Quality of Life Funding Strategy
San Diego Region

Needs Assessment and Cost Estimate for the Water Quality Enhancement Element

Draft

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LIST OF ACYRONMS AND ABBREVIATED PHRASES

B	billion
BMP	best management practice
County	County of San Diego
Element	Water Quality Enhancement Element
Framework	Water Quality Planning Framework
IBI	Index of Biotic Integrity
IRWM	Integrated Regional Water Management
JURMP	Jurisdictional Urban Runoff Management Program
M	million
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
Region	San Diego Region
Regional Board	Regional Water Quality Control Board
SANDAG	San Diego Association of Governments
SCAG	Southern California Association of Governments
TMDL	total maximum daily load
WQO	water quality objective
WQWG	Water Quality Working Group
WURMP	Watershed Urban Runoff Management Program

EXECUTIVE SUMMARY

Healthy rivers, lakes, groundwater aquifers, lagoons, bays, and coastal estuaries are vital to preserving the high quality of life enjoyed in San Diego. Pristine beaches and clean, beautiful water are key focal points of the tourism industry, and represent an important economic driver for the region. These waterbodies are also vital to maintaining public health, providing a local water supply, managing flood control, and preserving regional ecosystems. Funding regional programs and projects through the Water Quality Enhancement Element of the Quality of Life Funding Strategy will help preserve the San Diego experience for generations to come.



In early 2009, the County of San Diego Department of Public Works (County) accepted an invitation from the San Diego Association of Governments (SANDAG) to assist in developing an estimate of the funding needed for "underfunded" water quality programs and projects. This effort would support SANDAG's Quality of Life Funding Strategy, an ongoing evaluation of potential regional funding strategies to meet the infrastructure needs associated with water quality, habitat restoration, shoreline preservation, and transportation. The purpose of this report is to present a preliminary assessment of the needs for achieving regulatory water quality objectives (WQOs) and the associated cost of implementation across the San Diego Region (Region). The authors and stakeholders responsible for this report agree that the exercise is important and timely, as we are entering the third decade of efforts to bring our country's water bodies into compliance since the Clean Water Act, and over 40 years since the adoption of California's historic Porter Cologne Water Quality Act.

The County convened a broad cross-section of stakeholders from throughout the Region to come to consensus on this exercise. The resulting Water Quality Working Group (WQWG) developed the following guidelines to complete their mission:

1. The primary emphasis of this exercise should be directed towards urban and storm water quality programs, as these programs do not have a dedicated and sustainable funding source.
2. There is value in attempting to quantify the costs associated with achieving progress towards the WQOs because of an unwavering public interest in water quality, both locally and nationally.
3. It is important to quantify the magnitude of the solution, to inform decision-makers about its scale, and to emphasize the importance of prioritizing actions to ensure that the most cost-effective solutions are considered and implemented.
4. It is important to ask the question: "What solutions should/would/could be recommended if the funding were available to achieve WQOs in the region?", despite the fact that no funding measure may be sought during these challenging economic times.

5. There is value in beginning to develop a comprehensive region-wide water quality management plan, because programs and projects that are part of comprehensive regional plans are more likely to attract funding (from multiple sources) than stand-alone programs or projects.

Within this context, the WQWG developed, directed, and oversaw the needs analysis and cost estimate exercise. This report, developed in support of the Water Quality Enhancement Element of SANDAG's Quality of Life Funding Strategy, presents the preliminary conclusions on the achieving desirable water quality (i.e., compliance with the WQOs). A discussion is presented regarding the gap between existing water quality in the Region's waterbodies and the WQOs. This analysis justifies the need for enhanced water quality programs and projects. The cost estimate is based upon broad assumptions as well as the best professional judgment of professionals and experts who work in the industry of California water quality regulations. These assumptions and judgments are open to discussion and revision, and therefore this report should be considered a working draft which will be refined over the coming months. The preliminary 40-year cost estimate for accomplishing the WQOs in the San Diego Region is estimated to be $41.5 billion. This cost is comparable to several other studies developed throughout California over the past 15 years. It is also encouraging to note that the exercise relies upon lessons learned from previous regional studies. For example, the recommended "integrated approach" used to develop the cost estimate is based on an adaptive management strategy which integrates lower cost non-structural solutions, with more expensive but multiple-benefit technologies and innovative solutions.

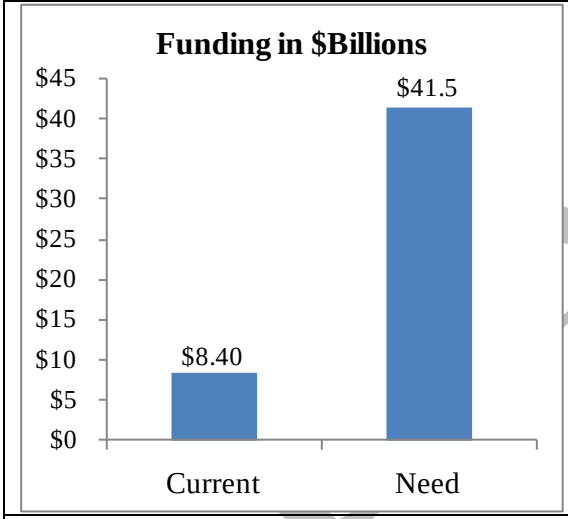

Figure ES-1. Gap Between Current Funding and Projected Funding Need

The current funding level for water quality programs in the San Diego Region is estimated to be $8.4 billion (extrapolated over 40 years). As acknowledged in this report, current levels of funding will provide for compliance with existing water quality regulations, but will not attain the existing and emerging WQOs. In recognition of the fact that the $41.5B funding needed is larger than any likely public appetite, the WQWG concluded it would be appropriate to provide preliminary recommendations for how programs and projects should be prioritized. The final section of this report outlines the conclusions of initial discussions on this topic, which have been based on the output of existing ranking systems under development, including the County's Integrated Regional Water Management (IRWM) planning process and SANDAG's Stakeholder Working Group.

The WQWG is presenting the results of this analysis as a part of their commitment to assist SANDAG with evaluation of funding strategies. Among the recommendations outlined in this report, the WQWG recommends that the report be refined in parallel with SANDAG's efforts in the coming months as they make progress with their evaluation. The WQWG intends that these revisions will reveal additional information useful to SANDAG, as well as further engage stakeholders throughout the region on this important topic.

ACKNOWLEDGEMENTS

The Water Quality Working Group (WQWG) acknowledges the many hours of dedication of the many agency representatives, non-governmental organizations, and community members for their participation in the development of this report throughout 2009 and 2010. We specifically acknowledge SANDAG for their guidance and financial support of the consultant who provided facilitation of the monthly meetings, and the County of San Diego (County) Department of Public Works, Watershed Protection Program for providing leadership and funding for the technical consultant to the WQWG.

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1.0 BACKGROUND

Regions are increasingly being asked to leverage or match state and federal funds with local money or programs to help fill funding gaps. This is due to a lack of available resources at the national and state level to finance regional and local infrastructure needs. Because potential funding needs for local infrastructure are both great and varied, the San Diego Association of Governments (SANDAG) embarked on a regional dialogue to examine funding priorities and potential funding mechanisms for a Quality of Life Funding Strategy. The impetus for this discussion stemmed from both a commitment made by the SANDAG Board as part of the *TransNet* extension measure passed by the voters in November 2004, and key region-serving infrastructure areas lacking a sustainable, long-term funding source as identified in the Integrated Regional Infrastructure Strategy (IRIS), a component of the Regional Comprehensive Plan (RCP). Of the eight areas analyzed in the IRIS, habitat conservation, shoreline preservation, and water quality enhancement[1] were found to be lacking a dedicated and sustainable funding source.

In 2007, SANDAG created the Quality of Life Ad Hoc Steering Committee to begin a dialogue on regional funding priorities and mechanisms available to achieve those priorities. As a participant on the Quality of Life Ad Hoc Steering Committee, the County of San Diego (County) was asked to lead an effort to identify and address regional needs for the Water Quality Enhancement Element (Element), one of the four areas under consideration for the Quality of Life Funding Strategy. The County initiated this effort by convening a group of stakeholders to provide input and direction on the formation of the Element. This stakeholder group, also referred to in this report as the Water Quality Working Group (WQWG), suggested that the Element could build upon other existing processes, such as the Integrated Regional Water Management (IRWM) planning process. The IRWM focuses on securing long-term water supply by pursuing projects yielding multiple objectives including water supply, water quality and natural resource benefits. Building upon the efforts of the IRWM, the WQWG defined guiding principles, identified overarching goals and objectives, and developed a Water Quality Planning Framework (Framework) to aid the WQWG in estimating the needs to achieve their goals and objectives.

1.1 San Diego Region

The Region of San Diego covers 4,086 miles^2. To simplify the regional cost estimation process, the WQWG proposed focusing effort on smaller geographic areas and scaling the results Region-wide. The western portion of the Region consists of hills, mesa, and canyons that make up nine coastal watersheds draining to the Pacific Ocean. The eastern portion of the Region drains to the Colorado River Basin Hydrologic Region (Region 7) and is made up of the Mountain Empire Subregion and Borrego Springs (Mills, 2009). The Region of San Diego is presented on Figure 1-1.

[1] Public transit was not included in the original IRIS analysis, but was later added to the scope of the Quality of Life Funding Strategy by the SANDAG Board of Directors.

Land uses across the Region may be generally classified as developed (i.e., urban or agricultural) or open space. Multiple waterbodies in each of the nine coastal watersheds have been identified by the San Diego Regional Water Quality Control Board (Regional Board) as either impaired or threatened. The particular causes of impairment vary from waterbody to waterbody but typically include one or more impairments, including indicator bacteria, metals (i.e., copper, lead, zinc, nickel, chromium, cadmium, manganese, and selenium), nutrients (e.g., nitrogen, phosphorus, and ammonia) and eutrophic conditions, pesticides, sediments and turbidity, and trash.

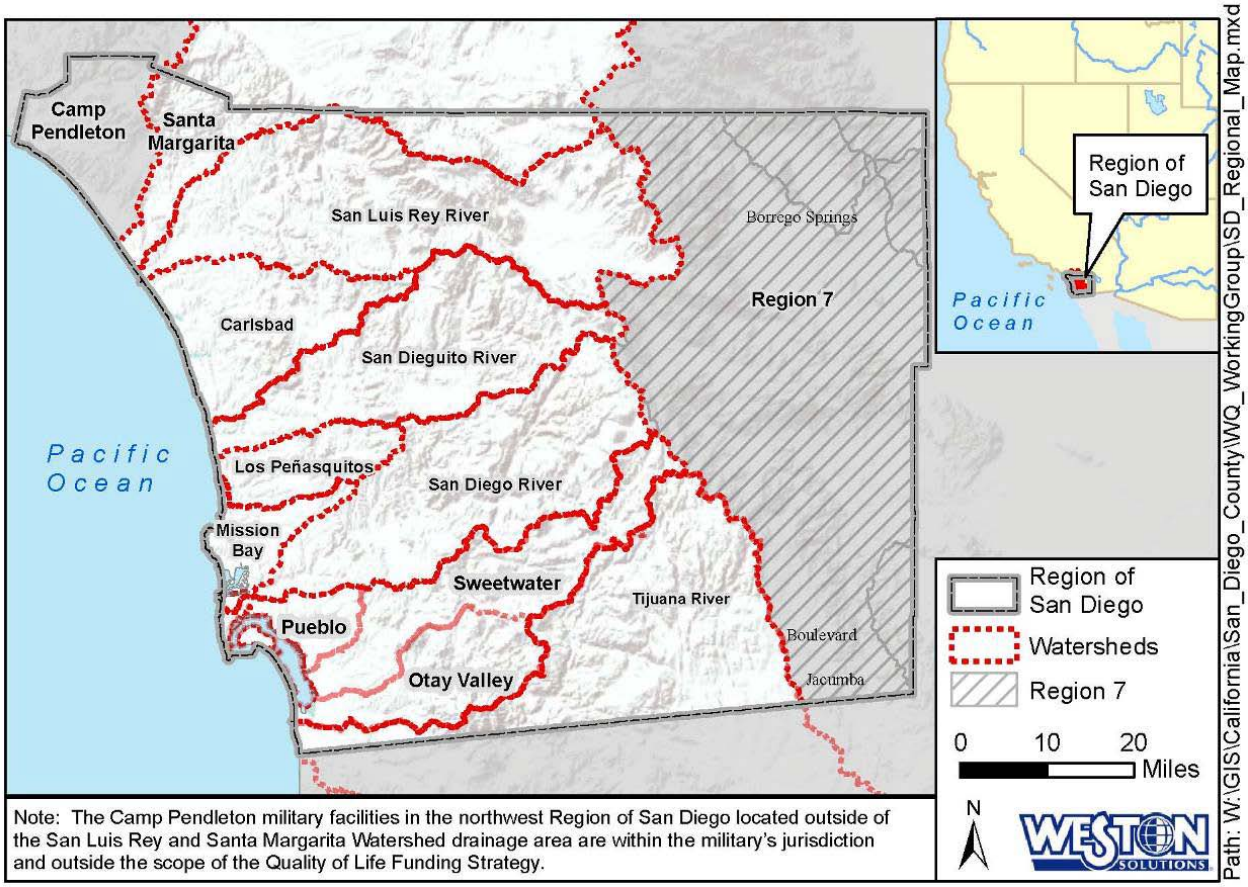

Figure 1-1. San Diego Region

1.2 Water Quality Working Group

In response to SANDAG's invitation to the County to develop a regional water quality needs assessment and cost estimate, a broad cross-section of stakeholders from throughout the San Diego Region (Region) was convened and the Water Quality Working Group (WQWG) was formed. The WQWG was formally established in 2009 to provide input on water quality issues (i.e., Water Quality Enhancement Element (Element)) for the Region to the Stakeholder Working Group (SWG). The SWG, in turn, is the advisory body to the Quality of Life Ad Hoc Steering Committee and SANDAG Board of Directors on the four elements proposed for the Quality of Life Funding Strategy (Figure 1-2).

