 19, 24, 25, 26, 27, 28, 29, 33, 34, 35, 39, 40
Road	Road Right of Way	3,476.359	20.20%	2, 3, 6, 13, 20, 26, 27, 28, 32, 33, 34, 35, 36, 37, 38, 40
Rural Residential	Spaced Rural Residential	14.874	0.09%	1, 2, 3, 6, 10, 11, 14, 18, 19, 22, 25, 26, 27, 28, 29, 31, 41
Transportation	Other Transportation Park and Ride Lot Parking Lot - Structure Parking Lot - Surface Rail Station/Transit Center Railroad Right of Way	226.103	0.67%	1, 2, 6, 13, 14, 20, 26, 27, 28, 32, 33, 34, 35, 36, 37, 38, 40
Water	Bay or Lagoon Lake/Reservoir/Large Pond	18.331	0.11%	
Total		17,319.334	100.00%	

a. The agriculture area listed above was calculated from the available SANDAG GIS layer. The actual agricultural area is likely less than this based on aerial imagery analysis, which indicates that many of the SANDAG agricultural areas are now open space.

b. The freeway area listed above was calculated from the GIS coverages. The actual Caltrans percentage of land use is 5.62% (1,113 acres).

Table 4-9. PGAs in the Chollas watershed

PGAs	Number	Recommended BMPs
AWM Fueling	43	5, 6
Airplane Repair	2	5, 6, 14, 20
Animals	12	1, 2, 3, 5, 6, 7, 9, 10, 11, 18, 22, 23, 24, 25, 26, 27, 28, 29, 31
Auto Body Paint	120	1, 3, 5, 6, 9, 13, 14, 28, 39, 41
Auto Repair	855	1, 3, 4, 5, 6, 9, 13, 14, 20, 22, 23, 25, 28, 39
Boat Repair	36	1, 3, 5, 6, 9, 14, 28, 39
Cemeteries	42	6, 23, 25, 41
Corporate Yards	24	1, 2, 3, 5, 6, 7, 9, 23, 24, 25, 26, 27, 28, 39
Equipment Repair	27	4, 5, 6, 9, 13, 14, 20, 28, 39
Food Facilities	7,070	1, 2, 3, 5, 6, 7, 9, 23, 24, 25, 27, 28, 39
Golf Courses	22	1, 2, 3, 5, 6, 9, 23, 24, 25, 26, 27, 28, 39, 41,
Industrial Facilities	2,976	1, 2, 3, 5, 6, 7, 9, 14, 23, 24, 25, 26, 27, 28, 39
Nurseries	144	1, 2, 3, 4, 5, 6, 7, 9, 12, 14, 25, 26, 27, 28, 39, 40
POTWs	34	6, 9, 27, 28, 40, 41

The locations of the PSC land uses and PGAs becomes especially important when trying to evaluate the need for specific BMPs. To evaluate these contributing factors, maps showing the land uses from the

PSC, PGAs from the LTEA, and HPMAs were prepared. Knowledge of the spatial distribution of each of these contributors allows designing (where practicable) nonstructural programs that address the appropriate PGAs and land uses, and if resources are limited and program design allows, enables the RPs to target uses and PGAs in the HPMAs for the first and most intensive implementation. Furthermore, mapping the PGAs, land uses, and HPMAs allows visualization of the spatial extent to which nonstructural practices, if applied on a watershed-wide, programmatic basis by the RPs, can be expected to address the land use-based pollutant sources and PGAs in the watershed. Figure 4-2 portrays the pollutant sources (land uses) and PGAs in the Chollas watershed.

Figure 4-2 also offers a method of further understanding the spatial distribution of potential pollutant sources in each watershed, particularly on the basis of the presence of PGAs in the HPMAs. Where PGAs coincide with an HPMA, some nonstructural BMPs can be prioritized to first address areas with the greatest potential for pollutant loading, improving the cost and environmental effectiveness of nonstructural programs.

However, not all pollutant sources can be represented spatially as specific geographic points or even as land use categories. Some identified pollutant sources, such as trash and bacteria contributions from homeless persons in the watershed, are documented in the Chollas watershed but cannot be assigned to a specific location. Others, such as runoff from over-irrigation or atmospheric deposition of copper from automobile brake pads, certainly are associated with specific land use or land cover types but cannot be located with the certainty of, for example, an animal-related facility or a community shopping center's trash area. Therefore, Figure 4-2 provides essential information relevant to final BMP selection, program design, and priority, but it cannot be used without considering the potential effects on PGAs that cannot reliably be mapped.

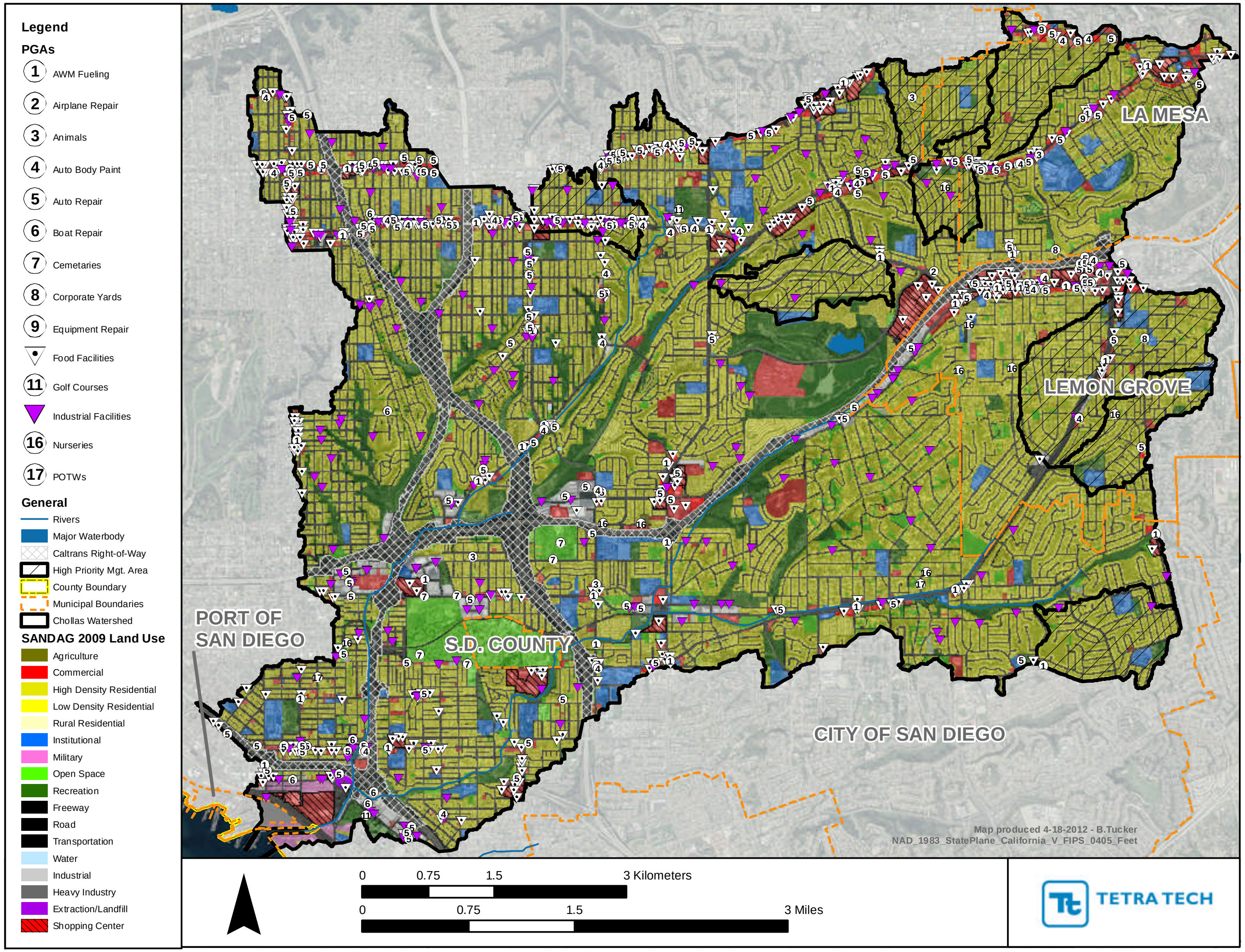

Figure 4-2. PGAs and land uses in the Chollas watershed

After assessing the prevalence and spatial distribution of PSC land uses and PGAs, BMPs were assessed relative to the impact of specific land uses and PGAs in the watershed. To ensure some cross-referencing capacity between the PSC for this CLRP and the 2011 LTEA report, Appendix F presents the expected relationship between land uses and PGAs or, in other words, the land uses in which the PGA, such as mobile carpet cleaning or pesticide use, reasonably might be expected to occur. Table 4-10 presents the expected relationships between BMP types and PSC land uses for the Chollas watershed. Table 4-10 lists the PSC land uses identified on Figure 4-2 as columns, with the BMPs as rows. The BMPs that might reasonably be applied to reduce pollutant loads generated by the PSC land are indicated by a water drop in the associated cell.

Table 4-10. Nonstructural BMP types and PSC land uses

BMP		Land use																
		Agriculture	Commercial	HD Residential	LD Residential	Rural Residential	Institutional	Military	Open Space	Recreation	Freeway	Road	Transportation	Water	Industrial	Heavy Industry	Extraction/Landfill	Shopping Center
Development Review Process																		
1	Amend zoning and other development regulations to facilitate LID implementation		💧	💧	💧	💧	💧			💧			💧		💧			💧
3	Train staff and boards to facilitate LID implementation and source control		💧	💧	💧	💧	💧			💧		💧			💧			💧
Enhanced Inspections and Enforcement																		
4	Training or certification requirements for mobile businesses	*Varies, not tied to a specific land use*																
5	Inspection/enforcement of power washing discharges		💧	💧			💧			💧					💧	💧	💧	
6	Enhanced IC/ID reporting and enforcement		💧	💧	💧	💧	💧	💧		💧	💧	💧	💧		💧	💧	💧	💧
7	Property-based inspections		💧	💧			💧			💧					💧			💧
8	Supplemental inspection standards for PGAs of concern	*Varies - see SUSMP requirements below*																
SUSMP and Regulatory Enhancement																		
Amend SUSMP, other code and zoning requirements, including the addition of retrofit requirements, to reduce pollutants from:																		
9	Trash enclosure and storage areas		💧	💧			💧		💧	💧					💧	💧		💧
10	Animal-related facilities	💧	💧			💧	💧	💧										💧

BMP		Land use																
		Agriculture	Commercial	HD Residential	LD Residential	Rural Residential	Institutional	Military	Open Space	Recreation	Freeway	Road	Transportation	Water	Industrial	Heavy Industry	Extraction/Landfill	Shopping Center
12	Nurseries and garden centers		●		●													●
13	Auto-related uses		●		●			●			●	●	●		●			●
15	Update minimum BMPs	*Varies by SUSMP and Regulatory Enhancement*																
New/Expanded Initiatives																		
16	Partnerships to address bacteria and trash impacts of homelessness	*Not tied to a specific land use*																
17	Pilot projects disconnecting impervious surfaces from the MS4 (e.g., rain barrels, downspout disconnection)		●	●	●		●								●			●
20	Support for Brake Pad Partnership										●	●	●					
Landscape Practices																		
Landscape BMP incentives, rebates, and training:																		
22	Residential properties			●	●	●												
23	Homeowners' associations/property managers			●	●													
24	Nonresidential properties		●				●	●		●					●			●
25	Reducing over-irrigation		●	●	●	●	●	●	●	●					●			●
26	Xeriscaping, turf conversion and other irrigation, pesticide and fertilizer reduction	●	●	●	●	●	●	●	●	●	●	●	●		●			●
Education and Outreach																		
27	Enhanced and expanded trash cleanup programs	●	●	●	●	●	●	●	●	●	●	●	●		●			●
28	Improved Web resources promoting reporting of enforceable discharges	●	●	●	●	●	●		●	●		●	●		●	●		●
Refocused or enhanced education and outreach to target audiences:																		
29	Equestrian community	●				●			●	●								

BMP		Land use																
		Agriculture	**Commercial**	**HD Residential**	**LD Residential**	**Rural Residential**	**Institutional**	**Military**	**Open Space**	**Recreation**	**Freeway**	**Road**	**Transportation**	**Water**	**Industrial**	**Heavy Industry**	**Extraction/Landfill**	**Shopping Center**
31	On-site agricultural practices (e.g., chickens, compost)	●		●	●	●			●									
32	General/other	*Varies by focus area*																
MS4 Maintenance																		
33	Optimized or enhanced catch basin inlet cleaning and management		●	●	●		●	●		●	●	●	●		●			●
34	Proactive MS4 repair and replacement		●	●	●		●	●		●	●	●	●		●			●
35	Increased channel cleaning and scour pond repair to improve MS4 function		●	●	●		●	●		●	●	●	●		●			●
Street sweeping enhancements and expansion:																		
36	Increased sweeping frequency or routes										●	●	●					
37	Sweeping medians on high-volume segments										●	●	●					
38	Upgraded sweeping equipment										●	●	●					
39	Sweeping of private roads and parking lots		●	●			●	●		●					●			●
Erosion repair and slope stabilization:																		
40	Public property and right of way								●	●	●	●	●					
41	Enforcement on private properties	●	●	●	●	●	●								●	●	●	
Capital Improvement Projects																		
42	Dry-weather flow separation	*Capital improvement project; not tied to land use setting*																
43	Sewer pipe replacement	*Capital improvement project; not tied to land use setting*																
44	Reducing groundwater infiltration	*Capital improvement project; not tied to land use setting*																
45	Mitigation and conservation initiatives	*Capital improvement project; not tied to land use setting*																

Table 4-11 presents the expected relationships between BMP types and PGAs. Table 4-11 lists the PGAs identified on Figure 4-2 as columns, with the BMPs as rows. The BMPs that might reasonably be applied to reduce pollutant loads generated by the PGAs are indicated by a water drop in the associated cell.

Table 4-11. Nonstructural BMP types and PGAs

BMP		PGAs													
		AWM fueling	Airplane repair	Animals	Auto body paint	Auto repair	Boat repair	Cemeteries	Corporate yards	Equipment repair	Food facilities	Golf courses	Industrial facilities	Nurseries	POTWs
Development Review Process															
1	Amend zoning and other development regulations to facilitate LID implementation			♦	♦	♦	♦		♦		♦	♦	♦	♦	
3	Train staff and boards to facilitate LID implementation and source control			♦	♦	♦	♦		♦		♦	♦	♦	♦	
Enhanced Inspections and Enforcement															
4	Training or certification requirements for mobile businesses					♦				♦				♦	
5	Inspection/enforcement of power washing discharges	♦	♦	♦	♦	♦	♦		♦	♦	♦	♦	♦	♦	
6	Enhanced IC/ID reporting and enforcement	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
7	Property-based inspections			♦					♦		♦		♦	♦	
8	Supplemental inspection standards for PGAs of concern	*Varies - see SUSMP requirements below*													
SUSMP and Regulatory Enhancement															
Amend SUSMP, other code and zoning requirements, including the addition of retrofit requirements, to reduce pollutants from:															
9	Trash enclosure and storage areas			♦	♦	♦	♦		♦	♦	♦	♦	♦	♦	♦
10	Animal-related facilities			♦											
12	Nurseries and garden centers													♦	
13	Auto-related uses				♦	♦				♦					
15	Update minimum BMPs	*Varies by SUSMP and Regulatory Enhancement*													
New/Expanded Initiatives															
16	Partnerships to address bacteria and trash impacts of homelessness	*Not related to PGAs*													
17	Pilot projects disconnecting impervious surfaces from the MS4 (e.g., rain barrels, downspout disconnection)	*Relates to structures and applies to multiple settings*													
20	Support for Brake Pad Partnership		♦			♦				♦					

BMP		PGAs													
		AWM fueling	Airplane repair	Animals	Auto body paint	Auto repair	Boat repair	Cemeteries	Corporate yards	Equipment repair	Food facilities	Golf courses	Industrial facilities	Nurseries	POTWs
Landscape Practices															
Landscape BMP incentives, rebates, and training:															
22	Residential properties			●		●									
23	Homeowners' associations/property managers			●		●		●	●		●	●	●		
24	Nonresidential properties			●					●		●	●	●		
25	Reducing over-irrigation			●		●		●	●		●	●	●	●	
26	Xeriscaping, turf conversion and other irrigation, pesticide and fertilizer reduction			●					●			●	●	●	
Education and Outreach															
27	Enhanced and expanded trash cleanup programs			●					●		●	●	●	●	●
28	Improved Web resources promoting reporting of enforceable discharges			●	●	●	●		●	●	●	●	●	●	●
Refocused or enhanced education and outreach to target audiences:															
29	Equestrian community			●											
31	On-site agricultural practices (e.g., chickens, compost)			●											
32	General/other	*Varies by focus area*													
MS4 Maintenance															
33	Optimized or enhanced catch basin inlet cleaning and management	*N/A, BMPs address public MS4*													
34	Proactive MS4 repair & replacement	*N/A, BMPs address public MS4*													
35	Increased channel cleaning and scour pond repair to improve MS4 function	*N/A, BMPs address public MS4*													
Street sweeping enhancements and expansion:															
36	Increased sweeping frequency or routes	*Not related to PGAs*													
37	Sweeping medians on high-volume segments	*Not related to PGAs*													
38	Upgraded sweeping equipment	*Not related to PGAs*													
39	Sweeping of private roads and parking lots				●	●	●		●	●	●	●	●	●	
Erosion repair and slope stabilization:															
40	Public property and right of way													●	●

BMP		PGAs													
		AWM fueling	Airplane repair	Animals	Auto body paint	Auto repair	Boat repair	Cemeteries	Corporate yards	Equipment repair	Food facilities	Golf courses	Industrial facilities	Nurseries	POTWs
41	Enforcement on private properties				●			●				●			●
Capital Improvement Projects															
42	Dry-weather flow separation	*N/A, BMPs address public MS4*													
43	Sewer pipe replacement	*N/A, BMPs address public MS4*													
44	Reducing groundwater infiltration	*N/A, BMPs address public MS4*													
45	Mitigation and conservation initiatives	*N/A, BMPs address public MS4*													

4.5 Summary of Nonstructural BMP Recommendations

In the Chollas watershed, nonstructural BMPs have been proposed that address the PGAs, PSC land uses, and other loading sources identified for the watershed. These nonstructural BMPs may be implemented over time (principally within an initial five-year period) as resources, funding, and authority become available. A prospective schedule of nonstructural BMP implementation is incorporated in Section 7, recognizing that, program initiation and scope will depend significantly on the availability of resources and funding. Therefore, these BMPs are intended as a general guide to the initiatives or efforts the RPs believe may be most effective in expanding or enhancing their nonstructural BMP programs given the extent and nature of PGAs and land uses in the watershed, the reduction effectiveness of the BMPs, and the physical distribution of the PGAs and sources addressed in the watershed.

