Update

Monterey Peninsula, Carmel Bay, and South Monterey Bay Integrated Regional Water Management Plan Update

JUNE 2014

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in cooperation with:

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Addendums and Changes since November 2007 (date of adoption)

June 2008 - add Resolutions of Adoption (Appendix 1-c), clarify Planning Region description (Executive Summary and Chapter 3)

August 2008 – add copy of fully executed Memorandum of Understanding to form a Water Management Group (Appendix 1-a)

February 2009 – update project descriptions and prioritization for Prop. 84/1E expedited implementation grant round

2012 - 2014 – update entire document in accordance with new governance, new project solicitation and ranking, and in compliance with updated guidance from DWR

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Acronyms

AB – Assembly Bill

ACS – American Community Survey

AF – acre-feet

AFA – acre-feet per annum

AFY – acre feet per year

AGO – America's Great Outdoors Initiative

ALERT – Automated Local Evaluation in Real Time

AMBAG – Association of Monterey Bay Area Governments

ARRA – American Recovery and Reinvestment Act of 2009

ASBS – Areas of Special Biological Significance

ASR – Aquifer Storage and Recovery

AWT – advanced wastewater treatment

BIRP – Begonia Iron Treatment Plant

BRP – Base Reuse Plan

BMP – best management practice

BSLT – Big Sur Land Trust

CALTRANS – California Department of Transportation

CARB – California Air Resources Board

CAS – Climate Adaptation Strategy

CAT – Cost Assessment Team

CAW – California American Water

CAWD – Carmel Area Wastewater District

CCA – Critical Coastal Area

CCAMP – Central Coast Ambient Monitoring Program

CCC – California Coastal Commission

CCR – Central Coast Region

CCRWQCB – Central Coast Regional Water Quality Control Board

CDFW – California Department of Fish and Wildlife

CDO – cease and desist order

CDP – Coastal Development Plan

CDPH – California State Department of Public Health

CDPR – California Department of Parks and Recreation (see also CSP)

CEDEN – California Environmental Data

CEIC – California Environmental Information Clearinghouse

CEQA – California Environmental Quality Act

CERES – California Environmental Resources Evaluation System

CFR – Code of Federal Regulations

CIFP – Capital Implementation and Financing Plan

CIP – capital improvement project

CNDDB – California Natural Diversity Database

CNRA – California Natural Resources Agency

COS – Center for Ocean Solutions

CPUC – California Public Utilities Commission

CRAM – Carmel River Area Management

CRB – Carmel River Basin

CRLF – California red-legged frog

CRMP – Carmel River Management Plan

CRRDR – Carmel River Reroute and Dam Removal

CRTF – Carmel River Task Force

CRWC – Carmel River Watershed Conservancy

CSA – County Service Area

CSIP – Castroville Seawater Intrusion Project

CSP – California State Parks

CSU – California State University

CSUMB – California State University Monterey Bay

CVSIM – Carmel Valley Simulation Program

CWA – Clean Water Act

CWC – California Water Code

CWP – California Water Plan

CWSRF – Clean Water State Revolving Fund

CZARA – Coastal Zone Act Reauthorization Amendment

DAC – Disadvantaged Community

DMA – Disaster Mitigation Act of 2000

DMS – Data Management System

DPB – disinfection by-product

DPH – State Department of Public Health

DPS – Distinct Population Segment

DSOD – California Division of Safety of Dams

DWR – California Department of Water Resources

EDU – Equivalent Dwelling Unit

EIR – Environmental Impact Report

EIS – Environmental Impact Statement

EJ – Environmental Justice

EPA – US Environmental Protection Agency

EPB – Environmental Protection Barrier

EQIP – Environmental Quality Incentives Program

F – Fahrenheit

FEMA – Federal Emergency Management Act

FORA – Fort Ord Reuse Authority

GAMA – Groundwater Ambient Monitoring and Assessment

GHG – greenhouse gas

GIS – Geographic Information Systems

GPD – gallons per day

GPM – gallons per minute

GRP – Groundwater Recharge Project

GWR – Groundwater Replenishment Project

ICWM – Integrated Coastal Watershed Management

ICWMP – Integrated Coastal Watershed Management Plan

IMS – Internet Mapping Site

IPCC – Intergovernmental Panel on Climate Change

IRWM – Integrated Regional Water Management

IRWMP – Integrated Regional Water Management Plan

IWRIS – Integrated Water Resources Information System

LAFCO – Local Agency Formation Commission

LCP – Local Coastal Plan

LID – low impact development

LIDAR – Light Detection And Ranging

LUP – Land Use Plan

MBEST – Monterey Bay Education, Science, and Technology Center

MBNMS – Monterey Bay National Marine Sanctuary

MCRCD – Monterey County Regional Conservation District

MCRMA – Monterey County Resource Management Agency

MCWD – Marina Coast Water District

MCWRA – Monterey County Water Resources Agency

MCWRP – Monterey County Water Recycling Project

MF/RO – Microfiltration/Reverse Osmosis

MGD – million gallons per day

MHI – median household income

MM – management measures

MOA – memorandum of agreement

MOU – memorandum of understanding

MPA – National Marine Protected Areas

MPIRWM – Monterey Peninsula Integrated Regional Water Management

MPRPD – Monterey Peninsula Regional Parks District

MPRWA – Monterey Peninsula Regional Water Authority

MPWMD – Monterey Peninsula Water Management District

MPWRS – Monterey Peninsula Water Resource System

MPWSP – Monterey Peninsula Water Supply Project

MRSWMP – Monterey Regional Storm Water Management Program

MRWPCA – Monterey Regional Water Pollution Control Agency

MS4 – Municipal Separate Stormwater Sewer Systems

MSR – Municipal Service Review

MURP – Model Urban Runoff Program

NEPA – National Environmental Policy Act

NFIP – National Flood Insurance Program

NMFS – National Marine Fisheries Service

NOAA – National Oceanic and Atmospheric Administration

NOI – notice of intent

NOP – notice of preparation

NPDES – National Pollutant Discharge Elimination System

NPS – non-point source

NRCS – National Resources Conservation Service

NTU – nephelometric turbidity units

PAC – Policy Advisory Committee

PBC – Pebble Beach Company

PBCSD – Pebble Beach Community Services District

PM10 – particle pollution

PRC – Pacific Rivers Council

RCD – Resource Conservation District

RCDMC – Resource Conservation District of Monterey County

RLP – Repetitive Loss Properties

RM – river mile

RMAP –Regional Monitoring and Assessment Plan

RMS – resource management strategies

RTP – Monterey Regional Water Pollution Control Agency Regional Treatment Plant

RURWP – Regional Urban Recycled Water Project

RUWAP – Regional Urban Water Augmentation Project

RWMG – Regional Water Management Group

RWQCB – Regional Water Quality Control Board

SAC – science advisory committee

SAM – sustainable asset management

SB – Senate Bill

SBGMP – Seaside Basin Groundwater Management Plan

SCC – State Coastal Conservancy

SCCS – south-central California steelhead

SCRCD – Santa Cruz Resource Conservation District

SCSD – Seaside County Sanitation District

SEP – Supplemental Environmental Protection

SFBCDC – San Francisco Bay Conservation and Development Commission

SGB – Seaside Groundwater Basin

SIRP – Seawater Intrusion Response Plan

SMWD – Seaside Municipal Water District

SNMP – salt and nutrient management plans

SSAMP – Sewer System Asset Management Plan

SVIGSM – Salinas Valley Integrated Ground and Surface Water Model

SVRP – Salinas Valley Reclamation Plant

SVRP – Salinas Valley Reclamation Project

SVWP – Salinas Valley Water Project

SWAMP – Surface Water Ambient Monitoring Program

SWAMP – Surface Water Ambient Monitoring Program

SWFM – Surface Water Flooding Managers

SWQPA – State water quality protection area

SWRCB – State Water Resources Control Board

TAC – technical advisory committee

TAMC – Transportation Agency of Monterey County

TDS – total dissolved solids

TMDL – total maximum daily load

UI – user interface

USACE – United States Army Corps of Engineers

USDA – United States Department of Agriculture

USFWS – United States Fish and Wildlife Service

USGS – United States Geological Service

UWMP – Urban Water Management Plan

VOC – volatile organic compounds

WDR – waste discharge requirement

WDS – water distribution system

WMI – Watershed Management Initiative

WSA – water service agreements

WQPP – Water Quality Protection Program

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Executive Summary

Introduction

This update to the Monterey Peninsula, Carmel Bay, and South Monterey Bay (Monterey Peninsula) Integrated Regional Water Management Plan (IRWMP or IRWM Plan) addresses the major challenges and opportunities related to managing water resources within the Monterey Peninsula IRWM region (Region) and serves as an update to the plan adopted in 2007.

The IRWM Plan follows the criteria established by the Department of Water Resources (DWR) 2012 Proposition 84 and 1E IRWM Guidelines, as amended through December 2013 (Guidelines) that establish the general process and criteria that DWR uses to implement each IRWM Grant Program. DWR designed the IRWM planning process to be consistent with the California Water Plan: the overarching document that integrates all regional planning efforts and provides a collaborative planning framework for elected officials, agencies, tribes, water and resource managers, businesses, academia, stakeholders, and the public to develop findings and recommendations and make informed decisions for California's water future.

Integrated regional water management in California is established as a way to increase regional self-sufficiency by encouraging local water resource managers to take a proactive role in solving water management problems through collaboration with stakeholders to create innovative strategies and effective actions to achieve water management objectives. California voters have passed several statewide bond measures providing billions of dollars to support local and regional water management activities. In November of 2002, California voters passed Proposition 50, the “Water Security, Clean Drinking Water, Coastal and Beach Protection Act,” approving the IRWM Program and authorizing $500 million in grant funds for IRWM projects.

In November 2006, California voters passed Proposition 84, the “Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Act of 2006,” which authorized $5.4 billion in bond funds. Administered by DWR, Proposition 84 includes an additional $1 billion in funding for the IRWM Grant Program. Of that $1 billion, $52 million has been allocated specifically for projects within the Central Coast Funding Area. Proposition 1E, the “Disaster Preparedness and Flood Prevention Bond Act of 2006,” was also passed in 2006, authorizing $4.09 billion in bonds to rebuild and repair California’s most vulnerable flood control structures to protect homes and prevent loss of life from flood-related disasters; and to protect California’s drinking water supply system by rebuilding delta levees that are vulnerable to earthquakes and storms.

The following sections describe the contents of the Monterey Peninsula IRWM Plan Update document.

Chapter 1 Governance

The Monterey Peninsula Regional Water Management Group (RWMG), the body responsible for the development and implementation of the IRWM Plan, includes seven local agencies and organizations. Members of the RWMG are required to enter into a memorandum of understanding (MOU) that acknowledges their cooperative efforts to form an institutional structure to develop and implement the IRWM Plan. A clearly defined governance structure and process creates a transparent working relationship with all stakeholders that participate in the creation of the IRWM Plan.

The RWMG was created to be a “working” group: its members expected to actively participate in RWMG meetings and committees. The RWMG ensures public involvement in its decision-making processes through various means, including: regular email updates to stakeholders on the IRWM planning process; occasional public workshops; a regularly updated website (mpirwm.org).

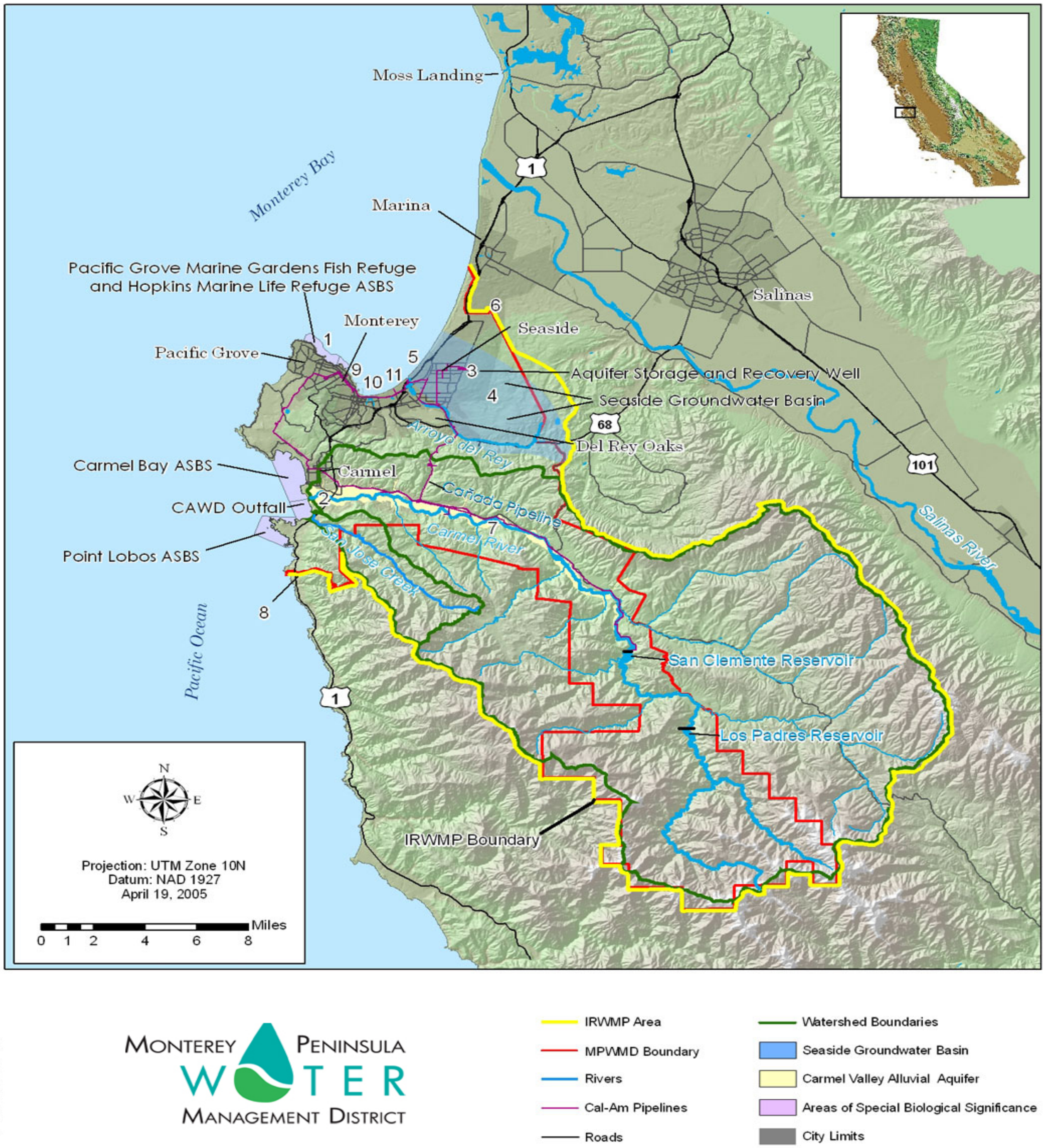
Broad stakeholder involvement is crucial to ensure that the Plan identifies local issues, reflects local needs, promotes the formation of partnerships, and encourages coordination with state and federal agencies. The IRWM Plan lead agency, Monterey Peninsula Water Management District, works to ensure that stakeholders, project proponents, and the general public are well informed of the latest IRWM activities and accomplishments.

The RWMG will continue to meet on an ongoing basis to implement the IRWM Plan and to carry out IRWM planning. The IRWM Plan is intended to be a long-term planning document with a minimum 20-year planning horizon. As such, the Plan will need to undergo periodic updates and revisions to reflect changing conditions. A review of the IRWM Plan may occur with each IRWM Plan project solicitation, which is expected to occur in response to stakeholder requests or with IRWM Grant application solicitation(s). The review would be consistent with DWR Guidelines and would reflect any significant changes that are relevant to the Region. It is expected that the RWMG meet periodically and that each member insure that adequate staff resources are available to implement the IRWM Plan.

Chapter 2 Region Description

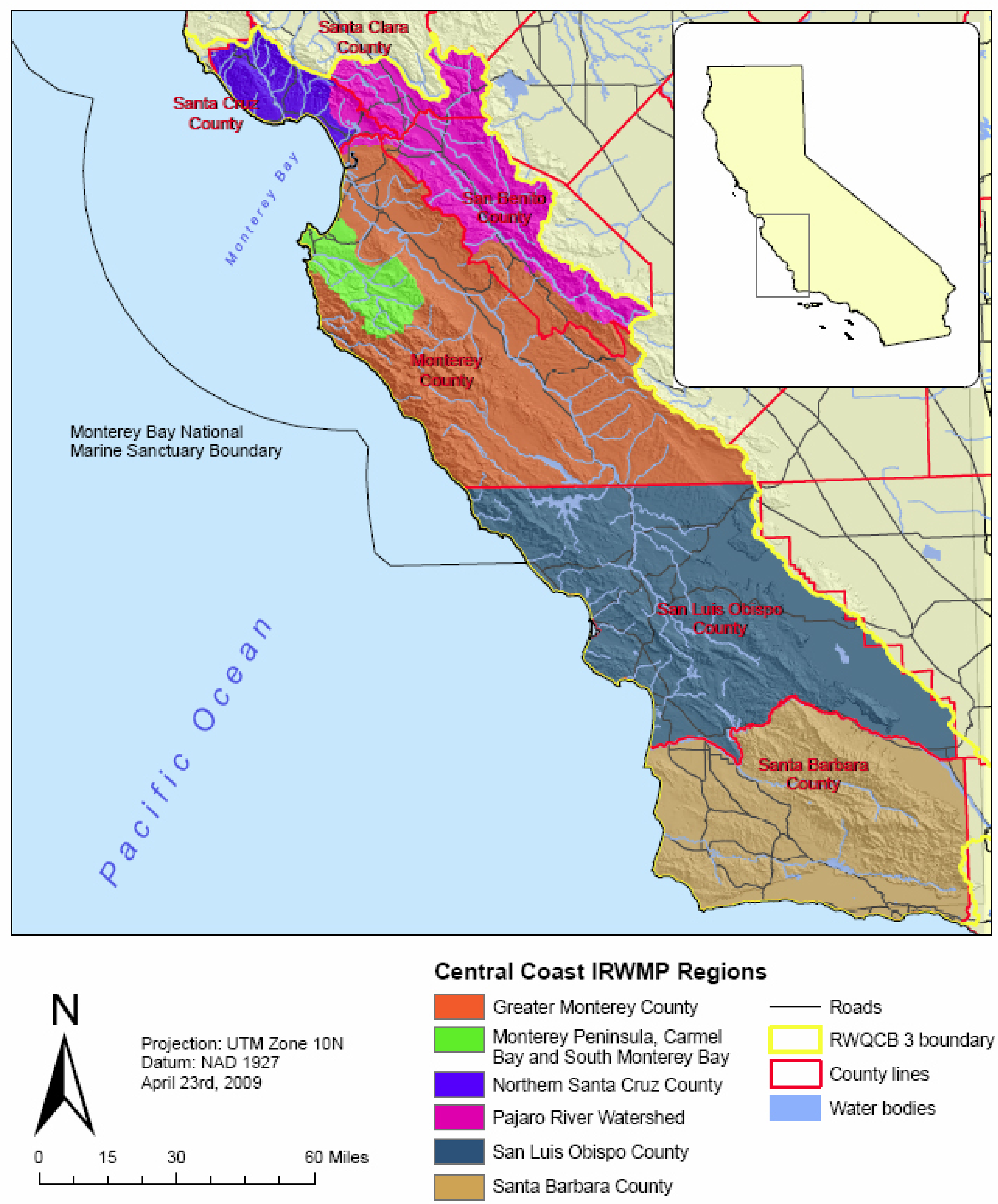
The Monterey Peninsula IRWM Plan region is approximately 350 square miles and includes the coastal cities of Carmel-by-the-Sea, Del Rey Oaks, Monterey, Pacific Grove, Sand City, and Seaside. Also included are the unincorporated portions of Monterey County in Carmel Valley, Pebble Beach, the Carmel Highlands, the Laguna Seca area, and a portion of the Ord Community (**Figure ES-1**). The region includes numerous state and federal marine and coastal protected areas, the Monterey Bay National Marine Sanctuary, and portions of the Ventana Wilderness and Fort Ord National Monument, all of which are extremely valuable for their ecological and socio-economic characteristics.

Figure ES-1: Map of Monterey Peninsula Integrated Regional Water Management Planning Region



The Pajaro River Watershed, Greater Monterey County, San Luis Obispo County, Santa Cruz County, and Santa Barbara County IRWM regions, form the Central Coast IRWM Funding Area (**Figure ES-2**).

Figure ES-2: Central Coast IRWM Funding Area



The planning area was established based on watershed and groundwater basin limits, while taking into consideration jurisdictional limits and political boundaries. The largest watershed in the region is the 255-square mile Carmel River Basin watershed. The two major groundwater resources within the region are located in the Carmel River Basin (also described by DWR as the Carmel Valley Groundwater Basin) and in the Seaside Basin that was described by DWR in Bulletin 118 as a sub-basin of the Salinas Valley Groundwater Basin. Surface water and groundwater conditions, water supply infrastructure, and wastewater and recycled water infrastructure are described in Chapter 2.