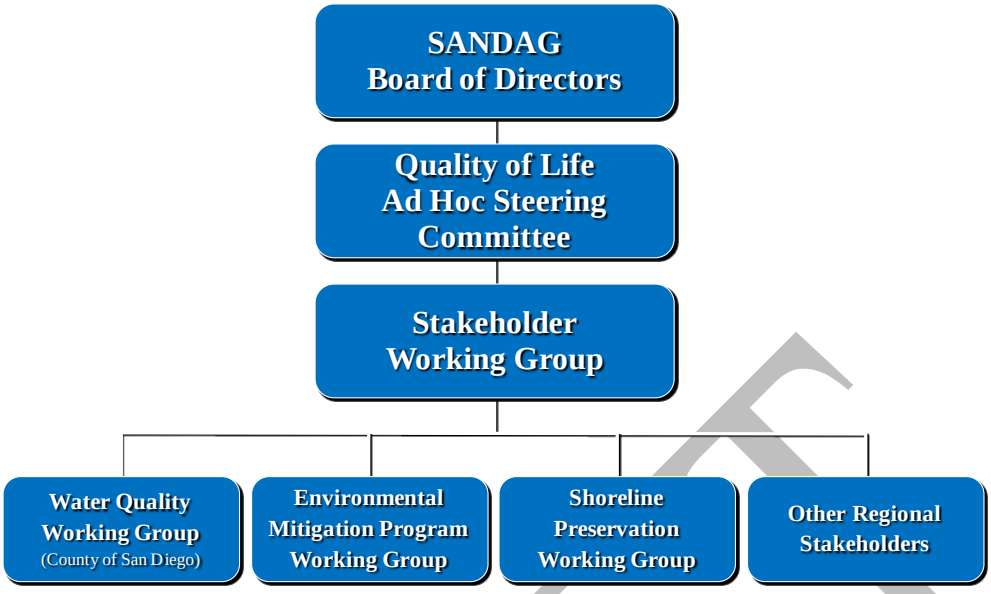

Figure 1-2. Quality of Life Funding Strategy Advisory Structure

The mission of the WQWG was to provide input on the development of a regional water quality needs assessment and cost estimate, and outline regional priorities for water quality programs and projects. In pursuit of this mission the WQWG proposed a process to develop the regional needs assessment and cost estimate. The process included developing a working definition of regional WQOs (Section 2.0) to evaluate existing water quality needs, and basing regional costs on a conceptual 'pilot' watershed with a series of assumptions to 'scale-up' the costs across the Region. The WQWG would validate the proposed pilot approach and costs using other cost estimates that have been performed throughout California over the past 15 years. An overview of the proposed process for developing the needs assessment and cost estimate, and the implementation schedule conceptualized by the WQWG and used to develop this report is presented on Figure 1-3. A more detailed description of this process may be found in Section 3.0.

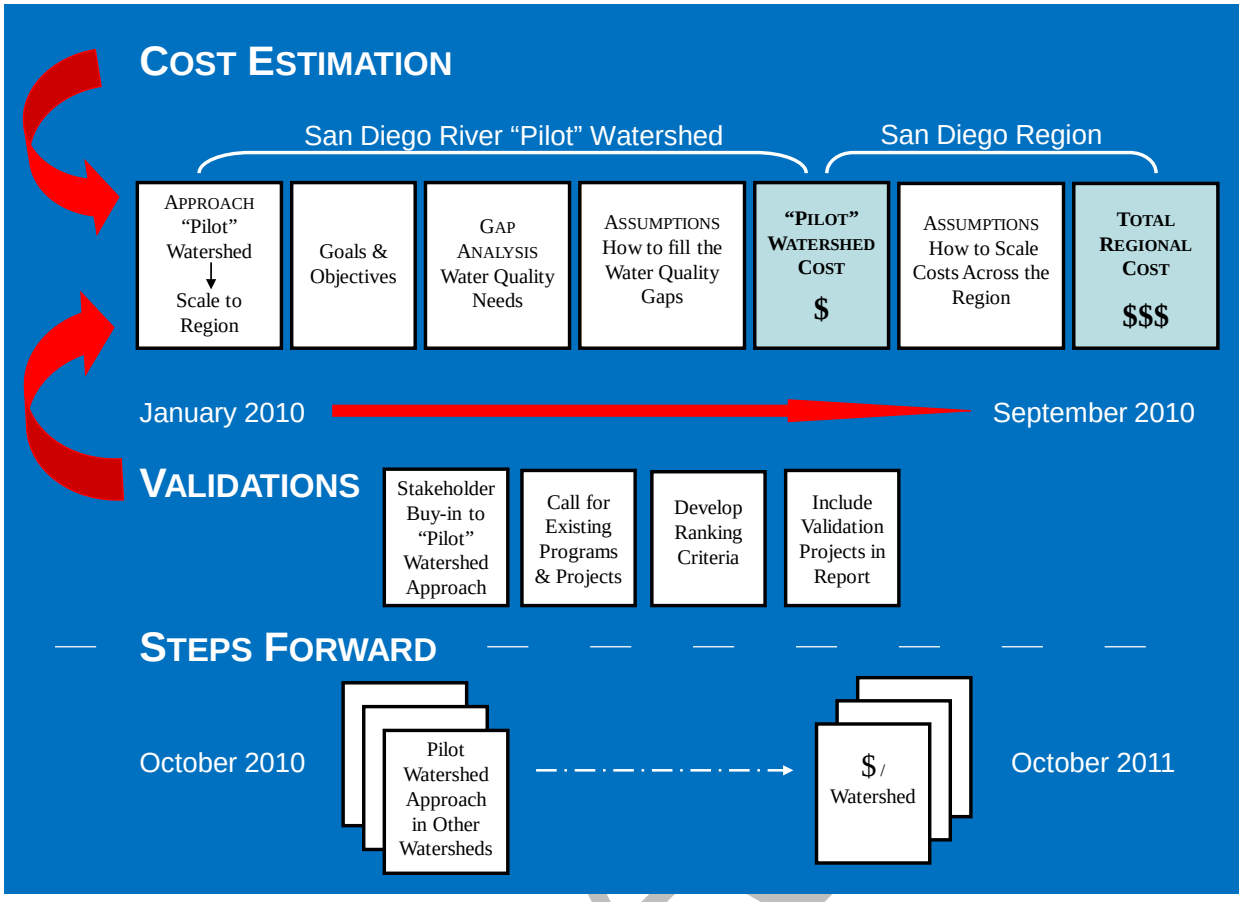

Figure 1-3. Process to Develop Water Quality Needs Assessment and Cost Estimate

Acing as the project manager, the County held public meetings and invited agencies from across the Region (i.e., representing both Region 7 and Region 9)[2] to participate in the needs assessment and cost estimation process. Participation also included stakeholders representing environmental groups, non-government organizations, regulatory agencies, water districts, farming communities, developers, and the Region at large. Public meetings were held monthly, generally on the third Tuesday of month. Minutes and other reports from the monthly meetings are available on the Project Clean Water website (PCW, 2010).

A representative from Region 7, Borrego Water District staff, attended the fourth WQWG meeting held on April 20, 2010. It was later determined that the Quality of Life Funding Strategy provides a funding opportunity to manage the unique water quality issues in the eastern drainage i.e., flash floods and groundwater management, but the representative elected not to participate further in the process. At the time publication, no other Region 7 agencies attended WQWG meetings, nor have these agencies provided input on the report. Therefore, this report focuses on projecting the cost and need for storm water and urban runoff management projects/programs in the nine coastal watersheds draining to the Pacific Ocean, i.e., Region 9. A cost estimate for Region 7 has been provided and is based on the assumptions used for the San Luis Rey Watershed Class, which are described in Subsection 3.4.)

[2] There are two branches of the California Regional Water Quality Control Board (Regional Board) with responsibility over the San Diego Region: Region 9 (San Diego), and Region 7 (Colorado River).

1.3 Existing Regional Water Management Planning Processes

As the WQWG considered their process for developing a regional needs assessment and cost estimate, they recognized that it would be beneficial to gather data on existing and proposed water quality programs and projects throughout the Region. In addition, they recognized that there were already local efforts underway to develop this information, and they committed to leveraging rather than duplicating these efforts. These efforts include local Watershed Management Plans, Watershed Urban Runoff Management Programs (WURMPs), other work completed by Regional Work Groups and Watershed Councils, and the Integrated Regional Water Management (IRWM) planning process. Existing watershed efforts were extremely useful in providing examples of programs and projects, including their costs. The IRWM was useful as it recognizes the inter-connectivity of water supplies and the environment, and promotes programs and projects yielding multiple benefits. The IRWM was also useful as it outlined a process for evaluating and prioritizing projects. This prioritization process was reviewed and modified by the WQWG to develop a preliminary set of recommendations for how water quality projects might be prioritized if SANDAG successfully implements a regional funding strategy (Section 6.0).

While there are many regional planning processes and mechanisms to fund regional water quality programs,[3] the WQWG concluded that these funding measures will not be sufficient to meet future local needs. There continues to be a need for additional funding to support existing efforts (e.g., education and outreach programs, monitoring and data collection, strategic planning efforts), operation and maintenance (O&M) of existing best management practices (BMPs), and funding of future nonstructural and structural BMPs to achieve WQOs for the Region. The Quality of Life Funding Strategy is the first step in creating a local funding mechanism that supports implementation of these programs and projects.

[3] Funding measures include agency General Funds, as well as state and federal grants (e.g., California State Proposition 50 and 84.)

2.0 REGIONAL WATER QUALITY GOALS

Residents and visitors to San Diego value the Region's beaches and recreational waters. Over the past few years several public opinion polls have been conducted to identify important regional issues. In April 2009 a poll conducted by the Nature Conservancy demonstrated that water quality is an important issue to San Diegans (Nature Conservancy, 2009).

Source: Nature Conservancy, 2009.

In spite of strong public support, regional water quality programs targeted at storm water and urban runoff management remain 'underfunded.' Typically programs are funded using a variety of sources, including the General Fund, state and federal grants, fees, tariffs, bonds, and/or facility charges. Depending on the source, funds are either limited to specific programs and/or projects, or place water quality management in direct competition with public services provided by the responsible agency.[4] As a result, water quality programs are generally limited to National Pollutant Discharge Elimination System (NPDES) permit compliance activities (i.e., non-structural programs including education, enforcement, monitoring, and two watershed activities per watershed each year). Therefore, although the majority of impacts caused by domestic and industrial wastewater discharges have been eliminated through the NPDES permit and treatment projects, storm water and urban runoff continue to be a leading cause of waterbody impairment.

2.1 Water Quality Planning Framework

As a part of the WQWG's mission to assess the needs and estimate the costs of achieving water quality objectives in the San Diego Region, the WQWG initially agreed it needed to establish a working definition of: 'water quality.' This process led to the development of a working report entitled the Water Quality Planning Framework. The purpose of the Water Quality Planning Framework (Framework) was to establish guidelines to help the WQWG focus this ongoing dialogue toward regional water quality, and achieve its mission. The Framework was developed based on the Regional Board's *Water Quality Control Plan for the San Diego Basin* (Basin Plan) (Regional Board, 1994) and State Water Resources Control Board's (State Board's) *Water Quality Control Plan for Ocean Waters of California* (Ocean Plan) (State Board, 2001), and is intended to ensure this final product met the requirements of the Quality of Life Funding Strategy. It outlines the long-term goals, objectives, evaluation criteria, and overall planning process used to develop this report. The Framework was a living report that was refined as the cost estimate took shape. The final version of the Framework used to develop this report has been provided in Appendix A.

[4] Fire and wildfire management, law enforcement, library services, land development planning, and engineering services are a few of the major public services which may be in direct competition with water quality programs.

The primary goal and objectives defined by the WQWG in the Framework are listed in the blue box. As reflected in the Objective 3, the WQWG recognizes that the Quality of Life Funding Strategy represents an opportunity for the Region to move beyond single-purpose water quality programs and projects, towards integrated solutions that enhance water quality and provide ancillary benefits (i.e., augment and protect water supplies, restore habitat, and enhance community amenities). By emphasizing local water quality, integrated solutions, and ancillary benefits, this report builds upon existing IRWM efforts in San Diego. Many of the programs and projects used to validate the cost estimates were obtained from the 162 projects submitted for funding through Proposition 50.

Water Quality Planning Framework

Element Goal

Protect and restore the beneficial uses of local waterbodies, watersheds, and aquifers from polluted runoff.

Water Quality Working Group Objectives

1. Support the implementation of watershed-based programs and projects that achieve cost-effective solutions for established water quality objectives.
2. Support jurisdictional water quality programs and projects.
3. Support (cost justified) projects with Ancillary Benefits which are complementary to and synergistic with other Elements of the Quality of Life Funding Strategy.