The nonstructural BMPs suggested in the CLRP and their respective schedules for implementation may be integrated with the RPs' current programs and, thus, have a high potential for implementation over the 20-year period of the CLRP. The cost estimates, while adjusted in Section 7 for future potential implementation reflect realistic levels of staff and financial resources needed to carry out the work involved. The RPs can use this information in program and budget development.

Section 7 of the CLRP provides an initial schedule for nonstructural BMP implementation based on feasibility and potential for funding. The CLRP provides a framework for decision making by the RPs, in consultation with the applicable watershed work groups, on the timing, level, and extent of implementing nonstructural programs. A prospective schedule of nonstructural BMP implementation is incorporated in Section 7, recognizing that any number of factors could affect the timing of implementation.

5 Developing Structural Solutions

Compliance with existing and future TMDL WLAs will require a combination of nonstructural and structural BMPs. For structural BMPs, it is important to carefully evaluate the effectiveness and the feasibility of implementing different types of practices, particularly because these types of BMPs will be the largest focus of *quantified* load reduction in the CLRP watersheds.

A critical consideration in selecting and evaluating structural BMPs is scale. On-site (hereafter called *distributed*) structural BMPs are built in the landscape at the site-scale. Examples of distributed structural BMPs include bioretention areas incorporated in landscaping and permeable pavement parking lots. Alternatively, large treatment (centralized) structural BMPs are regional facilities that receive flows from neighborhoods or larger areas, and often serve dual purposes for flood control or groundwater recharge. These BMPs are often in public spaces and can be co-located in parks or green spaces. Both distributed and centralized BMPs serve important purposes and should be considered in combination to determine their optimal level of implementation to meet the WLAs.

This section provides an assessment of opportunities for distributed and centralized BMPs in the Chollas watershed. It outlines the methods used to determine good candidate BMP locations, the RPs' existing and planned BMPs, and newly identified BMP opportunity sites. The top-ranked sites identified for centralized BMPs have a more detailed site evaluation and description, including fact sheets that can be used for implementation planning.

The structural solutions analysis yielded information needed to begin the planning of distributed and centralized BMPs and information essential for developing and evaluating load reduction alternatives. Section 7, Implementation Recommendations, includes a range of costs associated with implementing these structural BMPs. A more detailed quantification of the pollutant load reductions, design sizes, and costs will be developed in the initial phase of CLRP Implementation Program, including optimization modeling and assessment.

5.1 Structural Solution Screening Methodology

To develop the structural solution analysis, the RPs collected and summarized available information regarding their existing, proposed, or planned structural BMPs that could contribute to future load reduction. At the outset of the task, the RPs were instrumental in developing a screening methodology for identifying new BMP opportunity sites, and a menu of preferred structural BMP types to evaluate in more detail.

In researching new distributed and centralized BMP opportunities, a site screening was performed according to land ownership of parcels and site characteristics such as soil type, slope, and impervious area. HPMAs were identified on the basis of pollutant loading analyses and parcels in these areas received a higher weight because of their potential to make the most difference in comprehensive load reduction. Potential centralized BMP sites were further screened and prioritized on the basis of parcel ownership (i.e., public parcels were favored), field investigations of site characteristics that can affect or prevent BMP design or construction, and an evaluation of potential multi-use or multi-benefit features. Additional sites in canyon areas were screened for potential location of centralized BMPs. The screening methodologies for distributed and centralized BMP locations are discussed in detail in Appendix H, and the menu of preferred structural BMP types is described in Appendix I.

Once potential centralized parcels were evaluated using the prioritization methodology and review of aerial photography, candidate retrofit projects were then subject to a more detailed evaluation and site investigation. Implementation requirements were developed and assessed for each of these sites (including the needed for detailed plans, design, land acquisition, permitting, construction, and preliminary cost estimates), and each site was ranked for implementation feasibility. Appendix J provides the Detailed Evaluation of Centralized BMP sites, and Appendix K provides BMP Fact Sheets from this analysis.

Finally, it is important to note that it would be impractical to identify, map, and size BMPs for each potential BMP site in the Chollas watershed, particularly for the distributed BMPs, because of the varying goals and requirements for implementation and the sheer number of potential distributed BMP retrofits. The CLRP screening process identified key potential BMP projects that can be quantified for load reduction benefits and considered for CLRP Implementation Program planning. A key first step in the CLRP Implementation Program will be an optimization analysis of thousands of potential implementation sites to determine the degree to which distributed and centralized BMPs will be needed to meet the WLAs. Although the CLRP structural solutions assessment has focused implementation on public parcels as being most cost-effective, the program's future optimization analysis will also evaluate the need for BMP retrofits on private parcels. A complete description of the CLRP Implementation Program and associated recommended analyses is in Section 7.

5.2 Identification of Opportunities for Distributed, On-Site BMPs

This section briefly highlights the menu of preferred distributed BMP s that can help address the multiple parameters of concern in the Chollas watershed. It includes maps of distributed BMP projects implemented, planned, or proposed by the RPs in the watershed. Additionally, the screening and scoring system detailed in Appendix H was used to screen approximately 17,666 parcels. The top 30 new potential sites are listed and mapped along with the HPMAs. In addition, information is provided on the top new potential distributed BMP locations for each RP. The screening prioritized public parcels for BMP retrofit opportunities. These high-ranked potential public BMP projects can be quantified for load reduction benefits and considered for CLRP implementation planning. Clearly, there is additional opportunity for implementing distributed BMPs on parcels beyond those identified in this section.

5.2.1 Menu of Preferred Distributed BMPs

The RPs identified different types of distributed BMPs that can help address the multiple parameters of concern in the Chollas watershed and link the load reduction projects to the region's broader water resource management goals (for more information on how the CLRP recommended BMPs link to larger community goals, see Section 6). The RPs' menu of preferred distributed BMPs consist of 12 BMP types: bioretention areas and rain gardens, infiltration trenches, bioswales, planter boxes, permeable pavement, sand filters, vegetated swales, vegetated filter strips, water harvesting, green roofs, trash segregation, and proprietary BMPs. As was done in Table 4-7 above, Table 5-1 lists the proposed types of distributed BMPs and summarizes the effectiveness of the potential BMP projects in addressing the different causes of impairment and TMDL parameters of concern.

In Table 5-1, the closed circle (●) indicates that the BMP provides primary reduction for the pollutant; the half circle (◗) indicates secondary/incidental reduction; and the open circle (○) indicates that the BMP does not address the pollutant. Pollutant reduction assumptions represent best professional judgment based on the typical design approach, typical land use setting, and common geographic extent of application for the type of BMP. They are also based on literature review and internal RP program evaluations in 2011, developed in conjunction with the RPs. Appendix I provides a brief description of each of these BMPs.

BMPs that have volume reduction (and infiltration) as a primary design component and function should be a priority for distributed BMP implementation because they provide the greatest potential for pollutant reduction. The BMPs listed as having secondary volume reduction potential also typically provide some reduction through soil storage and evapotranspiration. Many of the distributed BMPs provide filtration and exposure to sunlight providing a primary reduction in bacteria.

For infiltration practices listed below, the BMP processes and the potential to remove pollutants through soil filtration will depend on a site's soil type. In the early phase of the CLRP Implementation Program, BMPs recommended for the Chollas watershed can be assigned infiltration rates on the basis of the parcel soil type, and the BMP processes can be predicted by model applications, thereby providing necessary information for appropriate design recommendations (e.g., the need for an underdrain). This assessment will help optimize the location of distributed BMPs by performance and cost.

Table 5-1. Effectiveness of distributed BMP types in addressing causes of impairment

BMP	Impairment										
	Bacteria	Metals	Organics	Sediment	Pesticides	Nutrients	Oil and grease	Dissolved minerals	Trash	Flow	Volume reduction
Distributed Structural BMPs											
Rain Gardens	●	◗	◗	●	◗	●	◗	◗	●	●	●
Bioretention Area	●	◗	◗	●	◗	●	◗	◗	●	●	●
Infiltration Trenches	●	◗	◗	●	◗	●	◗	◗	●	●	●
Bioswales	●	◗	◗	●	◗	●	◗	◗	●	●	●
Planter Boxes	●	◗	◗	●	◗	●	◗	◗	●	◗	◗
Permeable Pavement	●	◗	◗	●	◗	●	○	◗	○	●	●
Sand Filter	●	◗	◗	●	◗	◗	●	○	●	◗	◗
Vegetated Swales	◗	◗	◗	●	◗	◗	◗	◗	●	◗	◗
Vegetated Filter Strips	◗	◗	◗	●	◗	◗	◗	◗	●	◗	◗
Water Harvesting	◗	◗	◗	●	◗	◗	◗	◗	◗	●	●
Green Roof	◗	◗	○	●	○	○	○	◗	○	●	◗
Trash Segregation	◗	◗	○	○	○	○	◗	○	●	○	○
Proprietary BMPs	Dependent on proprietary BMP selected										

● provides primary pollutant reduction
◗ provides secondary pollutant reduction
○ does not address the pollutant

5.2.2 Existing, Planned, and Proposed Distributed BMPs

The RPs have proposed and implemented a number of distributed BMP projects in the Chollas watershed that together can significantly contribute to load reduction. As such, these existing proposed or planned projects form a central part of the CLRP and provide a head start in CLRP implementation planning. A table and map of the planned and implemented distributed BMPs are provided below (Table 5-2 and Figure 5-1). Where multiple BMPs are proposed for a single site, a single description is used for the potential retrofits. Note that this CLRP does not list all the BMPs that were developed to address SUSMP requirements because those BMPs are required to meet existing regulatory requirements. The CLRP focuses on BMP projects that provide additional water quality improvement above the SUSMP requirements.

Table 5-2. Planned/implemented distributed BMPs

BMP ID	Location/ jurisdiction	Owner	Description	Phase
1	Cities of San Diego and Lemon Grove	Caltrans	The Chollas Creek Stormwater Treatment BMP Retrofit project proposes to construct treatment BMPs along corridors within the Chollas Creek watershed to address the Metals/Bacteria TMDLs. A project report has been perpared and should be finalized by June 2012. Design has begun on seven Modified Infiltration Trenches (with modular filler) and three biofiltration swales to treat 32.3 acres	Planned
2	City of San Diego	City of San Diego	The Chollas Improvement/Stream Restoration project has plans to install or place distributed BMPs to treat storm water runoff. The details of these BMPs are unknown.	Planned
3	City of San Diego	City of San Diego	Distributed BMPs are proposed to be installed or place along El Cajon Boulevard.	Planned
4	City of La Mesa	City of La Mesa	La Mesa is proposing the University Avenue Revitalization Project, including installing a BMP in the median of University Avenue.	Planned
5	City of San Diego	City of San Diego	A BMP is proposed to be installed at the corner of 43rd and Logan.	Implemented
6	City of San Diego	City of San Diego	A BMP is proposed to be installed in Southcrest Park.	Planned
7	City of La Mesa	City of La Mesa	Eastridge-Serramar has proposed to install three vortex separators in La Mesa.	Implemented
8	City of La Mesa	City of La Mesa	The Lowell Street Condominiums have proposed to install two vegetated swales and two drain inserts on their property.	Implemented
9	City of La Mesa	City of La Mesa	Two drain inserts have been proposed for La Mesita (Belvedere).	Implemented
10	City of La Mesa	City of La Mesa	La Mesa Fire Station #11 has proposed to use a media filter storm screen to filter storm water.	Implemented
11	City of La Mesa	City of La Mesa	A vegetated swale and a drain insert have been proposed to be placed on the property of La Mesa Teen Center.	Implemented
12	City of La Mesa	City of La Mesa	The La Mesa Branch County Library has proposed to install a vortex separator.	Implemented
13	City of San Diego	City of San Diego	The N Chollas Community Park Phase 1B project has proposed to install several drainage inserts. The inserts are likely to be placed along the curb inlet closest to the parking on the northeast side of the street.	Planned

BMP ID	Location/ jurisdiction	Owner	Description	Phase
14-16	City of San Diego	City of San Diego	The N Chollas Community Park Phase 1B project has proposed to install several drainage inserts. The inserts are likely to be placed along the curb inlet closest to the parking on the northeast side of the street.	Planned
17-18	City of San Diego	City of San Diego	Under the Lisbon Street Roadway and Utility Improvements project, drainage inserts are proposed to be installed at the northeast corner of the intersection inlet at Lisbon Street and Imperial Avenue.	Planned
19-28	City of San Diego	City of San Diego	Fire Station #12 has proposed to install several drainage inserts on the north of side of the facility, near the alley.	Planned
29	City of San Diego	City of San Diego	The North 252 Corridor Park Phase I project proposes a grassed/vegetated swale or grassed/vegetated strip on the northwest corner of the park by the parking lot.	Planned
30-31	City of San Diego	City of San Diego	The North 252 Corridor Park Phase I project proposes two drainage inserts on the northwest corner of the park by the parking lot.	Planned
32-36	City of San Diego	City of San Diego	The Rigel Street Bridge Replacement Project proposes several inserts along the west side of the street, north of the bridge.	Planned
37	City of San Diego	City of San Diego	Central Region Public Health Center replaced 6250 ft^2 of impervious pavement with rubberized porous asphalt.	Implemented
38	City of San Diego	City of San Diego	Southeast Family Resource Center constructed four biofiltration planters in the parking lot and adjacent to the building to filter runoff from the roof and parking surface. They also installed porous pavers at the entrance and exit of the parking lot.	Implemented
39	City of Lemon Grove	Private	A retention basin and a media filter were placed in the parking lot at Broadway.	Implemented
40	City of Lemon Grove	Private	Walgreens and a vegetated swale were installed along the Broadway.	Implemented
41	City of Lemon Grove	Private	A media filter was installed at the territory of the Church at Main Street.	Implemented
42	City of Lemon Grove	Private	A bioretention basin was placed on the property of Citronica Multifamily Complex.	Implemented
43	City of Lemon Grove	Private	A vegetated swale is planned to be installed at the territory of a commercial business at West Street.	Planned
44	City of Lemon Grove	Private	A media filter is proposed for construction at the territory of a commercial business at Massachusetts Avenue	Planned
45	City of Lemon Grove	Private	A vegetated swale is proposed to be installed by the Automotive Shop at 7672 North Avenue.	Planned