Chapter 3 Goals and Objectives

A key step in the IRWM Plan Update process was for the RWMG and stakeholders to reassess the 2007 IRWM Plan goals and objectives. Goals are established for broadly outlining the IRWM Plan direction, whereas objectives provide a reasonable basis for decision making, guide work efforts, and may be used to evaluate project benefits. For this update, MPWMD coordinated additional stakeholder meetings and solicited input via email to reassess the goals and objectives from the November 2007 IRWM Plan in-light of locally changed conditions and new guidance from the DWR, the State Water Resources Control Board, and the Central Coast Regional Water Quality Control Board. Regional goals are organized into six general categories:

Goal Categories	
Water Supply	Environmental Protection and Enhancement
Flood Protection/Erosion Prevention	Water Quality
Climate Change	Regional Communication

These six goals encompass the shared regional vision for accomplishing integrated regional water resource plans and other future planning efforts in the area.

The objectives give focus to the IRWM Plan, help determine appropriate resource management strategies, guide project development, and are used to evaluate project benefits. In addition, the objectives are used to help the RWMG rank projects in the IRWM Plan. The process of developing and updating objectives was based on the new DWR Guidelines as well as the following overarching policy documents and laws:

- Central Coast Basin Water Quality Control Plan
- 20 x 2020 Water Efficiency Goals
- Requirements of California Water Code §10540(c)

Prioritized regional objectives follow the same six general categories as the regional goals. Stakeholders prioritized the following eight of the 25 total objectives:

- Meet existing water supply replacement needs of the Carmel River system and Seaside Groundwater Basin.
- Maximize use of recycled water and other reuse, including gray water systems, and stormwater capture and use
- Improve ocean water quality, including Areas of Special Biological Significance (ASBS), by minimizing pollutants in stormwater discharges

- Improve inland surface water quality for environmental resources (e.g. steelhead) and potable water supplies
- Protect and improve water quality in groundwater basins
- Develop regional projects and plans necessary to protect existing infrastructure and sensitive habitats from flood damage, erosion, and sea level rise, in particular, along the South Monterey Bay shoreline and Carmel Valley
- Identify cooperative, integrated strategies for protecting both infrastructure and environmental resources, including from climate change impacts
- Foster collaboration among regional entities as an alternative to litigation.

To create a system whereby the RWMG can monitor the achievement of the objectives, a quantitative and qualitative measurement matrix was created to enable future monitoring.

Chapter 4 Resource Management Strategies

A resource management strategy (RMS) is a project, program or policy that helps local agencies manage their natural resources. The intent of the RMS standard is to encourage a region to diversify its water management portfolio to become more resilient to uncertain future circumstances- including the effects of climate change and mitigate, if necessary. The RWMG developed an updated set of strategies based on the strategies included in the 2007 IRWMP, the most recent set of statewide strategies developed by DWR as part of the California Water Plan Update process, and future uncertainties, including the effects of climate change. The Monterey Peninsula RWMG chose to include 26 strategies through a process that was based primarily on the region's goals and objectives:

• Agriculture Water Use Efficiency	• Groundwater Remediation/Aquifer Remediation
• Urban Water Use Efficiency	• Matching Quality to Use
• Conveyance - Regional/Local	• Pollution Prevention
• System Reoperation	• Salt and Salinity Management
• Water Transfers	• Urban Runoff Management
• Conjunctive Management & Groundwater Storage	• Flood Risk Management
• Seawater or Brackish Water Desalination	• Agriculture Lands Stewardship
• Precipitation Enhancement	• Economic Incentives
• Recycled Municipal Water	• Ecosystem Restoration
• Surface Storage – Regional/local	• Forest Management
• Dewvaporation or Atmospheric Pressure Desalination	• Recharge Area Protection
• Fog Collection	• Water-Dependent Recreation
• Drinking Water Treatment and Distribution	• Watershed Management

For this IRWM Plan Update, the Guidelines added a new chapter to address the impending issue of climate change (see **Chapter 15**). The RWMG supports “no regret” adaptation Plans and gives higher priority to these strategies in the project ranking process by providing additional points under the “Climate Change” categories. Examples of “no regret” strategies include increasing water use efficiency, water supply sustainability, water recycling, matching quality to use, practicing increased integrated flood management, and enhancing ecosystems and their ability to provide multiple benefits to the region. The RWMG generally encourages the implementation of “no regret” strategies through the IRWM Plan.

Chapter 5 Integration and Coordination

As allowed by the Guidelines, the RWMG has chosen to address Guideline standards five (5) and fifteen (15) comprehensively as one chapter. The Integration standard in the Guidelines was created to ensure that the RWMG process is collaborative. Specifically, Chapter 5 centers on three types of integration: 1) stakeholder and institutional integration, 2) resource integration, and 3) project integration.

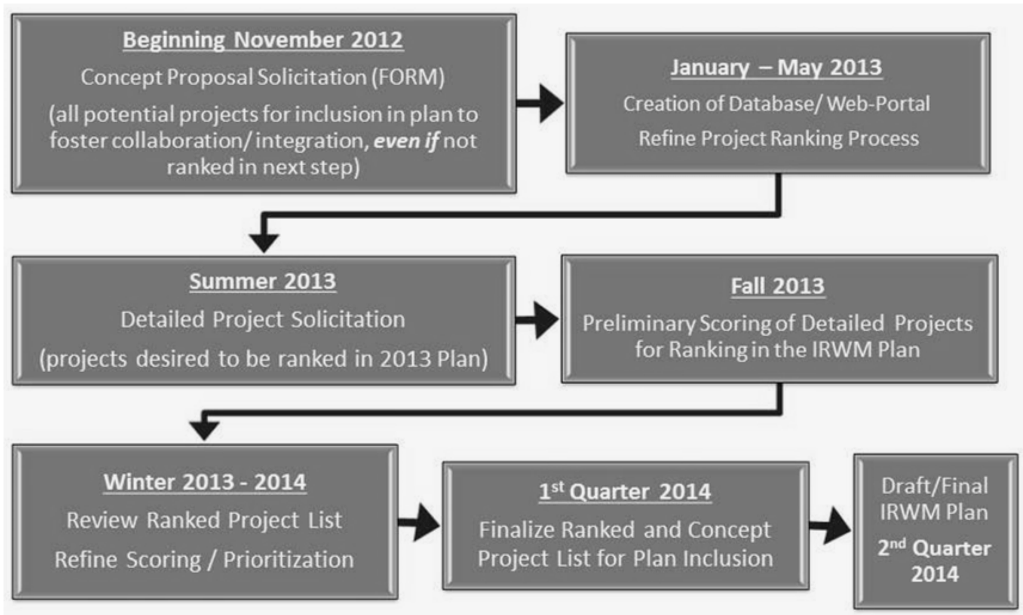
The intent of the Coordination standard in the Guidelines is to ensure that RWMG: (1) coordinate their activities with local agencies and stakeholders to avoid conflict within the region and to best utilize resources; (2) are aware of adjacent planning efforts and are coordinating with adjacent RWMGs; and (3) are aware of state, federal, and local agency resources and roles in the implementation of their plans and projects. Federal, state, and local agency consultation enables the RWMG to coordinate the IRWM planning effort closely with the mission of these agencies and helps to avoid regulatory or other conflicts in the planning and the implementation stages.

The planning process is designed to enable diverse stakeholder participation; the decision-making body incorporates disparate experts on water management, who collectively represent the geographic area. The RWMG members lend their expertise and unique perspectives through the ongoing planning process, and call in outside expertise from stakeholders as needed. Another way in which the RWMG promotes resource integration in the IRWM planning process is through designated data management systems. The RWMG promotes project integration both by encouraging stakeholders to collaborate on projects that meet regional needs and produce regional benefits, and by finding opportunities to integrate projects—such as combining projects into regional programs—during the project review process. The IRWM website (http://www.mpirwm.org) is a central coordinating tool for the IRWM planning effort and serves as a resource hub for project proponents and stakeholders to stay informed on all IRWM-related activities. The website is also a centralized database for projects currently being developed and implemented. Collaborative efforts have been undertaken to ensure that projects for the adjacent region (Greater Monterey County) are well understood and coordinated where overlapping interests may exist. For this Plan Update, additional project coordination and integration between the Monterey Peninsula and the Greater Monterey County regions occurred through the activities and reporting in the IRWM Planning Grant, Project 5, a summary of which is provided in Chapter 5 and the summary report is included in **Appendix 5-a**.

Chapter 6 Project Review Process

The RWMG solicited projects and proposals for the MPIRWM Plan Update with the intent to create a comprehensive list that includes those that were prioritized and ready to implement. All projects submitted for inclusion in the IRWM Plan must undergo a thorough review process before being adopted. The following figure captures the process used by the RWMG for the recent project solicitation and review for the Region.

Figure ES-3: Project Review Process



All implementation projects that meet minimum standards are ranked relative to one another. The project ranking process takes into account not only how well projects address regional objectives, but how well they address IRWM program criteria and preferences, and other factors such as “project need.” The ranking is to ensure that the IRWM Plan project list is competitive for the purposes of the IRWM Grant Program. This plan and the website contain the projects that were submitted to the plan, including concept proposals aimed at increasing collaboration and integration and projects that were submitted using the detailed solicitation form to be ranked. The project ranking process and methodology was developed in collaboration with the stakeholders, vetted through RWMG members, and is described in this chapter. The results of the 2013 project rankings were sent to key stakeholders on January 14, 2014.

Chapter 7 Impacts and Benefits

The anticipated impacts and benefits of individual projects in the IRWM Plan differ greatly: some projects will provide local benefits, others regional benefits; some will focus in just one resource area, such as water supply, while other projects will integrate different resource areas, such as water supply, water quality, environmental restoration, and recreation. However, combined over time, the projects implemented through the IRWM Plan will provide multiple benefits across the entire Region—and on a variety of resource areas.

All projects included in the IRWM Plan are reviewed for potential impacts to DACs and for potential environmental justice concerns; to date, no potential impacts to DAC or environmental justice concerns have been found in any project submittal. Impacts of the ranked projects would be primarily construction-related, temporary, and able to be mitigated to avoid adverse long-term effects. Numerous benefits to DAC are expected to result from implementation of the IRWM Plan. A list of projects included in the IRWM Plan may benefit, either directly or indirectly, DAC as well as the community at large, is provided in **Table 7-1**.

Furthermore, some of the more “intangible” benefits of the IRWM planning effort overall are described. The IRWM planning process fosters a spirit of positive collaboration among public, private, and non-profit agencies and organizations within the region, and ultimately results in increased efficiencies and cost savings. These more “intangible” benefits of the IRWM planning effort should be recognized equally alongside the numerous, significant, on-the-ground environmental and water resource benefits of project implementation.

Chapter 8 Plan Performance and Monitoring

Each project submitted for inclusion in the IRWM Plan is carefully reviewed by the RWMG to ensure that it would be able to comply with all applicable rules, laws, and permit requirements before it can be approved for inclusion in the plan. Progress toward meeting Plan objectives is directly tied to implementation, which will be tracked using the DMS. Two tables will be generated with each Plan Performance Review: 1) Status of Project Implementation; and 2) Progress toward Achieving IRWM Plan Objectives. Approximately every five years, the RWMG will conduct a Plan Performance Review, which will include the tables and a narrative, summarizing the overall progress to date in achieving IRWM Plan goals and objectives and describe areas that need further attention. The analysis will include data submitted to the statewide databases and to the Conservation Action Tracker tool, if available. Based on this analysis, the RWMG will evaluate how to fill the gaps and help achieve regional goals.

The IRWM Plan is a dynamic document and its success is related to how well its goals and objectives are accomplished, at both the plan and project levels. IRWM Plan objectives and regional priorities will continue to be reviewed for relevance and modified as needed to ensure the Plan reflects changing regional needs and continues to be effective.

Chapter 9 Data Management

The IRWM Plan adopted in 2007 included a component that describes a publically available web site that allows users to access the IRWM Plan and documents associated with water resources planning and management in the Region. Similarly, a GIS internet mapping and collaboration tool would be used for grant applications, project planning, project monitoring, and coordination with local, state and federal agencies.

As part of the 2014 IRWM Plan Update, an IRWM data management system that collects, stores, and shares data was developed to provide regional information to IRWM stakeholders, the public, and state and federal agencies. Data collected includes IRWM project information, reports and documents, plans and environmental studies. In addition, project documents including designs, feasibility studies, and reports are included and stored in the two locations. The two locations for data storage and retrieval are the IRWM Program and DMS site located on the Monterey Peninsula Water Management District website (http://www.mpirwm.org/Pages/default.aspx) and the Monterey Peninsula IRWM GIS-enabled project website (http://www.mpirwm.org/Pages/GISRegions.aspx). Both provide a forum for the sharing information, publicizing meeting dates, agendas, meeting minutes, and/or annual reports.

Figure ES-4: Image of the IRWM Plan Update Website

The SharePoint DMS has a query tool that allows state and federal agencies to perform keyword searches, and custom queries for all project data within the DMS. Likewise, similar search and query tools are available in the GIS Internet Mapping System. GIS map tools provide users with the ability to display disconnected layers via a "mash up" service and can be viewed based on varying characteristics such as project sponsor, data type, or project status. This functionality facilitates collaboration, integration, and identification of multiple benefits.

The SharePoint DMS has a basic map feature (web part) that uses a GIS service to locate the project areas of interest or boundaries. These GIS datasets allow the state or federal agencies to visualize the regional distribution of projects within the Region. Users can print the reports or map views (GIS) with simple search and sorting tools. Tools have been developed to save these outputs in PDF or JPG format, as well. Project summary or detail information can be accessed by clicking on the project name (DMS) or area/location on the map (GIS).

Chapter 10 Finance

The purpose of the Finance IRWM standard is to demonstrate that the RWMG has considered financing-not necessarily to document that all funding has been secured. In most cases, substantial funding uncertainty exists. More specifically, the finance chapter looks at how the financing of the IRWM Plan has been considered at a programmatic level by the RWMG, and that the strategy for financing the IRWM Plan is transparent.

The RWMG has identified the following potential alternative, non-IRWM sources of grant funds and other means to help implement projects and programs in the IRWM Plan.

Funding Sources		
Federal grant programs	Private grants	Bonded debt service
State grant programs	User fees	Non-profit sources
Proposition 218 Tax Assessments	Development impact fees	Mitigation fees
Local funds	Loans (such as Clean water State Revolving Fund loans)	

Chapter 11 Technical Analysis

A critical aspect of the regional planning process is the amalgamation of existing plans, reports, and studies as a basis for understanding current water resource conditions in the Region and for developing the IRWM Plan. The technical library allowed the RWMG as much information as possible- and provided an opportunity for each member to supplement his/her own expertise- to determine the goals, objectives, and priorities of the plan. The background information and technical data—including land use information, population studies and demographic information, economic data, water supply and water use data, watershed characteristics, hydrologic data, water quality data, environmental resources, and projected water demand—have been derived from a diverse set of documents.

Sources listed in the chapter were used to describe historic and existing conditions in the Region, as well as estimate future conditions and future water demand. Population data derived from the U.S. census, local/regional governmental forecasts and specific technical memoranda have also been used throughout the development of this plan.

Chapter 12 Relation to Local Water Planning

Ensuring that the IRWM Plan is congruent with other resource planning documents in the Region is important to the principles of integration and coordination that are the foundation of interregional water management planning.

IRWM planning does not replace or supersede local planning; rather, local planning elements are used as the foundation for the regional planning effort. This chapter describes how the RWMG has coordinated its water management planning activities to address or incorporate a myriad of planning documents. Although this chapter is dedicated to local water planning, there are a number of federal and regional plans relevant to the Region.

Federal and Regional Plans		
Groundwater management	Watershed management	City and County general planning
Water supply assessments	Stormwater management	Emergency response and disaster plans
Urban water management	Low impact development (LID)	Monterey Bay National Marine Sanctuary Management Plan

Federal and Regional Plans		
Flood management	Salt and salinity management	

The RWMG conducted a comprehensive analysis of the Region's water systems. This approach resulted in the formation of goals being driven by the perceived issues surrounding local water resource management. The RWMG has also developed a rapport with Central Coast regional water and land managers, which will ensure collaborative and proactive solutions regarding climate change.

Chapter 13 Relation to Local Land Use Planning

The guideline standards for chapter 13 are the basis for all resource management planning:

- Exchange knowledge and expertise between land use planners and water resource managers through the IRWM planning process
- Examine how RWMG and land use planning agencies currently communicate
- Identify how to improve planning efforts between the RWMGs and land use planning agencies

One of the goals of the *California Water Plan Update (2009)* is to ensure that water managers and land use planners make informed, collaborative water management decisions. Therefore, this standard helps meet this statewide goal. The relationship between the RWMG and land use decision-makers can significantly influence how both water management decisions and land use decisions are made. Opportunities may exist for the RWMG to provide input to land use planners in the following areas:

- Floodplain management
- Flood control planning
- Groundwater recharge and conjunctive water use
- Treatment and conveyance facilities
- Stormwater and runoff management
- Water conservation efforts
- Watershed management and restoration
- Municipal landscaping programs
- Public access and recreational area management
- Changes in land use that affect water resources
- General plan updates and long-term planning
- Planning review
- Development review
- Water supply for public safety and emergency planning
- Habitat management

While the level of coordination between land use planners and water managers varies considerably in the Region, it is clear that there is much room for improvement. The chapter provides some suggestions for improving communication and coordination between water managers and land use decision makers.

Chapter 14 Stakeholder Involvement

Along with the Regional Water Management Group (RWMG), over 130 stakeholders were identified and invited to be involved in the planning process, including federal, state, dozens of regional and local agencies, municipalities and special districts, non-profits (environmental, disadvantaged communities, and community groups), academic educational institutions, private companies and landowners, and individuals. **Appendix 1-d** contains the list of stakeholders and the record of stakeholder meetings conducted for the IRWM Plan Update.

The RWMG and stakeholders continue to identify groups, individuals, entities and other stakeholders who can benefit from participating in the IRWM planning process. Throughout the life-cycle of the IRWM Plan, an outreach effort will continue to identify any additional stakeholders that have not participated in plan development. Environmental justice is addressed by ensuring that all stakeholders have access to the decision-making process, additional outreach is conducted, and that minority and/or low-income populations do not bear disproportionately high and adverse human health or environmental impacts.

Chapter 15 Climate Change

The Intergovernmental Panel on Climate Change (IPCC) stated in its 2007 Synthesis Report: "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level" (IPCC 2007, p. 30). IPCC scientists predict that the serious consequences of climate change will continue to grow and expand. California's top scientists consider climate change to be a very serious issue requiring major changes in resource, water supply, and public health management.

By design, IRWM planning efforts are collaborative and include many entities dealing with water management. These aspects make IRWM a good platform for addressing broad-based concerns like climate change, where multiple facets of water management are affected.

Addressing climate change in the context of the IRWM process included:

1. Determining the predicted effects of climate change in California
2. Narrowing the potential impacts on the state down to likely impacts in the Monterey Peninsula
3. Determining which impacts will cause changes to water resources in the Region
4. Evaluating vulnerabilities and potential adaptabilities within water management systems
5. Creating a risk assessment analysis
6. Prioritizing vulnerabilities in the Region
7. Creating an initial adaptation strategy
8. Reevaluating the analysis as part of the continued planning process

Priority actions to address local climate change impacts should focus on the three prioritized vulnerabilities:

- Decreased water supply
- Increased flooding and erosion of creeks and rivers
- Coastal inundation of urban development, other land uses, and impacts to coastal river and wetland ecosystems

Continued communication with water managers and land use decision makers regarding climate change mitigation and greenhouse gas reduction efforts regionally will create greater opportunities for future planning efforts.

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Chapter 1 Governance

IRWM Standard 1

The Integrated Regional Water Management (IRWM) Plan must document a governance structure that ensures the IRWM Plan will be updated and implemented beyond existing State grant programs. The IRWM Plan must include:

- The name of the Regional Water Management Group (RWMG) responsible for development and implementation of the Plan. A RWMG must meet the definition of California Water Code (CWC) §10539, which states:

"*RWMG means a group in which three or more local agencies, at least two of which have statutory authority over water supply or water management, as well as those other persons who may be necessary for the development and implementation of a plan that meets the requirements of CWC §10540 and §10541, participate by means of a joint powers agreement, Memorandum of Understanding (MOU), or other written agreement, as appropriate, that is approved by the governing bodies of those local agencies.*"

The IRWM Plan must include a description of the RWMG and explain how the makeup of the RWMG meets CWC §10539 and is sufficient in breadth of membership and participation to develop and implement the IRWM Plan.