2.2 Defining the 'Gap' in Water Quality

Since issuance of the first NPDES permit for storm water in 1990, a great deal of data has been collected to understand the interaction between urban runoff, storm water runoff, and the environment. These data allow land use and development professionals to quantify and predict impacts of various levels of development on a wide range of water resources. But while urban runoff and storm water management programs have been implemented across the Region for over a decade, generally effort has been limited to regulatory compliance activities. As a part of the needs assessment, it was attempted to define, or determine the magnitude of, the gap between the current state of regional water quality and desirable water quality as defined by the WQOs of the Basin Plan and Ocean Plan. While a quantitative assessment of each individual pollutant of concern or water quality indicator is beyond the scope of this study, it is useful to consider the following general discussion on the Clean Water Act and regional waterbody impairment.

Identifying waterbodies within the Region which have been listed as 'impaired' and 'threatened' under the federal Clean Water Act represents one way of identifying an ongoing regional water quality issue. Section 303(d) of the Clean Water Act defines the requirements for listing streams, rivers, lakes, lagoons, bays, and other waterbodies as impaired or threatened due to pollutant concentrations greater than regulatory standards. When proven to contain the desired level of quality, a waterbody is removed from the Section 303(d) List.

As regional water quality improves, fewer water bodies would be expected to appear on the Regional Board's Section 303(d) List. A comparison of the 2008 and 2006 Section 303(d) Lists developed by the Regional Board indicate an increase in listed water bodies in the Region. Ninety-nine waterbodies were included on the 2006 Section 303(d) List, compared to 157 water bodies on the 2008 list. Similarly, the number of waterbody/ pollutant combinations increased from 233 in the 2006 to 1,570 on the 2008 Section 303(d) list (Regional Board, 2009). The increased number of listings may also be due to more information and data available to assess waterbodies, and the new standardized method of analysis that was incorporated State-wide during the 2008 Section 303(d) listing process.[5]

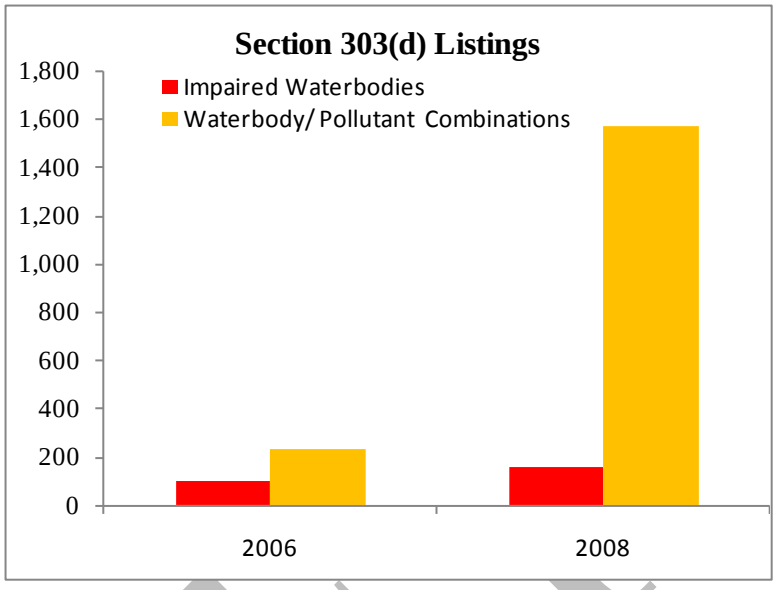

Figure 2-1. Changes in the San Diego Region (Region 9) Section 303(d) Lists Between 2006 and 2008

Figure 2-2 presents the 2006 State Board listed waterbodies in red. As illustrated by this map, the ninety-nine listed waterbodies appear in all nine watersheds in Region 9. GIS data is not available for the 2008 or 2010 Section 303(d) lists, but based on a comparison of the lists, the number of red versus unimpaired "blue" waterbodies increase, especially in the San Luis Rey, San Dieguito, Sweetwater, and Tijuana Watersheds.

The purpose of this discussion to demonstrate that there remains a noteworthy gap between the existing water quality of our Region's waterbodies, and the desired water quality. This gap supports the efforts of the WQWG to estimate the cost of water quality programs and projects on behalf of SANDAG's Water Quality Enhancement Element of the Quality of Life Funding Strategy.

[5] Subsequently, the 2010 Section 303(d) List was published by the State Board, and includes a very similar number of listings when compared to the 2008 list for the Region (State Board, 2010). A summary of the number of waterbodies added to the 2010 Section 303(d) List, or dropped from the List, is presently not available on the State Board's website.

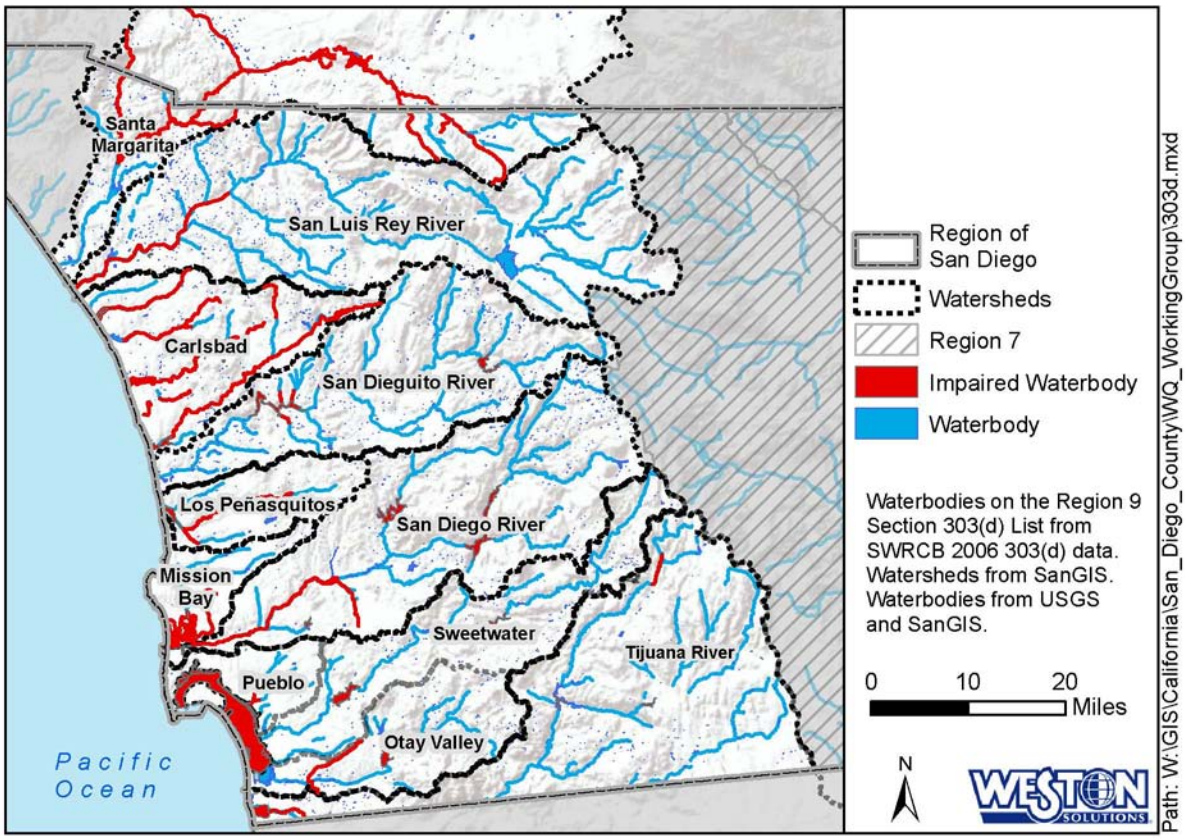

Figure 2-2. Waterbodies in San Diego Listed on the 2006 Section 303(d) List

2.3 Targeted Pollutants

To identify the key water quality issues for each watershed and therefore tailor appropriate water quality solutions, a review of existing data and regulatory drivers was conducted for the four watershed classes typical of the Region (Appendix B). The analysis for the San Diego River Pilot Watershed identified bacteria, sediments, and dissolved minerals as three major pollutants of concern (Table 2-1). Total maximum daily load (TMDL) waste load allocations governing wet and dry weather bacteria concentrations were adopted on February 10, 2010, and have been tied to a ten year compliance window beginning upon approval by the Office of Administrative Law. This short window, coupled with the significant concentration reductions necessary to achieve compliance (i.e., several orders of magnitude), make bacteria the primary pollutant of concern. Bacteria must be addressed using a combination of non-structural and structural solutions. The infiltration and treatment type BMPs necessary to address bacteria generally also address other regional pollutants. Therefore, selecting bacteria as the primary targeted pollutant ensures that the selected BMPs have adequate treatment capability to treat multiple and therefore meet the WQOs and the WQWG objectives without creating redundancies.

Table 2-1. Pollutant Trends and High Frequency of Occurrence Ratings for the San Diego River Pilot Watershed

SAN DIEGO RIVER WATERSHED	Ambient	Wet Weather			Pollutants of Concern
	2007–2008	2007–2008	2006–2007	2005–2006	
Bacteria	Enterococci	Fecal coliforms	Total coliforms Fecal coliforms	Total coliforms Fecal coliforms	HIGHEST PRIORITY *(existing TMDL)*
Dissolved minerals	TDS	–	–	–	PRIORITY
Sediments	–	Turbidity	Turbidity	Turbidity	PRIORITY
Metals	–	–	–	–	
Pesticides	–	–	–	–	
Gross pollutants	–	–	–	–	
Increasing trends	–	TSS Turbidity*	TSS Turbidity*	–	
Decreasing trends	–	Diazinon Chlorpyrifos Dissolved arsenic Dissolved copper Nitrate	Diazinon Chlorpyrifos Dissolved arsenic Dissolved copper Nitrate	Diazinon Chlorpyrifos	

Source: 2007–2008 Urban Runoff Monitoring Report (WESTON, 2009b).
TDS = total dissolved solids.
TSS = total suspended solids.
*Trend is above the water quality benchmark.
Note: For more info on this table see Appendix B.

3.0 PROCESS & STRATEGIES

Attainment of the WQWG objectives outlined in the Framework will require significant regional investment in water quality management programs and infrastructure over the long term. This section describes the methodology used to estimate the costs of achieving these objectives.

Attainment of beneficial uses in local waterbodies and aquifers is typically interpreted by comparing local watershed data to the WQOs established in the Basin Plan and Ocean Plan, as presented in the gap analysis in Subsection 2.2. As such, the cost estimation process used local water quality data and watershed criteria (e.g., acreage, land use, and channelized riverbed length) to project what would be required to attain the WQOs for San Diego's watersheds.

Due to comparable regional water quality problems, it was determined that a detailed analysis for a smaller geographic area could be scaled across the Region. This pilot watershed approach was determined feasible due to the similar pollutants, sources of pollution, land uses, and methods to achieve water quality enhancement across the Region. The pilot watershed approach was used to simplify the cost estimation process (Figure 3-1).

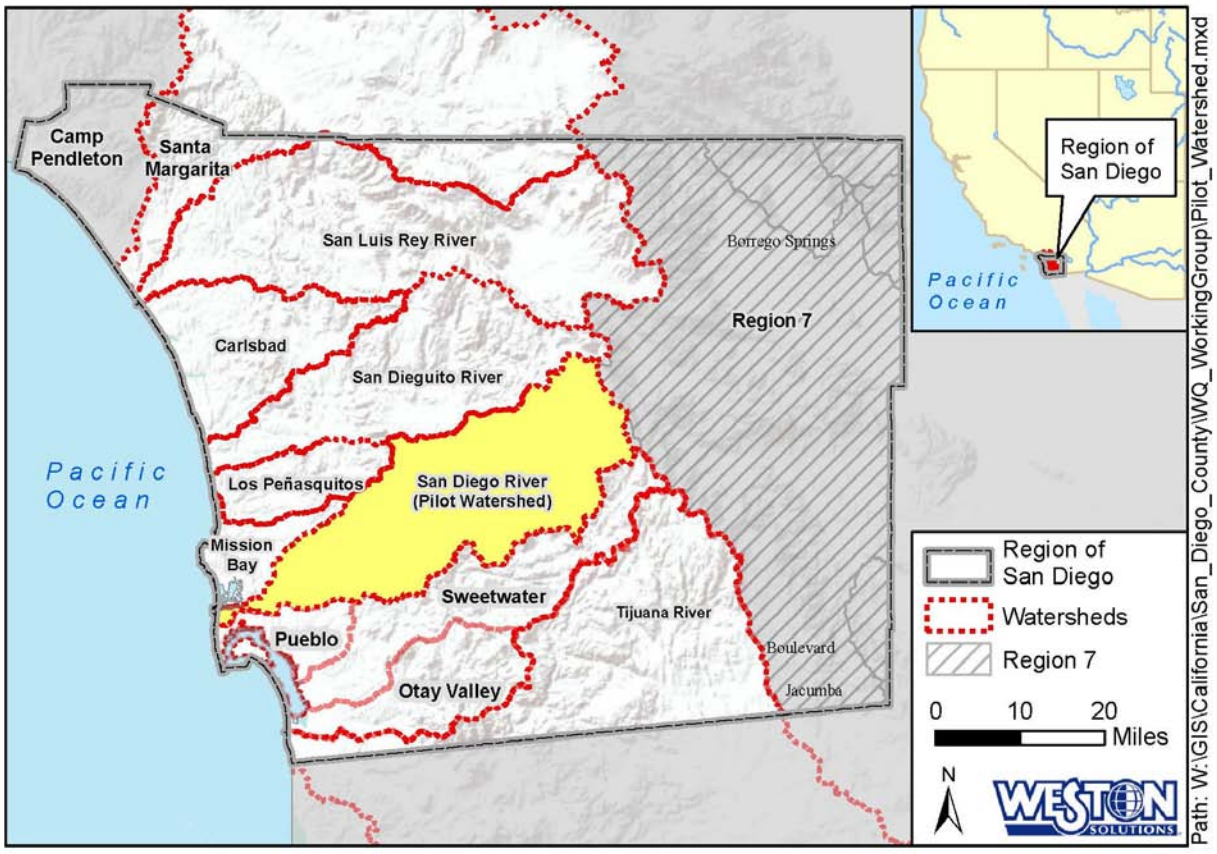

Figure 3-1. The Regional Cost Estimate is Scaled Based on Assumptions Used in the San Diego River Watershed

The regional cost estimate and water quality analysis process was iterative (Figure 3-2). Initial cost assumptions, based on unit price sheets (City of San Diego, 2009) for existing and proposed BMPs (both nonstructural and structural) were used to create a preliminary cost estimate for the pilot watershed. These assumptions were validated using actual storm water program costs and project costs from BMPs from throughout the region and state. Stakeholders compiled information about actual implementation costs, O&M costs, and tributary drainage areas for completed and planned water quality enhancement projects in Southern California.