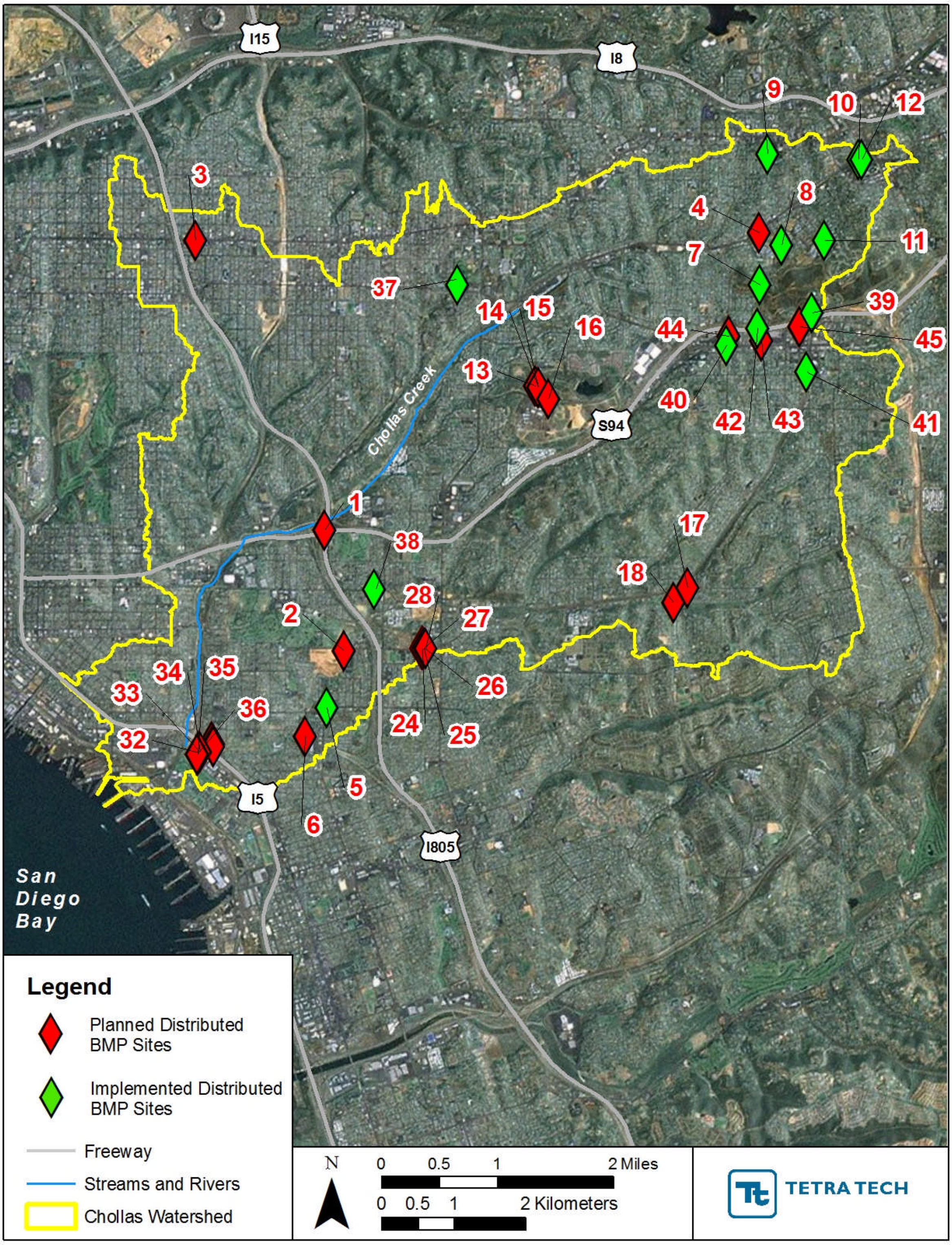

Figure 5-1. Planned and implemented distributed BMP sites

5.2.3 New Identified Opportunities for Distributed BMP Retrofits

Using the screening methodology discussed in Appendix H, opportunities for additional sites for distributed BMPs were identified, including alternatives for implementation on publicly owned parcels. Approximately 17,666 parcels were screened for suitability. The sections below list and map the new, high-ranked potential retrofit sites on public parcels. The maps show the HPMAs along with the high ranked areas identified for potential BMP retrofits (Figure 5-2). The blue circles indicate the top-ranked public parcels for potential distributed BMPs. Planned distributed BMPs are included in the map (red diamonds) to provide an overview of the potential for locating distributed BMPs in the Chollas watershed. A final series of tables lists the top-ranked sites for each RP, and indicates whether the sites are in an HPMA (for a description of the process, see Section 3.4) (Table 5-3 to Table 5-7).

Note that the tables indicate *watershed rank* and *watershed score*. The high-ranked public parcels are mostly in the HPMAs. Some of the recommended parcels are in Multiple Species Conservation Program (MSCP) or Multi-Habitat Planning Area (MHPA) boundaries where implementation could be limited. The level of implementation permitted should be coordinated before developing conceptual designs. In the CLRP Implementation Program, the RPs will use the Chollas watershed parcel prioritization methodology and optimization analysis to determine the degree to which these private parcels will need to be retrofitted with structural BMPs to meet the WLAs.

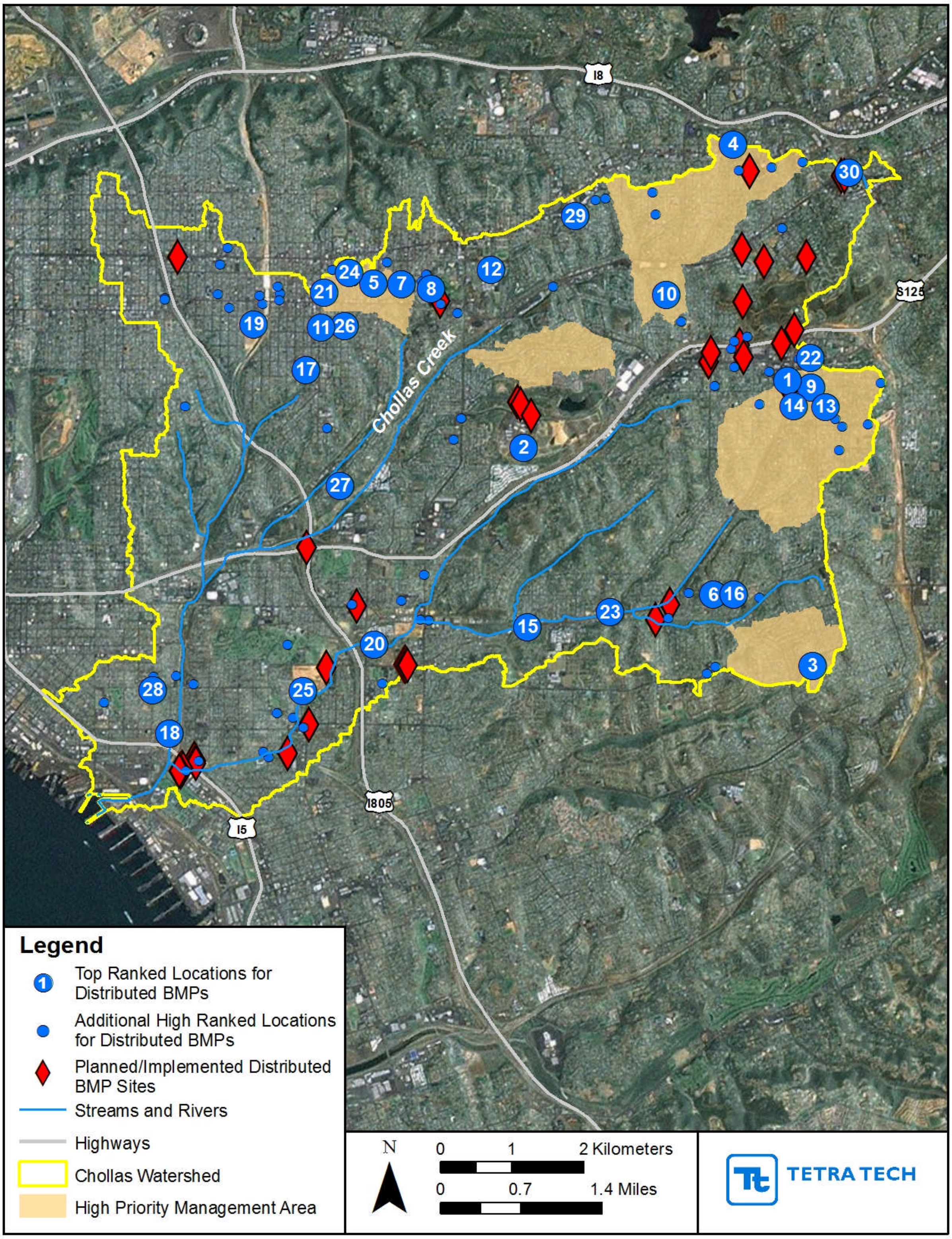

Figure 5-2. High ranked Chollas watershed locations for distributed BMPs

Table 5-3. Top 30 potential distributed BMP sites in the Chollas watershed

Public parcel rank #	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	Percent impervious cover (%)	Hydrologic soil group
1	39	Yes	No	4801740100 4801740400 4801740200 4801740300	City of Lemon Grove	City of Lemon Grove	2.20	75	D
2	38	No	No	4774900300 4774900200	City of San Diego	City of San Diego	55.95	66	D
3	37	Yes	No	5834001700	San Diego Unified School District	City of San Diego	9.27	80	D
4	37	Yes	No	4691101100	County of San Diego	City of San Diego	1.23	88	D
5	37	Yes	No	4714023000	San Diego Unified School District	City of San Diego	6.65	77	U
6	37	No	No	5810601300	San Diego Unified School District	City of San Diego	7.77	65	D
7	37	Yes	No	4714222800	San Diego Unified School District	City of San Diego	7.78	79	U
8	37	No	No	4722712400 4722712500	San Diego Unified School District	City of San Diego	5.88	73	D
9	37	Yes	No	4802800100 4802011100 4802800200 4802910100	Lemon Grove School District	City of Lemon Grove	16.19	75	D
10	36	Yes	No	4742801700	City of San Diego	City of San Diego	0.16	64	D
11	36	No	No	4716520500 4716630200	City of San Diego	City of San Diego	9.41	66	U
12	36	No	No	4722100400 4722900200 4721302700 4722203300	San Diego Unified School District	City of San Diego	27.27	64	D
13	36	Yes	No	4803700600	Lemon Grove School District	City of Lemon Grove	3.67	82	D

Public parcel rank #	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	Percent impervious cover (%)	Hydrologic soil group
14	36	Yes	No	4802721300	City of Lemon Grove	City of Lemon Grove	1.20	80	D
15	35	No	No	5491110800	City of San Diego	City of San Diego	0.95	78	D
16	35	No	No	5810602100	City of San Diego	City of San Diego	5.67	24	D
17	35	No	No	4760923000	San Diego Unified School District	City of San Diego	6.31	72	D
18	35	No	No	5501701700 5501700900 5501612900 5501613000	City of San Diego	City of San Diego	1.29	77	U
19	35	No	No	4476123600	San Diego Unified School District	City of San Diego	7.04	70	U
20	35	No	No	5473110100 5472500700	City of San Diego	City of San Diego	1.92	65	U
21	35	Yes	No	4714612300	City of San Diego	City of San Diego	0.25	79	U
22	35	Yes	No	4801113300	United States Postal Service	City of Lemon Grove	0.73	89	D
23	34	No	No	5491020700 5491020200	City of San Diego	City of San Diego	0.39	79	D
24	34	Yes	No	4713011200	City of San Diego	City of San Diego	0.07	63	U
25	34	No	No	5474032700 5476254500 5474032200	City of San Diego	City of San Diego	0.27	62	B
26	34	No	No	4716630100	San Diego Unified School District	City of San Diego	6.32	65	U
27	34	No	No	5410700100	City of San Diego	City of San Diego	0.18	70	D
28	34	No	No	5456212200 5456113600 5455321800	County of San Diego	City of San Diego	1.82	73	U

Public parcel rank #	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	Percent impervious cover (%)	Hydrologic soil group
29	34	No	No	4675420700	City of San Diego	City of San Diego	1.14	76	D
30	34	No	No	4705711300 4705711400	City of La Mesa	City of La Mesa	9.46	72	D

Table 5-4. City of La Mesa top-ranked potential distributed BMP sites

Jurisdictional rank # (watershed rank #)	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	percent impervious cover (%)	Hydrologic soil group
1 (30)	34	No	No	4705711300 4705711400	City of La Mesa	City of La Mesa	9.46	72	D
2 (52)	33	No	No	4944100500 4944100800 4944100600 4944100900 4944100700	City of La Mesa	City of La Mesa	0.73	62	D
3 (76)	32	No	No	4696301800 4750800300 4696301300 4696301900 4696303500 4696301200 4696300800 4750802400	La Mesa-Spring Valley School District	City of La Mesa	6.05	81	D
4 (77)	32	No	No	4751000900	La Mesa-Spring Valley School District	City of La Mesa	0.42	72	D
5 (78)	32	Yes	No	4684501500	La Mesa-Spring Valley School District	City of La Mesa	8.44	54	D
6 (79)	32	No	No	4944430500	City of La Mesa	City of La Mesa	0.37	73	D
7 (132)	30	Yes	No	4743531500	City of La Mesa	City of La Mesa	2.68	41	D
8 (139)	30	Yes	No	4684501700	La Mesa-Spring Valley School District	City of La Mesa	0.44	27	D

Jurisdictional rank # (watershed rank #)	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	percent impervious cover (%)	Hydrologic soil group
9 (188)	29	No	No	4750500600	Grossmont Union High School District	City of La Mesa	37.46	52	D
10 (275)	28	Yes	No	4684501900	La Mesa-Spring Valley School District	City of La Mesa	0.45	3	D
11 (284)	28	Yes	No	4684501600	La Mesa-Spring Valley School District	City of La Mesa	0.21	34	D
12 (298)	28	Yes	No	4684502000	La Mesa-Spring Valley School District	City of La Mesa	0.87	8	D
13 (301)	28	Yes	No	4684501800	La Mesa-Spring Valley School District	City of La Mesa	0.44	1	D
14 (575)	27	No	No	4944101700	City of La Mesa	City of La Mesa	0.06	<1	D
15 (675)	27	No	No	4944041200	San Diego Metropolitan Transit Development Board	City of La Mesa	0.08	70	D
16 (688)	27	No	No	4944041500	San Diego Metropolitan Transit Development Board	City of La Mesa	0.31	71	D
17 (2052)	25	No	No	4944040501	City of La Mesa	City of La Mesa	0.04	<1	D
18 (2060)	25	No	No	4705811000	City of La Mesa Community Redevelopment Agency	City of La Mesa	0.00	<1	D
19 (2070)	25	No	No	4944041100	City of La Mesa	City of La Mesa	0.11	<1	D
20 (2074)	25	No	No	4696302800	La Mesa-Spring Valley School District	City of La Mesa	0.45	20	D
21 (2092)	25	No	No	4942405401	City of La Mesa	City of La Mesa	0.01	<1	D
22 (2120)	25	No	No	4696302200	La Mesa-Spring Valley School District	City of La Mesa	0.22	44	D
23 (2121)	25	No	No	4696302300	La Mesa-Spring Valley School District	City of La Mesa	0.23	1	D
24 (2201)	25	No	No	4696300700	La Mesa-Spring Valley School District	City of La Mesa	0.24	1	D
25 (2219)	25	No	No	4696302600	La Mesa-Spring Valley School District	City of La Mesa	0.23	1	D
26 (5130)	23	No	No	4944040601	City of La Mesa	City of La Mesa	0.06	<1	D

Jurisdictional rank # (watershed rank #)	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	percent impervious cover (%)	Hydrologic soil group
27 (5133)	23	No	No	4744610300	Helix Water District	City of La Mesa	0.10	<1	D
28 (5153)	23	No	No	4942405700	San Diego Metropolitan Transit Development Board	City of La Mesa	0.15	<1	D
29 (5160)	23	No	No	4705810300	City of La Mesa Community Redevelopment Agency	City of La Mesa	0.00	<1	D
30 (5186)	23	No	No	4942404500	City of La Mesa	City of La Mesa	0.16	<1	D

Table 5-5. City of Lemon Grove top-ranked potential distributed BMP sites

Jurisdictional rank # (watershed rank #)	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	Percent impervious cover (%)	Hydrologic soil group
1 (1)	39	Yes	No	4801740100 4801740400 4801740200 4801740300	City of Lemon Grove	City of Lemon Grove	2.20	75	D
2 (9)	37	Yes	No	4802800100 4802011100 4802800200 4802910100	Lemon Grove School District	City of Lemon Grove	16.19	75	D
3 (13)	36	Yes	No	4803700600	Lemon Grove School District	City of Lemon Grove	3.67	82	D
4 (14)	36	Yes	No	4802721300	City of Lemon Grove	City of Lemon Grove	1.20	80	D
5 (22)	35	Yes	No	4801113300	United States Postal Service	City of Lemon Grove	0.73	89	D
6 (31)	34	Yes	No	5032432900	Lemon Grove School District	City of Lemon Grove	0.19	80	D

Jurisdictional rank # (watershed rank #)	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	Percent impervious cover (%)	Hydrologic soil group
7 (32)	34	Yes	No	4802622100	Helix Water District	City of Lemon Grove	0.15	66	D
8 (33)	34	Yes	No	4801730200	City of Lemon Grove	City of Lemon Grove	0.15	66	D
9 (34)	34	No	No	5762402700	Lemon Grove School District	City of Lemon Grove	6.39	61	D
10 (51)	33	Yes	No	4801111100	City of Lemon Grove Community Development Agency	City of Lemon Grove	0.15	84	D
11 (53)	33	Yes	No	4801111200	City of Lemon Grove Community Development Agency	City of Lemon Grove	0.14	89	D
12 (54)	33	Yes	No	4801730100	City of Lemon Grove	City of Lemon Grove	1.11	41	D
13 (73)	32	No	No	4793300400	Lemon Grove School District	City of Lemon Grove	9.30	61	D
14 (74)	32	Yes	No	5033101500	Lemon Grove School District	City of Lemon Grove	6.45	56	D
15 (75)	32	Yes	No	5033201400	Lemon Grove School District	City of Lemon Grove	17.11	59	D
16 (80)	32	No	No	4744500100	Lemon Grove School District	City of La Mesa	4.62	65	D
17 (135)	30	Yes	No	4802710900	City of Lemon Grove	City of Lemon Grove	0.11	<1	D
18 (138)	30	Yes	No	4802710300	City of Lemon Grove	City of Lemon Grove	0.20	36	D
19 (191)	29	No	No	4800432300	City of Lemon Grove Community Development Agency	City of Lemon Grove	0.36	84	D
20 (263)	28	No	No	4800430700	City of Lemon Grove Community Development	City of Lemon Grove	0.17	85	D