- The RWMG and individual Project Proponents who adopted the Plan
- A description of the IRWM governance structure
- A description of how the chosen form of governance addresses and ensures the following:
  - Public outreach and involvement processes
  - Effective decision making
  - Balanced access and opportunity for participation in the IRWM process
  - Effective communication – both internal and external to the IRWM region
  - Long term implementation of the IRWM Plan
  - Coordination with neighboring IRWM efforts and State and federal agencies
  - The collaborative process(es) used to establish plan objectives
  - How interim changes and formal changes to the IRWM Plan will be performed
  - Updating or amending the IRWM Plan

1.1 Introduction

Proposition 84 and 1E Guidelines (Guidelines) require that the IRWM Plan document the governance structure. This section of the IRWM Plan includes the following, as required by the Guidelines:

- *Section 1.2, Regional Water Management Group*
  - The name and description of the RWMG responsible for development and implementation of the Plan
  - How the makeup of the RWMG meets the definition of CWC Section 10539.[1]

[1] RWMG is defined by DWR: "a group in which three or more local agencies, at least two of which have statutory authority over water supply or water management, as well as those other persons who may be necessary for the development and

(Footnote continued on next page)

- The RWMG and individual Project Proponents who have adopted or will adopt the Plan.
- *Section 1.3, Governance Structure*
  - Effective decision making and communication
  - Long term implementation of the IRWM Plan
  - How interim changes and formal changes to the IRWM Plan will be performed
  - Updating or amending the IRWM Plan
- *Section 1.4, Revisions to the Regional Water Management Group*
  - Balanced access and opportunity for participation in the IRWM process
- *Section 1.5, Internal Coordination for Updates to and Adoption of the IRWM Plan*
  - How interim changes and formal changes to the IRWM Plan will be performed
  - Updating or amending the IRWM Plan
  - A summary of the collaborative process used to establish plan objectives
- *Section 1.6, External Coordination: Central Coast IRWM and Interregional Coordination*
  - Effective communication external to the IRWM region
  - Coordination with neighboring IRWM efforts and State and federal agencies

In addition, a detailed discussion of the 2013 IRWM Plan Stakeholder Involvement and Outreach is provided in **Chapter 14, Stakeholder Involvement,** including how the plan update process has addressed and ensured the following:

- Balanced access and opportunity for participation in the IRWM process
- Public outreach and involvement processes
- The collaborative process(es) used to establish plan objectives

Development of this 2013 Update to the IRWM Plan is a collaborative effort of public, non-profit, and for-profit (commercial) entities in the region, collectively, the stakeholders. The MPWMD is the lead agency for facilitating the development and implementation of the Plan.

1.2 Regional Water Management Group

The Monterey Peninsula RWMG represents the diverse interests of the IRWM Plan region (Region) and meets the definition of CWC section 10539. For the IRWM Plan first adopted in 2007, the RWMG was comprised of representatives from the Big Sur Land Trust (BSLT), the City of Monterey, the Monterey County Water Resources Agency (MCWRA), the Monterey Regional Water Pollution Control Agency (MRWPCA), and the Monterey Peninsula Water Management District (MPWMD). For this IRWM Plan Update, Marina Coast Water District (MCWD) and the Resource Conservation District of Monterey County (RCDMC) are proposed to be added to the RWMG, which represents the diverse interests of the Region.

Both MCWRA and MPWMD have responsibility for integrated water resource management within the Region. However, to ensure that resource management efforts are not duplicated, MPWMD and MCWRA entered into a Memorandum of Agreement (MOA) in 1993 that addressed water supply, flood control, water conservation, water recycling, and taxation and assessments in Monterey County (MCWRA, MPWMD, and Pajaro Valley Water Management Agency, August 24, 1993). It should be noted

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implementation of a plan that meets the requirements of CWC §10540 and §10541, participate by means of a joint powers agreement, Memorandum of Understanding , or other written agreement, as appropriate, that is approved by the governing bodies of those local agencies" (DWR, 2014).

that MCWRA, MRWPCA, MCWD, and RCDMC are also members of the RWMG for the Greater Monterey County IRWM Plan.

The City of Monterey provides storm water collection, maintains the sanitary sewer system, and manages park and open space areas for a population of approximately 30,000 within its jurisdiction. For the purposes of IRWM, Monterey represents many of the interests of the six Monterey Peninsula cities of Carmel-by-the Sea, Del Rey Oaks, Pacific Grove, Monterey, Sand City, and Seaside that are within the IRWM planning region.

The Big Sur Land Trust, which has been conserving land resources along the California central coast since 1978, serves as a bridge between private and public sectors and has increased its participation in resource planning in both the Carmel Valley and Salinas Valley. MRWPCA has multi-regional responsibility for wastewater treatment and the use of recycled water within the Monterey Peninsula and Salinas Valley areas. MCWD provides water and wastewater services within the Ord Community (former Fort Ord), which is geographically split between the Monterey Peninsula and Greater Monterey County planning regions. The RCDMC mission is to conserve and improve natural resources, integrating the demand for environmental quality with the needs of agricultural and urban users. The agencies participating in the RWMG are described in detail, below.

1.2.1 Big Sur Land Trust

Founded in 1978, The Big Sur Land Trust has worked in collaboration with partners and the community to conserve more than 38,000 acres of land in Monterey County. The Land Trust is committed to pursuing land and water conservation work that strengthens our communities and inspires a stewardship ethic so that Monterey County can maintain its unique and special place in the world. Since its inception, the BSLT has become a national leader in land conservation forging partnerships with willing landowners to protect land through acquisition or the establishment of conservation easements. Creating an effective private sector alternative for land preservation, the BSLT also serves as a bridge between private and public sectors.

Its efforts include habitat and nature restoration, watershed management, and land conservancy. The BSLT protects shoreline, wildlife habitat, streams, forests, grasslands and awe inspiring views. BSLT's vision includes leaving a remarkable legacy for all generations. In its 2013 Strategic Plan, BSLT broadened its mission to address stewardship of people and land with a goal to connect people with the land, as well as to develop a long term vision for interconnectivity of people and parklands.

BSLT has been working on several projects in the Region with partners that include the California Coastal Conservancy, the California Department of Parks and Recreation (State Parks), the Monterey County Resource Management Agency, the Monterey Peninsula Water Management District, The Point Lobos Foundation, the Carmel River Watershed Conservancy and the Monterey Peninsula Regional Park District. The BSLT brings a unique perspective to the Stakeholder group with their contacts and extensive experience with the private sector.

1.2.2 City of Monterey

The City of Monterey, founded when an expedition by land and sea brought Gaspar de Portolá and Franciscan Father Junipero Serra to Monterey in 1770, provides a range of services to its population including maintenance and development of outdoor recreation facilities (parks), management of historic Monterey Harbor, maintenance of sewers, and storm water management. Monterey is one of more than 300 California cities operating under the Council-City Manager form of government.

Monterey represents the interests of the six Monterey Peninsula cities that constitute a major urban service area in the MPWMD district boundary. Monterey and other cities provide various municipal services to their respective populations as well as to a significant tourist industry valued at an estimated $2 billion per year. The City of Monterey is represented on the Board of the MRWPCA and is a participating entity in the Monterey Regional Stormwater Management Program (see the description of the program, under the Monterey Regional Water Pollution Control Agency).

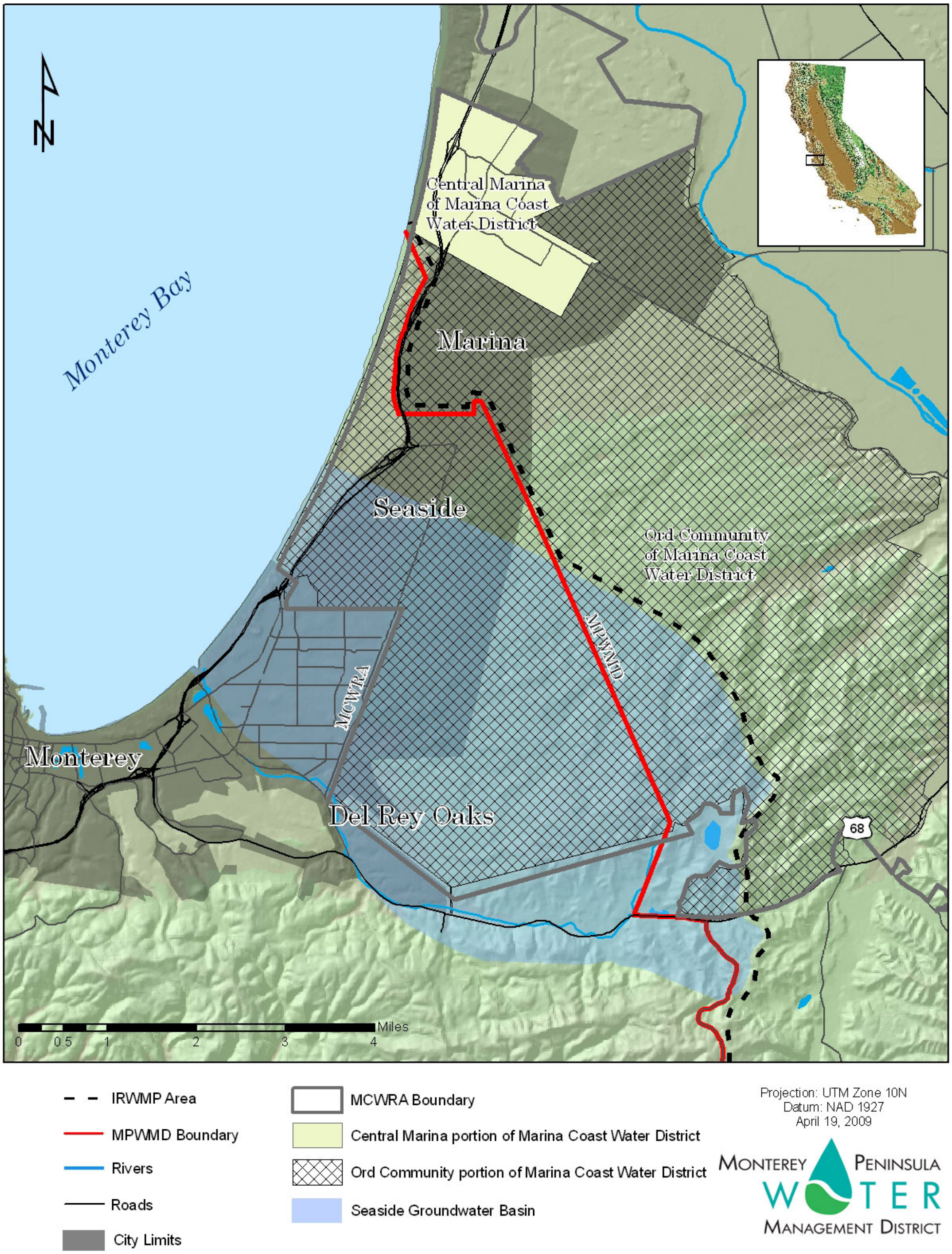
1.2.3 Marina Coast Water District

The MCWD was originally formed in 1960 to provide potable water service to all residential, commercial, industrial, environmental, and fire protection uses in the unincorporated community of Marina, an area of approximately six square miles located on the coast of the Monterey Bay at the northwest end of the Salinas Valley (**Figure 1-1**). The original boundary was coincident with the Marina Fire District. In 2001, the Army transferred the water and wastewater systems in the former Fort Ord area to MCWD and the 44-square mile area was renamed the Ord Community. In 2011, MCWD proposed formal annexation of the Ord Community into the MCWD boundary.

In 1970, MCWD constructed a wastewater treatment plant and installed a wastewater collection system to serve the community. The City of Marina incorporated in 1975, but MCWD remained separate. In 1991, MCWD constructed a pilot recycled water system providing tertiary treated wastewater for irrigation of public streetscapes and parks near the wastewater plant. This system operated only until 1992, when the wastewater collection system was connected to the regional wastewater system operated by the MRWPCA. The Marina wastewater treatment plant was retired, and MCWD now provides wastewater collection services only, with treatment performed at the regional plant. In 1996, MCWD constructed a seawater desalination facility to explore the feasibility of extracting seawater through shallow wells along the beach. The District also provides potable water delivery and wastewater conveyance services within the boundaries of the former Fort Ord Army Base, known as the Ord Community. The Ord Community encompasses a 44 square mile area, of which about 20 square miles is designated for redevelopment, with the balance being parks and open space.

In 1991, the former Army base was downsized and realigned pursuant to the Defense Base Closure and Realignment Act of 1990, with closure in 1994. Portions of the base were retained for use by the U.S. Army under the control of the Presidio of Monterey (Presidio Annex), with the balance being converted to civilian use under the guidance of the Fort Ord Reuse Authority (FORA), a public agency created for this purpose by the State of California. FORA's membership includes the land use jurisdictions encompassed by the former Fort Ord lands and others on the Monterey Peninsula. Redevelopment of the former Fort Ord has been focused on the development of several institutes of higher education, specifically, California State University, Monterey Bay (CSUMB), University of California, Monterey Bay Environmental Science and Technology Center, and Monterey Peninsula College.

Figure 1-1: Jurisdictional Boundaries in the Fort Ord Area



FORA has the statutory authority to provide for public capital facilities, including but not limited to, stormwater, water and wastewater facilities on the former Fort Ord. However, FORA has a limited statutory life and needed a reliable, long-term entity to provide public services to the area. In May 1997, the FORA Board approved the preparation of a Public Benefit Conveyance (PBC) application to the federal government for transfer of the water distribution and wastewater collection systems to MCWD. In June 1997, the U.S. Army and MCWD signed a caretaker agreement authorizing MCWD to operate the water and wastewater collection systems. In February 1998, MCWD and FORA executed an agreement for water and wastewater facilities, providing for the ownership and operation of water and wastewater facilities acquired from the federal government for the benefit of FORA. The Water and Wastewater Oversight Committee of the FORA Board oversees the operation of these facilities by MCWD. Title for these systems was transferred to MCWD in 2001, and the systems were subsequently interconnected. In 2007, MCWD combined the water system permits for the Central Marina and Ord Community service areas into a single California Department of Public Health permit.

The FORA Board retains the authority to allocate Salinas Valley groundwater supplies as provided for under an agreement between the federal government and the MCWRA dated September 1993. This agreement provides for groundwater extraction rights of 6,600 acre-feet per year (AFY), an amount consistent with the former average groundwater use at Fort Ord while under military operation. Consistent with this agreement, MCWD operates the Ord Community service area under a separate water allocation and cost center.

1.2.4 Monterey Peninsula Water Management District

The MPWMD (or District) is a special district formed in 1978 under the California Water Code, Chapter 118 to manage, augment, and protect water resources for the benefit of the community and the environment. Approximately 104,000 people live within the jurisdictional boundary of MPWMD, which includes the six Monterey Peninsula cities of Carmel-by-the-Sea, Del Rey Oaks, Monterey, Pacific Grove, Seaside, and Sand City, and unincorporated communities within Monterey County including Pebble Beach, the Carmel Highlands, a portion of Carmel Valley, and areas adjacent to Highway 68 between Del Rey Oaks and the Laguna Seca area (also known as Arroyo Del Rey or Canyon Del Rey).

The District is governed by a seven-member Board of Directors, five elected from voter divisions, one member of the Monterey County Board of Supervisors, and one elected official or chief executive officer appointed by the City Selection Committee comprised of mayors from all Cities within Monterey County.

The Legislature granted the MPWMD broad powers in order to carry out its mandates. This special district authority gives the MPWMD the power to adopt ordinances and resolutions, and promulgate rules governing the use of surface and groundwater resources. These powers exceed those of most water agencies or other special districts in California. Accordingly, the District has promulgated a set of Rules and Regulations that provide the governing foundation for the District’s groundwater management authority. MPWMD’s legislative functions are to:

- Augment the water supply through integrated management of surface and ground water resources;
- promote water conservation (including rationing, if needed);
- promote water reuse and reclamation of storm and waste water; and
- foster the environmental quality, native vegetation, fish and wildlife, scenic values and recreation on the Monterey Peninsula and in the Carmel River basin.

This has allowed the District to exercise the following functions in the Region:

- local, integrated control of resources, including groundwater
- obtain surface water right permits from the State Water Resources Control Board
- set production goals for each of California American Water's (Cal-Am) major sources of supply (Cal-Am supplies 95 percent of potable water users in the Region from Carmel River surface water, upper Carmel Valley groundwater, lower Carmel Valley groundwater, and coastal Seaside basin groundwater) through the Quarterly Water Supply Strategy and Budget process
- determine the release rate of surface water diversion at Cal-Am's Los Padres Dam and the minimum instream flow requirement below San Clemente Dam through the annual MOA process, which involves regular consultations between Cal-Am, the California Department of Fish and Game (CDFG), MPWMD, and NOAA Fisheries
- annual MOA process to manage the production of surface and groundwater by Cal-Am
- allocation program for water supply to the eight local jurisdictions: cities of Carmel, Del Rey Oaks, Monterey, Pacific Grove, Sand City, Seaside, and the Monterey Peninsula Airport District and unincorporated portions of Monterey County in Carmel Valley and Pebble Beach
- metering program for all wells and other water supply sources
- computer modeling of the water resources system
- hydrologic monitoring (surface and groundwater)
- water connection permit and inspection programs
- water conservation programs
- drought emergency and water rationing programs
- Carmel River environmental monitoring and mitigation programs
- river works projects (erosion control)
- regulation of new water distribution systems and expansions, including single-system supply
- sources
- annual reporting of water demand, production and environmental programs

MPWMD manages the production and use of water from the Carmel River stored in Los Padres Reservoir (the San Clemente Reservoir is no longer used to provide municipal supply), water production in the Carmel Valley aquifer, and groundwater pumped from municipal and private wells in Carmel Valley and the Seaside Groundwater Basins. Portions of MPWMD's jurisdictional area include watersheds and groundwater basins with area that is outside of the MPWMD political boundary, but that directly influences the quantity and quality of water resources within the MPWMD boundary.

Through its Water Distribution System permitting system, MPWMD regulates public fresh water supply systems including systems owned by Cal-Am, the largest purveyor of water in the Region. MPWMD monitors the production of water from approximately 1,200 public and private wells, of which approximately 750 are currently active. MPWMD regulates the creation of new water distribution systems and expansions, water connection permits, allocation of water to jurisdictions (cities and unincorporated areas), water conservation ordinances and inspections, determines drought emergencies and can impose rationing programs. The District also regulates activities within the streamside corridor of the lower 15.5 miles of the Carmel River.

Since the mid-1980s, Cal-Am and MPWMD have cooperated on a number of projects in the public interest including Carmel River restoration projects, water supply projects, and water conservation programs. Recently, a partnership was formed to carry out Aquifer Storage and Recovery projects to augment the water supply for the Region. MPWMD also works extensively with MCWRA and the County of Monterey in the unincorporated areas of the Region. Cooperative efforts include regulation of wells, monitoring and management of Carmel River resources, and management of the Seaside Groundwater Basin. MPWMD was involved with the financing of the Pebble Beach Reclamation project and sales of reclaimed water through the Carmel Area Wastewater District. MPWMD has also recently entered into an agreement with the MRWPCA to pursue use of reclaimed water in the Seaside Groundwater Basin. In the lower 15.5 miles of the Carmel River streamside corridor, MPWMD is often the lead agency in coordinating regulatory actions and issuance of authorizations for streamside alterations from CDFG, the U.S. Army Corps of Engineers, the Regional Water Quality Control Board, and Monterey County.

The MPWMD is guided by their Mission Statement, Vision Statement, and Strategic Goals (most recently adopted April 15, 2013), including the following:

> *Mission Statement:* The mission of the Monterey Peninsula Water Management District is to promote or provide for long-term sustainable water supply, and to manage and protect water resources for the benefit of the community and the environment.
>
> *Vision Statement:* The MPWMD: (1) Will strive to ensure a public role in development, ownership, and oversight of water supply solutions in collaboration with private or other public entities, resulting in sustainable, legal, affordable, and environmentally responsible water supply, consistent with adopted general plans; (2) Shall carry out its leadership role in water resource management in a fiscally responsible and professional manner.
>
> *One-Year Strategic Goals:*
>
> - Continue to advance water supply projects
> - Work with community to protect investment in water credits and “smart” development
> - Revise rationing program in advance of “regulatory drought”
> - Streamline essential services and organization
> - Continued progress in public outreach efforts
>
> *Three-Year Strategic Goals*:
>
> - Develop comprehensive strategy for permit 20808-B
> - Prepare for allocation of “new water”
> - Establish a long-term strategy for Los Padres Dam

MPWMD maintains a web site with IRWM planning information and a library of documents that can be accessed on-line.[2] It should be noted that while MPWMD does exercise authority over water resources, it does not exercise authority over land use except in a certain limited area along the Carmel River. Land use is governed by the Monterey Peninsula cities and Monterey County.