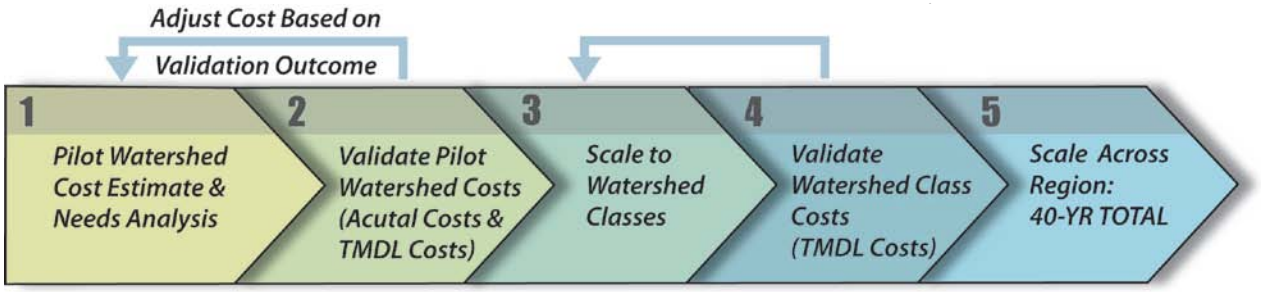

Figure 3-2. Iterative Process to Develop the Regional Cost Estimate

After the initial assumptions and BMP costs were refined, the pilot watershed cost estimate was scaled across the Region through a two-fold calculation. First, the pilot watershed results were scaled to three representative watersheds (i.e., Pueblo Watershed, San Luis Rey Watershed, and Tijuana Watershed) which had been selected based on land use. (See a detailed description of this scaling process in Section 3.4.) This scaling process involved adjusting the quantity of the different types of BMPs in order to address watershed-specific land uses, pollutants of concern, stream length, and total acreage.

The order-of-magnitude cost for each of these four watershed 'classes' (i.e., San Diego River Class, Pueblo Class, San Luis Rey Class, and Tijuana Class) was validated using TMDL implementation planning reports and cost estimates completed for watersheds in Southern California over the past decade. If the cost did not align with historic TMDL cost estimates, this first scaling calculation was refined. Once the watershed class cost estimates were finalized, the second scaling calculation was completed. A normalized cost value was determined for each watershed class (i.e., millions of dollars per developed square mile). This normalized cost was extrapolated to the remaining watersheds in the Region based on the land-use specific watershed classes and total acreage in the watershed.

3.1 Cost Estimation Assumptions

A series of fundamental assumptions about sources of pollutants, evaluating progress towards the WQOs, and BMP implementation costs were necessary for the WQWG to complete this task. Some of the key assumptions are defined in Table 3-1. Additional assumptions and processes used to develop the cost calculators for the pilot watershed are described in Appendix C.

Table 3-1. Assumptions Underlying the 40-Year Regional Cost Estimate

Category	Assumption	Justification
DRAINAGE AREA	San Diego Region – Emphasis on the nine Region 9 watersheds within County Jurisdiction	The Quality of Life Funding Strategy will provide funding opportunities for agencies within the San Diego Region (i.e., both Region 7 and Region 9). Due to minimal participation from San Diego agencies in Region 7 a representative watershed class could not be developed for the mountain/desert areas. Based on best professional judgment, this report assumed that the San Luis Rey Class would best represent this area.
SOURCE OF POLLUTION	Developed land uses (i.e., existing urban and agricultural land uses) (SANGIS, 2009)	Impacts to watersheds from urbanization are primarily attributed to impervious cover and development. Different suites of BMPs are needed to address urban and agricultural land uses, therefore developed land uses were separated into these two broad categories. It is assumed that by treating the developed land area, there will be a direct pollutant reduction. Open spaces (i.e., open space, vacant / undeveloped land, and water) that represent natural background assumed not to contribute to pollution. It was also assumed that existing regulations for new development and significant redevelopment will address pollutants generated by future development. But, this assumption would not preclude new development projects from applying for funds through the Quality of Life Funding Strategy.
PRIMARY TARGETED POLLUTANT	Indicator bacteria	A preliminary analysis indicated that BMPs with close to 100% pollutant reduction efficiency are needed to achieve the bacteria WQOs in the pilot watershed, whereas other pollutants (i.e., sediments, pesticides, metals, minerals) require BMPs to have 65–80% removal efficiencies. Priority was given to BMPs that address bacteria and other pollutants.
AGENCY SIZE	Small, medium, or large	Costs for programs and certain non-structural BMPs were scaled according to the size of each agency. Agency size was determined using a combination of jurisdictional area (square miles), population per square mile, and fiscal year (FY) 2008/2009 budgets dedicated to water quality enhancement and storm water. Generally, small agencies had dedicated storm water budgets of less than $1M and jurisdiction of 10 miles^2 or less. Large agencies had budgets greater than or equal to $30M and jurisdiction of more than 300 miles^2. Agencies falling between these classifications were considered to be medium sized.
COST PERIOD	40 years	Project costs included an annual maintenance cost over 40 years. Assumed costs were validated using actual project data from San Diego and Southern California.

3.2 Cost Estimate Approaches

Two types of cost estimates were evaluated in the pilot watershed - a full treatment approach that emphasized structural treatment projects and an integrated approach that emphasized non-structural programs, restoration projects, and a reduced structural program. The most cost-effective alternative was then scaled Region-wide. To provide a consistent frame of reference for selecting projects used to develop the pilot watershed cost estimates and the subsequent scaled cost estimates, BMPs were classified into three general types, or "buckets." The buckets were used to develop an adaptive management strategy for effective, efficient, long-term BMP implementation. The buckets were assumed to function together through the tiering process depicted on Figure 3-3. First, the non-structural BMPs in Bucket No. 1 study, control and prevent pollutants from entering the urban runoff and storm water, thus improving water quality and reducing the need for structural, restoration, and treatment BMPs. Similarly, Bucket No. 2 programs and projects would independently enhance water quality, and integrate with larger Bucket No. 3 treatment and restoration projects. Together all three buckets would provide a suite of BMPs which would effectively enhance runoff and receiving water quality. The bucket BMP classification system also served as a key organizational tool for the cost estimate "calculators." Bucket-specific calculators were used to evaluate watershed needs, address targeted land uses and pollutants, and compare cost estimates.

Figure 3-3. Bucket Strategy for Classifying Best Management Practices

Bucket No. 1 – Permit Required & Non-Structural Best Management Practices

Bucket No. 1 includes all NPDES permit required education, monitoring, and enforcement programs, and annual watershed activities. In addition to regulatory compliance, Bucket No. 1 would also provide funding for progressive non-structural BMPs, such as enhanced education programs, legislative controls, targeted enforcement, and special studies. Special studies would consist of monitoring and research activities used to fill gaps in watershed knowledge, pursue

TMDL re-openers and State Board Section (§)303(d) delisting, and provide research to ban toxic products (i.e., Brake Pad Partnership supporting Senate Bill 346).

Bucket No. 2 – Structural Best Management Practices

Bucket 2 consists of medium to low cost BMPs providing a physical intervention to achieve an improvement in water quality or runoff volume. These BMPs include runoff reduction systems (i.e., low-flow irrigation systems and rain barrels), catch basin inserts, aggressive street sweeping, detention basins, erosion controls, agricultural BMPs, and low-impact development (LID) projects.

Bucket No. 3 – Restoration & Treatment Best Management Practices

Bucket No. 3 consists of more-costly, infrastructure or labor intensive structural BMPs. These activities can include integrated stream habitat restoration, treatment devices (i.e., ultraviolet treatment), receiving water diversions, and sustainable approaches (i.e., large scale multi-pollutant treatment trains, natural treatment systems, and sustainable canyons / open space projects).

The 'bucket' BMP classification system was used in the two cost estimate approaches that are described below.

Full Treatment Approach—The full treatment approach assumed an infrastructure-intensive strategy for attaining beneficial uses. It assumed that all necessary pollutant load reductions will occur through the treatment of storm water and urban runoff. The BMP selection method under this approach addressed runoff from 100% of the developed areas in the pilot watershed - an area measuring 89,633 acres. Monitoring, education, enforcement, and other non-structural source control activities were assumed to be limited to basic regulatory requirements and were not assumed to result in any demonstrable water quality enhancement. Permit required source control programs, such as street sweeping and storm drain infrastructure cleaning, were assumed to maintain existing water quality (i.e., prevent degradation), and therefore using a conservative assumption, these activities were not credited with a load reduction benefit. Whereas, enhanced programs were credited with load reductions based upon the results of pilot studies.

Integrated Approach—Since the implementation cost of a full treatment approach is likely to be larger than any reasonable funding source, an alternative 'integrated' approach was used to estimate costs. Through the integrated approach, non-structural BMP programs (i.e., Bucket No. 1 programs, including regional monitoring, enforcement, education programs, etc.) were assumed to be effective in enhancing water quality. It was assumed that these types of aggressive programs could result in pollutant reductions of up to 40%.[6] Moreover, it assumed that alternative approaches to runoff management, such as pollutant source identification, delisting evaluations, and research to ban toxic products (i.e., synthetic pyrethroids and copper found in brake pads) could reduce regional pollutant loads by an additional 15% (USACE and USEPA, 2006). The integrated approach therefore assumes that treatment BMPs would only be required

[6]The Chollas Creek Dissolved Metals TMDL Implementation Plan determined that the effectiveness of individual non-structural source control and runoff reduction measures could achieve 30–70% pollutant reductions. These pollutant reduction values were based on published data presented in the United States Army Corps of Engineers (USACE) and United States Environmental Protection Agency (USEPA) BMP Database (USACE and USEPA, 2006), other technical publications, and best professional judgment. It was assumed that integrated programs, like proposed in Bucket No. 1 of the Integrated Approach, would achieve greater pollutant reductions.

to address the remaining 45% of pollution. This assumption represents the key difference between the two cost estimation approaches. The full structural approach limits Bucket No. 1 and enhances Bucket No. 2 and Bucket No. 3. In contrast, the integrated approach enhances Bucket No. 1, and reduces treatment needed by structural BMPs. By selecting non-structural BMPs that complement a reduced suite of structural BMPs, this approach allows stakeholders to design cost-effective solutions for established WQOs (WQWG Objective No. 1). Water quality assessments and efficiency/effectiveness evaluations are integrated into the overall planning strategy and cost estimate. This enables stakeholders to properly evaluate the problem, develop targeted solutions in the form of structural retrofits or programs, and then if subsequent evaluations identify additional need, aggressive treatment and restoration projects may be designed and implemented. Through adaptive management system inherent to the integrated approach allows stakeholders to identify a subset of the 'best' programs and projects that may be implemented within each watershed, and/or on a larger scale during subsequent planning phases.

The integrated approach allows watershed stakeholders to implement BMPs strategically. Programs and projects were 'bucketed' according to type, land use / pollutants addressed, and size/cost. Bucket No. 3 projects are typically larger and more costly, and therefore require years of planning prior to actual implementation. In contrast, Bucket No. 1 programs may be implemented in a much shorter period. The integrated approach incorporates water quality assessments and BMP efficiency/effectiveness evaluations into the short-term and long-term watershed planning process (i.e., enhanced non-structural programs in Bucket No. 1). Therefore, the integrated approach is structured to allow new programs and projects to be planned, implemented, assessed, modified, and re-implemented iteratively. Bucket No. 1 programs may be implemented quickly and efficiently during early years, whereas Bucket No. 2 undergo final design, and Bucket No. 3 projects undergo feasibility and planning efforts. Using adaptive management over the 40-year implementation period will allow watershed stakeholders to strategically implement the 'best' programs and projects to address local water quality issues.

3.3 Cost Validations

Estimated watershed costs were validated using costs generated for existing or planned programs and projects. Two types of validations were used to ensure that the cost estimates developed for the Region adequately represented real-world implementation needs. These validation methods are presented below:

Total Maximum Daily Load Approach—The TMDL approach was used to validate the order-of-magnitude costs developed for the Region using the two methods described in the previous section. This verification approach identified recent cost estimates completed as part of watershed-level TMDL compliance planning efforts across Southern California. Four estimates completed between 2004 and 2006 determined that TMDL compliance would cost between $20 million (M) and $100M/mile^2 of developed watershed (Subsection 4.2). If watershed costs for the Region differed significantly from this range (i.e., order of magnitude difference) a hypothesis was presented as a possible explanation for the significantly different cost and/or a more detailed cost evaluation was completed.