Jurisdictional rank # (watershed rank #)	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	Percent impervious cover (%)	Hydrologic soil group
					Agency				
21 (277)	28	No	No	4801110900	City of Lemon Grove Community Development Agency	City of Lemon Grove	0.16	86	D
22 (292)	28	No	No	4801110800	City of Lemon Grove Community Redevelopment Agency	City of Lemon Grove	0.16	89	D
23 (589)	27	No	No	4790940300	City of Lemon Grove Community Development Agency	City of Lemon Grove	0.18	78	D
24 (630)	27	No	No	4744500200	Lemon Grove School District	City of La Mesa	4.90	56	D
25 (1158)	26	No	No	4800431200	City of Lemon Grove Community Development Agency	City of Lemon Grove	0.18	82	D
26 (5120)	23	No	No	4792400300	Helix Water District	City of Lemon Grove	0.88	10	D
27 (5171)	23	No	No	4801112200	City of Lemon Grove	City of Lemon Grove	0.09	<1	D
28 (5200)	23	No	No	4801110700	City of Lemon Grove Community Redevelopment Agency	City of Lemon Grove	0.16	<1	D
29 (5206)	23	No	No	4800431100	City of Lemon Grove Community Development Agency	City of Lemon Grove	0.16	<1	D
30 (5214)	23	No	No	4801111000	City of Lemon Grove Community Development	City of Lemon Grove	0.15	<1	D

Jurisdictional rank # (watershed rank #)	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	Percent impervious cover (%)	Hydrologic soil group
					Agency				

Table 5-6. City of San Diego top-ranked potential distributed BMP sites

Jurisdictional rank # (watershed rank #)	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	Percent impervious cover (%)	Hydrologic soil group
1 (2)	38	No	No	4774900300 4774900200	City of San Diego	City of San Diego	55.95	66	D
2 (3)	37	Yes	No	5834001700	San Diego Unified School District	City of San Diego	9.27	80	D
3 (5)	37	Yes	No	4714023000	San Diego Unified School District	City of San Diego	6.65	77	U
4 (6)	37	No	No	5810601300	San Diego Unified School District	City of San Diego	7.77	65	D
5 (7)	37	Yes	No	4714222800	San Diego Unified School District	City of San Diego	7.78	79	U
6 (8)	37	No	No	4722712400 4722712500	San Diego Unified School District	City of San Diego	5.88	73	D
7 (10)	36	Yes	No	4742801700	City of San Diego	City of San Diego	0.16	64	D
8 (11)	36	No	No	4716520500 4716630200	City of San Diego	City of San Diego	9.41	66	U
9 (12)	36	No	No	4722100400 4722900200 4721302700 4722203300	San Diego Unified School District	City of San Diego	27.27	64	D
10 (15)	35	No	No	5491110800	City of San Diego	City of San Diego	0.95	78	D
11 (16)	35	No	No	5810602100	City of San Diego	City of San Diego	5.67	24	D

Jurisdictional rank # (watershed rank #)	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	Percent impervious cover (%)	Hydrologic soil group
12 (17)	35	No	No	4760923000	San Diego Unified School District	City of San Diego	6.31	72	D
13 (18)	35	No	No	5501701700 5501700900 5501612900 5501613000	City of San Diego	City of San Diego	1.29	77	U
14 (19)	35	No	No	4476123600	San Diego Unified School District	City of San Diego	7.04	70	U
15 (20)	35	No	No	5473110100 5472500700	City of San Diego	City of San Diego	1.92	65	U
16 (21)	35	Yes	No	4714612300	City of San Diego	City of San Diego	0.25	79	U
17 (23)	34	No	No	5491020700 5491020200	City of San Diego	City of San Diego	0.39	79	D
18 (24)	34	Yes	No	4713011200	City of San Diego	City of San Diego	0.07	63	U
19 (25)	34	No	No	5474032700 5476254500 5474032200	City of San Diego	City of San Diego	0.27	62	B
20 (26)	34	No	No	4716630100	San Diego Unified School District	City of San Diego	6.32	65	U
21 (27)	34	No	No	5410700100	City of San Diego	City of San Diego	0.18	70	D
22 (29)	34	No	No	4675420700	City of San Diego	City of San Diego	1.14	76	D
23 (35)	33	No	No	5812901100	City of San Diego	City of San Diego	0.56	74	D
24 (36)	33	No	No	5476004700 5474710200 5474710100	San Diego Unified School District	City of San Diego	40.42	79	D
25 (37)	33	No	No	4547621200	San Diego Unified School District	City of San Diego	5.60	79	U
26 (38)	33	No	No	4714321900	Central San Diego Housing Commission F H A L L C	City of San Diego	0.14	78	U
27 (39)	33	Yes	No	4714020800	San Diego Unified School District	City of San Diego	0.14	80	U

Jurisdictional rank # (watershed rank #)	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	Percent impervious cover (%)	Hydrologic soil group
28 (40)	33	No	No	4472422300	Central S D H C F N M A L L C	City of San Diego	0.14	75	U
29 (41)	33	No	No	5464300400	San Diego Unified School District	City of San Diego	6.27	77	D
30 (42)	33	No	No	5424800900	City of San Diego	City of San Diego	0.25	62	D

Table 5-7. County of San Diego top-ranked potential distributed BMP sites

Jurisdictional rank # (watershed rank #)	Watershed score	Within HPMA (Y/N)	Within MHPA or MSCP area (Y/N)	APN	Owner	Jurisdiction (location)	Total parcel acreage	Percent impervious cover (%)	Hydrologic soil group
1 (4)	37	Yes	No	4691101100	County of San Diego	City of San Diego	1.23	88	D
2 (28)	34	No	No	5456212200 5456113600 5455321800	County of San Diego	City of San Diego	1.82	73	U
3 (58)	32	No	No	4723900300	County of San Diego	City of San Diego	0.59	59	D
4 (92)	31	No	No	5470414300	County of San Diego	City of San Diego	1.42	70	D
5 (190)	29	Yes	No	4805921900	County of San Diego	City of Lemon Grove	0.09	59	D

5.2.4 Distributed BMP Strategies for TMDL Implementation

The overarching strategy for implementing the distributed BMPs in the Chollas watershed is to first target and treat on-site runoff for the publicly owned parcels listed and mapped in this section, particularly those in the HPMAs. It is anticipated that RPs will begin implementation on those sites that are already planned and newly identified sites that are ranked highest for their jurisdiction. For high-ranked parcels owned and operated by public agencies other than the RPs (such as school districts), partnerships will need to be established. A secondary benefit of first locating distributed BMPs on public land is public education. This is especially true for parks, libraries, schools, and the like, that have frequent use. As the public learns more regarding the functional and aesthetic value of these BMPs, they can be encouraged to implement similar practices on private property. Outreach will need to be conducted and partnerships formed with private owners of high-ranked parcels. Indeed, more widespread implementation of distributed BMPs on private property might be critical to meeting the WLAs. Initial actions of the CLRP Implementation Program will assess the optimal balance of distributed BMP types and locations.

5.3 Assessment of Opportunities for Large, Centralized Structural BMPs

This section highlights the centralized BMP types selected to meet the multiple parameters of concern in the Chollas watershed. Three existing and proposed centralized BMPs are highlighted, and eight new opportunity sites identified and evaluated in detail. General cost estimates are provided for implementing the BMPs at each site in Section 7. Canyon areas were also screened as potential options where characteristics of the undeveloped land would not compromise the functionality of a centralized BMP.

5.3.1 Menu of Preferred Centralized BMPs

The RPs' menu of preferred centralized BMPs has six BMP types: surface infiltration basins, subsurface detention systems, subsurface infiltration galleries, dry extended detention basins, subsurface flow wetland systems, and constructed and pocket wetland systems. Table 5-8 lists the proposed centralized BMPs and indicates the effectiveness of the potential BMP projects in addressing the different causes of impairment and TMDL parameters of concern. The performance of the infiltration practices in removing pollutants through soil filtrations will depend on the soil type. As discussed above, at the outset of the CLRP Implementation Program, the Chollas CLRP model will assign infiltration rates according to the parcel soil type and will adjust the simulation of BMP process and design accordingly. Appendix I provides a brief description of each of the preferred centralized practices. The preferred centralized BMP configuration includes surface BMPs designed for infiltration, particularly infiltration basins and dry extended detention basins. However, given the constraints of a site, this configuration might not always be feasible. Therefore, multiple BMP options are provided to meet the multiple potential site needs and constraints.

Table 5-8. Effectiveness of centralized BMP types in addressing causes of impairment

BMP	Impairment										
	Bacteria	Metals	Organics	Sediment	Pesticides	Nutrients	Oil and grease	Dissolved minerals	Trash	Volume reduction	Flow
Centralized Structural BMPs											
Surface Infiltration Basins	●	◗	◗	●	◗	●	●	◗	●	●	●
Subsurface Infiltration Galleries	●	◗	◗	●	◗	●	●	◗	○	●	●
Dry Extended Detention Basins	●	◗	◗	●	◗	●	●	◗	●	●	●
Subsurface Detention Galleries	●	◗	◗	●	◗	●	●	◗	○	●	●
Subsurface Flow Wetland Systems	●	◗	◗	●	◗	●	●	●	○	◗	●
Constructed and Pocket Wetland Systems	●	◗	◗	●	◗	●	●	●	○	◗	●

● provides primary pollutant reduction
◗ provides secondary pollutant reduction
○ does not address the pollutant

5.3.2 Existing, Planned, and Proposed Centralized BMPs

The RPs have proposed or planned to build a number of centralized BMP projects in the watershed that should be prioritized in CLRP implementation planning. A table and map of the existing and planned centralized BMPs are provided below (Table 5-9 and Figure 5-3).

Table 5-9. Existing and planned centralized BMP projects in the Chollas watershed

BMP ID	Jurisdiction	Owner	Description	Phase
1	City of La Mesa	City of La Mesa	A city park is proposed to be built in a parcel of barren land along Waite Drive. This area can be included for long-term centralized planning.	Planned
2	City of La Mesa	City of La Mesa	A centralized BMP is proposed to be installed in the Future Rehabilitation Project of Vista La Mesa Park.	Planned
3	City of San Diego	City of San Diego	Runoff from the parking on the west side of the Memorial Park was diverted from the existing storm drain system to the new infiltration basin. Before entering the basin, the runoff passes through a hydrodynamic separator that removes pollutants that settle out or float. Runoff then enters the basin where it infiltrates into the underlying soils. Runoff in excess of the 5-year storm bypasses the BMP via an overflow pipe and returns to the regular storm drain system.	Implemented

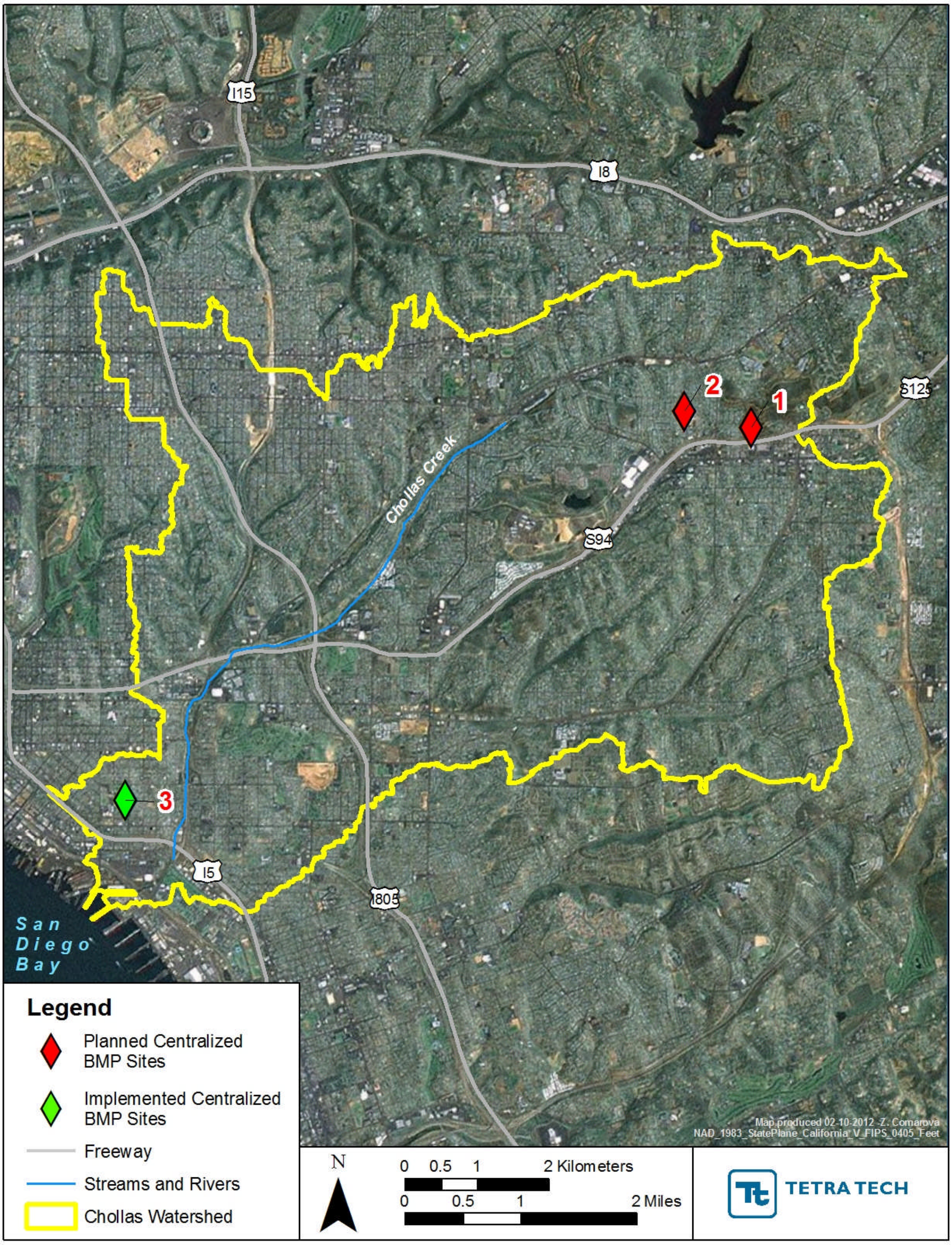

Figure 5-3. Existing and planned centralized BMP sites in the Chollas watershed

5.3.3 New Identified Opportunities for Centralized BMPs

Using the screening methodology discussed in Appendix H, 38 new opportunities for centralized BMPs were identified and prioritized in the Chollas watershed. Using aerial imagery, the list of new opportunities was reduced from 38 to 16 because of the location of the site and size of the watershed. A more detailed field investigation was performed at the 16 remaining sites. On the basis of observation made during the field visits and ownership, 8 feasible potential sites were identified for centralized BMP implementation (Table 5-10 and Figure 5-8).

Each of the sites was ranked according to whether it is in an HPMA, results of the field investigations, and implementation feasibility. High, medium, and low rankings were assigned to each site accordingly. Sites in an HPMA were given a feasibility rank of high regardless of the watershed size or the necessity of pumping. Sites with a small catchment area that require pumping were given a low ranking. Below are descriptions of the high- and medium-ranked sites identified, including level of priority, location, size of catchment area, and current land use. All public sites considered feasible (even those receiving a low rank) are listed and mapped along with the HPMAs. Existing and planned centralized BMP sites are included in the map to provide the larger picture of existing and potential centralized BMP locations in the watershed.

1. Park De La Cruz and Cherokee Point Elementary School

Priority: Low

The 81-acre catchment is in the City of San Diego, the northwest portion of the Chollas watershed, just west of State Road 15. The catchment is predominantly single-family residential with approximately 1/8-acre lots but also includes multifamily residential; an urban, densely situated shopping district with restaurants, grocery stores, shops, and vehicle service centers; and educational institutions. The only green space is the athletic field at Cherokee Point Elementary School and a small open space at Park De La Cruz adjacent to Cherokee Point Elementary School. The catchment is approximately 74 percent impervious.

Figure 5-4. Park De La Cruz open area

2. Alba Middle/High School

Priority: Low

The 67-acre catchment is in the City of San Diego in the central portion of the Chollas watershed, south of El Cajon Boulevard, and east of 54th Street. It is a mixture of single-family residential with approximately 1/8-acre to 1/4-acre lots, multifamily residential, educational institutions, and an approximate six-block business district along El Cajon Boulevard. Businesses include restaurants, a grocery store, motel, auto sales shops, car lube shop, a shopping plaza, and other retail and service shops. Green space in the catchment includes residential yards and school athletic fields. The catchment is approximately 75 percent impervious.