1.2.5 Monterey County Water Resources Agency

The MCWRA was formed under Chapter 699 of the Statutes of 1947 as the Monterey County Flood Control and Water Conservation District. In 1990, the District was renamed the Monterey County Water Resources Agency.[3] The agency is governed by a nine-member Board of Directors, five appointed by the Monterey County Board of Supervisors (one by each supervisor), four directors appointed by a majority

[2] http://www.mpirwm.org

[3] Chapter 52 Monterey County Water Resources Agency Act (former Chapter 52, Monterey County Flood Control and Water Conservation Act, Stats. 1947, c. 699, editorially classified as Water Code Appendix §§ 52-1 to 52-36, was repealed by Stats. 1990, c. 1159 (S.B.2580), § 49)

vote of the supervisors from nominees submitted by three Monterey County agricultural groups and one from the Monterey County Mayors Select Committee.

Within the Monterey Peninsula IRWM Planning Region, MCWRA is responsible for providing flood protection and stormwater management to the unincorporated areas. The Agency develops regional stormwater management plans, regulates activities in the 100-year floodplain of the Carmel River, and administers the National Flood Insurance Program (NFIP) in Monterey County. Monterey County has been a voluntary participant in the Community Rating System since October 1, 1991, and the County was upgraded to Class 5 on May 1, 2007 (one of only a handful with this rating in the United States). With the improved rating, buildings located in a Special Flood Hazard Area receive a 25 percent discount for new or renewed NFIP policies. In the late 1970s, Monterey County developed the first ALERT (Automated-Local-Evaluation-in-Real-Time) flood warning system. The system consists of self-reporting remote sensors, located throughout the County, that transmit rain and stream level data by radio to the MCWRA and the county courthouse base station computers in Salinas. A few of the stations are also connected to the web and allows for the earliest possible flood warnings and river flow forecasts. Currently, the Monterey County ALERT system consists of 24 rain gages, 10 combination rain and stream gages, and 20 stream or reservoir/lagoon level sensors.

MCWRA is a member of the MRWPCA and the Seaside Basin Watermaster. It should be noted that MCWRA is also the lead agency for the Salinas Valley IRWM Plan and is a key partner in coordinating the use of recycled water from Monterey County's largest treatment plant, which is located on the Salinas River and operated by MRWPCA.

1.2.6 Monterey Regional Water Pollution Control Agency

The MRWPCA is a joint powers agency formed in 1972 to provide wastewater collection and treatment to the Monterey Peninsula cities (except Carmel-by-the-Sea). MRWPCA also serves communities within its boundaries that are outside of the Monterey Peninsula Region (Salinas and Castroville). MRWPCA is governed by a Board of Directors representing each of the jurisdictions that it serves. The agency has a regional treatment plant on the Salinas River and discharges treated wastewater effluent into the Monterey Bay near the Salinas River mouth in addition to producing recycled water for agricultural irrigation; however, MRWPCA has a long-term plan to eliminate wastewater discharges to the Monterey Bay by constructing projects to recycle water within its jurisdictional area. Member agencies include Del Rey Oaks, Monterey, Pacific Grove, Salinas, Sand City, Seaside, Boronda, Castroville, Moss Landing, Fort Ord, Monterey County, and Marina.

In 1992, MRWPCA and the MCWRA formed a partnership to build two projects: a water recycling facility at the Regional Treatment Plant; a distribution system including 45 miles of pipeline and 22 supplemental wells. Its objective was to retard the advance of seawater intrusion by supplying irrigation water to nearly 12,000 acres of farmland in the northern Salinas Valley. The MCWRA partnered with the Salinas Valley community (primarily agricultural users in the northern portion of the County) to help build the projects. The $75 million dollar projects were funded by U.S. Bureau of Reclamation and State of California low-interest loans, plus local funding. Construction costs are being paid back using water delivery charges and assessments.

MRWPCA is also the Program Manager for the Monterey Regional Storm Water Management Program (MRSWMP) and is responsible for program management and administration, permit management, technical program management, and related duties. Participating entities in the MRSWMP include the cities of Pacific Grove, Monterey, Seaside, Sand City, Del Rey Oaks, and Marina, and the County of Monterey.

MRWPCA's mission statement: "The Monterey Regional Water Pollution Control Agency is dedicated to meeting the wastewater and reclamation needs of our member agencies while protecting the environment," and their Vision Statement is: "The Monterey Regional Water Pollution Control Agency will be a model customer service provider for the efficient, innovative utilization of wastewater." MRWPCA's Core Values include the following (not in priority order):

- Cost-efficient, consistent and reliable service and business practices
- Open, honest lines of communication between and among board, public and staff
- Ethical behavior
- Customer-focused and centered
- Helpful and timely responses
- Loyalty and dedication

MRWPCA's three-year goals for 2011-2014 are as follows (not in order of priority):

- Develop the use of recycled and replenishment water
- Achieve sufficient pump station and conveyance capacity to meet the needs of member agencies
- Enhance and maintain our aging infrastructure
- Update and consolidate a disaster preparedness plan

1.2.7 Resource Conservation District of Monterey County

The Resource Conservation District (RCD) has been at the forefront of natural resource management and protection in Monterey County and the Central Coast. We work extensively with growers, ranchers, landowners, and partner organizations and agencies throughout the Central Coast to accomplish our mission. The RCD works closely with the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) to provide technical assistance to Monterey County landowners, growers and ranchers. The USDA Service Center in Salinas hosts an NRCS staff of nine with expertise in agronomy, range management, engineering, soil science, hydrology, plant science, and biology.

The RCD staff includes technical specialists with expertise in a variety of areas, including permitting, project funding, hydrology, engineering, weed management, erosion control, and species protection. In accordance with the current 5-Year Strategic Plan, the RCD provides landowners and growers assistance with conservation planning and design, project funding, permitting and implementing management practices. The RCD works with local researchers to develop new ways to improve water quality, and to evaluate the effectiveness of management practices. The RCD also assists landowner and grower applications to funding sources such as the USDA Environmental Quality Incentives Program.

The RCD has demonstrated success in education, outreach and conservation and restoration project design and implementation. During the past 10 years, RCD-NRCS teamwork has resulted in the establishment of voluntary conservation and restoration projects on over 80 farms by collaborating with over 160 farmers and land managers.

1.3 IRWM Governance Structure

This section summarizes the formalized IRWM governance structure embodied in the Memorandum of Understanding (MOU). The MOU acknowledges the collaborative approach to planning and is written to ensure that the chosen form of government can address the following items as part of its structure:

- Public outreach and involvement process
- Effective decision making

- Opportunity of participation in the IRWM Plan process
- Communication within and outside the IRWM Region
- Long term implementation of the IRWM Plan
- Coordination with other IRWM efforts
- Coordination with state and federal agencies
- How interim changes and formal changes to the IRWM Plan will be performed
- Updating or amending the IRWM Plan
- The collaborative process(es) used to establish plan objectives

An MOU was approved in June 2008 by the Regional Water Management Group (**Appendix 1-a, Memorandum of Understanding, 2008**) to acknowledge cooperative efforts in the planning Region and to form an institutional structure to develop and implement the IRWM Plan. The MOU formalizes the collaborative planning effort that these agencies have been involved in for several years, describes the processes for completing the IRWM Plan and make amendments in the future, and also describes the role of stakeholders in carrying out the Plan. A draft MOU for the 2013 Update to the IRWM Plan has been prepared and is included in **Appendix 1-b, Draft Memorandum of Understanding, 2013.**

As discussed in the draft MOU, the IRWM Plan may be amended or changed should any member of the RWMG or Stakeholder request that the Lead Agency convene for the purposes of amending the IRWM Plan or the prioritized project list. However, the IRWMP may only be amended once a year, unless more frequent amendments are required to meet state IRWM standards or grant application cycles. An amended IRWM Plan must be consistent with state IRWM standards.

The status of adoption of the MOU is shown in **Table 1-1**. In 2009, MCWD requested to be included in the RWMG. Staff representatives of the RWMG reviewed the request and recommended in 2010 that MCWD become a member. Subsequently, MCWD adopted a revised MOU. The revised MOU to include both MCWD and MCRCD will be presented to the Boards of the original RWMG for adoption.

Table 1-1: Regional Water Management Group MOU Status

RWMG Organizations/Agency	Acronym	Adopted MOU to form RWMG	Adopted revised MOU?
Big Sur Land Trust	BSLT	Yes	TBD
City of Monterey	Monterey	Yes	Yes
Marina Coast Water District	MCWD	No	Yes
Monterey County Water Resources Agency	MCWRA	Yes	TBD
Monterey Peninsula Water Management District	MPWMD	Yes	Yes
Monterey Regional Water Pollution Control Agency	MRWPCA	Yes	TBD
Resource Conservation District of Monterey County	RCDMC	No	Yes

1.4 Long term Implementation of the IRWM Plan

The RWMG will continue to meet on an ongoing basis to implement the IRWM Plan and to carry out IRWM planning. The IRWM Plan is intended to be a long-term planning document with a minimum 20-year planning horizon. As such, the Plan will need to undergo periodic updates and revisions to reflect changing conditions. RWMG membership and governance processes may also evolve over time, and the IRWM Plan will be revised to reflect those changes. This section describes how the governance structure allows for periodic formal and informal changes to the IRWM Plan.

A review of the IRWM Plan may occur with each IRWM Plan project solicitation, which is expected to occur in response to Stakeholder requests or with IRWM Grant application solicitation(s). The review would be consistent with DWR Guidelines and would reflect any significant changes in the issues and conflicts in the region, the goals and objectives, resource management strategies, and other IRWM Plan "milestones." In addition, with each new IRWM Plan project solicitation, all projects, both existing and new, will get re-ranked and a new project list will be generated and available for viewing on the website. All amendments resulting from reviews of the IRWM Plan will be officially incorporated into the Plan upon approval by the RWMG, as determined by vote at a regularly scheduled RWMG meeting open to the public and according to the decision-making protocols outlined in this plan and the RWMG MOU. However, revisions to the prioritized project list would not require re-adoption of the plan, as long as the prioritization is consistent with the IRWM Plan (**Chapter 6, Project Review Process)**.

Plan review may include a review and re-assessment of RWMG composition, regional boundaries, and other "big picture" issues related to IRWM planning in Monterey Peninsula region. A plan review may also include re-assessment of IRWM Plan "milestones," as described above. Formal updates and re-adoption of the IRWM Plan, requiring the approval of the governing boards of each RWMG entity, will occur only as required by the State (for example, in the case of a Region Acceptance Process) or as deemed necessary by the RWMG. Ideally the RWMG would formally review, revise, and adopt the IRWM Plan no less frequently than every five years; however, a formal review is an intensive process and the frequency of this type of review will depend on whether adequate funding is available and the need to reflect updated conditions.

Finally, a Plan Performance Review will occur on an approximately bi-annual basis. The intent of the Plan Performance Review is not to review the "content" of the Plan per se but to determine the extent to which project implementation is achieving Plan objectives (further description in **Chapter 8, Plan Performance and Monitoring**). Project data from all projects implemented through the Plan will be tracked using the data management system as described in **Chapter 9, Data Management**. Monitoring the projects over time will not only enable the RWMG to determine its success in implementing the IRWM Plan but will keep the Plan alive and help drive it forward.

1.5 Revisions to the Regional Water Management Group

Any qualified stakeholder may petition to become a member of the RWMG. A qualified stakeholder must demonstrate the following: a) an interest, responsibility or authority over multiple resources within the region; or b) a unique interest, responsibility, authority, or asset not shared by any other entity within the RWMG. The RWMG considers such requests for a change to the RWMG and votes by majority to accept or reject the request.

Members of the RWMG may change from time to time, depending on the level of resources available to each entity. However, there is no required minimum or maximum length of time required as a member of the RWMG. If an entity withdraws from the RWMG, the remaining entities attempt to replace the interest, responsibility or authority lost by the withdrawal.

It is expected that the RWMG meet periodically and that each member insure that adequate staff resources are available to implement the IRWM Plan.

1.6 Interim Changes and Formal Changes to the IRWM Plan

1.6.1 Balanced access and opportunity

The IRWMP and prioritized project list may be amended from time to time. Any member of the RWMG or stakeholders group may request that the Lead Agency convene a meeting of the RWMG and Stakeholders for the purposes of amending the IRWMP or the prioritized project list. However, it is anticipated that the IRWMP or prioritized project list will be amended no more frequently than annually, unless more frequent amendments are required to meet State IRWM standards or grant application cycles. An amended IRWMP must be consistent with State IRWM standards as described in the IRWM Guidelines (November 2012)[4]. Decisions within the RWMG are normally made by consensus and the plan itself will be subject to adoption by the RWMG and Project Proponents. Lead agencies for each project must adopt the IRWM Plan in order to receive grant funds. Should it become necessary to broaden or establish a different procedure for changing, updating and amending the plan, the MOU will be revised to describe the procedure.

Project Proponents are responsible for completing proposed projects and providing project reports to the lead agency. The RWMG is responsible for monitoring the implementation of the IRWMP. MPWMD will be the lead agency for facilitating information exchange among the Stakeholder Group and other interested parties. All projects included in the IRWM Plan will incorporate monitoring components.

Each project sponsor that receives grant funding is required to adopt the IRWM Plan. The Resolutions of Adoption will be provided in **Appendix 1-c, Resolutions of Adoption**, prior to finalization of this plan.

1.6.2 Public Outreach and Involvement

This 2013 Update to the IRWM Plan includes ample opportunity for stakeholders, including the RWMG and disadvantaged communities (DAC), to provide public input concerning changes to objectives, priorities, and existing regional efforts. Therefore, this update process includes a strenuous public and stakeholder outreach component that will be vetted by the stakeholder group and is further detailed in **Chapter 14, Stakeholder Involvement**.

1.7 Coordination and Communication

This section provides a description of how the planning process addresses and ensures the following:

- Effective communication external to the IRWM region
- Coordination with neighboring IRWM efforts and state and federal agencies

[4] 2012 Guidelines were approved in November 2012; the Draft 2014 IRWM Guidelines are available for public review at http://www.water.ca.gov/irwm/grants/docs/Guidelines/P84_IRWM_GL_Drought2014_PublicReviewDraft.pdf

The RWMG governance structure fosters effective communication both within the RWMG and externally with Project Proponents, neighboring RWMGs, government agencies, and the general public. Internally, the RWMG strives to create an environment of open communication, cooperation, collaboration, and respect among its members and at the monthly RWMG meetings. Time has been devoted at RWMG meetings for individual RWMG members to discuss their projects, their water management issues, and any concerns.

The IRWM Plan lead agency, MPWMD, works to ensure that stakeholders, Project Proponents, and the general public are well informed of the latest IRWM activities and accomplishments. MPWMD sends regular email communications to interested stakeholders about IRWM news and events; the emails always contain contact information (email address and phone number) for the IRWM Plan lead at MPWMD so that stakeholders can voice their comments, concerns, or questions about the IRWM planning process.

The RWMG communicates with federal and state government agencies as needed. Numerous federal and state agencies are included on the IRWM Plan Update stakeholder list provided in **Appendix 1-d, Current Stakeholders List**. The IRWM Plan Coordinator and RWMG members participate in the statewide Roundtable of Regions meetings, a forum for discussion between all RWMGs in the state, and regionally, in Central Coast Funding Area meetings to coordinate IRWM planning activities between the Central Coast IRWM regions and to discuss potential funding strategies. See **Chapter 5, Integration and Coordination,** and **Chapter 6, Project Review Process**, for a more detailed description of how the RWMG communicates with neighboring regions and government agencies.

The Monterey Peninsula, Carmel Bay, and South Monterey Bay (Monterey Peninsula) IRWM Plan region shares a border with the Greater Monterey County region. Along this border, the 45 square-mile Ord Community is a geographical transition zone containing areas and resources that are managed by many agencies, including some that are in both IRWM RWMG. Fundamental challenges are: 1) determining which regional IRWM Plan proposed projects should be described in each IRWM Plan; 2) prioritizing projects in each region; 3) cooperating between regions in order to ensure that Ord Community projects do not fall into a “no man’s land” between the regions; and 4) moving projects forward that benefit both regions. A detailed analysis of the inter-regional issues and coordination of the two regions is included in the report titled: “Integrated Regional Water Management Inter-Regional Coordination: Greater Monterey County and Monterey Peninsula, Carmel Bay, and South Monterey Bay Regions” that is summarized in **Chapter 5, Integration and Coordination**, and included in **Appendix 5-a**. That report describes the relationship between regions, identifies resource challenges, and outlines areas of potential cooperation between the regions.

1.8 Adoption of the Plan

A notice of intent (NOI) to prepare the IRWM Plan was published in the Monterey County Herald on April 26 and May 1, 2012 (**Appendix 1-e**) in accordance with §6066 of the Government Code. A Notice of Public Hearing to receive input on the Draft IRWM Plan Update was published in the Monterey County Herald on May 7 and May 14, 2014 (**Appendix 1-e**). Each of the RWMG members have received a Draft amended MOU, found in **Appendix 1-b,** which includes a requirement to adopt the Monterey Peninsula IRWM Plan through resolution by their governing boards or by other means according to organizational protocol. **Appendix 1-c** (pending) contains the formal resolutions signed by the governing boards of each member of the RWMG to adopt the IRWM Plan. In addition, each project proponent named in an IRWM grant application is also required to adopt the IRWM Plan in order to be eligible to receive IRWM grant funds. Each project proponent will be required to submit a formal, signed resolution adopting the IRWM Plan, prior to submission of an IRWM grant application.

Chapter 2 Region Description

IRWM Standard 2

An IRWM Plan must include a description of the region being managed by the RWMG. This description should include a comprehensive inclusion of the following:

- A description of the watersheds and the water systems, natural and anthropogenic (i.e. "man-made"), including major water related infrastructure, flood management infrastructure, and major land-use divisions. Also include a description of the quality and quantity of water resources within the region (i.e. surface waters, groundwater, reclaimed water, imported water, and desalinated water). As relevant, describe areas and species of special biological significance and other sensitive habitats, such as marine protected areas and impaired water bodies within the region.
- A description of internal boundaries within the region including the boundaries of municipalities, service areas of individual water, wastewater, flood control districts, and land use agencies. The description should also include those not involved in the Plan (i.e. groundwater basin boundaries, watershed boundaries, county, State, and international boundaries).
- A description of water supplies and demands for a minimum 20-year planning horizon. Including a discussion of important ecological processes and environmental resources within the regional boundaries and the associated water demands to support environmental needs. This includes a description of the potential effects of climate change on the region.
- A descriptive comparison of current and future (or proposed) water quality conditions in the region. Describe any water quality protection and improvement needs or requirements within the area of the Plan.
- A description of the social and cultural makeup of the regional community. Identify important cultural or social values. Identify DACs in the management area. Describe economic conditions and important economic trends within the region. Describe efforts to effective involve and collaborate with Tribal government representatives to better sustain Tribal and regional water and natural resources (if applicable).
- A description of major water related objectives and conflicts in the defined management region, including clear identification of problems within the region that focus on the objectives, implementation strategies, and implementation projects that ultimately provide resolution.
- An explanation of how the IRWM regional boundary was determined and why the region is an appropriate area for IRWM planning.
- Identification of neighboring and/or overlapping IRWM efforts (if any) and an explanation of the planned/working relationship that promotes cooperation and coordination between regions.
- For IRWM regions that receive water supplied from the Sacramento-San Joaquin Delta, and explanation of how plan will help reduce dependence on the Sacramento-San Joaquin Delta for water supply (SB 855 (Committee on Budgets), Section 31.(c)(1)). *NOTE: NOT APPLICABLE TO THIS REGION*.

2.1 General Description

The planning region is located in Central Coast Regional Water Quality Control Board (RWQCB) Region 3 and lies between the Salinas River groundwater basin and the Big Sur coast. The planning area was established based on watershed and groundwater basin limits, portions of the near-shore environment areas affected by inland area activities, and takes into consideration jurisdictional limits, powers and responsibilities for water resource management. A map is presented in **Figure 2-1**. The planning region is approximately 347 square miles and consists of coastal watershed areas in Carmel Bay and south Monterey Bay between Pt. Lobos on the south and Sand City on the north – a 38.3-mile stretch of the coast that includes three Areas of Special Biological Significance (Pt. Lobos, Carmel Bay, and Pacific Grove). The area encompasses the six Monterey Peninsula Cities of Carmel-by-the Sea, Del Rey Oaks, Pacific Grove, Monterey, Sand City, Seaside, and extends into portions of the unincorporated area of Monterey County at the former Fort Ord, in the Carmel Highlands, Pebble Beach, the inland areas of Carmel Valley and the Laguna Seca area.