Programs Validation—Information provided by regional stakeholders regarding current and planned programs and projects was used to validate individual BMP costs used in the cost calculators. In addition to construction/implementation costs and maintenance costs, the data collected through this validation process were used to evaluate the type and mix of BMPs appropriate for the Region, the typical drainage area addressed by the each BMP, and implementation constraints.

Programs and projects used for the cost of programs validation were evaluated against the WQWG goals and objectives, SANDAG Element Criteria, and overall mission of the Quality of Life Funding Strategy. Additional criteria, specific to the Element goals, were developed by a subcommittee of WQWG and used to aid in example projects selection. Additional information regarding the criteria and evaluation process is provided in Appendix A.

3.4 Scaling Process

Based on input from the WQWG, it was assumed that only urban and agricultural land uses contribute to pollution in storm water and urban runoff. Based on this assumption, land use data for each watershed were evaluated by comparing the developed land area and the ratio of agricultural to urban land uses. This analysis identified four classes made up of watersheds with similar land uses, water quality issues, and BMP needs. The watershed classes developed for the regional cost estimate are summarized in Table 3-2 and presented on Figure 3-4.

The San Diego River Pilot Watershed and two other watersheds within the San Diego Class represent mixed urban development and open spaces. The Pueblo Class represents the nearly built-out urbanized land uses, and the San Luis Rey Class represents rural agriculture land uses. The large percentage of open space and rural agricultural land uses found in Region 7 fit most closely with the San Luis Rey Class. The Tijuana Watershed did not match any of these descriptions and therefore underwent separate analysis.

Once the final suite of BMPs was completed for the pilot watershed cost calculator, BMPs were scaled for the three remaining watershed classes based on the dominant land uses (i.e., a higher urban to undeveloped land use ratio would translate to a greater number of BMPs suited for urban environments). The final costs for each class were extrapolated to the remaining watershed within each class based on the amount of developed area within each watershed.

Table 3-2. Watershed Classes and Dominant Land Uses

Class	Land Use	Implication	Watershed
'SAN DIEGO'	32% Developed *31% Urban* *2% Agriculture*	Opportunities for a full range of BMPs	San Diego River
			Otay Valley
			Sweetwater
'PUEBLO'	90% Developed *90% Urban* *0% Agriculture*	Limited space for structural BMPs	Pueblo
			Mission Bay
			Carlsbad
			Los Peñasquitos
'SAN LUIS REY'	37% Developed *14% Agriculture* *23% Urban*	Additional need for erosion control and agricultural BMPs	San Luis Rey
			San Dieguito River
			Santa Margarita
	3.4% Developed *2.4% Agriculture* *1.0% Urban*	Need for flood control and groundwater management	Region 7
'TIJUANA'	15% Developed *13% Urban* *3% Agriculture*	Opportunities for a full range of BMPs. *Trash management*	Tijuana River

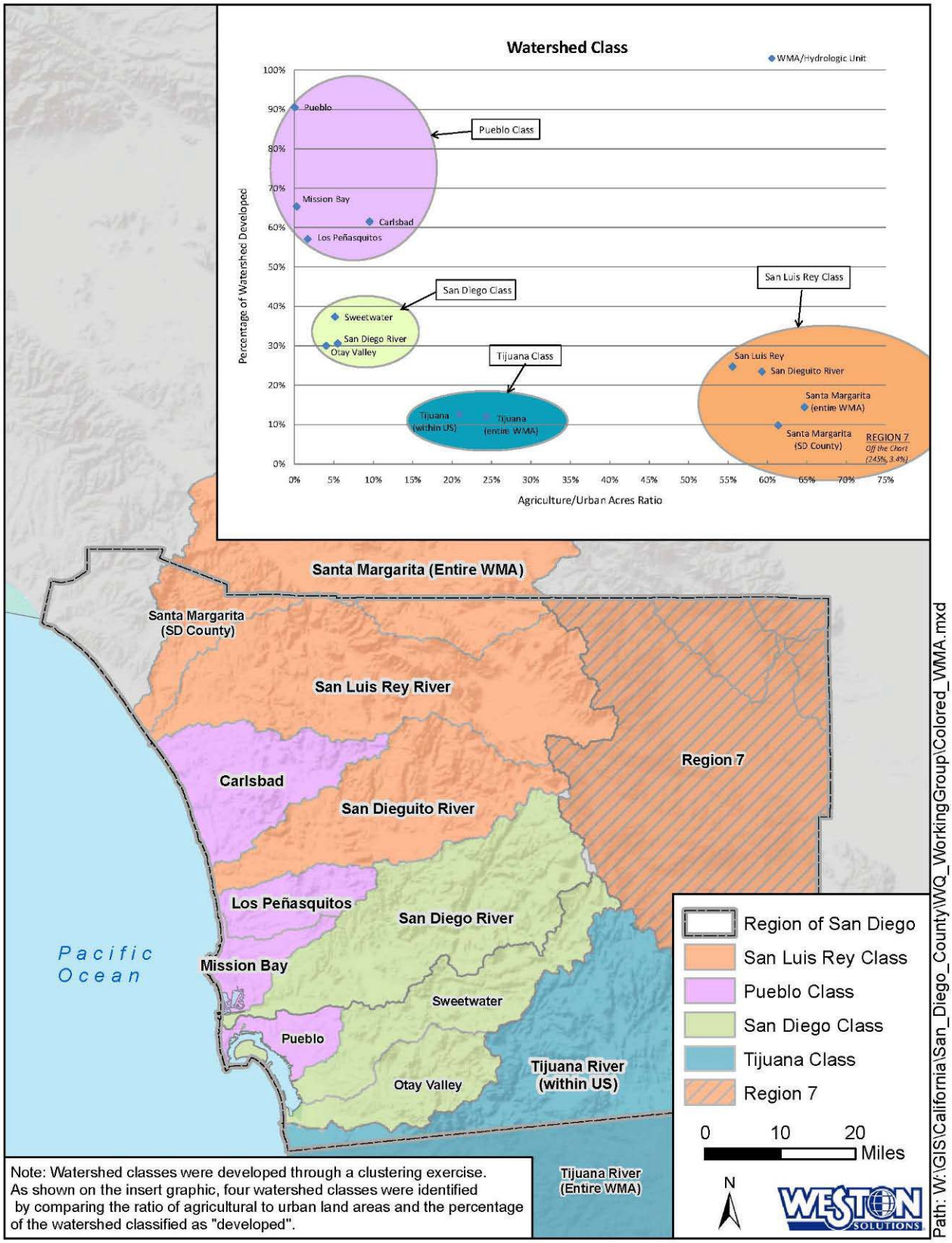

Figure 3-4. Watershed Classes Used to Scaling Implementation Costs across the Region

4.0 COST ESTIMATE RESULTS FOR THE PILOT WATERSHED

The purpose of this section is to present the results of the cost estimate for the pilot watershed. As presented earlier, it was deemed appropriate and simpler to focus on a pilot watershed and extrapolate costs based on land area or scale costs though minor adjustment to the cost calculator. The pilot watershed was used to establish and test assumptions, review available data, and evaluate the cost-estimation model. The results discussed in this section are for the San Diego River Pilot Watershed.

4.1 San Diego River Pilot Watershed

The San Diego River Watershed, shown on Figure 4-1, was selected as the pilot watershed for several reasons. The land use within the watershed includes both urbanized and open space areas (i.e., 2% agricultural, 30% urbanized, and 68% open space land uses), and the geology includes coastal valleys, upland mesas, and mountains. The San Diego River Watershed has a significant body of water quality and biological quality data. In addition to agency monitoring efforts, the San Diego River Watershed has also been subject to special studies and data collection activities completed by third-party organizations, such as the Southern California Coastal Watershed Research Project (SCCWRP), San Diego River Foundation, San Diego Coastkeeper, and university researchers. Finally, the San Diego River Watershed was selected as the pilot watershed to leverage existing Special Drainage Area reports, IRWM projects, and other watershed-level planning efforts.

The cost estimate for the pilot watershed was used as a representative watershed for the San Diego Class. The final costs for each BMP Bucket were calculated for the pilot watershed and normalized by the total watershed and developed area (i.e., millions of dollars per developed square mile). Using the normalized cost and watershed-specific developed area, costs were extrapolated to the two the Otay Valley Watershed and Sweetwater Watershed, the additional watersheds within the San Diego River Class.

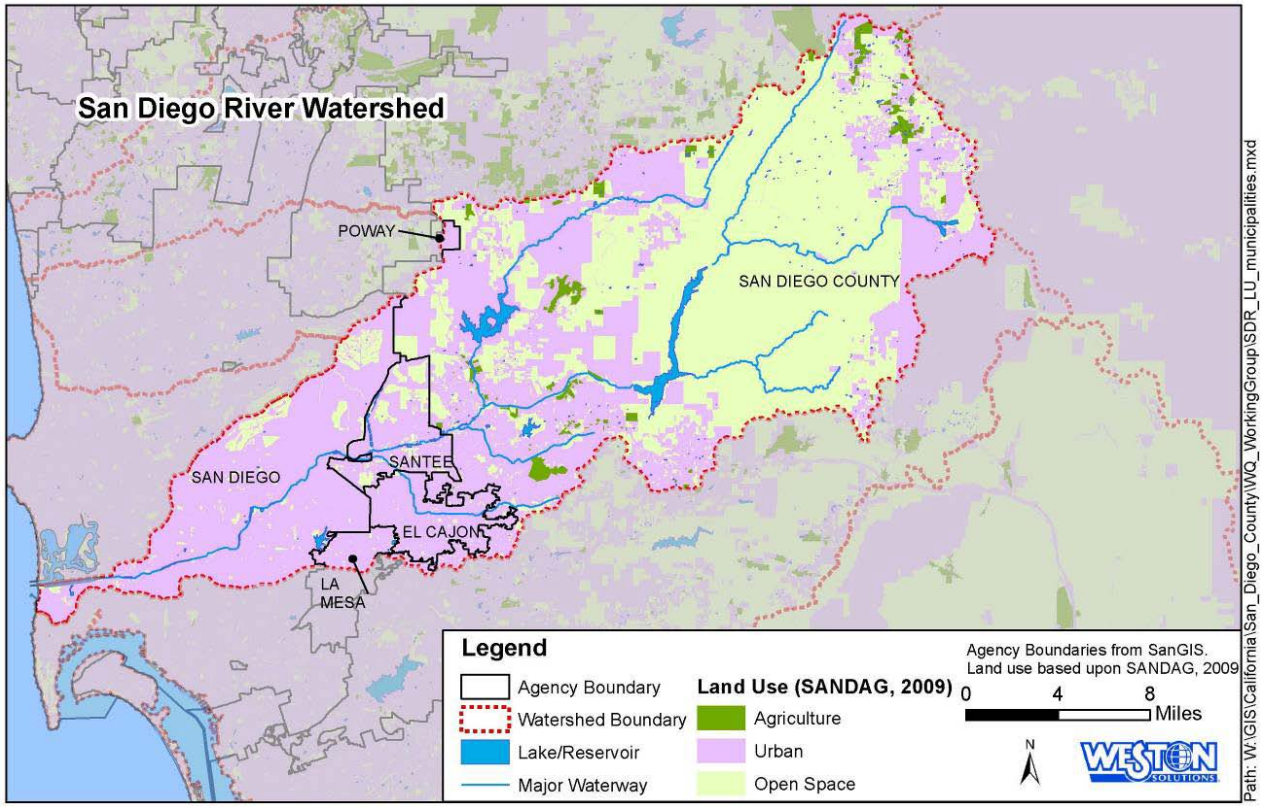

Figure 4-1. San Diego River Watershed

4.2 Cost Estimate Results for the Pilot Watershed

Full Structural Approach and Integrated Approach cost estimates were developed for the pilot watershed. Both approaches were assumed to enhance water quality to achieve 100% of the WQOs (Table 4-1). The summary of the assumptions and processes used to create the cost calculators for each of the three Buckets are described below. The detailed cost calculators and final results, broken down into projects and projects for each Bucket, are provided in Appendix D.

Table 4-1. Land-Area Treatment Assumptions Applied to Each Bucket

Bucket	Full Structural Approach	Integrated Approach	
Bucket No. 1	0% WQO	55% WQO	
Bucket No. 2	65% WQO	45% WQO	65% WQO
Bucket No. 3	35% WQO		35% WQO
TOTAL	**100% WQO**	**100% WQO**	

Bucket No. 1 Permit-Required & Non-Structural Best Management Practices Cost Calculator

The Bucket No. 1 cost calculator was based on existing budget data provided by the 21 San Diego Copermittees in the 2008–2009 Jurisdictional Urban Runoff Management Program (JURMP) report. The fiscal budgets were analyzed to determine the range of total annual budgets for water quality enhancement and storm water programs in the Region. The JURMP data was

also analyzed to determine typical annual budgets for permitting, program administration, education, enforcement, monitoring, and capital improvement projects, and other activities. These agency-specific costs were grouped into cost ranges for small, medium, and large agencies based on population density, land area, and annual budget (Appendix C). The agencies with jurisdiction over developed land within the San Diego River Pilot Watershed (i.e., County of San Diego, City of San Diego, City of La Mesa, City of El Cajon, and City of Santee) were assigned an agency size classification. It was assumed that the each agency would each contribute the typical program budget for the assigned agency size. The Bucket No. 1 cost calculator output a one-year program implementation budget. A final budget was determined using simple interest growth over the 40-year implementation period. The interest rate used for the Full Structural Approach was comparable to the standard rate of inflation (i = 3%). To conservatively account for the additional staff and resources likely to be associated with the enhanced non-structural programs, the Integrated Approach assumed 1.5 times larger annual budgetary growth need (i = 4.5%).