3. Clay Park

Priority: Low

The 27-acre catchment is in the City of San Diego in the north-central portion of the Chollas watershed, south of El Cajon Boulevard, and west of Rolando Boulevard. The catchment is predominantly characterized by a razed shopping mall area. It has approximately eight single-family homes on 1/8-acre lots, approximately four multifamily buildings, a post office, a pharmacy, a church, and a public park.

Green space in the catchment includes residential yards and the park. The catchment is approximately 73 percent impervious.

4. Joyner Elementary School

Priority: Low

The 87-acre catchment is in the City of San Diego in the northwest portion of the Chollas watershed, east of State Road 15 and west of Fairmount Avenue. The catchment is predominantly single-family residential with approximately 1/8-acre lots but also includes multifamily residential, police department, community college, and elementary school. The only green space is the athletic field at the elementary school and public lawn/landscaping at the upstream end of the catchment. The catchment is approximately 75 percent impervious.

Figure 5-5. Athletic field at Joyner Elementary School.

5. Ibarra Elementary School

Priority: Low

The catchment is in the City of San Diego the northwest portion of the Chollas watershed, crossing El Cajon Boulevard and west of 54th Street. It is predominantly single-family residential with approximately 1/8-acre lots and includes a five-block business district along El Cajon Boulevard. Businesses include restaurants, a grocery store, several auto repair shops, motel, and other retail shops. The only green space in the catchment is the athletic field at the elementary school. The catchment is approximately 77 percent impervious.

6. Rolando Drainage Area

Priority: High

The 39-acre catchment is in the City of La Mesa in the northeast portion of the Chollas watershed, north of University Avenue and east of College Avenue. Besides Rolando Park, the catchment is single-family residential on 1/8-acre lots. Green space in the catchment includes residential yards and the park. The catchment is approximately 60 percent impervious.

Figure 5-6. Athletic Field at Rolando Park.

7. Euclid Elementary School

Priority: High

The 76-acre catchment is in the City of San Diego in the northwest portion of the Chollas watershed, south of El Cajon Boulevard and north of University Avenue. The catchment is predominantly single-family residential with approximately 1/8-acre lots but also includes multifamily residential scattered throughout, an elementary school, and some businesses along University Avenue including restaurants, a grocery store, small retail shops, and a tire shop. In effect, no open green space exists in the catchment for a centralized BMP. The catchment is approximately 75 percent impervious.

8. Highwood Drainage Area

Priority: Low

The 114.5-catchment is in the City of La Mesa in the northeast portion of the Chollas watershed, southeast of the intersection of University Avenue and Yale Avenue. The catchment is predominantly single-family residential on 1/4-acre lots adjacent to La Mesa Middle School and Highwood Park. Green space in the catchment includes residential yards, the school grounds, a green belt behind a group of about 92 homes, and Highwood Park. The catchment is approximately 44 percent impervious.

Figure 5-7. Athletic field at La Mesa Middle School.

Table 5-10. Eight new potential centralized sites in the Chollas watershed

Site ID #	Rank	APN	Name	Jurisdiction
1	Low	4476123700/ 4476123600	Park De La Cruz/Cherokee Point Elementary School	City of San Diego
2	Low	4721302700	Alba Middle/High School	City of San Diego
3	Low	4674900400	Clay Park	City of San Diego
4	Low	4760923000	Joyner Elementary School	City of San Diego
5	Low	4714222800	Ibarra Elementary School	City of San Diego
6	High	4685811300	Rolando Drainage Area	City of La Mesa
7	High	4714023000	Euclid Elementary School	City of San Diego
8	Low	4751901500	Highwood Drainage Area	City of La Mesa

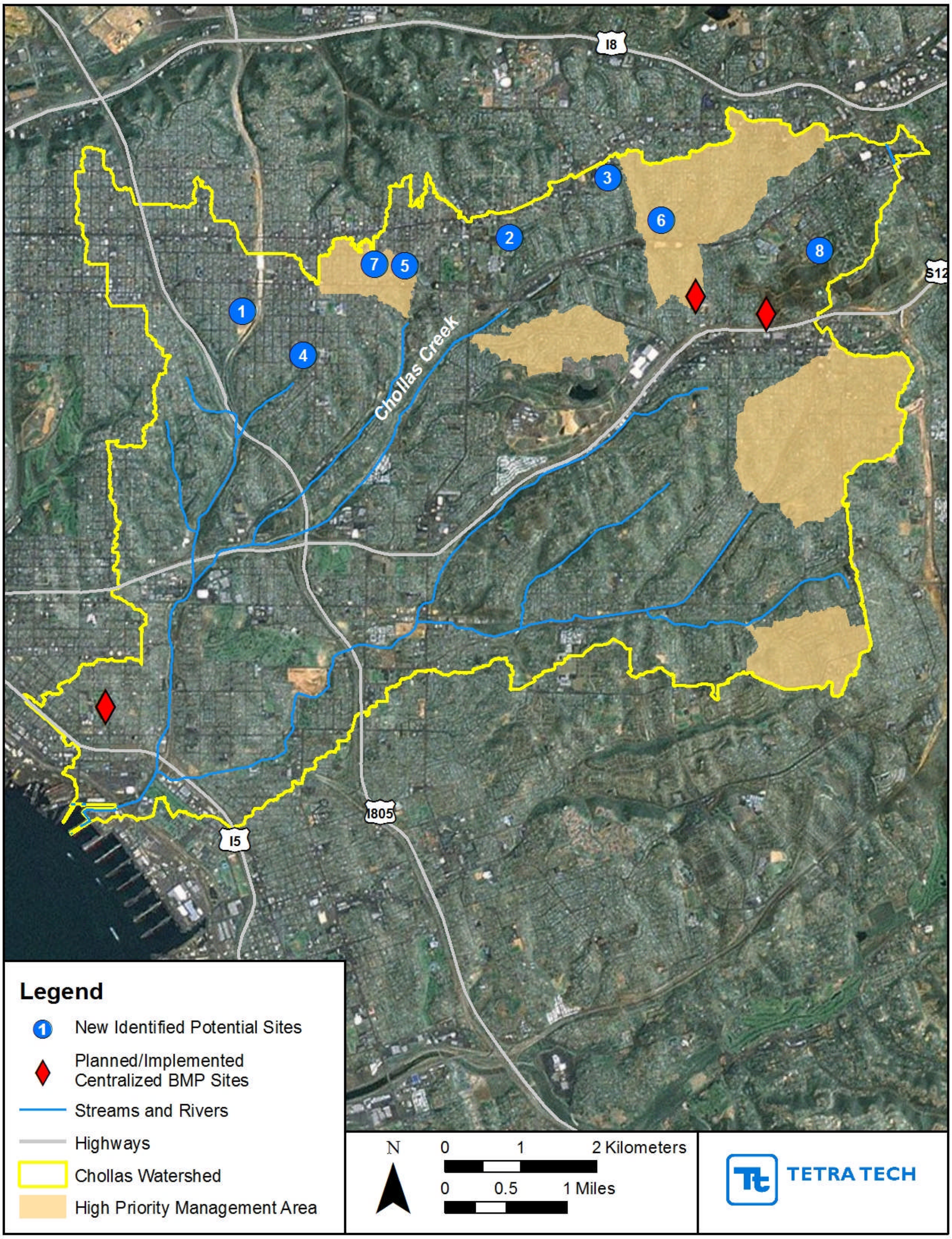

Figure 5-8. Locations for centralized BMPs in the Chollas watershed

To broaden opportunities for centralized BMP implementation, potential sites were identified specifically in canyon areas using the methodology discussed in Appendix H. Although the use of canyon areas for storm water treatment allows for treating larger drainage areas in *unoccupied* areas, the feasibility of this space is restricted by several key factors: the steep slopes and limited level space, slope instability, and distance from public utilities. The table and map below show the top 10 sites for potentially locating centralized BMPs in canyon areas (Table 5-11 and Figure 5-9).

Table 5-11. Top 10 potential canyon area locations for centralized BMPs

Rank	APN	Owner	Jurisdiction	Total parcel acreage	Parcel acreage < 15% slope	Canyon score
1	4538212800	City of San Diego	City of San Diego	1.24	0.51	34
2	5411900400	City of San Diego	City of San Diego	0.00	2.10	34
3	5812001600	City of San Diego	City of San Diego	5.93	1.73	34
4	5423331600	City of San Diego	City of San Diego	29.17	11.60	34
5	5410800900	City of San Diego	City of San Diego	3.51	2.10	34
6	4765810200	City of San Diego	City of San Diego	5.76	2.58	34
7	5433300800	City of San Diego	City of San Diego	33.65	9.44	34
8	5395612100	City of San Diego	City of San Diego	0.54	0.14	34
9	4538010900	City of San Diego	City of San Diego	0.00	0.06	33
10	5811903500	City of San Diego	City of San Diego	2.86	0.15	33

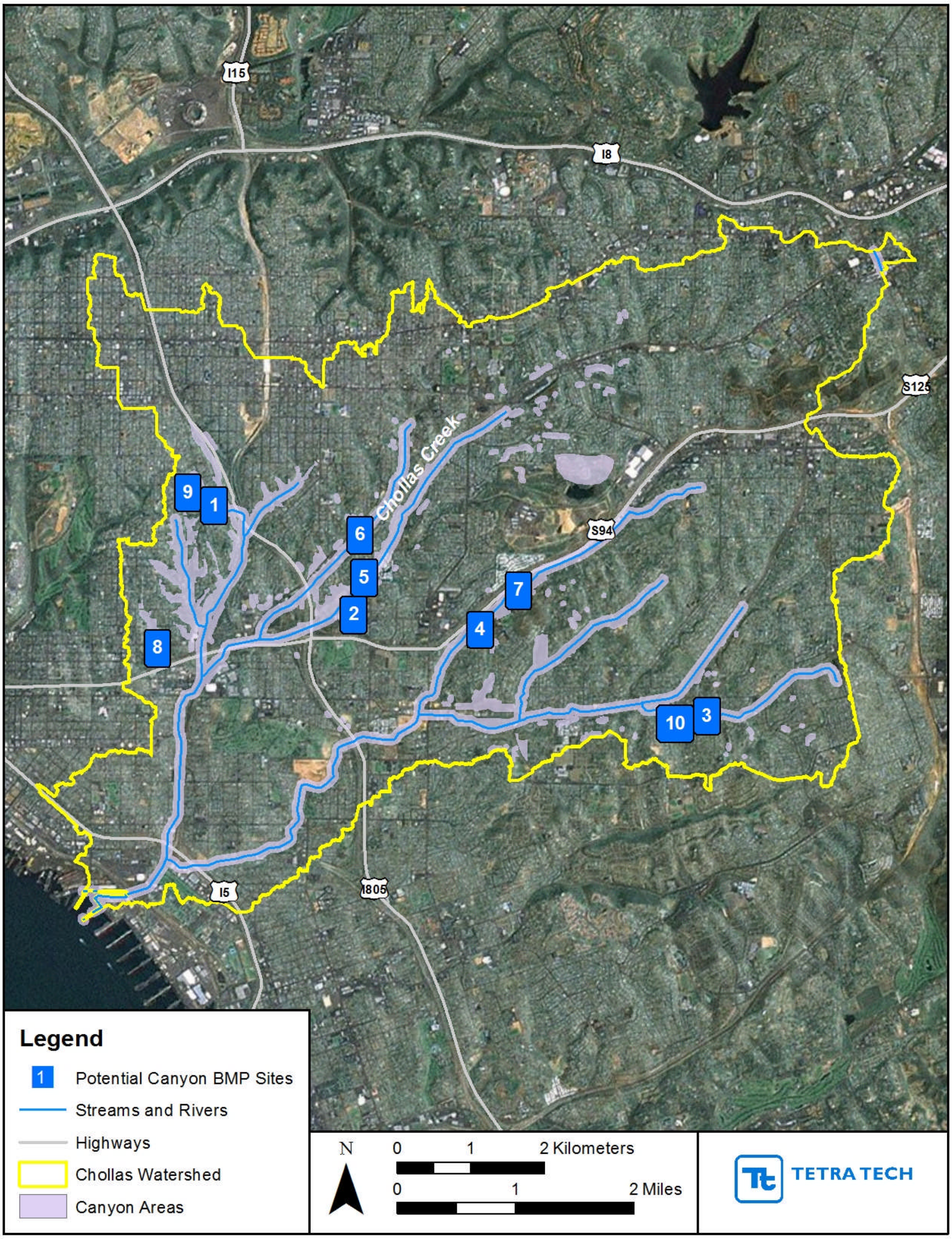

Figure 5-9. Potential canyon area locations for centralized BMPs in the Chollas watershed

Appendix J provides more detailed information for each newly identified site (excluding potential canyon locations), including potential sources of pollution, soil and drainage characteristics, BMP options and constructability, implementation requirements, estimated costs, and potential multi-use benefits. Detailed site maps are also provided. Estimated cost and load reduction benefits for each site will be developed in more detail in the early stage of the CLRP Implementation Program.

5.3.4 Centralized BMP Strategies for TMDL Implementation

The overarching strategy for implementing the centralized BMPs in the Chollas watershed is to first target and treat on-site runoff for the publicly owned parcels listed and mapped in this section, particularly those in the HPMAs. As with the potential distributed BMP sites, is anticipated that RPs will begin implementation on those sites that are already planned and newly identified sites that are ranked highest for their jurisdiction.

The preferred centralized BMP configuration includes surface BMPs designed for infiltration, particularly infiltration basins and dry extended detention basins. However, given the constraints of a site, this configuration might not always be feasible. Therefore, multiple BMP options and configurations are provided to meet the multiple potential site needs and constraints.

5.4 Summary of Structural Solutions

The assessment of opportunities for distributed and centralized BMPs in the Chollas watershed revealed that the RPs have already planned or proposed a number of structural BMP retrofits in the study area that can significantly support comprehensive load reduction. Moreover, the screening analysis revealed many other potential sites for locating distributed or centralized BMP. Through review of numerous local studies and GIS analysis of more than 17,666 parcels in the watershed, the assessment identified significant structural opportunities including

- 38 distributed BMP projects planned by the RPs or other agencies in the watersheds
- 106 new high-ranked potential distributed BMP sites on public parcels
- 3 centralized BMP projects planned by the RPs or other agencies
- 8 new public parcels for potentially locating centralized BMPs
- 10 new potential centralized BMP sites in canyon areas

The costs for implementing BMPs at each of the newly identified sites will vary widely, depending on site conditions and BMPs selected. Section 7 provides a range of general, planning level cost estimates for implementing the distributed and centralized BMPs. This range of costs is provided for general planning purposes only; a more refined cost estimate will be provided at the outset of the program implementation. A more detailed cost analysis should be performed during the conceptual design phase of each project before implementation.

The analysis of structural solutions yielded information needed to begin planning for distributed and centralized BMPs. The high ranked BMP sites in this section provide an immediate and strong foundation for each RP's CLRP program development.

6 Identifying Water Resources Plans and Other Planning Objectives

6.1 Water Resources Planning Overview

The purpose of this section is to identify opportunities to achieve co-benefits among water resource and storm water management strategies, groundwater and surface water storage, water reclamation and reuse, and conservation. Many of the strategies used to manage the region's water supply, such as conservation measures, water retention/detention and storage, groundwater infiltration, serve both water supply and storm water management purposes by managing storm volumes, providing treatment of runoff, and reducing dry-weather or *nuisance* flows that carry pollutants into and through the storm drain system. At the same time, many storm water treatment measures, particularly regional retention/detention facilities, constructed wetlands, and systems that infiltrate storm flows into groundwater, can augment water supply and improve water resource quality. The information in this section is also in Appendix L in more detail**.**

This section examines the region's current beneficial uses, water supply, use and reuse strategies, plans for enhancing regional water supplies, and the potential impact or benefit of those practices on water quality. It also highlights how the types of nonstructural and structural BMP projects discussed in Sections 4 and 5 meet the required California Water Plan strategies and support multiple regional water resources objectives.

To develop this analysis, the City of San Diego, the County of San Diego, and the San Diego County Water Authority (SDCWA) collaborated to collect and summarize available information on the region's water supply system and any existing or potential benefits realized from storm water storage or use. Studies used in analysis are in Appendix L.

Just as planned water supply projects can provide water quality benefits, structural solutions for load reduction can have benefits for water reuse and groundwater recharge. Integral to this task were targeted interviews with key staff from the RPs and regional entities whose policies and investments most affect water resource policy and program environment. These interviews included the SDCWA, the City of San Diego Public Utilities Department, San Diego Association of Governments (SANDAG), and local government conservation contacts. On the basis of input received, additional targeted interviews were conducted. Through this interactive approach, regional water resource management planning was coordinated with the screening of nonstructural and structural solutions discussed in Sections 4 and 5.