Figure 2-1: Pacific Grove Areas of Special Biological Significance

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

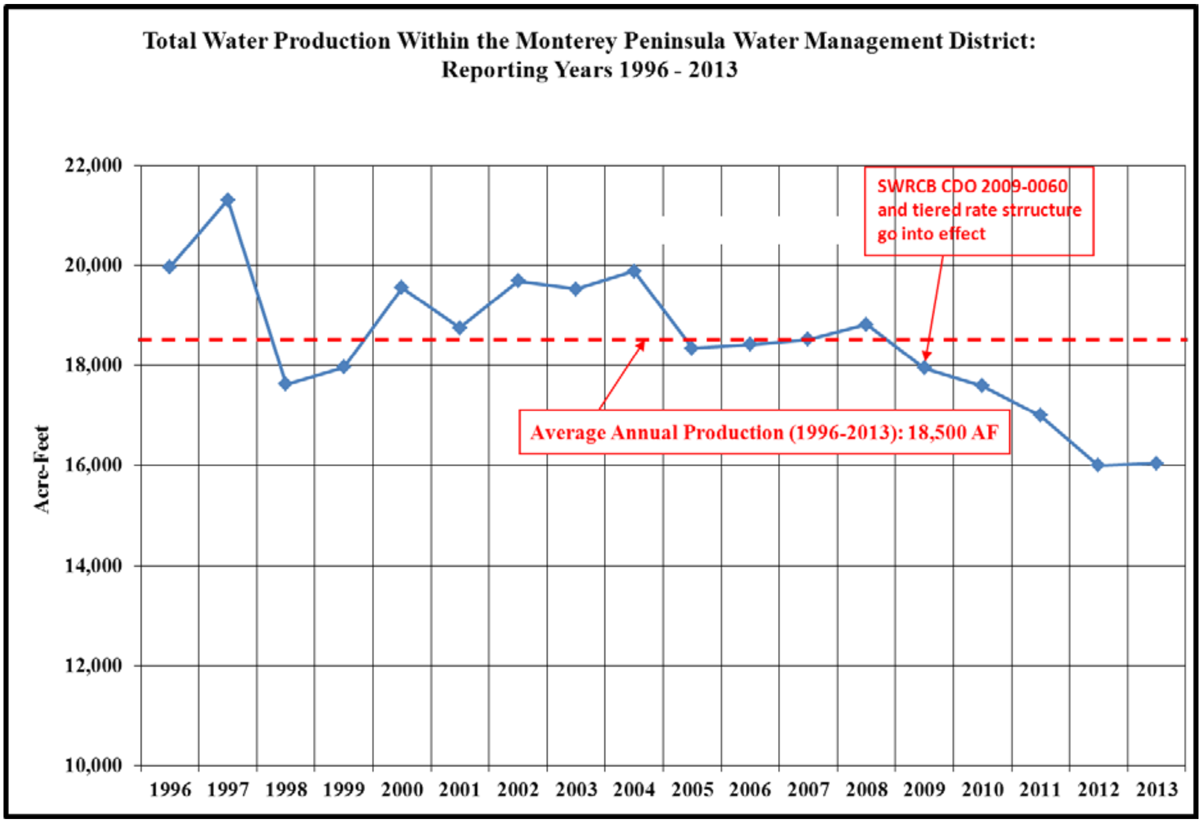
The planning area is adjacent to the Monterey Bay National Marine Sanctuary (MBNMS). The MBNMS was designated in 1992 as a federally-protected marine area offshore of California's central coast. Stretching from Marin to Cambria, the MBNMS encompasses a shoreline length of 276 miles and 5,322 square miles of ocean, extending an average distance of 30 miles from shore. At its deepest point, the MBNMS reaches 10,663 feet (more than two miles). It is our nation's eleventh Marine Sanctuary and its largest. The MBNMS was established for the purpose of resource protection, research, education and public use. Its natural resources include our nation's largest kelp forest, one of North America's largest underwater canyons and the closest-to-shore deep ocean environment in the continental United States. It is home to one of the most diverse marine ecosystems in the world, including 33 species of marine mammals, 94 species of seabirds, 345 species of fishes, and numerous invertebrates and plants. This remarkably productive marine environment is fringed by spectacular coastal scenery, including sandy beaches, rocky cliffs, rolling hills and steep mountains.

The southeastern portion of the region includes a part of the Ventana Wilderness, which is in the Los Padres National Forest. The region includes all the area within the jurisdiction and management of the Monterey Peninsula Water Management District (MPWMD) including all the incorporated Cities in the Monterey Peninsula area, a portion of the Carmel Valley, and the Arroyo Del Rey. The region also includes watersheds and groundwater basins that are outside of the MPWMD political boundary, but that directly influence the quantity and quality of water and water resources.

The population of the region, which is estimated to be about 106,400, is entirely dependent on local rainfall and runoff for its potable water supply, with no connections to California state or federal water supply sources outside of the region. Climate in the region is considered Mediterranean, with wide annual swings in precipitation and surface runoff that can result in near desert-like, arid conditions or in periodic downpours resulting in large floods. The average annual runoff of the Carmel River, the largest stream in the region, was 74,440 acre-feet (AF) for the period of record 1962-2013 (U.S. Geological Survey, measured at U.S.G.S Near Carmel gage, 3.56 River Miles upstream of the Pacific Ocean). No flow reached this station for a 16-month period during the drought of 1976-77 – a condition that was a factor in the destabilization of streamside areas along the Carmel River during subsequent high flows in the years following this drought. The greatest amount of runoff recorded was estimated by the U.S.G.S. at nearly 368,000 AF during the 1982-83 el Niño event. As shown in **Figure 2-2**, total water production from all sources within the Monterey Peninsula Water Management District boundary averaged 18,500 acre-feet annually (AFA) during Water Years 1996 through 2013 (October 1 to September 30)[1].

[1] Reported and Adjusted Annual Average Water Production Within MPWMD During Water Years 1996 through 2013, MPWMD records.

Figure 2-2: Total Water Production



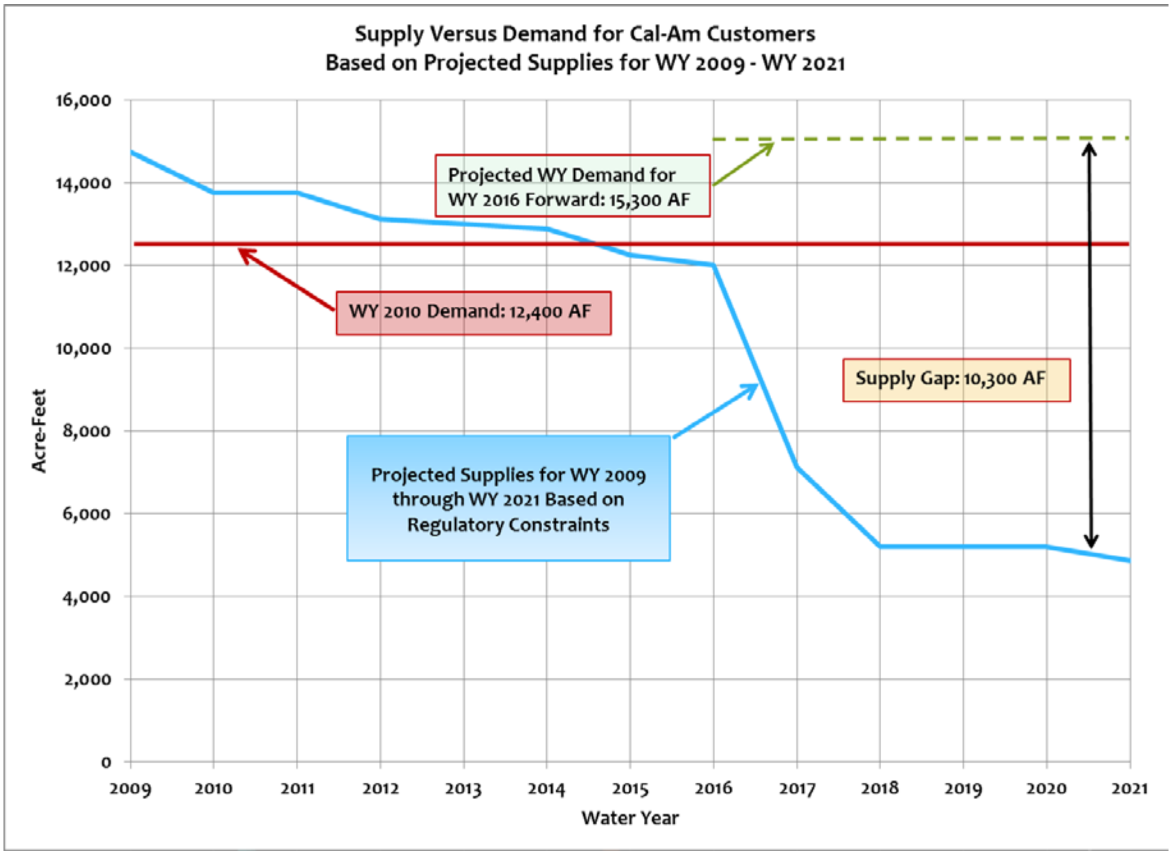
Although the region generates a significant quantity of wastewater, the majority of it is transported out of the region and is used for the Castroville Seawater Intrusion Project in Northern Salinas Valley. Wastewater is treated at the Monterey Regional Water Pollution Control Agency Regional Treatment Plant near the mouth of the Salinas River, which services a total population of about 250,000 that includes areas both inside and outside of the planning region, and processes up to about 18 million gallons per day (MGD). A substantial portion of this flow is tertiary treated, recycled and supplied for irrigation to nearly 12,000 acres of farmland in the northern Salinas Valley. Peak daily average flow capacity of this plant is calculated at 29.6 MGD (10 MGD would result in about 11,200 AFY). Up to approximately 800 AFY of wastewater from the Carmel Area Wastewater District treatment plant is reclaimed and piped within the region for turf irrigation, golf courses and other areas in Pebble Beach. In Carmel Valley, it is estimated that several thousand homes and many businesses use individual septic systems to treat wastewater; however, Monterey County does not have an exact number of these systems.

Total usable storage in the region, including surface and groundwater, is estimated to be about 37,500 AF in the Carmel River Basin and approximately 52,030 AF in the confined aquifers of the Seaside Groundwater Basin (SGB)[2]. Storage in the Carmel River Basin fills to capacity nearly every year due to Carmel River streamflow, whereas available storage in the unconfined aquifers above sea level in the SGB ranges from 2,000 AF to 3,000 AF. However, production limits have been imposed in both basins

[2] February 3, 2010 Seaside Watermaster Board Report.

that substantially reduce the annual amount of water that can be produced. As shown in **Figure 2-3**, eventually, extraction of native water in these basins will be reduced to an authorized sustainable level.

Figure 2-3: California American Water Production



Usable surface storage at the two main stem reservoirs on the Carmel River represents less than 2 percent of total storage and, without maintenance, is projected to decrease to zero within 100 years due to the relatively high sediment yield in the contributing watersheds. Direct diversions from surface storage in Carmel Valley are no longer relied on to meet municipal supply. Instead, stored water is released during dry periods from the Los Padres Reservoir to meet instream flow requirements and partially offset environmental damage from groundwater extractions. The lower main stem reservoir (San Clemente Reservoir) has no usable storage during dry periods as the pool of water behind the dam is lowered to reduce the potential for failure during a seismic event (California Division of Safety of Dams requirement). This dam is also proposed for removal in 2015 order to enhance fisheries habitat. Winter season diversions along the Carmel River for injection into the Seaside Basin and which are recovered in the summer season could provide an average of about 2,000 AFY. Thus, the region is mostly dependent on a system of wells to extract groundwater and meet municipal demand for potable water.

2.1.1 Regional Watersheds

Except for the Laguna Seca, a sub-basin in the Seaside Basin which has no surface outlet, all the watersheds within the region flow directly into the Pacific Ocean. Thus, the main stem streams in these watersheds are considered waters of the United States (33 Code of Federal Regulations (CFR) Part 328). The largest watershed in the region is the 255-square mile Carmel River Basin watershed. Its headwaters originate in the Santa Lucia Mountains at 4,500 to 5,000-foot elevations, descend and merge with seven major stream tributaries along a 36-mile river course, and discharge into Carmel Bay about five miles south of the City of Monterey. About 70 percent to 80 percent of the surface runoff in the Carmel River watershed is generated from rainfall within the Los Padres National Forest and Ventana Wilderness. The remaining watersheds (about 92 square miles) within the region do not currently provide municipal water supply from surface runoff, although groundwater recharge in these basins is an important source for municipal supply.

2.1.2 Groundwater Basins

The two major groundwater resources within the region are located in the Carmel River Basin (also described by DWR as the Carmel Valley Groundwater Basin) and in the Seaside Basin. Alluvial deposits underlying the Carmel River form the Carmel Valley aquifer. State Water Resources Control Board (SWRCB) Order No. WR 95-10 includes a finding that downstream of river mile (RM) 15, the aquifer underlying and closely paralleling the surface watercourse of the Carmel River is a subterranean stream subject to SWRCB permitting authority. Groundwater levels within the aquifer are influenced by pumping or production at supply wells, evapotranspiration by riparian vegetation, seasonal river flow infiltration and subsurface inflow, outflow from the basin, and reservoir releases to augment summer low flows. During the dry season, pumping of wells causes significant declines in the groundwater levels and leads to decreased surface flows in the Lower Carmel River along as much as nine river miles. Complete recharge of this aquifer generally occurs quite rapidly after winter rains commence and the Carmel River begins flowing into the dry reaches. SWRCB order No. 2009-0060 (Cease and Desist Order) found that the region had not complied with Order 95-10.

Groundwater production in Carmel Valley outside of the MPWMD boundary is not as well quantified as within the MPWMD area. However, water production records for Water Year 2013 (October 1, 2012 to September 30, 2013) for a portion of this area (Carmel Valley upland area) show that production is about seven percent of the volume produced in the alluvial aquifer.

The Seaside Groundwater Basin underlies a hilly coastal plain that slopes northward toward the Salinas Valley and westward toward Monterey Bay. The water-bearing aquifers used for potable water supply extend offshore under the Monterey Bay, but the extent of the aquifers under the bay has not been fully explored. The basin area includes a 19 square-mile area of Sand City, and much of the cities of Seaside and Del Rey Oaks, as well as unincorporated parts of Monterey County, including a portion of the Ord Community in the former Ford Ord. The physiography is characterized by young, active dunes near the coast and mature dunes to the east on the former Fort Ord. Land surface elevations range from sea level at the beach to approximately 900 feet near the eastern boundary of the basin. Recharge to the groundwater system is primarily from infiltration of precipitation, with minor additional amounts contributed by deep percolation of irrigation water, leaky pipes, septic systems, and possibly stream flow. Artificial recharge from existing and planned recharge projects will become more significant sources in the future.

Groundwater conditions in the Seaside Basin have deteriorated in the past two decades. Groundwater extraction near the coast increased markedly beginning in 1995, resulting in declining water levels and depletion of groundwater storage. Until the basin was adjudicated in 2006, basin-wide groundwater withdrawals were up to 5,600 AFY. The Final Decision set a three-year goal aimed at reducing annual extractions to 3,000 AFY, which is termed the “natural safe yield,” by 2021.

The southern portion of the Ord Community is within the planning region and is supplied from the Salinas Valley Groundwater Basin under a 1993 agreement between the United States (later assigned to

Marina Coast Water District) and the Monterey County Water Resources Agency, which has jurisdiction over that basin.

2.1.3 Internal Boundaries

The internal boundaries of the region include political boundaries of cities and special districts, boundaries for groups within the region, watershed boundaries that define areas of interest for groups and regulatory agencies, groundwater basins, and other boundaries influencing land uses. They are summarized below and shown in the Regional Land Use Map and Monterey Peninsula, Carmel Bay, and South Monterey Bay Map in **Figure 2-1**, **Map of Monterey Peninsula Integrated Regional Water Management Planning Region.**

Political Boundaries

- The region includes the coastal incorporated cities of Carmel-by-the-Sea, Del Rey Oaks, Monterey, Pacific Grove, Sand City, and Seaside.
- Also included are the unincorporated portions of Monterey County in Carmel Valley, Pebble Beach, the Carmel Highlands, the Laguna Seca area and a portion of the Ord Community.

Special Districts and Agencies in the Region

- Monterey Peninsula Water Management District (MPWMD) – formed in 1977 by the California State Legislature for the integrated management of ground and surface water supplies (AB 1329);
- Monterey Peninsula Regional Park District (MPRPD) – formed in 1971 to acquire and maintain open space land. MPRPD's current boundaries cover over 500 square miles and extend beyond the region up to Marina on the north and south along the Big Sur Coast;
- Monterey Peninsula Airport District – created in 1936. This district is not incorporated into the City of Monterey or Monterey County nor is it a public utility. The Airport District includes portions of Monterey, Pacific Grove, Del Monte Forest, Pebble Beach, Carmel-by-the-Sea, greater Carmel, Del Rey Oaks, Seaside, Sand City, the Monterey-Salinas Highway to Laureles Grade, and the west end of Carmel Valley. The District owns and operates Monterey Airport, a 598 acre facility, serving as a "Medium Non-Hub" airport.
- Fort Ord Reuse Authority (FORA) – FORA was created to facilitate conversion of the former Fort Ord from military to civilian activities that support our local and regional communities. Known now as the Ord Community, the area is an important "border region" between the Greater Monterey County and Monterey Peninsula IRWM regions.
- Carmel Area Wastewater District (CAWD) – formed in 1908 to provide wastewater collection and treatment in the Carmel and Pebble Beach area;
- Monterey Regional Water Pollution Control Agency (MRWPCA) – a joint powers agency formed in 1972 to provide wastewater collection and treatment to the Monterey Peninsula cities (except Carmel-by-the-Sea). MRWPCA also serves areas within its boundaries that are outside of the Monterey Peninsula region (e.g. Salinas and Castroville).
- Pebble Beach Community Services District (PBCSD) – formed to provide wastewater collection in the Pebble Beach area (PBCSD contracts with CAWD for treatment).

- Community Services Area 50 – benefit assessment area formed in the lower Carmel River area (Mission Fields/Crossroads) to carry out flood control improvements.
- Seaside County Sanitation District – the Seaside County Sanitation District (SCSD) is a special district responsible for the maintenance and operation of the sanitary sewer collection system serving the Cities of Del Rey Oaks, Sand City and Seaside. The District's sanitary sewer collection system serves an area of approximately 2,400 acres with a population of about 30,000.
- Marina Coast Water District – the District was formed in 1960 by a vote of the registered voters within the original service area, which was expanded in 1998 from 3.2 square miles to encompass the Ord Community in the former Fort Ord, which is 44 square miles. MCWD provides water and sewer services and has the latent power to provide fire protection, recreational, and sanitation (garbage) services.
- Monterey Peninsula Regional Water Authority – The Monterey Peninsula Regional Water Authority (MPRWA) is a Joint Power Authority that consists of six cities, the Cities of Carmel-by-the-Sea, Del Rey Oaks, Monterey, Pacific Grove, Sand City and Seaside. The purpose is to study, plan, develop, finance acquire, construct, maintain, repair, manage, operate, control and govern water projects either alone or in cooperation with other public or private non-member entities.

Groups

- Monterey Regional Storm Water Management Program Participating Entities – this group includes the cities of Monterey, Del Rey Oaks, Sand City, Seaside, Pacific Grove, Carmel-by-the-Sea, Marina, and the County of Monterey. The group developed a storm water program to comply with the National Pollutant Discharge Elimination System (NPDES) requirements for obtaining a permit to discharge storm water. The Pebble Beach Company, the Monterey Peninsula Unified School District, the Pacific Grove Unified School District and the Carmel Unified School District participate in the group as coordinating entities to implement specific Best Management Practices. The Monterey Regional Water Pollution Control Agency acts as the group's administrative agent, holding meetings and working with the group to develop this regional program.
- Carmel River Watershed Conservancy (CRWC) – a 501(c)(3) Non-Profit corporation formed in 2005 by the Carmel River Watershed Council, which itself was formed in 1999. This group represents diverse watershed community interests in managing the water resources in the Carmel River Basin. The role of the Conservancy is to raise funding to support the programs, projects and activities of the Council.
- Big Sur Land Trust (BSLT) – formed in 1978 to conserve the significant lands and waters of California's Central Coast for all generations. BSLT has protected thousands of acres of important open space throughout the planning region through land purchase and conservation easements, as well as partnerships with other agencies for habitat restoration and similar objectives. The mission of BSLT is to inspire love of the land and conservation of our treasured landscapes.
- Others (see Current Stakeholder List in **Appendix 1-d**)

Groundwater Basins

- Seaside Groundwater Basin – The basin underlies a hilly coastal plain that slopes northward toward the Salinas Valley and westward toward Monterey Bay. The basin area includes Sand City, and much of the cities of Seaside and Del Rey Oaks, as well as unincorporated parts of Monterey County. In addition, the basin underlies most of the land formerly occupied by the Fort Ord military base. The extent of this basin is not well defined under Monterey Bay and the most recent comprehensive investigation describes the location of the flow divide that forms the northern and eastern boundaries of the basin as a broad swath, reflecting the uncertainty regarding its exact location and variation in its location with depth. In 2006, the basin was adjudicated and a Watermaster was appointed to manage the basin and bring the groundwater budget into balance.
- Carmel Valley Aquifer (also described in Bulletin 118 by the Department of Water Resources as the Carmel Valley Groundwater Basin, Basin Number 3-7) – This area has been defined by the Monterey Peninsula Water Management District (MPWMD) and the State Water Resources Control Board (SWRCB) as the water-bearing strata directly associated with the Carmel River. It was originally mapped by the U.S. Geological Survey (USGS) in 1984 and was adopted as the area within the jurisdiction of the SWRCB as described in Order No. WR 95-10 and large-scale maps available at the MPWMD office. The map of the alluvial aquifer is subject to refinement over time based on updated hydrologic information.