Based on the conservative assumption that permit compliance activities would maintain the existing level of water quality, the Bucket No. 1 cost calculator for the Full Structural Approach was not credited with a load reduction. Therefore, Bucket No. 2 and Bucket No. 3 were assumed to treat 100% of the developed area in the pilot watershed. In contrast, the Integrated Approach credited the Bucket No. 1 cost calculator was credited with approximately 55% of the total load. The total developed area for the pilot watershed was determined using SANGIS data and the 45% total area to be treated using structural BMPs was calculated to 40,335 acres (i.e., 63 miles^2). The area treated by each BMP was the key factor to determine treatment in the Bucket No. 2 and Bucket No. 3 cost calculators.

Bucket No. 2 Structural Best Management Practices Cost Calculator

The Bucket No. 2 cost calculator is a compilation of BMPs typical for the Region. BMPs in the calculator were color coded by type, including source control, runoff reduction, agriculture, erosion control, LID, and treatment. The calculator presents BMP data in terms of tributary area treated, unit cost, number of BMPs to be implemented over the 40-year implementation period, and final total cost. The unit cost includes the cost of implementing the BMPs, a 40-year O&M fee, and any anticipated land acquisition costs. Unit costs and typical drainage areas were validated using the example projects provided by the WQWG. The quantities of the various BMPs in Bucket No. 2 were increased until to the total area treated roughly matched 65% of the total developed area to be treated. Standard street sweeping and storm drain infrastructure cleaning programs required the NPDES permit were assumed to be minimal and were not credited with any load reduction benefit.

Bucket No. 3 Restoration and Treatment Cost Calculator

The costs for the regional restoration and treatment BMPs associated with Bucket No. 3 were developed similar to the process used for Bucket No. 2. The quantities of the various BMPs in Bucket No. 3 were increased until to the total area treated equaled the 35% of the remaining pollutant load and developed area to be treated. The key difference between the Bucket No. 2 and Bucket No. 3 processes for the Full Treatment and Integrated Approaches was the restoration component of the calculator. Restoration was excluded from the Full Treatment calculator, but included in the Integrated Approach calculator. Given the large open space areas in the San Diego River Watershed, the goal was to restore approximately 20% of the watershed through a combination of wetland and channel restoration projects. Channels are typically

restored based on linear feet of riverbed. The typical drainage area 0.16 acre/linear ft restored was determined based on example projects provided by the WQWG. A geographic information system (GIS) analysis was completed to determine the total length of the San Diego River and its major tributaries, and the length which has been channelized. In order account for flood control needs, it was assumed that 10% of this total length could be restored. A comparable area of the watershed was marked for restoration. More information may be found in Appendix C.

The final cost estimate results for the pilot watershed are shown in Table 4-2. The pilot watershed results indicate that approximately $4.45B will be saved by implementing the Integrated Approach. If this amount was proportioned across the Region based on the developed area in each watershed, using the Integrated Approach in place of the Full Structural Approach translates to approximately $33.7B, or 45%, saved over 40 years. The Integrated Approach represents a cost-savings alternative that will achieve the WQWG goal and objectives.

Table 4-2. Cost Estimate Results for the San Diego River Pilot Watershed

Approach	Bucket	Cost	$/Total Area ($M/miles^2)	$/Developed Area ($M/miles^2)
FULL STRUCTURAL APPROACH	Bucket No. 1 *(only permit-required programs)*	$0.36 billion (B)	0.8	2.6
	Bucket No. 2 *(aggressive structural program)*	$7.34B	16.9	52.4
	Bucket No. 3 *(aggressive treatment program)*	$2.22B	5.1	15.9
	40-YEAR TOTAL	**$9.92B**	**22.9**	**70.9**
INTEGRATED APPROACH	Bucket No. 1 *(permit-required programs, enhanced non-structural programs, and special studies)*	$1.43 B	3.3	10.2
	Bucket No. 2 *(reduced structural solutions program)*	$3.14 B	7.2	22.4
	Bucket No. 3 *(reduced treatment program, with restoration projects)*	$0.90 B	2.1	6.4
	40-YEAR TOTAL	**$5.47B**	**12.6**	**39.1**

4.3 Cost Validations

The pilot watershed cost estimates were validated using the TMDL Approach and the Programs Validation, as described below.

TMDL Approach Cost Validation

The TMDL Approach was used to validate the order of magnitude costs generated by the cost calculator used for the pilot watershed. The TMDL Approach identified recent cost estimation efforts completed for TMDL compliance planning completed across Southern California. In 2000, the California Department of Transportation (Caltrans) completed the first large-scale BMP cost estimates for Southern California. According to the BMP Retrofit Pilot Program

report, it would cost approximately $1.0M to implement BMPs at eight locations across Los Angeles County and therefore treat approximately 33,700 meters^2 of urbanized area (Caltrans, 2000). The Caltrans estimate was used to validate the Los Angeles IRWMP completed in 2006. The Los Angeles IRWMP estimated TMDL compliance in a 2,058-mile^2 drainage area (approximately 77% developed area) to cost between $27B and $76B over 20-year timeframe (Leadership Committee, 2006). The Sun Valley Watershed Management Plan cost estimate for 4.4 miles^2 of developed area would cost $150–279M and take 10–12 years to implement (LADPW, 2004). The Santa Monica Watershed Management Plan estimated costs of $209M over 8.1 miles^2 and 20-year timeframe (Brown & Caldwell, 2006). The Chollas Creek TMDL Source Loading Assessment, BMP Evaluation, and Recommended Monitoring Strategy Report (2006) estimated a full structural program would cost from $1.2–1.4B over 13,027 developed acres and 10 years (WESTON, 2006).[7] The typical cost of TMDL compliance across Southern California was estimated to be $20–100M/mile^2 of developed area. As shown on Table 4-3, the pilot watershed cost estimates fell within this typical range. The cost savings by implementing the Integrated Approach in place of the Full Structural Approach was 40%, comparable to the cost saving estimated for the Chollas Creek Subwatershed (WESTON, 2006).

Table 4-3. Cost Validations Using the Total Maximum Daily Load Approach

Cost Estimate[a]	Developed Area (miles^2)	Low Range Cost ($M/developed miles^2)	High Range Cost ($M/developed miles^2)
Caltrans (2000)	1.3E (-2)	$103.3	-
Chollas Creek (2006) Full Structural Approach	20.4	$66.4	$77.4
Chollas Creek (2006) Integrated Approach[b]	20.4	$39.8	$46.4
Sun Valley (2004)	4.4	$40.7	$75.7
Santa Monica (2006)	8.1	$29.0	-
Los Angeles (2006)[c]	1,585 [b]	$19.2	$54.0
Pilot Watershed (2010)	**140.1**	**39.1**	**70.9**

[a]The cost estimate implementation period used is shorter than the 40-year timeframe used in this report. All cost estimate values have been adjusted to 2010 dollars using annual compounding and an annual interest rate of i=3.0%, for standard inflation.

[b]The integrated approach resulted in an approximate 40% reduction in cost over a prolonged 20-year life cycle (WESTON, 2006).

[c]The developed area addressed by the Los Angeles IRWMP is not provided in the report. The jurisdictional/ watershed boundaries for the participating agencies are unknown. Based on a GIS analysis using land use data from the Southern California Association of Governments (SCAG), it was determined that the Region is approximately 77% developed.

Programs Validation

Stakeholders participating in the WQWG provided actual project costs and implementation data (i.e., project type, drainage area, O&M requirements, etc), which was used to validate the original estimated watershed costs. Lessons learned from the planning and implementation processes were used to identify and confirm the types of BMPs appropriate for the Region of San Diego based on soil type, space constraints, and other design factors.

[7] This cost estimate was completed for the City of San Diego's jurisdictional area only.

The Programs Validation also provided an opportunity for the WQWG to evaluate the WQWG goals and objectives, SANDAG Element Criteria, and overall mission of the Quality of Life Funding Strategy. By reviewing actual programs and projects, additional criteria, specific to the Element goals, were developed by a subcommittee of WQWG. Additional information regarding the criteria and evaluation process is provided in Appendix A. These criteria may be used to aid in selecting projects appropriate for Quality of Life Funding in the future.

4.3.1 Watershed Projects Used for the Programs Validation

This section presents examples of programs and projects which fall within the scope of Water Quality Enhancement Element. Four one-page descriptions summarize the implementation cost associated with targeting priority pollutants and achieving ancillary benefits. A complete list of example projects used for this validation process is located in Section 4.3.2.

River Clean-Up Campaign—The San Diego River Park Foundation River Clean-up Campaign Clean Team and Green Team lead volunteers in bi-monthly greening and clean-up efforts along San Diego River.

Bucket No. 1 – Education & Bucket No. 2 – Clean-Up	
Cost	$100K per year
Stakeholder	San Diego River Park Foundation
Watershed/Location	San Diego River
Targeted Pollutants	Trash and debris

Volunteers remove trash and debris from the river and restore habitat, which helps improve water quality (Figure 4-2). The River Clean-Up Campaign engages communities around San Diego River by providing an entry point for stewardship and service. As part of the program, educational resources for reducing storm water pollution and litter are on hand and available for participants to take home after each event.

During FY 2009–2010, there were 23 events total. The San Diego River Park Foundation Clean Team and Green Team organize events annually.

Figure 4-2. Before Alvardo Clean-Up Project (left) and After Clean-Up (right)

Forester Creek Restoration Project—The Forester Creek Restoration Project removed 400 ft of existing concrete channel along Forester Creek (tributary to the San Diego River) and widened the channel to accommodate the 100-year flood event flows. Trash and invasive species were removed to provide water quality enhancement, flood control, and habitat restoration (Figure 4-3). A trash collector was installed at the beginning of the restored and unlined section of Forester Creek (jurisdictional boundary between the City of Santee and City of El Cajon) to remove refuse before it entered the creek. The banks of creek were planted with coastal sage scrub and southern willow scrub. These native plants have attracted a variety of bird life, including gnat-catchers, terns, and cliff swallows. In addition to water quality enhancement and channel restoration, the project benefited the community through construction of pedestrian and bicycle paths, a small linear park with picnic tables and native plants and trees (i.e., sycamores, coastal live oaks, and toyans). A baseline water-quality survey of the project has been conducted. The baseline data indicated low levels of dissolved oxygen and high levels of phosphorus and fecal coliforms from sewage, homeless encampments, and wildlife. This project was designed to address these water quality issues. As native plants oxygenate the water and slower flows decrease turbidity, pollutants (e.g., hydrocarbons, metals, nutrients, and fecal coliforms) should be removed from the water through natural biological treatment in the wetland. Trash should be removed via the trash collector. Water quality and various biological indicators will be closely monitored for five years post project completion. This project won the Association of Environmental Professionals awards for Outstanding Environmental Solution (2002) and Outstanding Environmental Analysis Report (2003).

Bucket No. 3 – Restoration

Cost	$36M total ($10M for creek restoration)
Stakeholder	City of Santee
Watershed	San Diego River
Location	El Monte Valley (540 acres of drainage and 1.2 miles of creek)
Targeted Pollutants	Bacteria, dissolved oxygen, nutrients, and trash

Figure 4-3. Forester Creek Before Restoration (left) and After Restoration (right)

Cottonwood Creek Park Project— Cottonwood Park was built on an empty parcel of land in downtown Encinitas, which was originally used for storage and truck parking for the works department. Cottonwood Creek was located in a 96-inch pipe underneath the property. In an effort to improve the water quality, the City of Encinitas re-surfaced the creek and built an 8-acre passive recreation park. The creek emerges from underneath Encinitas Boulevard and first flows into a sedimentation pond. This is where all the impurities in the water can settle into the mud of the, once the water leaves the pond it flows for 650 ft over boulders through Willows, Cottonwoods, Sycamores and other native Californian rushes. This process aerates and treats the water. The park provides a facility for community recreation, including playing fields, walking path, and picnic areas (Figure 4-4).

Bucket No. 2 – Sedimentation Basin
Bucket No. 3 – Restoration

Cost	$6.4M
Stakeholder	City of Encinitas
Watershed	Carlsbad
Location	Spring Valley
Targeted Pollutants	Bacteria and sediments

Figure 4-4. Cottonwood Creek Park Project

Memorial Park Infiltration Basin—At the time of writing, a storage and infiltration basin is being installed beneath the grassy area of Memorial Park. Runoff from the parking on the west side of Memorial Park will be diverted from the existing storm drain system to the new infiltration basin (Figure 4-5). Before entering the basin, the runoff will pass through a hydrodynamic separator that removes pollutants that settle out or float. Runoff will then enter the basis where it will infiltrate into the underlying soils. Runoff in excess of the five year storm event (i.e., the BMP design storm) will bypass the BMP via an overflow pipe and return to the normal storm drain system. This project was designed to target pollutants subject to TMDLs in the Chollas Creek Subwatershed. Baseline water quality monitoring was conducted at the project site during the 2007–2008 Monitoring Season. This wet weather and dry weather will be used to evaluate the load reduction achieved by this infiltration basin design.