Detailed review of available documentation identified many water resource programs and projects in the San Diego region but left some uncertainty regarding the degree to which they are being implemented in the CLRP watersheds. Most projects were reported by jurisdiction or by a larger watershed area or groundwater basin area, rather than by individual location. Existing or planned enhancements to local water supplies, recycled water projects and groundwater projects reviewed were included if they appeared to be in or near the study area. Water conservation programs were reported by jurisdiction. The SDCWA provides information on potable water efficiency and conservation targets needed to meet state requirements in the coming decades; however, estimates were reported by region using an aggregate regional water efficiency target. To translate the regional targets to watershed specific targets, additional information will be needed such as specific water efficiency targets in gallons per capita per day (GPCPD) for each jurisdiction/water purveyor, specific and verifiable recycled water use in the study area, and estimates of population per watershed. Therefore, water efficiency and conservation targets noted below are based on a more regional perspective. In the early stages of CLRP program implementation, the RPs may consider translating the regional targets into watershed specific targets and potentially tracking water supply and conservation efforts in the watershed to account for load reduction and other water resources benefits.

6.2 Water Resource Management Setting

The following section discusses current regional water resources goals and management objectives that significantly frame the water resources management setting in the region and that also complement comprehensive load reduction efforts. It also shows how the recommended CLRP BMPs support the required regional and state water plan strategies.

6.2.1 Regional Water Resource Plans and Objectives

In 2005 the City of San Diego, San Diego County, and the SDCWA committed to guiding and managing development of an IRWM Plan. A 32-member Regional Advisory Committee was established with members representing water suppliers, wastewater agencies, environmental groups, flood managers, farm and business interests, tribes, and other parties key to integrated water resources planning. The plan was prepared in accordance with statewide IRWM Program Guidelines, which were established by the State Water Resources Control Board in 2004 and updated in 2007 and prepared pursuant to the California Water Plan Update 2005. The Regional Advisory Committee adopted IRWM Plan Goals and Objectives to both guide their plan and to use as a basis for tracking progress.

In 2009 California experienced its third consecutive year of drought conditions. Effects of the drought were compounded by reduced water supplies and a growing population. Climate change has reduced snowpack storage (and thus water supply reliability) and increased the frequency and intensity of floods. These trends contributed to the continued decline of ecosystems and impairment of waterbodies. The state recognized the importance of these trends for water resources planning in its Water Plan Update 2009, giving new consideration to uncertainty, risks, and resource sustainability; integrated flood management and drought contingency planning; and climate change adaptation and mitigation strategies (CADWR 2009a, 2009b). The plan articulated a number of objectives, some overlapping with the goals and objectives in the IRWM Plan.

Additionally, the California legislature has enacted a number of water conservation and water reliability laws, with several recent enactments particularly pertinent to water supply planning and the CLRPs. Senate Bill 7 enacted in 2009, referred to as SBX7-7, sets a goal of 20 percent statewide reduction in urban per capita water use by December 31, 2020 (with a 2015 interim target), and requires each urban retail water supplier to develop urban water use targets to meet the goal. SB 610 and SB 221 amended the state water code to improve the link between information on water supply reliability and local land use decisions.

On the basis of SBX7-7, SDCWA and its member agencies in the region have established water use efficiency targets through 2035 and projected the amount of additional conservation required after subtracting water cycling projects that can also help meet the target. To meet the SBX7-7 20 percent reduction target, conservation efforts must decrease annual water use by 46,951 acre-feet by 2020. Although SBX7-7 does not require targets beyond 2020, for planning purposes, the SDCWA set year 2025-2035 GPCPD demand according to the member agencies’ 2020 GPCPD targets. To meet the 2030 targets, water conservation measures must lead to a reduction in annual water use of 117,528 acre-feet in the region.

These regional and state water resources goals and objectives may significantly shape comprehensive load reduction efforts. A merged listing of these regional goals and objectives is provided in Table 6-1. These may be used throughout the CLRP program development and implementation to screen and evaluate the selection of BMP types; screen and evaluate the design and location of BMP projects; and evaluate CLRP management scenarios combining different BMP options. While load reduction is the primary goal, the BMPs and strategies may also be evaluated according to how well they support multiple regional goals and objectives.

Table 6-1. Water resources goals and objectives supporting comprehensive load reduction

Overarching goals
Optimize water supply reliability
Protect and enhance water quality
Provide stewardship of our natural resources
Coordinate and integrate water resource management
Integrated water resources management objectives supporting load reduction
Develop and maintain a diverse mix of water resources
Construct, operate, and maintain a reliable infrastructure system
Reduce the negative effects on waterways and watershed health caused by hydromodification and flooding
Effectively reduce sources of pollutants and environmental stressors
Use and reuse water more efficiently; meet water conservation requirements of SBX7-7
Expand conjunctive management of multiple supplies
Reduce energy consumption of water use systems and use
Ensure equitable distribution of benefits
Invest in new water technology
Protect, restore, and maintain habitat and open space

6.2.2 CLRP Structural and Nonstructural BMPs that Support Required Water Resource Management Strategies

IRWM Program Guidelines (CADWR 2004, 2007) established criteria for Proposition 50 funding and listed 11 water management strategies that must be addressed in IRWM Plans: water supply reliability, groundwater management, water quality protection and improvement, water recycling, water conservation, storm water capture and management, flood management, recreation and public access, ecosystem restoration, wetlands enhancement and creation, and environmental and habitat protection and improvement.

The California Water Plan Updates for 2005 and 2009 provided 27 strategies that must be considered in IRWM Plans, and the 2007 San Diego IRWM Plan developed recommended actions/projects using this more detailed list. Of the 27 strategies listed in the Update 2009 Implementation Plan, the following are most relevant to the CLRP's load reduction analyses:

1. Urban runoff management
2. Urban water use efficiency
3. Pollution prevention
4. Ecosystem restoration
5. Conjunctive management and groundwater storage
6. Matching quality to use
7. Flood risk management
8. Economic incentives

9. Agricultural water use efficiency
10. Agricultural lands stewardship
11. Forest management
12. Land use planning/management

6.2.2.1 Structural and Nonstructural BMPs that Support Regional and State Water Plan Strategies

Drawing from the strategies above, the RPs developed a list of structural and nonstructural BMPs that can help address the multiple parameters of concern as discussed in Sections 4 and 5. Table 6-2 lists these BMPs and how they support the 12 required California Plan strategies identified above.

Table 6-2. Structural and nonstructural BMPs supporting required California Water Plan strategies

Type of BMP	Required California Water Plan strategies
Structural BMPs	
Rain gardens	Urban runoff management; Urban water use efficiency; Economic incentives
Bioretention area	Urban runoff management; Urban water use efficiency; Conjunctive management/groundwater recharge
Infiltration trenches	Urban runoff management; Conjunctive management/groundwater recharge
Bioswales	Urban runoff management; Conjunctive management/groundwater recharge
Planter boxes	Urban runoff management
Permeable pavement	Urban runoff management
Sand filter	Urban runoff management
Vegetated swales	Urban runoff management
Vegetated filter strips	Urban runoff management
Water harvesting	Urban runoff management; Urban water use efficiency; Conjunctive management/groundwater recharge; Economic incentives; Matching quality to use
Green roof	Urban runoff management
Trash segregation	Urban runoff management
Surface infiltration basins	Urban runoff management; Conjunctive management/groundwater recharge; Flood risk management
Subsurface infiltration galleries	Urban runoff management; Conjunctive management/groundwater recharge; Flood risk management
Dry extended detention basins	Urban runoff management; Conjunctive management/groundwater recharge; Flood risk management
Subsurface detention galleries	Urban runoff management; Conjunctive management/groundwater recharge; Flood risk management
Subsurface flow wetland systems	Urban runoff management; Conjunctive management/groundwater recharge;

Type of BMP	Required California Water Plan strategies
Constructed and pocket wetland systems	Urban runoff management; Conjunctive management/groundwater recharge;
Nonstructural BMPs	
Development review process	Urban runoff management; Urban water use efficiency; Economic incentives; Pollution prevention; Conjunctive management/groundwater storage; Matching quality to use; Flood risk management; Land use planning/management
Enhanced inspections and enforcement	Urban runoff management; Pollution prevention; Urban water use efficiency
SUSMP and regulatory enhancement	Urban runoff management; Urban water use efficiency; Pollution prevention
New/expanded initiatives	Urban runoff management; Urban water use efficiency; Pollution prevention; Agricultural water use efficiency
Landscape practices	Urban runoff management; Urban water use efficiency; Pollution prevention; Conjunctive management/groundwater storage; Matching quality to use; Flood risk management
Education and outreach	Urban runoff management; Urban water use efficiency; Economic incentives; Pollution prevention; Conjunctive management/groundwater storage; Matching quality to use; Flood risk management; Land use planning/management; Agricultural water use efficiency; Forest management
MS4 maintenance	Urban runoff management; pollution prevention
Capital improvement projects	Urban runoff management; Ecosystem restoration; Water use efficiency; Pollution prevention

6.3 Water Supply, Water Conservation Programs and Associated Load Reductions

The following sections summarize water supplies in the region and conservation efforts throughout the watershed. They discuss potential load reduction benefits associated with the water supply and conservation programs.

6.3.1 Water Supplies

SDCWA purchases water from the Metropolitan Water District of Southern California (MWD). In turn, SDCWA's 24 member agencies purchase the imported water for retail distribution in their individual service areas. The City of San Diego is the largest member agency of the SDCWA, both in terms of land area (22 percent of the service area) and in normal year water demand (42 percent of the demand in 2010) (SDCWA 2011).

The SDCWA imported supply comes from two suppliers: the State Water Project, diverting water from Northern California to Southern California through a 444-mile-long aqueduct; and the Colorado River, via a 242-mile-long aqueduct bringing Colorado River water from Lake Havasu to the MWD service area. The Colorado River makes up 50 percent of the imported water supply. MWD blends Colorado River water and State Water Plan water at a facility in Riverside County, and then transfers it to the water treatment plants in the San Diego region. Because of the increasing cost and potential vulnerabilities of these two systems, local resources developed by SDCWA's member agencies have become increasingly critical in developing a more diverse and reliable water supply for the region.

The Chollas watershed overlies the Sweetwater Valley groundwater basin. Although groundwater basins in the region generally have stable groundwater levels and none are in overdraft (CADWR 2004), groundwater supplies and production are more limited in the San Diego region than in other regions of California (SDCWA 2011). Constraints to the use of the regional groundwater basins include

- Small geographic extent of the more productive sand and gravel (alluvial) aquifers
- The shallowness of most of the alluvial aquifers
- Limited yield and storage in the sedimentary deposits
- The lack of rainfall and groundwater recharge
- Impacted water quality from human activities, requiring treatment before domestic or agricultural uses.

Despite these constraints, the SDCWA and its member agencies believe that the undeveloped brackish groundwater could meet a larger portion of the region's future water demand than presently projected. The 2007 IRWM Plan established a target of increasing groundwater supply within the Water Authority Service Area from about 14,960 acre-feet per year (AFY) in 2006 to 28,580 AFY by 2010 and to 31,180 AFY by 2030. According to the August 2011 IRWM Plan Report Card, groundwater supplies from the SDCWA member agencies totaled 20,833 AFY in 2010 and are projected to total more than 48,000 AFY by 2030. Appendix L includes more details regarding surface and groundwater resources.

In late 2011 the City of San Diego will begin a multiyear project to further investigate, evaluate, and develop its groundwater assets (City of San Diego 2010d). Some elements of the project include preparing aquifer storage and recovery plans, seawater intrusion and control plans, nutrient and salinity management plans, and groundwater specific designs. Although no centralized storm water capture and groundwater recharge facilities are planned in the study watershed areas, such facilities could be effective at reducing pollutant loads and should be considered from a multi-benefit perspective. Moreover, many of the structural BMPs being evaluated for the CLRP and conservation measures such as rainwater harvesting and permeable landscapes, if implemented on a widespread scale in the watershed, have potential for significant storm water and rainwater infiltration and selective groundwater recharge.

6.3.1.1 Potential Load Reduction Benefits associated with Water Supplies

In recent years, the cost of imported water has doubled and is projected to double again in the next 10 years. This increased cost along with drought and water supply reliability issues have spurred efforts to develop a more diverse mix of water resources in the region.

The clear trends for enhancing regional water supply systems are increasing the production and use of recycled water and brackish groundwater. Increased recycled water use does not appear to have storm water load reduction benefits. Indeed, recycled water used for irrigation has the potential to increase storm water loading of nutrients and salts because of elevated concentrations of total dissolved solids, which characterize the region's recycled water. The RPs must take care to mitigate this potential impact as recycled water use is expanded. If properly managed, recycled water can yield reductions in wastewater discharge loading and provide other beneficial uses such as providing nutrients for agricultural and landscaping/nursery areas and enhancing environmental features such as wetlands.

A number of structural storm water BMPs and conservation measures under evaluation provide load reduction and increased infiltration. The degree to which these distributed and centralized BMPs are implemented will determine the cumulative potential for groundwater recharge benefits in the study area watersheds.

Although there are no plans for storm water capture and recharge of groundwater or plans for storm water capture and treatment, such projects could also play a role in comprehensive load reduction and increased local water supplies and should be considered from a triple bottom line perspective. In the future, an overarching strategy in evaluating and selecting among these various options will be, “the right water supply for the right use.”

6.3.2 Water Conservation Programs

The 2007 IRWM Plan set a target of increasing water conservation savings in the region from about 51,000 AFY in 2006 to at least 79,960 AFY by 2010 and 108,400 AFY by 2030. According to the August 2011 *IRWMP Report Card*, SDCWA and member agencies reduced per capita water use by 27 percent between 2007 and 2010. The SDCWA and its member agencies have committed to an aggregate efficiency target of 167 GPCPD by 2020. This includes all water uses except those for agriculture. (Note that communities have each established their own efficiency target. By way of comparison, the City of San Diego has established a 2020 goal of 142 GPCPD.) The region has now set a more aggressive target of water conservation savings of 138,400 acre-feet annually by 2030.

As noted above, when verifiable recycled water projects are subtracted from water use efficiency targets for the region, significant additional conservation is required to meet the state’s 20 percent reduction goal by 2020 (Table 6-3). The 2020 conservation target for the region (46,951 acre-feet) more than doubles by 2035 if the region is to maintain the 2020 per capita water use efficiency. Note that some jurisdictions and water agencies have met or are making significant progress in meeting the 2020 target.

Table 6-3. Regional conservation requirements to meet and sustain SBX7-7 targets

Targets to sustain SBX7-7 (acre-feet)	2015	2020	2025	2030	2035
Additional conservation required	6,737	46,951	72,234	97,280	117,528

This section discusses storm water-related water conservation programs in the watershed that are ongoing or are being explored, and it evaluates the potential for these BMPs to help meet the long-term water conservation and load reduction targets. It focuses particularly on those local programs related to rainwater harvesting, downspout redirection, permeable landscapes, whole-site functional landscapes, and urban irrigation reduction.

6.3.2.1 Types and Purposes of Programs

Water conservation has been a part of the outreach throughout San Diego County. Rainwater harvesting or rain barrels, lawn and garden practices, *good housekeeping* for outdoor projects, and pet waste management are typical residential BMPs promoted by regulated municipalities across the country. California’s recent droughts and population growth have added new layers of urgency and regulations, requiring even stronger conservation measures. The most prevalent types of water conservation, recharge, and turf conversion programs related to storm water load reduction can be generally characterized as

- **Rainwater harvesting**: Initiatives promoting the use of rainwater catchment systems (i.e., rain barrels and cisterns) that intercept wet-weather or storm event runoff in a storage unit, enabling use of the retained water for non-potable purposes.
- **Downspout redirection**: Modification of structural rainwater collection systems (i.e., gutters, downspouts and drains) to direct storm event runoff intentionally into storage systems or permeable areas of a site, reducing direct discharge of storm water to constructed storm drainage systems or across impervious surfaces.

- **Permeable landscapes**: The use of landscape materials and techniques, including turf conversion, xeriscaping, grading, soil amendment, or removal of impervious surfaces, intended to: reduce irrigation demand; increase the area of a site that performs natural hydrologic functions such as rainwater storage, groundwater infiltration, and evapotranspiration; and reduce the volume of storm water reaching constructed drainage systems or impervious surfaces.
- **Whole-Site Functional Landscapes:** This approach combines rainwater harvesting, downspout redirection, and permeable landscapes on a site scale to replicate a natural landscape and have a neutral hydrological impact from development.

In arid and semi-arid climates such as Southern California, urban irrigation reduction and water efficient irrigation device incentives are common components of local water department conservation programs. Through reducing over-irrigation, these incentive programs can reduce dry-weather runoff. More detailed information about these water conservation and water efficiency approaches is in Appendix L.

Despite their increasing prevalence and available financial incentives, these types of residential BMP programs generally have not been deployed as a strategy to yield measurable, quantifiable pollutant reduction, either in an NPDES permitting or TMDL context. In most urbanized watersheds, modeling and assessments consistently indicate that residential properties represent a substantial source of pollutant loading and storm water runoff volume. However, the nature and scale of these residential BMPs, and of nonpoint source pollution reduction efforts in general, makes it difficult to assess the effective pollutant reduction that can be obtained.