Other Boundaries:

- Coastal Zone – this zone generally includes land west of Highway 1 from Sand City south to Del Rey Oaks, but then departs west from Highway 1 and generally follows the coast through Monterey and Pacific Grove. Portions of Pebble Beach, including the Del Monte Forest, most of the City of Carmel-by-the-Sea, and the southwest corner of the region are also included within the Coastal Zone. The zone includes shore areas within the tidal zone. Regulations of the California Coastal Act apply to land uses within this area.
- Monterey Bay National Marine Sanctuary– The entire coastline within the region lies within the MBNMS, a department under the National Oceanic and Atmospheric Administration (NOAA).
- California American Water (CalAm) Monterey District Service Area – CalAm serves about 95 percent of the residents and businesses within the MPWMD boundary. The Service Area is shown in **Appendix 2-a**.
- Areas of Special Biological Significance (ASBS) – these are ocean areas monitored and maintained for water quality by the State Water Resources Control Board. There are two ASBS – Carmel Bay from the east boundary of Point Lobos State Park to Ghost Tree in Pebble Beach and an area adjacent to Pacific Grove near the boundary of the City of Monterey.
- National Marine Protected Areas (MPA) – defined areas where natural and/or cultural resources are given greater protection than the surrounding waters. In the U.S., MPA span a range of habitats including the open ocean, coastal areas, inter-tidal zones, estuaries, and the Great Lakes. They also vary widely in purpose, legal authorities, agencies, management approaches, level of protection, and restrictions on human uses. The MBNMS is a designated MPA.

Table 2-1 summarizes responsibilities for water management in the region.

Table 2-1: Public Entities and Water Purveyors with Water Resources Authority in the Region

	MPWMD	CalAm	CAWD	CDFG	Coastal Commission	CDPH	DWR	Jurisdictions	MBNMS	MCHD	MCWD	MCWRA	MRSWMG	MRWPCA	NMFS	PUC	RWQCB	Seaside Watermaste	SWRCB	USACE	USFWS
Directly Accountable to Local Voters for Water Management Issues	✓																				
Plans and Constructs Water Supply Projects	✓	✓									✓	✓				✓					
Manages and Protects Regional Water Supply for Monterey Peninsula	✓																				
Conveys/Stores/Treats/Distributes Drinking Water		✓						✓			✓										
Regulates/Monitors CalAm Water Production Levels/Sources	✓			✓											✓			✓	✓		✓
Regulates/Monitors Private Water Production Levels/Sources	✓														✓			✓			
Monitors Carmel Valley for Seawater Intrusion	✓																	✓			
Reviews/Evaluates Water Development Proposals for Water Production Impacts	✓			✓	✓	✓			✓	✓	✓				✓		✓				✓
Monitors/Conducts/Funds Environmental Mitigation Programs Required	✓	✓							✓												
Secures Water Rights for Water Sources	✓	✓									✓	✓						✓			
Approves CalAm Water Rates																✓					
Facilitates CAWD/PBCSD Reclaimed Water Project	✓		✓																		
Monitors Local Surface and Ground Water Quality	✓	✓						✓										✓			
Monitors Local Surface and Ground Water Flows and Storage	✓	✓																✓			
Administers Comprehensive Water Conservation and Retrofit Program, Including Rebates and On-Site Inspection	✓										✓										
Issues Water Distribution System Permits	✓									✓											
Monitors Compliance with Surface and Ground Water Discharge Permit Conditions										✓			✓	✓			✓				
Regulates Drinking Water Quality						✓				✓											
Implements and Manages Water Rationing, as Necessary	✓										✓							✓			
Monitors/Restores Carmel River Riparian Habitat	✓														✓						
Monitors CalAm Compliance with Endangered Species Act & Other Laws				✓											✓						✓
Manages Steelhead Fishery	✓	✓		✓											✓						
Conducts Land Use Planning								✓				✓									
Regulates Activities in Streams and Riparian Corridors	✓			✓	✓		✓	✓				✓			✓		✓		✓	✓	✓
Monitors Seaside Basin for Water Quantity and Quality	✓	✓										✓						✓			
Plans and Constructs Recycled Water Projects			✓								✓	✓		✓							

CalAm= California American Water Company; MBNMS=Monterey Bay National Marine Sanctuary; NMFS = National Marine Fisheries Service; CAWD = Carmel Area Wastewater District; MCHD=Mont. County Health Department; PUC = Public Utilities Commission; CDFG= Calif. Department of Fish & Game; MCWD= Marina Coast Water District; RWQCB=Regional Water Quality Control Board; Coastal Commission = California Coastal Commission; MCWRA = Mont. County Water Resources Agency; SCSD = Seaside County Sanitation District; DPH = State Department of Public Health; MPWMD = Monterey Peninsula Water Management District; SWRCB = State Water Resources Control Board ; DWR/DSOD= Dept. of Water Resources/Division of Safety of Dams; MRSWMG = Monterey Regional Storm Water Management Group; USACE = U.S. Army Corps of Engineers; JURISD= Cities, County and Airport District; MRWPCA = Monterey Regional Water Pollution Control Agency; USFWS = U.S. Fish & Wildlife Service

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2.1.4 Major Land Uses

The Monterey Peninsula and its surrounding areas are composed of a wide range of land uses that serve residential, commercial, industrial, recreational, and open space purposes. See **Appendix 2-b** for land use designations within the cities and County area plans in the region. While Monterey County is dominated by open space and agriculture uses—together they comprise 85 percent of countywide land—only a small fraction of agriculture takes place in the planning region.

Similar to many watersheds along the Central Coast of California, commercial and residential development is the densest near the coast and progressively lessens in the upstream direction of the watershed. Land use in the 255-square mile Carmel River watershed includes wilderness, viticulture, grazing, recreation (golf courses and park areas), and sparse residential, suburban, commercial and light industrial. Very little of the watershed is currently in traditional agricultural use. Urban development in the region is concentrated primarily in the coastal cities - the Monterey Peninsula is dominated by low density residential lots with some medium density areas within the Cities. Outside of the Cities, low to rural density residential areas dominate, especially along the Carmel Valley and Highway 68 corridors.

Resource conservation makes up another important use of land throughout the region. Parts of the planning area include the Ventana Wilderness and Los Padres National Forest. The Big Sur Land Trust, the Monterey Peninsula Regional Park District, State Parks and others have actively promoted land conservation in the watershed through property acquisition and management. The Carmel River Watershed Conservancy has sought to educate the public about resource conservation and has actively participated in various restoration projects.

2.2 Current Water Resources

2.2.1 Major Water Related Infrastructure

Water Supply Infrastructure

There are two small main stem reservoirs in Carmel Valley, with the larger of the two (Los Padres Dam and Reservoir at RM 24, measured from the ocean) currently estimated to have approximately 1,669 AF of usable storage, which is less than 2 percent of the annual runoff in the watershed. Usable storage at this location is projected to reach zero within 100 years at historic rates of sedimentation. Flows released from this facility are used to augment instream flows during the dry season. The San Clemente Dam and Reservoir, built in 1921 at RM 18.6, is nearly full of silt and no longer has usable storage. Although there are facilities to divert and treat water at the San Clemente Dam, no diversions have occurred since May 2003. DSOD has ordered the dam owner, CalAm, to maintain a minimum pool in the reservoir that is 10 feet below the spillway level in order to reduce the potential for failure during an earthquake. In 2015, the dam is scheduled to be removed making it the largest dam removal in California history.

About 80 percent of water within the MPWMD boundaries is collected, stored, and distributed by the CalAm, which serves 95 percent of the residents and businesses in the Peninsula. CalAm owns and operates a series of production wells along the Carmel River and in the Seaside Groundwater Basin (SGB), and a network of pipelines extending from the San Clemente Reservoir through Carmel Valley to the Monterey Peninsula and Seaside communities. The CalAm Service Area Map in **Appendix 2-a** shows CalAm satellite system areas outside of the main Carmel Valley and Monterey Peninsula system.

MPWMD and CalAm own and operate two injection/extraction sites in the coastal area of the SGB that are used to inject excess winter flows from the Carmel River via the CalAm distribution system, called the Aquifer Storage and Recovery project. The average annual yield of this system is anticipated to be 2,000 AFY; however, is highly dependent upon rainfall and river flows due to permit requirements for the river to achieve minimum flow conditions in order to divert water for the ASR system.

Wastewater/Recycled Water Infrastructure

Wastewater from all the cities in the region (except Carmel-by-the-Sea), unincorporated areas along Highway 68, a portion of the Ord Community, and from communities outside of the planning region—including Castroville, Marina, Moss Landing, Salinas, and portions of the former Ft. Ord—is treated at the MRWPCA Regional Treatment Plant near the mouth of the Salinas River. This plant services a total population of about 250,000 and processes up to about 18 million gallons per day (MGD). In 1992, MRWPCA and the MCWRA formed a partnership to build two projects: a water recycling facility at the Regional Treatment Plant (currently known as the Salinas Valley Reclamation Plant) and a distribution system including 45 miles of pipeline and 22 supplemental wells. The distribution system is called the Castroville Seawater Intrusion Project (CSIP). Its objective was to retard the advancement of seawater intrusion by supplying recycled water for irrigation to nearly 12,000 acres of farmland in the northern Salinas Valley in lieu of groundwater that was currently in use. This would significantly reduce the draw of water from the underground aquifers. The $75 million projects were completed in 1997 after three years of construction, and highly treated wastewater (meeting Title 22 requirements for unrestricted reuse) is currently used for irrigation.

Peak dry weather flow capacity of the Regional Treatment Plant at the MRWPCA plant is calculated at 29.6 MGD, and peak wet weather flows are estimated at 75.6 MGD. Treated municipal wastewater not recycled is discharged to the Pacific Ocean through an 11,260 foot (3,432 m) outfall/diffuser system. The outfall terminates in the Monterey Bay in approximately 100 feet (30.5 m) of water. The minimum dilution of the outfall is 145:1 (parts seawater to effluent).

Wastewater from Carmel-by-the-Sea, parts of unincorporated Carmel Valley, and Pebble Beach is treated at the Carmel Area Wastewater District (CAWD) plant located at the mouth of Carmel Valley adjacent to the Carmel River. Wastewater flows in the most recent planning document prepared for CAWD (1979) were higher than they are presently. The 1979 plan included treatment capacity for both the Highlands and the lower Carmel Valley. As of 2011, CAWD daily dry weather flows were under 1.5 MGD, which is less that 50 percent of the permitted capacity of 3.0 MGD. There are possibly 500 lots in the Highlands that could connect to CAWD. At a capacity reserve of 235 gallons per day (GPD) per unit, that would result in another 117,500 GPD. Plant capacity is shared with the PBCSD, which has rights to one-third of the plant capacity or about one MGD. The CAWD-only flow is currently about one MGD, which leaves about one MGD of capacity for additional service. CAWD is aware of potential developments at the Highlands and in the lower Carmel Valley at September Ranch and Rancho Canada Village and believes there is enough capacity presently to serve those developments. There are no plans to expand capacity at this time.

According to a June 2001 summary, CAWD provides wastewater collection, treatment, and disposal services to approximately 10,000 customers. In 2004, CAWD estimated that between 1,500 and 2,200 acre-feet per year (AFY) of wastewater is treated. Approximately 950 AFY of wastewater from the CAWD treatment plant is reclaimed and piped within the region for turf irrigation, golf courses and other areas in Pebble Beach. The reclamation project was completed in 1994, the Forest Lake Reservoir facility was rehabilitated for storing the reclaimed water in 2004-2005, and an advanced tertiary treatment process was added to the plant in 2009 to reduce the sodium concentrations in the reclaimed water (due in part to residential water softeners). The advance treatment included a Microfiltration/Reverse Osmosis (MF/RO) system, located at the CAWD plant site to reduce the sodium content of the tertiary reclaimed water from 150 mg/L to less than 55 mg/L to reduce the stress on the golf greens and eliminate the need for flushing the courses with potable water. The retrofit eliminated the existing use of 300 AFY of potable water on Pebble Beach area golf courses and athletic fields.

Treated municipal wastewater not currently recycled is discharged to the Pacific Ocean through a 600-foot (183 m) outfall diffuser system. The plant outfall terminates in Carmel Bay within the MBNMS in approximately 36 feet (11 m) of water. The minimum initial dilution of the outfall is 121:1. The maximum design flow of the plant and outfall is 4.0 MGD.

Areas in Carmel Valley outside of the CAWD service area are on individual septic systems. Monterey County does not have information on the number of septic systems in Carmel Valley; however, it is estimated that there may be several thousand.

Table 2-2: Major Water Infrastructure by Entity

Agency Name	Major Water Infrastructure and/or Resources
California State Parks	Carmel River Lagoon and vicinity, Point Lobos State Reserve and Hatton Canyon property
Carmel Area Wastewater District	conveyance facilities, pumping plants, wastewater treatment plant, water recycling plant
Monterey Regional Water Pollution Control Agency	conveyance facilities, pumping plants, wastewater treatment plant, water recycling plant
Marina Coast Water District	wells, conveyance facilities, pumping plants (Ord Community)
Pebble Beach Community Services District	conveyance facilities, pumping plants (contracts with CAWD for wastewater treatment)
Cities of Carmel-by-the-Sea, Del Rey Oaks, Pacific Grove, and Pebble Beach Company	stormwater and wastewater conveyance facilities, open space (turf, landscape)

Agency Name	Major Water Infrastructure and/or Resources
City of Monterey	water bodies, flood control facilities, wastewater conveyance facilities, pumping plants, storm water conveyance facilities, open space (turf, landscape)
City of Seaside	Storm water conveyance facilities, groundwater production wells, municipal supply conveyance facilities, water treatment plant, pumping facilities, open space (turf, landscape)
Monterey County Service Area 50	Carmel River property and levees
Big Sur Land Trust	Carmel River property, levee, major landholder in Carmel River watershed, including wetland areas
California State University at Monterey Bay	Storm water conveyance facilities
California American Water	groundwater production wells, municipal supply conveyance facilities, water treatment plants, injection wells, pumping facilities, dams and reservoirs (open lakes)
Monterey Peninsula Water Management District	injection wells in Seaside Basin operated in cooperation with California American Water
Monterey Peninsula Regional Park District	Carmel Riverfront property, major landholder in Carmel River watershed, including wetland areas
Seaside County Sanitation District	Wastewater conveyance system

2.2.2 Surface and Ground Water Resources

The Carmel River Basin, which has an average annual runoff of 74,400 AFY, supplies about 70 percent of the MPWMD area domestic water supply. The water supply reservoirs on the main stem of the Carmel River are owned by California American Water, but generally water from this source flows through the Carmel River and is pumped by CalAm to the Monterey Peninsula through a well field in the alluvial aquifer downstream of the San Clemente Dam. During the rainy season, river flow is often unregulated by main stem reservoirs, which have a maximum combined storage capacity of about 2 percent of the average annual flow in the watershed. Flow releases in the dry season from the Los Padres Reservoir in Carmel Valley are used conjunctively to meet flow requirements in the Carmel River for steelhead and to augment natural flows along the riparian corridor. To reduce impacts to streamside areas from water extraction, flow diversions for municipal supply generally occur at the farthest downstream production wells and progress upstream in response to demand.

In the Carmel River Basin, groundwater pumping results in up to nine miles of dewatered Carmel River annually in summer and fall, which is a prime factor in SWRCB orders against CalAm to reduce pumping from the CRB (SWRCB WRO 95-10 and WRO 2009-0060). To meet municipal demand greater than what can be supplied from the Carmel River Basin, water is pumped from a well field in the Seaside Groundwater Basin. To the extent feasible, production from the Seaside Basin is maximized to reduce pumping from Carmel Valley. Although the Seaside Basin has significant storage capacity (> 52,000 AF of usable storage space), groundwater in the Seaside Basin is limited and the 2006 adjudication ordered phased reductions in the annual rate of extraction to 3,000 AFY by 2021 in order to address over-pumping in the groundwater basin.

CalAm also operates satellite water supply systems along the Highway 68 corridor to supply those areas. These distribution systems are dependent on groundwater extraction (see **Appendix 2a, California American Water Company Service Area Map**).

2.2.3 Storm water

MPWMD investigated the potential for capture and reuse of storm water in the region (outside of the Carmel River watershed) and estimated an average annual runoff volume of approximately 2,400 AF in urbanized areas. This was based on a runoff volume of 10 percent of an annual rainfall total of 18 inches over the Monterey Peninsula (MPWMD, August 2000). Recently, several cities have expressed an interest in investigating the potential for enhancing rainfall infiltration and in recycling stormwater for water supply. In 2006, the City of Monterey carried forward an investigation of alternatives for reducing flows to the Pacific Grove ASBS (MACTEC Engineering and Consulting, Inc., 2006). In addition, diversion of stormwater to the regional wastewater collector is being studied as an option for source water for the Groundwater Replenishment Project proposed for the Seaside Groundwater Basin. These efforts are expected to continue over the next few years and may result in projects to recycle a portion of the stormwater in the region. For more information, see **Chapter 12, Relation to Local Water Planning**, Section 12.2.8, Areas of Special Biological Significance, and the Final Environmental Impact Report for the ASBS City of Pacific Grove Monterey -Pacific Grove ASBS Stormwater Management Project.[3]

2.3 Quality and Quantity of Water Resources within the Region

2.3.1 Water Quality

Regional efforts have focused on monitoring water supply levels and water quality changes over time. Existing monitoring efforts in the region have been very successful in generating data necessary for the public, water managers, and relevant regulatory agencies to understand and plan.

Water quality monitoring has taken place in four main areas of the planning region:

- Carmel River Basin Surface Water
- Carmel Valley Alluvial Aquifer
- Seaside Groundwater Basin
- Monterey Bay National Marine Sanctuary

MPWMD maintains groundwater and surface water monitoring in the Carmel River Valley and Seaside Coastal sub-areas. Ambient conditions in surface waters are measured by dissolved oxygen, carbon dioxide, pH, temperature, turbidity, conductivity, and salinity, while groundwater is monitored for specific conductance, total alkalinity, pH, chloride, sulfate, ammonia nitrogen, nitrate nitrogen, total organic carbon, calcium, sodium, magnesium, potassium, iron, manganese, orthophosphate, and boron.

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[3] Final Environment Impact Report available at:
http://www.ci.pg.ca.us/modules/showdocument.aspx?documentid=10633.

MPWMD will continue to track future data for trends that might indicate significant changes in concentrations of these or other constituents in surface and groundwater resources.

Carmel River Basin Surface Water

MPWMD has found that, in general, dissolved oxygen, carbon dioxide, and pH levels in the main stem of the Carmel River have met Central Coast Basin Plan objectives set by the California RWQCB. However, average daily water temperature during the late summer and fall commonly exceeds the range for optimum steelhead growth (50-60°F). Monitoring stations along the river show that water temperature during these months remains in a stressful range and can reach levels that threaten aquatic life (above 70°F). Linear trend analysis of data from the eight-year period between 1996 and 2004 at the Garland Park station, where water temperature annually exceeded 70°F, showed a slight downward trend in maximum daily water temperature. This may have been due to the recovery of the riparian zone upstream and the shade it provides along the river. Additional data collected between 2004 and 2008 continue to show temperatures exceeding objectives, particularly at or downstream of existing reservoirs. Water temperature in winter and spring is frequently in the range that is considered optimum for steelhead growth.

Turbidity in the main stem is normally low, except during winter when storm runoff events can elevate turbidity for several days during and after a storm event. Very wet years, such as in 1998, can cause extensive landslides and bank erosion, which can increase turbidity in the main stem for up to several months. More recently, in the reach immediately downstream of the San Clemente Dam, it appears that fine sediment released from the reservoir during drawdown operations has increased turbidity at the Sleepy Hollow weir. This condition is likely to worsen in the near term as the reservoir foreslope, which is comprised of very fine silt particles, fans out and progrades (moves downstream) to the dam spillway.