Bucket No. 2 – Medium Infiltration Basin

Cost	$800K
Stakeholder	City of San Diego
Watershed	Pueblo
Location	Memorial Park (1.4 acres of drainage)
Targeted Pollutants	Bacteria; pesticides; and dissolved copper, lead, and zinc

Figure 4-5. Schematics and Construction Photos for the Memorial Park Infiltration Basin

4.3.2 Results of the Programs Validation

Table 4-4 summarizes the final costs used to formulate the final cost estimates used for the San Diego River Pilot Watershed and regional cost estimates.

Table 4-4. Cost Validations for Best Management Practices

Bucket No. BMP Type	Project	Agency/ Stakeholder	Actual Project Cost	Drainage Area [a]	Assumed Cost[a]	San Diego River Cost[a]
Bucket No. 1 Agriculture Education & Source Control	Education Program targeting small-farm fertilizing and watering practices. Recommended BMPs would be subsidized	County of San Diego	$300K / yr	Regional	Watershed-specific *(agricultural area, acres)*	$12.4K/yr
Bucket No. 1 Master Planning	Water quality treatment for the Special Drainage Area (SDA)-7 Storm Water Quality Master Plan	County of San Diego	$1.4M	4,565 acres	Small: $10K Medium: $100K Large: $500K	Small: $100K Medium: $500K Large: $1.5M
	JURMP 2008/2009 Regional Shared Costs and TMDL Investigations	City of Solana Beach	$10–47K	Small agency		
		Port of San Diego	$75K	Medium agency		
		City of Vista	$65–335K	Medium agency		
		City of Chula Vista	$165K	Medium agency		
Bucket No. 2 Clean Ups	Clean Team and Green Team	San Diego River Park Foundation	$100K/yr	Watershed	$100K/yr	Small: $15K/yr Medium: $75K/yr Large: $100K/yr
	JURMP 2008/2009 Budget for Annual Clean-Up Events	City of Coronado	$18K	Small agency		
		City of Solana Beach	~$10K	Small agency		
		Port of San Diego	~$2.0K	Medium agency		
		City of Poway	$250K	Medium agency		
Bucket No. 2 Rain Barrels (filtration)	Rain Barrels / Down Spout Disconnect Pilot Study – Southcrest Park	City of San Diego	$22.7K/ yr	0.25 acre	$21K/40-yrs	$29K/ 40-yrs
	Rain Barrels / Down Spout Disconnect Pilot Study – South Bay Wastewater Treatment Plant	City of San Diego	$19.6K/ yr	0.07 acre		
Bucket No. 2 Rain Barrels (harvesting)	Rain Barrels / Down Spout Disconnect Pilot Study	City of San Diego	$3,600–4,500/ system	0.05 acre	$19K/40-yrs	$25K/ 40-yrs

Table 4-4. Cost Validations for Best Management Practices

Bucket No. BMP Type	Project	Agency/ Stakeholder	Actual Project Cost	Drainage Area [a]	Assumed Cost[a]	San Diego River Cost[a]
Bucket No. 2 Green Roof	Unknown County Building – 4-inch design	City of San Diego/ County of San Diego	$480,700	0.11 acre	$110K	$574K
	Unknown County Building – 8-inch design		$326,850	0.11 acre	(0.07 acre)	(0.10 acre)
Bucket No. 2 Green Lot	Phase I Bioretention Planter – Environmental Service Facilities	City of San Diego	$284K	0.9 acre	–	$437K/ 40-yrs
Bucket No. 2 Green Mall	Complex Street	City of San Diego	$116K	0.59 acre	$186K/ 40-yrs (0.6 acre)	$415K/ 40-yrs (3.0 acres)
	San Ysidro Boulevard	City of San Diego	$200K	1.7 acres		
	Environmental Services Facility	City of San Diego	$893K	13.6 acres		
Bucket No. 2 Treatment Train	Mission Valley Library	City of San Diego	$181K	5.0 acres	$211K/ 40-yrs (5.0 acres)	$347K/ 40-yrs (3.5 acres)
	Phase II Bacteria Treatment Train – Environmental Service Facilities	City of San Diego	$488K	2.0 acres		
Bucket No. 2 Bioretention System	Environmental Service Facilities (small)	City of San Diego	$89K	1.0 acre	$101K/ 40-yrs (0.8 acre)	$229K/ 40-yrs (0.9 acre)
	Environmental Service Facilities (large)	City of San Diego	$284K	2.0 acres		
Bucket No. 2 Pervious Concrete (filtration)	Allied Gardens (full)	City of San Diego	$166K	0.6 acre	$158K/ 40-yrs (1.5 acres)	$355/ 40-yrs (1.0 acre)
	Allied Gardens (partial)	City of San Diego	$123K	0.3 acre		
	Green Alley Filtration BMPs for San Diego Bay Protection	City of San Diego	$566K	2.0 acres		
Bucket No. 2 Medium Infiltration Basin	Sefton Field Infiltration Basin *(Amended soils project)*	City of San Diego	$170K	5.5 acres	$448,200[b] / 40-yrs (5.5 acres)	$762,800[b]/ 40-yrs (3.5 acres)
	Memorial Park Infiltration Basin *(Underground storage tank project)*	City of San Diego	$800K	1.4 acres		
	Chollas Creek Infiltration Basin[c]	City of San Diego	$2.3M	22.9 acres	–	$1.1M/ 40-yrs (10 acres)
Bucket No. 2 Erosion/ Agriculture Type 2 – Structural	Erosion / Sediment Control BMPs for Famosa Slough and San Diego River Watershed Protection	City of San Diego	$120K ($1,000/ yr O&M)[d]	1.3 acres	$250,000/ 40-yrs (2.0 acres)	$158,600/ 40-yrs (1.5 acres)
	Vortex Separator	San Diego River Park Foundation	$35–120K/ system	1.0 acre or less		

Table 4-4. Cost Validations for Best Management Practices

Bucket No. BMP Type	Project	Agency/ Stakeholder	Actual Project Cost	Drainage Area [a]	Assumed Cost[a]	San Diego River Cost[a]
Bucket No. 3 Creek/River Restoration	Forester Creek Restoration Project	City of Santee	$10.0M	1.2 creek miles	$1,500/ linear ft (0.16 acre)	$1,524/ linear ft (0.16 acre)
	Cottonwood Creek Park Project	City of Encinitas	$1.2M	650 linear ft		
	Ruxton Avenue Channel Project	County of San Diego	$790K	500 linear ft		
	Sustainable Canyons Program – Maple Street Canyon Upland Restoration	City of San Diego	$330K	300 linear ft		
Bucket No. 3 Wetland Restoration	Forester Creek Restoration Project	City of Santee	$36.0M	540 acres	$15,000 (1.0 acre)	$17,016 (1.0 acre)
	Cottonwood Creek Park Project	City of Encinitas	$6.4M	2,200 acres		
	Kimball and Bickmore Natural Treatment Project	City of Chino	$2.3M	1,487 acres		
	San Diego Zoo Safari Park Treatment Wetland Demonstration Project	County of San Diego	$600K	62.5 acres		
	Sustainable Canyons Program – Maple Street Canyon Natural Treatment Wetland	City of San Diego	$420K	96 acres		
Bucket No. 3 Dry Weather / Low Storm Flow Creek Diversion with Wetland / Basin	Water Quality Case Study – Santa Ana River	Orange County Water District	$160M	2,650 miles^2	$30M / 40-yrs (2,500 acres)	$10M / 40-yrs (2,500 acres)
	Cucamonga Creek Watershed Regional Water Quality Project	City of Chino	$19.7 M	76.7 miles^2		
	Westchester Storm Water BMP Design *(Detention basin and infiltration system with pump systems)*	City of Los Angeles	$21.8 M	2,190 acres		
Bucket No. 3 Large Scale Multi-Drainage Area Treatment Train	Robb Field	City of San Diego	$9.5M	460 acres	$30.8M/ 40-yrs (460 acres)	$19.3M/ 40-yrs (300 acres)
	Bannock Avenue	City of San Diego	$3.6M	65 acres		

[a]Agency size was determined using a combination of jurisdictional area (square miles), population per square mile, and FY 2008/2009 budget. Generally, small agencies had budgets of less than $1M and jurisdiction of 10 miles^2 or less. Large agencies had budgets greater than or equal to $30M and jurisdiction of more than 300 miles.^{2} Agencies falling between these classifications were considered to be medium sized.

[b]Assumes additional land acquisition cost. Initial assumption of $3M per acre acquired was reduced to $2.6M per acre acquired based on regional land acquisition prices.

[c]Large underground infiltration basin with a small tributary drainage area. This cost was only applied to the highly urbanized watersheds (i.e., Pueblo Class) where project space is limited.

[d]Assumed value.

5.0 REGIONAL COST ESTIMATE RESULTS

5.1 Cost Results and Validations

The cost calculators developed for the pilot watershed were modified for the three remaining watershed classes based on land use and water quality data. The scaling methods were defined as follows:

- In the Pueblo Watershed, the calculators were scaled to include fewer agricultural BMPs, infiltration-type BMPs, and BMPs requiring extensive land acquisition. The number of programs and projects targeted at urban area and with a relatively small footprint were increased. Source control structural BMPs (e.g., aggressive street sweeping and catchment cleaning) were increased by a factor of two. Given the relatively small drainage area, and limited opportunities to restoration without impacting development, restoration projects were reduced by half.
- In the San Luis Rey Watershed, the calculators were scaled to include more agricultural BMPs, specifically cisterns and runoff reduction systems, and detention basins. Given the large open spaces and limited trash problems, source control structural BMPs and restoration opportunities were generally reduced. In Bucket No. 3, emphasis was placed on dry weather flow diversion projects to manage irrigation flows and discharges.
- In the Tijuana Watershed, the calculators were scaled to have a suite of BMPs relatively similar to the pilot watershed. Given the known trash problems, the number of clean-up projects was doubled. The number of Bucket No. 2 detention basins and infiltration basins was increased.

The watershed class cost results, evaluated in terms of millions of dollars per developed square mile, differed from the pilot watershed result as show on Figure 5-1 and Table 5-1. The result for the Pueblo Watershed increased. The result for the San Luis Rey Watershed decreased. The cost result for the Tijuana Watershed was slightly smaller, but comparable, to San Diego River Watershed. All watershed class cost results fell within the expected range of $20–100M/developed mile^2 (i.e., TMDL Approach cost validation).[8] Therefore, these results were considered reasonable and representative for Southern California.

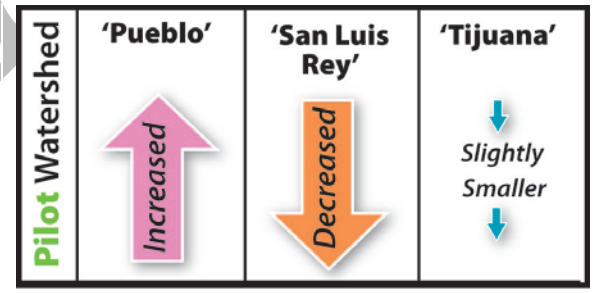

Figure 5-1. Result of Scaling Costs from the Pilot Watershed to Each Watershed Class ($M/developed miles^2)

[8]Further analysis indicated that the Pueblo Watershed Class cost result was slightly larger than the 2006 integrated approach estimate for the Chollas Creek Subwatershed (i.e., $59M / developed sq. mi versus $35–41M / developed sq. mi.). This increased cost was largely due to the different life cycles (i.e., capital cost of implementation plus budget set-aside for BMP O&M) used for the two estimates. The cost presented in this report represents a 40-year life cycle, whereas the 2006 Chollas Creek estimate assumed a 20-year life cycle.

Table 5-1 presents the normalized costs (i.e., $M / Developed Mile^2) calculated and validated for each of the four watershed classes. As described in Section 2.0, the total 40-year regional cost was calculated by extrapolating the normalized watershed costs for each watershed class to the remaining watersheds within the class. For example, in the San Diego Class, the normalized cost for the pilot watershed as extrapolated to the Otay Valley Watershed by multiplying $39.1 by the developed acreage. Table 5-1 uses bold to identify the validated watershed costs and italics to identify extrapolated watershed costs. The regional water quality cost estimate for the Region, in terms of 2010 dollars, is $41.5B.

Table 5-1. Final 40-Year Regional Cost Estimate for San Diego

Class	Watershed	Developed Area (miles^2)	$ M / Watershed Mile^2	$ M / Developed Mile^2	Total Watershed Cost
'SAN DIEGO'	**San Diego River**	**140.1**	**$12.6**	**$39.1**	**$5.47**
	Otay Valley	48.0	–	–	*$1.88B*
	Sweetwater	89.9	–	–	*$3.52B*
'PUEBLO'	**Pueblo**	**53.0**	**$50.4**	**$55.7**	**$2.95B**
	Mission Bay	44.3	–	–	*$2.47B*
	Carlsbad	142.5	–	–	*$7.93B*
	Los Peñasquitos	54.8	–	–	*$3.05B*
'SAN LUIS REY'	**San Luis Rey**	**209.3**	**$10.4**	**$27.7**	**$5.81B**
	San Dieguito River	133.0	–	–	*$3.69B*
	Santa Margarita	31.3	–	–	*$0.87B*
	Region 7	42.7	–	–	*$1.18B*
'TIJUANA'	**Tijuana River**	**71.3**	**$5.7**	**$37.6**	**$2.68B**
TOTAL COST FOR 40 YEAR PROGRAM FOR SAN DIEGO:					**$41.5 B**

5.2 Defining the 'Gap' in Existing Funding

The current expenditures on water quality programs were determined using budgetary data reported in the 2008–2009 JURMP report. The annual budget was projected over the 40-year program using a standard rate of inflation (i=3.0%). A summary of the mean annual agency budget, actual report annual budget reported, and the projected 40-year budget are presented by agency size in Table 5-2.