While rainwater harvesting systems generally are not used as primary treatment for water quality and pollutant removal, there is increasing evidence that rain barrels and cisterns can be successful at reducing pollutant loads when used in a *treatment train* that discharges water to other BMPs, such as bioretention areas or rain gardens.

Almost all the local governments in the region and a number of other water agencies are implementing water conservation incentives and educational programs to some degree. For the most part, these include rebates for water efficient irrigation devices and some form of permeable landscape assistance, typically free advice from a landscaper or in the case of the City of San Diego, rebates for landscape conversion. The County of San Diego has an ongoing rain barrel incentive program. These and other incentive programs being explored in the watershed are discussed more fully below. Note that in addition to these incentive programs, the City of San Diego has water conservation in landscaping ordinances requiring water efficient landscaping for new development.

6.3.2.2 City of San Diego Water Conservation Program Activities

At this time, the City of San Diego is evaluating development of an ongoing rainwater harvesting program to provide rain barrels at a discount from retail costs. The rain barrel program began in January 2012. The purpose of the program would be to promote water conservation and reuse, runoff reduction, and redirection of collected rainwater to permeable surfaces and landscaping.

In 2009 the city’s Transportation and Storm Water Department, Storm Water Division implemented Phase II Rain Barrel Downspout Disconnect (RBDD) Best Management Practices Effectiveness Monitoring and Operations Program. The study included installing and assessing 24 rain barrels at seven facilities in the City of San Diego. The project was intended to evaluate the potential for RBDD as a cost-effective BMP that reduces storm water runoff and improves water quality. The project monitored the effectiveness of storm water flow reduction and pollutant load reduction from rooftop runoff. In addition, the program has potential applicability for TMDL implementation programs in reducing heavy metals, pesticides, nutrients, bacteria and sediment in the local watershed.

The RBDD systems were designed to reduce the volume of storm water runoff from rooftop drainage areas and use existing landscaped vegetated areas or planter boxes to infiltrate and treat the runoff. The

RBDD configuration for each facility was based on existing site constraints. Where feasible, the rooftop runoff was discharged into the existing landscape. For sites with insufficient existing landscape or where soils had low infiltration rates, a raised planter bed (planter box) was constructed to provide treatment and filtration.

The study included an evaluation of three different RBDD configurations

- Gravity-flow system that discharges to existing landscape. This system continuously captures and discharges the runoff throughout the storm event.
- Automated storage system that captures and stores runoff for use once the storm event has passed.
- Planter-barrel system that discharges to raised planters. This configuration was designed to accommodate both gravity-flow and automated discharge.

The city conducted water quality and volume monitoring and found a significant reduction in water volume but no significant change in water quality. Pre- and post-installation monitoring took place at five of the seven sites. The gravity-flow system was ranked the highest for flow reduction, pollutant load reduction and ease of O&M. In certain configurations, the gravity-flow system was able to reduce the rooftop runoff by 6.5 times the actual volume of the rain barrel. When the gravity-flow system was discharged to areas of existing vegetation, 100 percent of the flow was attenuated (assumed but not measured). The automated system is limited to capturing the volume of the barrel (because of pump failure) and therefore has lower flow attenuation and pollutant load reduction. In the automated systems, capacity was often exceeded because of electrical or mechanical problems with the drainage pumps. Overflow volumes from RBDD systems were not monitored.

The gravity-flow, planter-barrel system was found to have insufficient infiltration area for the larger roof drainage areas. In these situations, infiltration can be increased through a series of infiltration strategies (e.g., overflowing into an area of permeable paving).

Pollutant load reductions were calculated for metals, TSS, and bacteria. Facilities with copper or galvanized metal roofing materials had higher measurable concentrations of copper and zinc. The gravity-flow system was able to provide the greatest load reduction for all constituents because of flows reaching porous landscapes. The planter-barrel system was able to provide metal load reductions at sites that had metal roofing materials but had an increase in TSS concentrations and indicator bacteria. This was likely because of the lack of fully established vegetation. The increase in bacteria could also be associated with the underdrain and environmental bacteria in the soil. It is presumed that planters with increased heights will provide greater treatment; however, no qualitative results are available. It is suggested that the planter-barrel system be flushed at least annually to prevent buildup of bacteria and sediment. The automated storage systems provided the least pollutant load reduction.

The City of San Diego Public Utilities Department has a turf conversion rebate program that provides $1.25 per square foot converted. Applicants must convert at least 400 square feet of existing turfgrass to more drought-tolerant vegetation. The maximum area covered by the rebate is 1,600 square feet, and the maximum rebate per household or participant is $2,000.

The City of San Diego Public Utilities Department also has a rebate program, which was initiated as an incentive to improve irrigation systems and shift residential customers to more water-efficient irrigation, particularly *smart controllers* that adjust watering schedule according to weather and season and reduce watering when not required. The City's current rebate of $1.25 per square foot of turf converted to sustainable landscaping, or $1.50 if professionally designed plans are submitted, is above the median rebate amount of $1 per square foot among the programs surveyed (Table 6-4). Single-family, commercial and multifamily properties are eligible for micro-irrigation rebates. These rebates ($0.20 per square foot up to $1,000) are funded through a California grant on a first-come first-served basis. City of

San Diego residents can also participate in the rebate program sponsored by the Metropolitan Water District of Southern California.

The City also offers residential and commercial surveys that include an assessment of the irrigation system and irrigation scheduling.

Table 6-4. City of San Diego Public Utilities Department rebate programs utilization as of 5/10/11

Total residential and commercial combined	Total rebate applications received	Total rebate checks sent
Smart irrigation controller rebate	18	7
Micro irrigation rebate	55	13
Sustainable landscape – turf replacement	83	10
Total	156	30

The City does not have an active downspout redirect program but is exploring incentives for such a program, as noted above.

6.3.2.3 San Diego County Conservation Program Activities

San Diego County Department of Public Works implemented a rain barrel sales program. Rain barrels and downspout diverters were made available to qualifying County unincorporated area residents at a subsidized rate of ~$30.00. Residents from other areas paid full price for the set ups. The program has generated a lot of interest in the community. A growing list of interested parties now has over 100 names. The program is currently being evaluated, and may offer more flexibility to residents in the future.

6.3.2.4 San Diego County Water Authority Conservation Program Activities

SDCWA helps single-family and multifamily customers and businesses of participating agencies identify indoor and outdoor water savings opportunities through *smart landscape* evaluations. Technicians review the performance of the site's irrigation system and provide customers with a list of recommendations to improve water efficiency, including plant alternatives and a proposed water schedule. This service is provided at no cost to the customer.

SDCWA participates in the MWD's regional SoCal Water$mart rebate program. Among a variety of incentives for residential customers, the program offers rebates for weather-based irrigation controllers (base rebate $25) and rotating nozzles and sprinklers (base rebate $13). SDCWA also participates in the Metropolitan Water's Save A Buck program, which offers commercial, industrial, and institutional vouchers for water saving devices including weather-based irrigation controllers ($25 rebate per station), large rotary nozzles ($13 rebate per set), and central computer irrigation controllers ($25 rebate per station) with a $25,000 limit on rebates per service address.

The Mission Resource Conservation District has been under contract to the SDCWA to operate agricultural management services since 1990. The district has provide more than 1,700 audits on more than 28,000 acres of avocados, citrus, field flowers, and other fruits and ornamentals. The goals of the program are to provide technical assistance to growers to enable them to irrigate crops as efficiently as possible.

6.3.2.5 Potential Load Reduction Benefits associated with Water Conservation Programs

Most local governments in the region are implementing conservation incentive and educational programs to some degree, the most typical being incentives for water efficient irrigation devices and free professional advice upon request regarding landscape conversion. Stronger programs for rainwater harvest, downspout disconnection, permeable landscapes, and urban irrigation reduction offer significant potential for comprehensive load reduction and groundwater recharge and have become increasingly important in light of the state's water efficiency targets for 2020 and the region's MS4 permit requirements for reductions in effective impervious area.

Despite the increasing prevalence of conservation BMPs, their load reduction benefits have not been systematically measured and quantified. A few studies exist with site-scale observed performance monitoring data, but extrapolating site-scale benefits to the watershed cannot be done readily because performance is influenced by degree of implementation, available lot space, timing of rainfall and pollutant transport, and many other factors. However, the CLRP program has modeling tools that can be used to simulate and estimate benefits from these BMPs. For example, urban irrigation can be simulated in the LSPC model using a program module that calculates evapotranspiration demand on the basis of soil moisture condition and allows for demand-based irrigation to be specified. Irrigation can also be disabled for a user-specified period following a rainfall event. Irrigation technologies of varying efficiencies can be incorporated, and irrigation can be applied to varying fractions of urban pervious land cover. Land cover representing xeriscaping and water harvesting can also be developed. Studies indicate that California could reduce outdoor residential water use by 25 to 40 percent through improved landscape management practices and better application of available technology (Gleick et al. 2003). In a recent model application in Los Angeles County evaluating dry-weather runoff, an assumption of 25 percent reduction in urban irrigation was used as a conservative estimate of what is achievable, which resulted in an average dry-weather flow and load reduction of 43 percent. Rainwater harvesting practices can be simulated directly in SUSTAIN or on a unit-area basis in LSPC, accounting for variations in storage volume, water use, and time-varying precipitation.

This leads to another key finding: it is easy and common to overestimate the benefits of conservation BMPs. The RPs and contractors must take care to develop conservative and realistic assumptions for model simulation inputs, including the realistic participation rates by residential, commercial, and other properties in the study watersheds.

6.4 Water Quality Project Opportunities with Multiple Water Resources Benefits

As discussed above, the *types* of BMPs being evaluated for load reduction were specifically selected because they support multiple water resources goals and objectives, including improved water quality; water conservation and efficiency; groundwater recharge; open space and habitat; water supply diversity and reliability; and investment in new, and where possible, more energy-efficient technologies (Table 6-5). According to studies and experience in other arid and semi-arid climates, several of these BMPs offer the broadest water resource opportunities: infiltration basins, extended detention, rain gardens, bioretention areas, and water harvesting.

Table 6-5. BMP project types supporting multiple regional water resources objectives

BMP	Water quality	Water conservation/efficiency	Selective groundwater recharge	Improve open space & habitat	Hydromodification & flooding	Reliability/diversity of supply	New technology\energy efficiency
Centralized structural BMPs							
Surface infiltration basins	✓	✓	✓		✓	✓	
Subsurface infiltration basins	✓	✓	✓		✓	✓	
Dry extended detention basins	✓	✓	✓		✓	✓	
Subsurface detention systems	✓	✓	✓		✓	✓	
Constructed and pocket wetland systems	✓	✓	✓	✓	✓	✓	
Subsurface flow wetland systems	✓	✓	✓	✓	✓	✓	
Distributed structural BMPs							
Rain gardens	✓	✓	✓	✓	✓	✓	
Bioretention area	✓	✓	✓	✓	✓	✓	
Infiltration trenches	✓	✓	✓				
Bioswales	✓	✓	✓				
Planter boxes	✓		✓				
Permeable pavement	✓		✓				
Vegetated swales	✓		✓				
Vegetated filter strips	✓		✓				
Water harvesting	✓	✓	✓	✓			✓
Green roofs	✓						✓
Trash segregation	✓						
Nonstructural BMPs							
Development review process	✓	✓		✓	✓		✓
Enhanced inspections and enforcement	✓						✓
SUSMP and regulatory enhancement	✓	✓			✓		✓
New/expanded initiatives	✓	✓		✓	✓	✓	✓
Landscape practices	✓	✓	✓	✓	✓	✓	✓
Education and outreach	✓	✓		✓			
MS4 maintenance	✓			✓	✓		
Capital improvement projects	✓		✓	✓			✓

7 Implementation Recommendations

This section provides a summary of the CLRP implementation recommendations for the Chollas watershed. These recommendations form the basis of a CLRP Implementation Program which together with the CLRP itself represents the initiation of an ongoing implementation process. This program will facilitate the RPs' continued BMP analyses, planning, assessment, and optimizing adjustments. It will also be used to explore joint funding opportunities, conduct future water quality monitoring evaluations and periodic program review, and identify needed modifications and improvements to the CLRP over the implementation period.

Included in this section is a BMP Implementation Schedule that lists the potential future actions of the CLRP Implementation Program and nonstructural and structural BMP opportunities. These recommendations serve as the foundation for future decisions for comprehensive load reduction planning in the watershed. Given the iterative and adaptive framework for the CLRP Implementation Program, these recommendations are subject to change depending on future assessments, BMP optimization, available funding, and other essential RP obligations.

7.1 CLRP Implementation Program

The RPs are committed to embarking on a CLRP Implementation Program to attain compliance with the TMDL and facilitate strategic decision making, assessment, and adaptation of the CLRP. The RPs recognize that no plan is meaningful without commitment and a mechanism for continued coordination and planning. During development of the CLRP, the RPs worked to present one watershed-based plan both to better manage pollutant loads and to serve as a foundation for decisions regarding future BMP implementation. In the coming years, lessons will be learned from projects implemented, conditions will change, new technologies will emerge, and unanticipated challenges will present themselves. Thus, implementation of the CLRP will require continued evaluation and adaptation. The following discusses key management actions planned for the CLRP Implementation Program.

7.1.1 Establishment of CLRP Implementation Program

A CLRP Implementation Program will be established, incorporating an adaptive management approach. The program will allow the RPs to continue coordinating on selecting and implementing cost-effective BMPs over the implementation period. The program will allow for refinements of the implementation recommendations over time as new information is obtained regarding cost-effectiveness and to achieve compliance with the Bacteria TMDL and other applicable water quality permits and standards. Importantly, it will assess the optimal balance of centralized and distributed BMP types and locations in light of planned nonstructural BMP load reduction activities. Quantification of the pollutant load reductions, design sizes, and costs will be developed in the early phase of the program. The program will also assess the degree to which centralized and distributed BMPs may need to be implemented on private land, in addition to those specified in this CLRP, to meet required load reductions.

The CLRP recommendations provide the information needed to begin planning for nonstructural and structural BMPs that may be implemented. The high-ranked BMP sites and activities in Sections 4 and 5 of this plan provide an immediate and strong foundation for each RP's CLRP program development.

7.1.2 Initial Structural and Nonstructural BMP Analysis

Although a number of nonstructural and structural BMPs have been recommended for comprehensive load reduction in the Chollas watershed, additional analysis is needed regarding their sufficiency and cost-effectiveness in meeting the WLAs. Section 4 identifies a potential list of new nonstructural BMPs or enhancements of existing nonstructural BMPs that are anticipated to yield significant load reductions for the key PGAs and HPMAs. Section 5 identifies distributed and centralized structural BMPs that RPs can implement on publicly owned land to further reduce pollutant loads, particularly in HPMAs. The RPs will use adaptive management to continue to refine the understanding of the optimal combination of these recommended BMPs and the potential need for BMP retrofits on privately owned land.

In the CLRP's nonstructural and structural BMP planning, the relative cost-effectiveness of the various BMPs was key in the phasing of implementation. Nonstructural BMPs are effective at reducing pollutant loads before they enter the storm drain and are recommended to begin in the early stages of implementation. Initial program activities will focus on the PGAs and HPMAs, which will be further refined on the basis of future monitoring and modeling studies. Centralized BMPs on public land are included in the CLRP and may help facilitate compliance with the Bacteria TMDL. These BMPs will also be considered early in the scheduling of BMP implementation, particularly in the HPMAs. Again, early implementation will focus on the development of distributed BMPs in HPMAs, where feasible. BMPs implemented on public land outside the PGAs and HPMAs would further reduce loading; however, the cost per load reduced could be greater.

Figure 7-1 presents a conceptual cost-effectiveness curve that can form the basis for future analyses. With a modeling tool capable of providing comparative BMP performance results, such a cost-optimization curve can be developed for the watershed by selecting those BMPs that provide the greatest load reduction relative to cost early in the planning process (represented by the steep slope at the beginning of the curve), followed by the addition of less cost-effective BMPs (represented by the reduced slope at the end of the curve). Essentially, the combination of those BMPs that are most cost effective can be selected for implementation early in the planning period (e.g., nonstructural BMPs and structural BMPs on public land); the less cost-effective BMPs (e.g., structural BMPs on private land requiring land acquisition) are scheduled for later in the planning period. This strategy allows more time for evaluation of alternatives, acquiring funding, and verifying load reductions achieved by BMPs implemented earlier in the schedule.

The initial structural and nonstructural BMP analysis will yield an improved understanding of the cost-effectiveness and benefits of the alternative strategies and their combinations. These results will better inform the remaining CLRP Implementation Program and provide a basis for adapting the CLRP to maximize its likelihood of successfully attaining the WLAs in the watershed based on available funding and other RP priorities and responsibilities.