Water quality in the Carmel River Lagoon typically declines during late summer and fall as freshwater inflows cease and ocean waves start to overtop the sandbar at the mouth of the river. Water temperature often exceeds 70°F, which is above Central Coast Basin Plan guidelines. Dissolved oxygen levels also periodically drop below guidelines (not less than 7.0 mg/L), probably due to a combination of increasing water temperature and decomposition of marine organic material washed into the lagoon by high Ocean waves (MPWMD, 2004).

Carmel Valley Aquifer

Monitoring activities in this basin have indicated only minor changes in overall water quality in recent years. MPWMD is particularly interested in monitoring for potential sea-water intrusion in the lower portion of the Carmel Valley Aquifer. At this time, there are no indications of long term water quality changes that would be indicative of seawater intrusion.

Seaside Coastal Subareas

Monitoring results indicate no remarkable changes in general constituent concentrations in the Seaside coastal subarea over the period of record for the existing monitoring wells. Although portions of the basin aquifers show groundwater levels are below sea level, there is also no indication of seawater intrusion in the two principal aquifer units - the Paso Robles Formation (i.e., shallower unit) and Santa Margarita Sandstone (i.e., deeper unit) - in this area of the Seaside Basin at the present time. For additional information, see the Seaside Basin Salt and Nutrient Management Plan in **Appendix 2-c**.

Monterey Bay National Marine Sanctuary

Monitoring and analysis in both the near shore environment and coastal watersheds has pointed to urban runoff as the leading cause of water pollution affecting the MBNMS. This monitoring has revealed high concentrations of nutrients, metals, pathogens, detergents and other contaminants in local creeks and rivers as well as in the numerous urban outfalls that drain into the MBNMS. Growing evidence suggests that these contaminants are having an adverse impact on MBNMS resources. Toxicity analysis has shown that in most locations sampled, urban runoff is toxic to test organisms representative of those found in the MBNMS, and research into increased mortality among the threatened southern sea otter population suggests that protozoa introduced to the marine environment via runoff from land-based sources may contribute to this mortality rate.

The cities participating in the Monterey Regional Storm Water Management Program (MRSWMP) and the MBNMS Water Quality Protection Program (WQPP) have sought to reduce non-point source urban runoff through a combination of end-of-pipe treatments and source control programs through the implementation of the Sanctuary's Urban Runoff Plan, the Model Urban Runoff Program (1996), and now the MRSWMP. The projects contained in these plans and programs recognize that certain pollutants associated with urban runoff can partially be controlled by end of pipe best management practices such as swales, filters and retention basins. A cost-effective and comprehensive program must also target contamination at its source by addressing the multitude of behaviors and activities that introduce this type of pollution.

2.3.2 Water Quantity and Future Demand

Monterey Peninsula Water Resources System (MPWRS)

The Monterey Peninsula Water Resources System (MPWRS)[4] includes: surface water in the Carmel River and in Los Padres and San Clemente Reservoirs and groundwater in the Carmel Valley Aquifer, which are in the Carmel River Basin (CRB); groundwater in the coastal subareas of the Seaside Groundwater Basin (SGB). The maximum storage capacity of the MPWRS at this time is 37,515 AF. The two relatively small reservoirs on the Carmel River, Los Padres and San Clemente, have been severely impacted by sedimentation. Total Los Padres Reservoir storage is currently estimated at slightly less than 1,800 AF. San Clemente Reservoir, which holds about 60 AF feet at the spillway level, is not operated for municipal supply, and is scheduled to be removed in 2015. The MPWRS contains the majority of water resources within the planning region.

In the 2013 Water Year (October 1, 2012 to September 30, 2013), CalAm produced 11,622 AF within the region. Another 4,422 AF were produced from non-CalAm sources. CalAm supplied approximately 66 percent of its demand from Carmel Valley, 32 percent from the Seaside Groundwater Basin and 2 percent from the Sand City desalination plant. The estimated total use within the region (all sources) was approximately 16,050 17,000 AF (note – see discussion of Ord Community production below).

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[4] Defined by MPWMD as lands that overlie or are contiguous to (in whole or in part) water in the Carmel River (mainstem and tributaries), ground water within the alluvial aquifer, and groundwater within the Seaside Coastal Ground water Subbasin, as identified on MPWMD Boundary Map #1; or the ground water and surface water supplies which serve Cal-Am, other water distribution systems, and private well owners within the District, including the surface water and groundwater resources of the Carmel Valley (both the Carmel River and the Carmel Valley Aquifer) and the resources of the Seaside Coastal groundwater subbasin. This definition excludes resources of the Seaside Inland groundwater subbasin, and the Carmel Valley upland formation.

Water Supply Needs for the Monterey Peninsula

Due to regulatory and judicial constraints on water use within the MPWMD boundary and loss of storage at Los Padres Reservoir (i.e., the MPWRS), there is a current need to replace a substantial portion of existing water supplies with other sources. CalAm has submitted an application to the CPUC for the Monterey Peninsula Water Supply Project (application A12-04-019), which would supply about 9,000 AFY. In order to comply with orders from the SWRCB, CalAm is required in calendar year 2017 to reduce production in the CRB by 55 percent over the 2011 level. In the SGB, CalAm is required to reduce production by 60 percent over the 2011 level by year 2021. The total loss in supplies from these sources is about 61 percent of the 2011 demand.

In 2006, the Monterey Peninsula Water Management District (MPWMD) Board of Directors held a series of workshops to review the future water needs of customers in the California American Water main distribution system in the Monterey Peninsula area. A Board-appointed Technical Advisory Committee (TAC), comprised of a staff member representing each land use jurisdiction (i.e. the Monterey Peninsula Airport District, County of Monterey, and each city located within the boundaries of the MPWMD), was asked to provide a recommendation on developing a methodology for predicting future water needs.

The TAC recommended using General Plan build-out numbers to project future water needs. After these numbers were provided by each jurisdiction, the TAC met regularly to develop water use factors for various types of anticipated development. After reaching a consensus on water use factors, MPWMD staff compiled the future water need estimates that are summarized in **Table 2-3**, **Estimated Additional Water Demand (AFY).**

Table 2-3: Estimated Additional Water Demand (AFY)

	Single-Family Dwellings	Multi-Family Dwellings	2nd Units	Non-Residential	Residential Remodels	20% Contingency	Residential Retrofit Credit Repayment	Total AF of Water Needed
Airport District				115		23		138
Carmel	19	56	25	20	120	48		288
Del Rey Oaks	5			30	5	8		48
Monterey	46	426		123		109	0.526	705
Pacific Grove	73	376	298	260	43	210	3.545	1,264
Sand City	48	68		210		60		386
Seaside	133	21	44	283	4	97	0.023	582
Unincorporated County	892			10	37	188	8.134	1,135
Total	***1,216***	***947***	***367***	***1,051***	***209***	***743***	***12***	***4,545***

These estimates are based on:

1. TAC recommended factors;
2. A contingency of 20 percent to cover unanticipated water needs or upgrades from current restrictions; and
3. Water needs associated with “paying back” residential retrofit credits allowed by MPWMD Ordinances No. 70 and No. 90. These Ordinances allowed a jurisdiction to borrow against the next water allocation.

Residential water needs in unincorporated areas within the MPWMD boundary include the TAC-recommended adjusted residential factor that takes into account the county’s larger lot sizes. The result of this effort is an additional long-term water need of 4,545 acre-feet per year to satisfy the build-out projections of regional jurisdictions.

Outside of the MPWMD boundary, the County has proposed new goals and policies in a March 2006 Draft General Plan update. These include assuring an adequate and safe water supply to meet the County’s current and long-term needs. A program to eliminate overdraft of water basins will be developed as part of the Capital Implementation and Financing Plan (CIFP) in the General Plan using a variety of strategies, including but not limited to:

a. Water banking;
b. Groundwater management and aquifer recharge and recovery;

c. Desalination;

d. Pipelines to new supplies; and

e. A variety of conjunctive use techniques.

The CIFP will be reviewed every five years in order to evaluate the effectiveness of meeting the strategies noted in this policy. Areas identified to be at or near overdraft will be a high priority for funding. Proposed new developments will be required to demonstrate "… that there is a long term, sustainable water supply, both in quality and quantity, to serve the development." (Monterey County, 2010). The plan, when adopted, is intended to cover an approximate 20-year period. It should be noted that this plan update was the subject of several competing measures on the June 2007 Monterey County ballot. Voters said no to a measure to approve the Board of Supervisors-approved update, but also said no to a measure to repeal that update. It is unclear at this time when or how the General Plan may change and if this IRWMP would be affected by the changes.

Carmel River Basin Resources

The 255-square-mile Carmel River Basin includes the Santa Lucia Mountains to the south and the Sierra del Salinas to the north. The mean annual rainfall varies from about 14 inches along the northeast perimeter of the basin, to over 40 inches in the high peaks of the southernmost portion of the basin. The average annual runoff on the Carmel River at U.S.G.S gage Near Carmel (3.56 River Miles upstream of the Pacific Ocean) was 74,400 acre-feet (AF) for the period of record WY 1962-2013.

The Carmel Valley aquifer, which underlies the alluvial portion of the Carmel River downstream of San Clemente Dam, is about six square-miles and is approximately 16 miles long. It varies in width from 300 to 4,500 feet and in thickness from about fifty feet near Carmel Valley Village to greater than 150 feet near Highway 1. The thickness of the alluvium averages 75 feet and is adequately defined by well logs (U.S.G.S., 1984). In the spring and summer, the alluvial aquifer is drawn down by private pumpers and California American Water (CalAm), which results in dewatering of the lower six miles of the river for several months in most years and up to nine miles in dry to extremely dry years. Recharge of the aquifer is derived mainly from river infiltration which composes 85 percent of the net recharge. The aquifer is recharged relatively quickly during normal rainfall years.

In 1995, the State Water Resources Control Board issued Order No. WR 95-10, which initially limited CalAm to 11,285 acre-feet of diversions from the Carmel River Basin (CRB) and ordered CalAm to maximize diversions (to the extent feasible) from the Seaside Groundwater Basin (SGB). In 2009, SWRCB issued Order No. 2009-0060, which ordered CalAm to cease and desist its unauthorized diversions in the CRB by 2017 and reduce authorized diversions to 3,376 AFY.

Seaside Groundwater Basin (SGB)

The SGB has been characterized as underlying an approximately 19-square-mile area at the northwest corner of the Salinas Valley, adjacent to Monterey Bay. The hydrogeology of the Seaside Basin has been the subject of numerous studies since the mid-1970s. The more significant of the hydrogeologic studies begins with a study by the California Department of Water Resources in 1974. Reliable monitoring data gathered since 1987 shows that water levels have been trending downward in many areas of the basin. A steep decline beginning in 1995 in the northern coastal basin, where most of the groundwater production occurs, coincided with increased production in that area after implementation of SWRCB Order No. WR 95-10.

Yates et al. (2005), hydrology consultants for MPWMD, completed a detailed analysis of water level trends and groundwater budgets and estimated the sustainable yield of the Seaside Groundwater Basin at 2,880 AFY and the usable groundwater storage capacity at 6,200 AF. The main limitation on yield in the SGB is the risk of seawater intrusion, which may reach production wells before the groundwater budget can be brought into balance. It is known that the coastal aquifers extend under Monterey Bay, but the limits have not been determined. An overview of groundwater conditions in the Seaside Basin is given in **Table 2-4,** below.

Table 2-4: Current Groundwater Conditions of Seaside Basin

Subbasin	Subarea	Current Groundwater Conditions	Sustainable Yield (AFY)
Northern	Northern Inland	There are very few wells for water-level analysis. There is also no production from this subarea, but groundwater levels have been declining steadily since 1988 at a rate of about 0.7 ft/yr because of pumping in adjacent areas. In other words, the yield from this subarea is already fully used.	1,840
	Northern Coastal	Most of the basin groundwater production is in this subarea. Increased production beginning in 1995 has been mostly from the Santa Margarita aquifer. Pumping troughs have developed in both the Paso Robles and Santa Margarita aquifers, with water-level declines averaging more than 1 ft/yr near the centers of the troughs. Water levels are continuously below sea level in the Santa Margarita aquifer throughout the subarea, with gradients from the ocean boundary toward the pumping trough. The pumping trough in the Paso Robles aquifer is separated from the coastline by a strip where water levels are above sea level.	
Southern	Laguna Seca	Almost all groundwater production is from the Santa Margarita aquifer in the eastern half of the subarea. Water levels in that aquifer have been chronically declining, and Paso Robles water levels are level or slightly declining. There is little production from the western half of the subarea, and a significant amount of groundwater flows from there into the Southern Coastal Subarea. Increased production from the western half would decrease the yield of the Southern Coastal Subarea.	1,040
	Southern	The basin is relatively thin in this subarea and there are few production wells. There are no noticeable or widespread water-level	

Subbasin	Subarea	Current Groundwater Conditions	Sustainable Yield (AFY)
	Coastal	declines. There appears to be significant outflow from this subarea, some of which flows to the ocean and some to the Northern Coastal Subarea.	
Entire Basin		Basin-wide average annual storage depletion is approximately 1,540 ac-ft/yr.	**2,880**

Adjudication of the Seaside Groundwater Basin occurred in 2006 with a Final Statement of Decision filed on March 27, 2006. The Decision was amended on February 9, 2007. The court ordered the formation of a Watermaster and mandated a "physical solution" to the overdraft problem. The operating yield for three (3) years beginning in March 2007 for the Seaside Basin as a whole was defined as 5,600 acre feet (Coastal Sub area is 4,611 acre feet and 989 acre feet for the Laguna Seca Sub area). The judgment required that the operating yield for coastal subareas (4,611 AFY) be decreased by 10 percent every three years starting in year four, e.g. 10 percent decrease at the start of the fourth year for years four, five, and six, and an additional 10 percent decrease at the start of the seventh year for years seven, eight and nine, etc. These decreases will continue until production reaches the "natural safe yield", which was initially set at 3,000 AFY, unless the Watermaster (1) has secured an equivalent amount of "non-native" replacement water and added it to the basin, or (2) the Watermaster has secured an equivalent amount of recycled water and contracted with one or more of the producers in the basin to use this quantity of recycled water in lieu of their production allocation with the producers agreeing to forego their right to claim a storage credit for their forbearance, or (3) any combination of replacement or recycled water results in the required decrease in production of "native water" in the basin, or (4) water levels in the aquifers are sufficient to ensure a positive offshore gradient to prevent seawater intrusion.

In the event the Watermaster cannot procure replacement water to offset operating yield over-production in an administrative year, production in the following administrative year must be curtailed to the targeted operating yield or a replenishment assessment may be levied on the producers. In recent years, the Watermaster has allowed CalAm to combine production from sub-areas into a single basin report and has allowed CalAm to overproduce from the basin (relative to the natural safe yield and operating safe yield amounts) without incurring a monetary penalty. However, CalAm will be required to replenish this overdraft, which has grown to approximately 12,000 AF through WY 2013, and is projected to be approximately 19,000 AF by WY 2018, when CalAm's Monterey Peninsula Water Supply Project is estimated to be fully operational.[5] In compliance with the judgment entered in the SGB adjudication, the final "Seaside Monitoring and Management Program" (Program) was adopted by the Seaside Basin Watermaster in September 2006 to ensure that the SGB is protected and managed as a perpetual source of water for beneficial uses. The Program was approved by the court with the Amended Decision on February 9, 2007. The Program sets forth actions that will be taken to: (a) monitor

[5] See Item VIII A of 4/2/2014 SB Watermaster board agenda. http://www.seasidebasinwatermaster.org/Agenda.pdf/WM%204-2-2014%202013-2014%20Board%20Agenda.pdf

current overdraft conditions and the present threat of potential seawater intrusion into the Coastal Subarea of the Basin; (b) develop and import supplemental water supplies for the purpose of eliminating Basin overdraft and the associated threat of seawater intrusion, and (c) establish procedures that will be implemented to address seawater intrusion should seawater intrude into the onshore portions of the Basin. Key elements of the Basin Management Program include: a) a monitoring component that builds on MPWMD's efforts to collect and organize data regarding groundwater production, water levels, water use, land use, rainfall, and other pertinent information; b) development of an enhanced Seaside Basin groundwater model; c) development of recommendations regarding implementation of strategies to import supplemental water supplies into the basin; and d) development of strategies for redistribution of pumping to avoid various adverse impacts within the basin.

Groundwater is produced by 35 wells for 16 well owners in the Seaside Groundwater Basin. Of these 16 well owners, California American Water (CalAm), an investor-owned public utility that serves approximately 38,480 customer accounts in the Monterey Peninsula area, owns 12 wells and currently pumps approximately 80 percent of the water produced in the basin. The City of Seaside is the second largest producer in the basin with three wells that until recently had pumped about 17 percent of the water that is produced in the basin. The City of Seaside operates two systems; the Municipal Water System that serves approximately 790 customers within the city and a Golf Course System that provides non-potable water to Black Horse and Bayonet golf courses. In WY 2010, the Marina Coast Water District began providing water to these golf courses from the Salinas Valley Groundwater Basin under an agreement with the Marina Coast Water District using water supplied from the Salinas Valley Groundwater Basin. This agreement is currently anticipated to sunset in 2018.

CalAm also owns and operates the Ryan Ranch, Hidden Hills, and Bishop systems in the Laguna Seca Subarea. CalAm acquired these systems in 1990, 1993, and 1997, respectively. Presently, only the Ryan Ranch Unit has an emergency interconnection with CalAm's main system. None of these smaller units are interconnected with each other, although the Hidden Hills Unit has an emergency interconnect with the adjacent Toro Water System, also operated by CalAm.

Ord Community Existing Supply and Future Demand

The following excerpts are from "Water Supply Assessment and Written Verification of Supply for the Monterey Downs Specific Plan," Prepared by Marina Coast Water District and Schaaf & Wheeler Consulting Engineers, November 2012."

Within the Ord Community, the 6,600 AFY of existing Salinas Valley groundwater supply has been allocated among the land use jurisdictions by the Fort Ord Reuse Authority (FORA), as shown in **Table 2-5**, below. The municipal jurisdictions (Cities and Monterey County) formally sub-allocate this supply to developments. Until additional water supplies are developed and allocated within the Ord Community, MCWD will only allow new service connections up to the usage totals allocated by the respective jurisdictions. **Table 2-5** shows projected water demands for the District through 2030, taken from the 2010 UWMP.

Table 2-5: Urban Water Demands by Jurisdiction (AF)

	Jurisdiction	2010	2015	2020	2025	2030	Notes
Ord	CSUMB	403	441	631	754	778	
Ord	Del Rey Oaks	0	326	527	527	527	
Ord	City of Monterey	0	0	92	92	92	
Ord	County of Monterey	4	627	1,087	1,087	1,087	
Ord	UCMBEST	2	93	276	474	474	
Ord	City of Seaside	792	1,130	1,351	1,664	2,093	1
Ord	U.S. Army	752	792	838	997	997	
Ord	State Parks and Rec.	0	12	18	20	25	
Ord	Marina Ord Comm.	281	812	1,537	1,738	1,739	
Ord	Marina Sphere	10	10	10	10	10	
Ord	FORA Strategic Res.	0	0	0	0	0	
Ord	Assumed Line Loss	348	348	348	348	348	
Marina	Armstrong Ranch	0	0	550	680	680	
Marina	RMC Lonestar	0	0	0	0	500	
Marina	Marina Central	1,962	2,324	2,630	2,746	2,864	
	Subtotal - Ord	2,592	4,591	6,715	7,712	8,172	
	Subtotal - Marina	1,962	2,324	3,181	3,426	4,044	
	Total	4,554	6,915	9,896	11,137	12,216	

1. 2010 demands include Seaside Resort Golf (temporary allocation)

Source: Table 3.5 of the 2010 MCWD Urban Water Management Plan

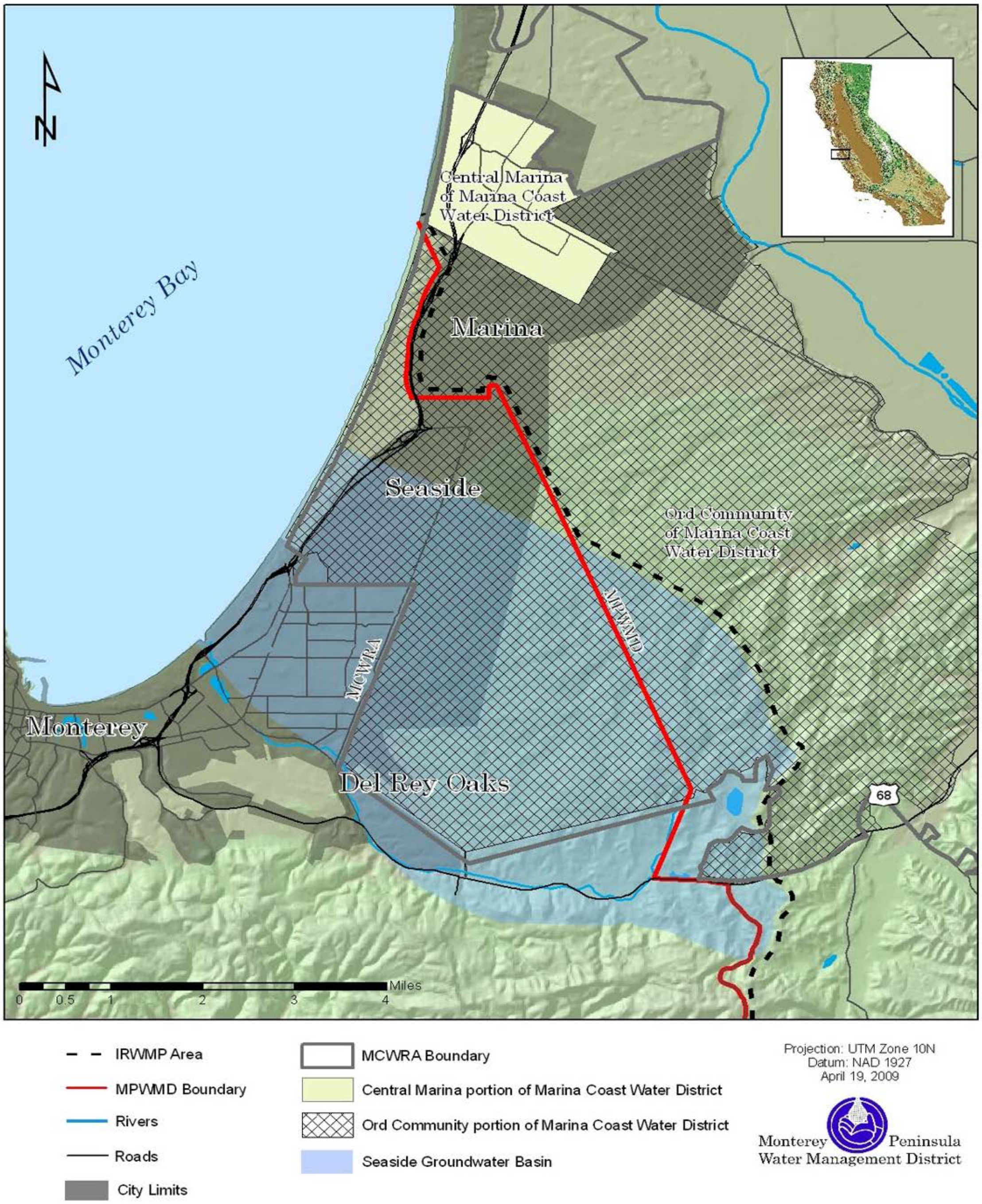
FORA has also formally allocated the recycled water supply from the Phase 1 Recycled Water Project. Although this project is not yet constructed, the allocations are included in **Table 2-6** for reference.