Table 5-2. Current Water Quality Program Budgets and 40-Year Projection

Agency Size	Number of Agencies	Mean Annual Budget	Annual Budget for Agencies by Size	Projected 40-Year Budget
Small	8	$0.7 M	$5.6 M	$0.43 B
Medium	11	$3.0 M	$38.9 M	$2.93 B
Large	2	$38.4 M	$67.2 M	$5.07 B
40 YEAR COST TOTAL FOR SAN DIEGO (21 AGENCIES):				**$8.4 B**

If the existing water quality programs continue to be budgeted at the current level of permit compliance, and are implemented over the next 40 years, the 21 agencies are projected to spend $8.4B. Even when accounting for reduced costs associated with an integrated, adaptive management strategy (i.e. Integrated Approach), this exercise has projected a 40-year funding need of $41.5B. The gap between existing funds and projected need is $32.8B (Figure 5-2). This means that existing effort will need to be increased fivefold to achieve the WQOs. As described earlier in this document, the mechanisms which fund existing water quality programs are limited to either specific programs and/or projects, or place water quality management in direct competition with other public services. Therefore, it is unlikely that existing funding mechanisms will fill this gap. Water quality is not only 'underfunded' but has a significant need for a new revenue stream, such as the Quality of Life Funding Strategy.

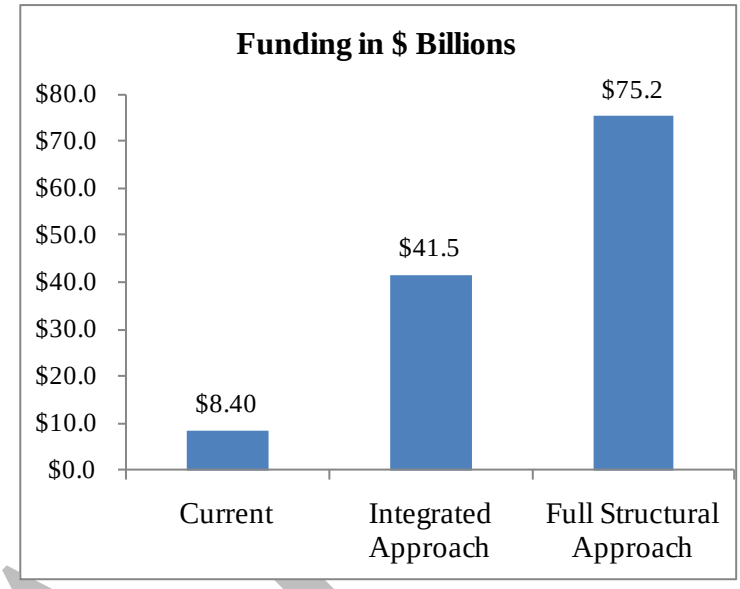

Figure 5-2. Gap Between Current Funding and Projected Funding Need

6.0 STEPS FORWARD

The purpose of this section is to discuss the steps forward contemplated by the WQWG in support of the Quality of Life Funding Strategy. It is anticipated that SANDAG will be evaluating the input received on the needs for each Element towards the end of 2010, and then refining the funding strategy throughout 2011. Based on SANDAG's current schedule, the WQWG intends to use 2011 to also refine its primary objectives to support SANDAG with the Water Quality Enhancement Element. The steps forward recommended by the WQWG are summarized in Table 6-1. Ongoing efforts by the WQWG to ensure that these steps are accomplished include holding public meetings and subcommittee meetings, coordination between agencies and with other stakeholders in the WQWG, engaging stakeholders not currently represented on the WQWG, and planning activities.

Table 6-1. Steps Forward for the Water Quality Working Group to Support Development of the Water Quality Enhancement Element

Steps Forward	Effort	Purpose
STEP 1 REFINE THE 2010 REGIONAL COST ESTIMATE	The rough cost estimate developed during 2010 included scaled costs based on the detailed analysis completed for the pilot watershed. Steps to refine the regional cost estimate will include: ▪ Discussing the value of the pilot watershed exercise with stakeholders in each watershed. ▪ Completing similar detailed exercises in each of the other watersheds across the Region over the next 12 months.	▪ To refine the rough cost estimate developed during the compressed schedule used in 2010.
STEP 2 DEVELOP FINAL RANKING CRITERIA FOR PROGRAMS AND PROJECTS	The WQWG Criteria Subcommittee developed a prioritization process that was used to evaluate programs and projects used for cost validation (*see discussion later in this section*). Steps to finalize the ranking criteria used in the prioritization process will include: ▪ Refining the prioritization process and evaluation criterion developed by the WQWG subcommittee. ▪ Integrating the criterion with the BMP Bucket strategy (Subsection 3.2). ▪ Presenting the ranking process and criteria to SANDAG.	▪ To provide a consistent prioritization process that may be used to evaluate/rank programs and projects submitted for funding through the Quality of Life process. ▪ To support SANDAG in finalizing the Quality of Life Funding Strategy.
STEP 3 DEVELOP A COMPREHENSIVE REGIONAL WATER QUALITY PLAN	A comprehensive water quality plan will focus regional water quality management. It will provide a common strategy, developed and supported by agencies across the Region that prioritizes pollutants of concern, pollutant sources, monitoring activities, structural BMPs, and integrated regional solutions. Similar to the IRWM planning process, this plan will also provide a nexus for developing example projects eligible for Quality of Life Funding, IRWM funding, and other grant opportunities.	▪ To support SANDAG in finalizing the Quality of Life Funding Strategy. ▪ To attract outside funding ▪ (i.e., state/federal grants). ▪ Achieve WQOs through a comprehensive regional strategy.

7.0 PROPOSED PROJECT RANKING STRATEGY

It is generally understood that the Quality of Life Funding Strategy will only provide a percentage of the funds required to achieve the water quality needs identified in this report. Based on efforts by the WQWG Criteria Subcommittee, a prioritization process was developed to evaluate programs and projects used for cost validation. The proposed prioritization process consists of the following (Table 7-1):

1. ***Qualifying Criterion*** – Each project will be evaluated using the Qualifying Criterion, which will ensure that the program or project fell within the scope of the Element (i.e., addresses the water quality issue or water resource impaired by urban runoff and/or storm water runoff).
2. ***Screening Criterion*** – Next each project would be screened for funding eligibility under the Quality of Life Funding Strategy using the four screening criteria developed by SANDAG.
3. ***Ranking Criterion*** – If programs and projects passed these first two stages, they would undergo ranking and prioritization using the raking criterion. Although program and projects would not be penalized for being single purpose, additional points would be given for demonstrable ancillary benefits and/or integration with other regional activities.

Table 7-1. Proposed Prioritization Process

Qualifying Criterion *(WQWG objectives in framework)*	**Screening Criterion** *(SANDAG criterion)*	**Ranking Criterion** *(integrated ranking system)*
WQWG OBJECTIVE 1 Watershed-based programs and projects that achieve cost-effective solutions for established WQOs. **WQWG OBJECTIVE 2** Jurisdictional water quality programs and projects (i.e., typical Bucket No. 1 activities including monitoring, education, enforcement, and source control).	Has a clearly demonstrable nexus to Region's quality of life – Economy, Equity, & Environment. Moves the Region towards sustainable growth and long-term solutions rather than presenting short-term fixes. Addresses underfunded or underfunded need. Benefits are quantifiable, measurable, and/or transparent.	**WQWG OBJECTIVE 3** Additional points are given for programs with ancillary benefits (i.e., in addition to water quality, provides additional water supply, habitat restoration, or enhanced community amenities). Additional ranking criteria include: ▪ Addresses underlying causes affecting quality of life. ▪ High cost/benefit ratio. ▪ Benefits a larger number of communities in the Region. ▪ Is equitable in its benefits and impacts and addresses social justice concerns. ▪ Leverages other funding. ▪ Addresses a previously deferred program need or activity. ▪ Anticipates evolving regulatory trends. ▪ Benefits are important to those who are being asked to help fund. ▪ Significant O&M costs. ▪ Significant or costly regional consequences if not funded. ▪ Credibility.

The WQWG used this draft prioritization process to evaluate multiple programs and projects used for the cost validation in the pilot watershed. Types of programs that ranked well using this method included the following:

- Agency programs for compliance.
- Agency programs for ongoing O&M.
- Pilot programs and projects.
- IRWM projects, and/or programs and projects with ancillary benefits, especially for habitat restoration, transit improvement, public/environmental health, etc.

One challenge encountered by the WQWG Criteria Subcommittee was equitably apportioning funds to nonstructural, structural, restoration, and treatment programs and projects. As described in the bucketing strategy, enhancing water quality to achieve the WQOs will require integrated BMP selection and implementation (i.e., a combination all three buckets rather than discrete implementation of BMPs in a single bucket). A benefit of the bucket classification system is that programs and projects are inherently separated into three types of dissimilar BMPs. Therefore, one recommended solution to this challenge would be to prescribe a minimum portion of Quality of Life funding to each bucket and then apply the prioritization process to the proposals for each bucket. This solution ensures that dissimilar programs and projects are not placed in direct competition, but that all programs and projects undergo the same rigorous prioritization process. The actual implementation of this process is still undergoing evaluation by the WQWG Criteria Subcommittee. It is anticipated that this effort will continue into the following 12 months, and will require approval by the SANDAG Board of Directors.

The WQWG acknowledges that the prioritization and ranking of projects within the Water Quality Enhancement Element is likely to be discussed at length by SANDAG as part of a larger discussion regarding the prioritization and ranking of projects within the overall Quality of Life Funding Strategy. The WQWG offers the recommendations in this section of the report for SANDAG's consideration based on their experience within the water quality arena. The WQWG looks forward to working with SANDAG throughout the coming months to further refine these recommendations.

8.0 REFERENCES

Brown & Caldwell. 2006. *City of Santa Monica Watershed Management Plan*. Prepared for the City of Santa Monica. April 2006.

Caltrans (California Department of Transportation). 2000. *BMP Retrofit Pilot Program, Basis of Design Report, Drainage Design, District 7 Procurement A*. Caltrans Report ID# CTSW-RT-2000-001. Approved July 31, 1998, Revised June 15, 2000.

City of San Diego, Development Services Department. 2009. Unit Price List. January 2009.

LADPW (County of Los Angeles, Department of Public Works). 2004. *Sun Valley Watershed Management Plan*. May 2004.

Leadership Committee. 2006. *Greater Los Angeles County Integrated Regional Water Management Plan*. December 2006.

Mills, W. 2009. *Integrated Water Resources Management Plan*. Prepared for the Borrego Water District. March 2009.

Nature Conservancy. 2009. *Public Opinion Survey of Voters in San Diego County Regarding the Importance of Element Areas Proposed for the Quality of Life Funding Strategy*. Prepared for SANDAG. April 2009.

Ode, P., A. Rehn, and J. May. 2005. "A Quantitative Tool for Assessing the Ecological Condition of Streams in Southern Coastal California." In *Environmental Management*, 35:493–504.

PCW (Project Clean Water). 2010. *Project Clean Water Website*. Accessed at: www.projectcleanwater.org.

Regional Board (California Regional Water Quality Control Board, San Diego Region). 1994. *Water Quality Control Plan for the San Diego Basin*.

Regional Board (California Regional Water Quality Control Board, San Diego Region). 2009. 2008 Integrated Report for the San Diego Region. Presented at the Integrated Report Workshop (10/12/2009).

SANGIS (San Diego Geographic Information Source). 2009. Land use dataset.

State Board (State Water Resources Control Board, Cal-EPA). 2001. *Water Quality Control Plan for Ocean Waters of California*. Effective December 2001.

State Board (State Water Resources Control Board, Cal-EPA). 2010. *Impaired Water Bodies*. Accessed at: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

USACE and USEPA. 2006. *International BMP Database*. Accessed at: http://www.bmpdatabase.org/.

WESTON (Weston Solutions, Inc.). 2006. *Chollas Creek TMDL Source Loading Assessment, BMP Evaluation, and Recommended Monitoring Strategy Report*. Prepared for the City of San Diego. September 2006.

WESTON (Weston Solutions, Inc.). 2007. *San Diego County Municipal Copermittees 2006-2007 Urban Runoff Monitoring*. Prepared for the County of San Diego. January 2007.

WESTON (Weston Solutions, Inc.). 2008. *San Diego County Municipal Copermittees 2006-2007 Urban Runoff Monitoring*. Prepared for the County of San Diego. January 2008.

WESTON (Weston Solutions, Inc.). 2009a. *Chollas Creek Dissolved Metals TMDL Implementation Plan*. Prepared for the Dischargers. July 2009.

WESTON (Weston Solutions, Inc.). 2009b. *San Diego County Municipal Copermittees 2007–2008 Urban Runoff Monitoring*. Prepared for the County of San Diego. January 2009.

Wright, T., J. Tomlinson, T. Schueler, K. Cappiella, A. Kitchell, D. Hirschman. 2006. *Direct and Indirect Impacts of Urbanization on Wetland Quality*. Prepared for the Center for Watershed Protection. December 2006.