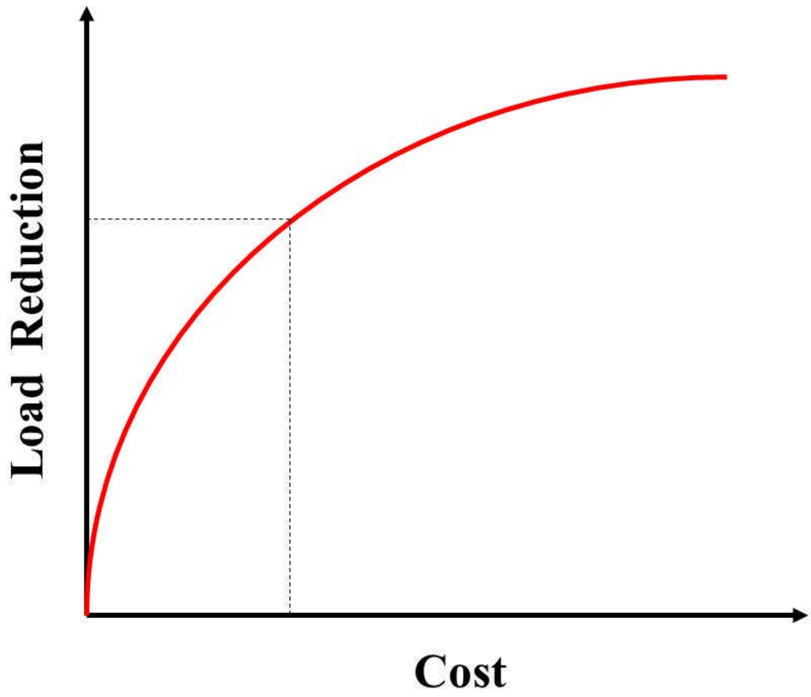

Figure 7-1. Example cost-effectiveness curve for structural and nonstructural BMP analysis

7.1.3 CLRP Modifications and Improvements

An iterative and adaptive framework is essential to ensuring that the RPs attain compliance with the Bacteria TMDL. During the periodic program reviews, findings from the activities of the CLRP Implementation Program and modifications to the BMPs will be included in the BMP Implementation Schedule. Activities that will support justification for CLRP revisions and inform alternative strategies for BMP implementation and the BMP Implementation Schedule include, for example, the following:

- Initial structural and nonstructural BMP analysis (Section 7.1.2)
- Periodic BMP assessment and optimization adjustments (Section 7.1.4)
- CLRP reporting (Section 7.1.5)
- Monitoring (Chapter 8)

The overlapping schedules for these activities are presented in the BMP Implementation Schedule in Section 7.2.

7.1.4 Periodic BMP Assessment and Optimization Adjustments

As both structural and nonstructural BMPs are implemented, their effectiveness will be tracked in parallel efforts for CLRP reporting (Section 7.1.5) and continuous monitoring (Section 8). BMP assessments will be periodically performed to provide meaningful information for needed CLRP revisions or adjustments to the nonstructural and structural BMPs that may be implemented in the future.

For nonstructural BMP assessment, the information collected varies significantly depending on the activities undertaken. Moreover, the methods for assessing effectiveness vary tremendously from one BMP to another. Through past experience in WURMP reporting, and internal methods for ensuring cost-effective program implementation, the RPs have developed various procedures for assessing nonstructural

BMP effectiveness which can be shared with all RPs in the watershed as part of the CLRP Implementation Program.

As structural BMPs are implemented, their effectiveness is more straightforward to assess. Methods that can be employed include pre- and post-construction monitoring, and tracking of the costs for planning, permitting, design, construction, operation, and maintenance. Likewise, it will be important to track the specific characteristics of each BMP to build a local database that ties these characteristics to effectiveness measures. Such characteristics could include the size of the area treated by the BMP (distributed or centralized), the type of BMP (e.g., bioretention, detention, porous pavement, or combination or various types), soil characteristics, infiltration rates, land use, and the like. With such a database in place, research can be focused to better inform the overall CLRP Implementation Program and guide specific studies and resources to those BMP characteristics for which their effectiveness is less understood. As a result, not every structural BMP would require monitoring. Rather, as the effectiveness of certain BMP characteristics is well understood, those results can be extrapolated to all other BMPs sharing those same characteristics. Also, these results can be incorporated into future modeling studies, as discussed in Section 7.1.2, thereby providing an improved prediction of future load reductions and costs for implementing structural BMPs in the BMP Implementation Schedule. With this ability to prioritize research needs on those BMP characteristics least understood, the CLRP program will optimize the overall cost for BMP assessment.

Initially, BMP assessment will focus primarily on information compiled and reported in WURMPs , and results of monitoring studies as discussed in Chapter 8. BMP-specific studies may be recommended to focus future BMP assessments and optimization adjustments to support program refinements in subsequent years.

7.1.5 CLRP Reporting

The RPs will prepare periodic Progress Reports to document progress of the CLRP in accordance with the approved schedule included in the applicable regulatory document. Progress Reports will provide status updates of BMP activities and the results of monitoring studies. These reports may also include updates to this CLRP and the BMP Implementation Schedule. The first CLRP update may replace the current Watershed Urban Management Plan (WURMP) for the Chollas watershed.

7.1.6 Continued Coordination

The RPs will meet regularly throughout the duration of the BMP Implementation Schedule to continue collaboration and coordination. These meetings will include status updates from each RP on BMP implementation and strategizing of ongoing activities in the CLRP Implementation Program.

7.2 Comprehensive Compliance Schedule—BMP Planning and Scheduling

The Bacteria TMDL Basin Plan Amendment was approved in April 2011, which represents the start date for complying with the WLAs and other TMDL requirements. This CLRP incorporates a 20-year compliance schedule and recognizes BMP development and planning efforts that have been completed to date, including development of the CLRP itself. A BMP Implementation Schedule was developed to focus on the BMP and monitoring actions that may be implemented in future years according to the following overarching strategy: nonstructural BMPs are scheduled to be implemented in years 0–5; currently planned structural BMPs on public land in years 0–10, centralized and distributed structural BMPs on public land in years 3–15, and structural BMPs on private land in years 15–20.

Table 7-1 provides the BMP Implementation Schedule to meet the TMDL compliance milestones. For each nonstructural BMP category, the BMP Implementation Schedule designates the anticipated timeline for BMP implementation and O&M, which corresponds to cost estimates reported in Section 7.3. Likewise, for each structural BMP, the BMP Implementation Schedule designates expected timelines for planning, design, construction, and O&M, also incorporated in developing cost estimates in Section 7.3. Implementation of BMPs may be subject to funding availability and other considerations.

Most of the planned or newly identified BMP opportunities are not funded, and the time frame to secure the necessary funding for each BMP is not incorporated in the implementation schedules. With the state of the economy, the availability of financial resources is extremely limited, and the lack of funding could delay the implementation start and end dates. These challenges will be continually re-evaluated and addressed through an adaptive management process throughout the implementation period.

BMP implementation is subject to further evaluation of funding opportunities and other considerations. For example, Caltrans funds are subject to legislative appropriation and availability given the constraints in California law (Streets and Highway Code Section 114 & 130) and the California Constitution (Article XVI, Section 7. Additional factors related to the order of phasing will be considered during periodic program reviews and optimization adjustments. The prioritization of projects in Section 5 can be a preliminary aid to project selection when implementing the BMP Implementation Schedule.

Table 7-1. BMP Implementation Schedule

	Implementation
	Alternate RP implementation phase
	O&M

Management actions	RP						Implementation year																		
	CSD	CTRANS	LAMESA	LGR	SDC	PORT	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
CLRP IMPLEMENTATION PROGRAM ACTIONS																									
Initial structural and nonstructural BMP analysis	√	√	√	√	√	√																			
CLRP modifications and improvements	√	√	√	√	√	√																			
CLRP reporting	√	√	√	√	√	√																			
NONSTRUCTURAL																									
DEVELOPMENT REVIEW PROCESS																									
Amend regulations to facilitate LID implementation	√		√	√																					
Train staff and boards	√		√	√																					
ENHANCED INSPECTIONS and ENFORCEMENT																									
Mobile business training requirements	√		√	√																					
Power washing discharges inspection/	√		√																						

Management actions	RP						Implementation year																		
	CSD	CTRANS	LAMESA	LGR	SDC	PORT	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
enforcement																									
Enhanced IC/ID reporting and enforcement		√																							
Property based inspections	√	√	√	√																					
Inspection standards for PGAs of concern				√																					
SUSMP and REGULATORY ENHANCEMENT[11]																									
Amend SUSMP, other code and zoning requirements, including adding retrofit requirements, to reduce pollutants from:																									
Trash enclosure & storage areas	√		√	√																					
Animal-related facilities	√		√																						
Nurseries and garden centers	√		√																						
Auto-related uses	√		√																						
Update minimum BMPs	√																								
NEW/EXPANDED INITIATIVES																									
Address bacteria & trash impacts of homelessness	√		√																						
Pilot projects to disconnecting impervious surfaces	√																								
Support for brake pad partnership	√	√	√	√		√																			
LANDSCAPE PRACTICES																									

[11] Adoption of revised standards and use in development review at the end of the implementation period

	RP						Implementation year																		
Management actions	**CSD**	**CTRANS**	**LAMESA**	**LGR**	**SDC**	**PORT**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Landscape BMP incentives, rebates, and training:																									
Residential properties	√		√	√																					
Homeowners' associations/property managers	√			√																					
Non-residential properties	√																								
Reduction of over-irrigation	√		√																						
Irrigation, pesticide & fertilizer reduction		√				√																			
EDUCATION AND OUTREACH																									
Enhanced and expanded trash clean-up programs	√	√	√	√		√																			
Improve web resources on reporting	√		√	√		√																			
Refocused or enhanced education and outreach to target audiences:																									
Equestrian community	√																								
General/Other	√		√	√																					
MS4 MAINTENANCE																									
Optimized or enhanced catch basin inlet mgmt.,	√		√																						
Proactive MS4 repair & replacement	√	√	√	√																					
Increased channel cleaning & scour pond repair	√	√																							

Management actions	RP						Implementation year																		
	CSD	CTRANS	LAMESA	LGR	SDC	PORT	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Street sweeping enhancements & expansion:																									
Increased/optimized sweeping	√		√																						
Sweeping medians on high-volume segments	√		√																						
Upgraded sweeping equipment	√	√	√																						
Sweeping of private surfaces in targeted areas	√		√																						
Erosion repair and slope stabilization:																									
Public property & right of way	√	√		√																					
Enforcement on private properties	√																								
CAPITAL IMPROVEMENT PROJECTS																									
Dry weather flow separation	√																								
Sewer pipe replacement			√																						
Reduction of groundwater infiltration			√																						
Mitigation and conservation initiatives		√																							
STRUCTURAL[12]																									

[12] Implementation phases for structural BMPs includes periods for planning, design, and construction, with each period considered and included in cost estimates presented in Section 7.3.

Management actions	RP						Implementation year																		
	CSD	CTRANS	LAMESA	LGR	SDC	PORT	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
STRUCTURAL: PLANNED AND IMPLEMENTED																									
PLANNED AND IMPLEMENTED BMPS: CENTRALIZED																									
Implemented - Centralized 1	√																								
Implemented- Centralized 2	√																								
Planned - Centralized 3			√																						
Planned - Centralized 4			√																						
PLANNED AND IMPLEMENTED BMPS: DISTRIBUTED																									
Implemented - Distributed 1-10	√		√	√																					
Planned - Distributed 11-14	√		√	√																					
Planned - Distributed 15-19	√		√	√																					
Planned - Distributed 20-23	√			√																					
Planned - Distributed 24-27	√			√																					
Planned - Distributed 28-30	√																								
Planned - Distributed 31-33	√																								
Planned - Distributed 34-36	√																								
Planned - Distributed 37-39	√																								
Planned - Distributed 40-42	√																								

Management actions	RP						Implementation year																		
	CSD	CTRANS	LAMESA	LGR	SDC	PORT	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
STRUCTURAL: NEW BMPS ON PUBLIC PARCELS																									
NEW BMPS: Centralized																									
Centralized - BMP 1	√																								
Centralized - BMP 2-3	√		√																						
Centralized - BMP 4	√																								
Centralized - BMP 5-6	√		√																						
Centralized - BMP 7	√																								
Centralized - BMP 8	√																								
NEW BMPS: DISTRIBUTED																									
Distributed - BMP 1-20	√		√	√																					
Distributed - BMP 21-43	√		√	√	√																				
Distributed - BMP 44-65	√		√	√																					
Distributed - BMP 66-88	√		√	√																					
Distributed - BMP 89-112	√		√	√	√																				
Distributed - BMP 113-135	√		√	√																					
Distributed - BMP 136-158	√		√	√																					
Distributed - BMP 159-182	√		√	√	√																				
Distributed - BMP 183-205	√		√	√																					
Distributed - BMP 206-228	√		√	√																					

Management actions	RP						Implementation year																		
	CSD	CTRANS	LAMESA	LGR	SDC	PORT	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Distributed - BMP 229-251	√		√	√	√																				
Distributed - BMP 252-272	√		√	√																					
Distributed - BMP 273-292	√		√	√																					
STRUCTURAL: NEW BMPS ON PRIVATE PARCELS																									
NEW BMPS: CENTRALIZED																									
Planning through O&M																									
NEW BMPS: DISTRIBUTED																									
Planning through O&M																									

7.3 Economic Justification

For each of the nonstructural BMPs and structural BMPs on public land included in the BMP Implementation Schedule, preliminary cost estimates were developed to support future planning and securing funds for implementation. This excludes the potential need for structural BMPs on private land that might be needed in the later phase of the schedule. As noted, the initial structural and nonstructural BMP analysis and periodic BMP assessment and optimization adjustments will continue to assess the degree to which centralized and distributed BMPs would need to be implemented on private land to meet required load reductions. On the basis of optimization modeling performed for these activities, cost estimates will be adjusted, and the timeline of implementing specific BMP projects will be refined.

Implementation actions and cost estimates for recommended nonstructural and structural BMPs are presented in Table 7-2. Detailed descriptions of the methods for estimating BMP costs are provided in Appendix M.

Table 7-2. Estimated present value cost of potential nonstructural and structural BMPs over 20-year timeframe

Watershed implementation categories	Present value cost[a]
Nonstructural BMPs	
Development Review Process	$1,027,545
Enhanced Inspections and Enforcement	$7,265,877
SUSMP and Regulatory Enhancement	$1,289,624
New/Expanded Initiatives	$2,584,488
Landscape Practices	$9,616,489
Education and Outreach	$1,945,485
MS4 Maintenance	$208,700,945
Capital Improvement Projects	$15,388,338
Subtotal	$247,966,539
Structural BMPs	
New Identified Centralized BMPs	$27,560,866
New Identified Distributed BMPs	$58,414,659
Planned/Implement Centralized BMPs	$24,614,826
Planned/Implement Distributed BMPs	$39,100,051
Subtotal	$149,690,402
Total present value cost	**$397,656,941**

Note:
a. These are preliminary estimated costs subject to refinement and improvements as a result of further analyses and assessments performed as part of the CLRP Implementation Program. Implementation of BMPs is subject to availability of resources

8 Monitoring Plans

A monitoring plan was developed to outline a CLRP Monitoring Program designed to fulfill the monitoring requirements of the approved TMDLs and generate data to support the Chollas watershed CLRP Implementation Program as detailed in Section 7 (see Appendix N). The CLRP Monitoring Program will collect data to evaluate the approved TMDL pollutants, draft TMDL pollutants, and other 303(d) constituents. The goals of the CLRP Monitoring Program include the following:

- To assess progress toward meeting the approved TMDL numeric targets and WLAs
- To characterize potential sources of approved TMDL pollutants, draft TMDL pollutants, and other 303(d) constituents
- To support the selection and evaluation of potential BMPs

Four principal types of monitoring could be conducted to address the goals of the CLRP Monitoring Program.

- ***Compliance Monitoring*** is required by the Bacteria, Metals, and Diazinon TMDLs to demonstrate progress toward meeting TMDL requirements including numeric targets and WLAs.
- ***Optional Monitoring*** is not required by the TMDL; however, if sufficient funds are available, RPs could implement it to better understand water quality conditions in the receiving water, support management decisions, and demonstrate progress toward meeting TMDL WLA requirements.
- ***Follow-up Monitoring*** will be implemented to characterize the source, magnitude, and duration of exceedances of bacteria WQOs in the receiving water.
- ***Special Studies*** will be implemented according to the available data, resources, and funding to address management questions regarding adopted TMDLs, and 303(d) listed pollutants.

The monitoring plan includes a quality assurance project plan (QAPP) to provide the methodology and data requirements to meet the goals of the CLRP Monitoring Program and address specific monitoring requirements of the Compliance Monitoring and Optional Monitoring components scheduled to be implemented during Fiscal Year 2012–2013. Each year of implementation, the monitoring plan and QAPP will be reviewed and revised as necessary to generate the quality of data needed to meet the goals of the CLRP Monitoring Program.

An Annual CLRP Monitoring Summary will be included in the WURMP Annual Report as an appendix. The summary will describe the sample collection methods, sampling events, and present key findings of the analytical results. The summary will assess TMDL compliance, identify constituent concentrations above water quality criteria, and present trend information for TMDL and other pollutants, if possible. The report will also include any deviations from protocols listed in the Monitoring Plan or QAPP and the implications of those deviations on the interpretation of the data.

9 References

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