Table 2-6: FORA Allocations in the Ord Community

Land Use Jurisdiction	Existing Groundwater Allocation (AFY)	Future Recycled Allocation (AFY)
City of Del Rey Oaks	243	280
City of Marina (Ord)	1,325	345
City of Monterey	65	0
City of Seaside	**1,012**	**453**
County of Monterey	**710**	**134**
Marina Sphere (existing use)	10	0
CA State Parks and Rec.	45	0
CSU Monterey Bay	1,035	87
Univ. of California MBEST	230	60
U.S. Army	1,577	0
Assumed Line Loss	348	68
Total – Ord Community	6,600	1,427

The Ord Community consists of areas in both the Monterey Peninsula IRWM Plan and the Greater Monterey County IRWM Plan. It should be noted that in the Ord Community, only University of California Monterey Bay Education, Science, and Technology Center and Marina Sphere (existing use) appear to have 100 percent of their areas located in the Greater Monterey County planning region. The City of Seaside, County of Monterey and CSU Monterey Bay jurisdictions appears to be shared between the two regions, although there is not an equal weighting geographically for each jurisdiction. The remainder appears to be entirely within the Monterey Peninsula region. **Figure 2-4** shows the former Fort Ord area boundaries.

Figure 2-4: Former Fort Ord Area Boundaries



Recycled Water

The Carmel Area Wastewater District (CAWD) treatment plant, located at the mouth of Carmel Valley, supplies recycled water (approximately 790 AFY) to irrigate turf at several Monterey Peninsula golf courses and at one local school. Use of this reclaimed water has resulted in a one-for-one decrease in CalAm system demand. CAWD is investigating the potential to recycle an additional 300 AFY in a terminal wetland near the Carmel River lagoon.

MRWPCA treats up to 25,000 AFY of municipal wastewater, with nearly 9,000 AFY coming from within the Monterey Peninsula region. A portion of this treated water is used to retard seawater intrusion in the Salinas Valley Groundwater Basin and to irrigate agricultural land in the northern Salinas Valley. Currently, up to about 4,500 AFY is not used during the winter season when demand for crop irrigation is at its lowest. This treated wastewater flows to the Monterey Bay when it can't be used. MRWPCA and MPWMD are working on a Groundwater Replenishment Project that would treat 3,500 AFY of excess winter flows to a highly purified level and inject the water into the Seaside Groundwater Basin for later extraction to meet municipal demand.

Other Sources of Water

Other named creeks included in the region are San Jose Creek and Canyon del Rey Creek. San Jose Creek discharges directly to the south end of Carmel Bay. Because of the presence of steelhead in the watershed and the intermittent nature of flow, diversions from this source have not been pursued. Additional information about the watershed and steelhead habitat is contained in **Appendix 2-d**, **San Jose Creek Watershed Assessment**. The Canyon del Rey watershed is a 13.8-square-mile watershed within the Seaside Basin with an average annual runoff of 499 acre-feet for the period of record from 1967 to-1978. The creek discharges seasonally to Monterey Bay near the Monterey/Seaside boundary. It is not thought to contribute significantly to groundwater recharge in the Seaside Groundwater Basin and does not provide a reliable source of water. Additional information is available in **Appendix 2-e**, **Canyon Del Rey Master Drainage Plan Update**.

2.4 Ecological Processes and Environmental Resources

The region, along California's central coast, includes a diverse assemblage and mosaic of plant and animal species. The wide range of topography, rainfall patterns, different soils, geologic processes, episodic wild fires and landslides, and proximity to marine air in the region has created ideal conditions for endemism and localized genotypic variations in plant and animal species. The planning region is also adjacent to the MBNMS. The MBNMS was designated in 1992 as a Federally-protected marine area offshore of California's central coast for the purpose of resource protection, research, education, and public use. Included in the MBNMS are four biologically diverse and unique ASBS (Pt. Lobos, Carmel Bay, and Pacific Grove).

The region also contains thirteen stream basins including Wildcat Canyon, Gibson Creek, San Jose Creek, Carmel River, Pescadero Creek, Stillwater Creek, Fan Shell Creek, Seal Rock Creek, Sawmill Gulch Creek, Josselyn Canyon Creek, Aguajito Canyon, Iris Canyon, and Arroyo del Rey. Riparian forest/woodland and meadow habitats are distributed along the bottomland of most stream courses in these watersheds, with exceptions where roads, housing, commercial development and other human activities have encroached or displaced native flora. Low rainfall and inflow during the Mediterranean-type dry season limits the extent of aquatic habitats, but four coastal lagoons and surrounding wetlands persist throughout the year, including the Carmel River Lagoon, El Estero Lake, Del Monte Lake, and Laguna del Rey (Robert's Lake).

Terrestrial vegetation within the region ranges from rocky onshore Coastal Bluff Scrub and Active Dune at elevations near zero to Maritime Coast Range Ponderosa Pine Forest and Santa Lucia Fir Woodland at elevations above 3,000 feet in the upper Carmel River Basin. As highlighted by the California Native Plant Society and the California Department of Fish and Game, several rare, endemic tree species occur in the region including Santa Lucia Fir, Monterey Cypress, Gowen Cypress, Bishop Pine and Monterey Pine.

2.4.1 Threatened, Endangered and Species of Special Concern in the Region

Evolutionary patterns and modern man's tendency to simplify habitats and restrict the range of many species have led to lower reproductive success, survival rates and restrictions of some species' distribution and abundance. As a consequence, there are species within the region that are threatened or endangered. An assessment of the flora and fauna in this region shows there are 121 special status species including 66 species of plants, six plant communities, 30 species of birds, six species of reptiles and amphibians, one specie of fish, four species of insects, and eight species of mammals classified by the California Department of Fish and Wildlife (CDFW). Of these special status species, 15 plant species and 10 animal species are formally listed as threatened or endangered under State or Federal endangered species laws. In relation to the IRWMP, 12 special-status animal species are particularly important, including California red-legged frog, South-Central California steelhead, Southwestern pond turtle, black legless lizard, California tiger salamander, Western snowy plover, California horned lizard, yellow warbler, black swift, common loon, barn swallow and double-crested cormorant. These animal species inhabit aquatic systems, depend directly on food produced in aquatic habitats, or are distributed in areas where water projects may be planned and constructed. A complete list of special status species is given in **Appendix 2-f**.

Distribution and Abundance of Special-Status Species

Appendix 2-f contains a complete list of special status species known to occur within the planning region as identified by the CDFW, the National Marine Fisheries Service (NMFS), the United States Fish and Wildlife Service (USFWS), the California Natural Diversity Database (CNDDB) and the California Native Plant Society. Maps in **Appendix 2-g** also illustrate the potential distribution of special status species based on habitat type within the planning region boundary and information from the CNDDB.

Federally Threatened Species in the Carmel River

Since 1996, Federal involvement in water resource management within the region has increased, with special attention given to two aquatic species – the California red-legged frog and south-central California steelhead. Historical water development has reduced potential habitats and along with it, survival and population numbers. The California red-legged frog (CRLF) and south-central California steelhead (SCCS) were listed as threatened under protection of the Federal Endangered Species Act in 1996 and 1997, respectively. The following is a brief description of the status of each species and its relationship to water development in the region.

California red-legged frog

At just over five inches long as an adult, the California red-legged frog (CRLF) (*Rana aurora draytonii*) is the largest native frog in the western United States. The historic range of CRLF extends from the Sierra foothills to the coast and from Shasta County to the boarder of Mexico, excluding the Coast Range north of Marin County. It is estimated that CRLF have disappeared from over 99 percent of the inland and southern California localities within its historic range and have been extirpated from at least 70 percent of all localities within its entire historic range (Jennings, Hayes, and Holland 1992). CRLF occur throughout the entire Central Valley hydrographic basin, but the area from Ventura County south to the border of Mexico is the most depleted in California (Jennings, Hayes, and Holland 1993). Populations of CRLF in the Coast Range from Marin County south to Santa Barbara are more intact than populations in the rest of the state. The estimated disappearances of historical populations in the Coast Range are 50 percent. USFWS listed this species as Threatened in 1996. The Carmel River Watershed and the Santa Lucia mountain range have been identified as a core area (number 20), where recovery actions will be focused (USFWS, 2002). Critical habitat throughout California was designated in 2006. In the Monterey

Peninsula region, a little more than one-quarter of the Carmel River watershed (primarily, areas adjacent to the main stem and in the Garzas Creek and San Clemente Creek watersheds) and a portion of the nearby San Jose Creek watershed is designated as critical habitat for California red-legged frogs.[6]

Surveys and incidental sightings in the Carmel River Basin indicate that CRLF is well distributed throughout the drainage, especially in the main stem (MPWMD, 2004). But mapping of potential reproductive sites and actual sightings of egg masses and larvae in the main stem during 2003 indicates that the population is not fully utilizing the potential or available reproductive habitat. Sampling in selected tributaries within the basin during 1999-2003 surveys also indicates patchy utilization of suitable habitat, as known reproductive sites are not used consistently on a year-to-year basis. Although the distribution and abundance of CRLF may be limited, there is general agreement that the Carmel River Watershed is extremely important to the current distribution of CRLF.

Many factors contributed to the historical decline or loss of CRLF populations in their native range, including introduction of predators, loss of habitat and degradation from urbanization, agriculture, mining, overgrazing, recreation, timber harvesting, invasion from nonnative plants, impoundments, water diversion, and degraded water quality (65 FR 54893). Of special interest in relation to planning in this region are the impoundments and water diversions in the Carmel River Basin. The existing dams and water extractions are opined to affect CRLF in the following ways:

- San Clemente and Los Padres Dams fragment habitat in the basin by blocking or hindering dispersal of individuals. However, the planned removal of San Clemente Dam in 2015 will re-connect large portions of the watershed that may have hindered CRLF dispersal. After the dam is removed, only the upper 45 square miles of the 255-square mile watershed will be blocked by a large main-stem dam.
- San Clemente Reservoir is nearly filled with sediment which has created favorable off-channel breeding sites in shallow ponds within the reservoir area during times of the year when flow is uncontrolled (i.e., much of the winter). However, to help reduce the threat of a dam failure during a seismic event, DWR requires the dam owner, California American Water, to draw down the water surface during low flow times (i.e., spring, summer, and fall). This can expose tadpoles and cause desiccation of eggs masses in the reservoir area.
- In most years, summer releases from Los Padres Reservoir contribute enough water to the lower alluvial Carmel Valley to help prevent premature draw down of reproductive sites in a portion of the lower Carmel River.
- Water diversions via well pumping in the lower Carmel Valley can significantly impact CRLF by rapidly dewatering reaches of the Carmel River, as the combined well production during late spring through summer is often 2 to 4 times the stream flow. The majority of wells capable of dewatering reaches of the Carmel River during the low flow season are California American Water production wells that can divert up to 15 cfs. In addition, the area within the MPWMD boundary in the Carmel Valley watershed has approximately 561 private wells, including wells in the alluvial aquifer and upland areas, that produce another 2,500 AFY. It is estimated that about 60 percent of production from these wells is during the dry season; however,

[6] See Map 14 California Red-Legged Frog April 2006 Final Critical Habitat Unit MNT-2 and 19244 Federal Register / Vol. 71, No. 71 / Thursday, April 13, 2006 / Rules and Regulations.

instantaneous production rates are not available. The cumulative impact of these wells significantly reduces the amount of water available for CRLF.

South-Central California Steelhead

Steelhead (*Oncorhynchus mykiss*) inhabit two coastal streams in the region, San Jose Creek and the Carmel River. Very little is known or published on the population in San Jose Creek, but the population in the Carmel River Basin is well studied. The Basin supports one of the stronger steelhead populations in the South-Central Coast distinctive population segment, extending from the Pajaro River in Santa Cruz County south to streams north of the Santa Maria River in Ventura County. While the population is relatively strong compared to other streams, the numbers of adult fish returning to the basin have declined by about 50 percent-75 percent since the mid-1970s. This decline is opined to have been related to several factors, but paramount was the effect of dam construction, reservoir operations, out-of-basin exports, and extensive well pumping from the alluvial portions of Carmel Valley (Carmel River Watershed Assessment, MPWMD, 2004). In particular, the increase in water pumping associated with expansion of California American Water well fields after 1964, and other private wells in the lower Carmel Valley affected habitat in the Carmel River and the success of fish migration and several life phases of steelhead.

To complete their life cycle, steelhead depend on perennial stream flow and suitable spawning and rearing habitat. In December 2013, the National Marine Fisheries Service issued the “South-Central California Steelhead Recovery Plan,” citing dams and diversions (including groundwater extractions) on the Carmel River as having the most severe adverse impacts to steelhead in the Carmel River. Increased groundwater production beginning in the mid-1960s directly jeopardizes most life stages including upstream and downstream migration of adults, incubation of larvae, emergence of fry, rearing of juveniles, and the downstream migration of smolts. Upstream adult migration from the ocean into the river is delayed in fall and early winter as runoff fills main stem reservoirs and recharges the depleted Carmel Valley Aquifer. In relation to the IRWM Plan and meeting the Statewide priority of restoring steelhead populations, projects in the Plan should implement strategies that reverse the historical pattern of exporting water during periods of low flow in the Carmel Basin, reduce impacts from groundwater extraction throughout the region, reduce the dependence on surface storage in Los Padres Reservoir to maintain summer habitat in the Carmel River, and mitigate for impacts to spawning and rearing habitat from retention of sediment in the main stem reservoirs.

2.4.2 Ventana Wilderness Area

This rugged portion of the beautiful Santa Lucia Range was established as an official Primitive area in 1931 and Congress designated it a formal wilderness area in 1969. Its topography is characterized by steep-sided canyons and sharp-crested ridges with remarkably remote streams and valleys, despite its proximity to major human population centers. Within the region, elevations in the Ventana Wilderness range from about 1,055 feet near the upstream end of Los Padres Reservoir to nearly 5,000 feet at South Ventana Cone along Chews Ridge at the upper boundary of the Carmel River Basin. Streams in the Wilderness Area fall rapidly through narrow canyons, over bedrock, exposed boulders, and several waterfalls spill into deep pools. Many springs flow from cracks in the underlying granitic rock. The vegetation is dominated by chaparral series, but grassy meadows, ponderosa pine forests, several unique stands of Santa Lucia fir and virgin coastal redwood trees are located in the area. Importantly, future water development is tightly restricted, and human intervention in natural processes is discouraged. The area functions as a major source of water for the region.

2.4.3 Areas of Special Biological Significance

In the mid-1970s, 34 areas on the coast of California were designated as areas requiring protection by the State Water Resources Control Board and were called Areas of Special Biological Significance (ASBS) and include the following.

Pacific Grove

Critical Coastal Area (CCA) No. 42a flows into the Pacific Grove ASBS and forms a State Water Quality Protection Area (SWQPA) 3.3 miles in length along the Pacific Grove shoreline. The southern portion of the Monterey Bay coastline, including Pacific Grove, is listed as impaired for metals, based on historical mussel water data.[7] However, the Coastal Commission has set a low priority for determining a total maximum daily load.

Carmel Bay

The Carmel Bay SWQPA is roughly 5.0 miles in length encompassing the area of Carmel Bay between Pescadero Point and Monastery Beach. The Carmel River and San Jose Creek watersheds, which include storm water from the City of Carmel-by-the-Sea and the Pebble Beach area, drain into the Carmel Bay ASBS.

Point Lobos Ecological Reserve

The California State Parks Department described this area as "…one of the richest marine habitats in California" and quotes landscape artist Francis McComas as saying this area is "…the greatest meeting of land and water in the world." The ecological reserve area is the first underwater reserve in the nation and comprises approximately 775 acres of tide and submerged land lying at the south end of Carmel Bay. The underwater reserve is adjacent to the Point Lobos State Reserve, which includes about 554 acres of coastal lands immediately south and west of Carmel River State Beach.

2.4.4 Marina Protected Areas (MPAs)

Marine protected areas (MPAs) along the central California coast (Pigeon Point to Point Conception) have been in effect in state waters since September 21, 2007. State waters in this area cover approximately 1,144 square miles of ocean, estuary, and offshore rock/island waters. The central coast network includes 29 new or modified areas (28 MPAs and one marine recreational management area), covering approximately 204 square miles or about 18 percent of the central coast. Various restrictions are in place on the taking of fish within these areas.

There are several MPAs are within the planning including:

1) Four contiguous designations from approximately the Coast Guard pier in Monterey to Point Joe in Pebble Beach.

2) Four areas in the vicinity of the Carmel River Bay and Point Lobos.[8]

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[7] California Coastal Commission, California's Critical Coastal Areas, State of the CCAs Report, June 2, 2006, CCA #42a.

[8] More details and maps are at http://www.dfg.ca.gov/marine/mpa/ccmpas_list.asp

Monterey Bay National Marine Sanctuary

The Monterey Bay National Marine Sanctuary, designated in 1992, is a Federally protected marine area offshore of California's central coast. Stretching from Marina to Cambria, the MBNMS encompasses a shoreline length of 276 miles and 6,094 square miles of ocean, extending an average distance of 30 miles from shore. At its deepest point, the MBNMS reaches 12,713 feet (more than two miles). It is our nation's eleventh Marine Sanctuary and its largest- larger then Yosemite or Yellowstone National Parks.

2.5 Social and Cultural Makeup and Values of the Community

Approximately 38 miles of coastline offer scenic value and access to coastal resources. The Carmel River and many streams, creeks, lagoons, and other water bodies are also available to the public. The entire coastline of the planning area is located within the Monterey Bay National Marine Sanctuary. Several public and non-profit institutions have programs and resources related to marine science, such as Monterey Peninsula College, the local community college, Monterey Bay Aquarium, Friends of the Sea Otter, Stanford University's Hopkins Marine Laboratory, and the National Weather Service. The community actively participates in protecting and enhancing local natural resources through volunteer work projects, informational forums, and cash donations in support of these activities.

The current estimated population of the region is about 106,400[9] or about 25 percent of the total population of Monterey County in 2010 (415,057). The population within the MPWMD boundary is approximately 104,000. In the next 20 years, population in the six cities in the region (not including areas in the Ord Community) is projected to add less than 8,000 people (AMBAG, 2008). The unincorporated portion of the region has essentially five distinct population segments. These are located along the Highway 68 corridor, in the Pebble Beach/Carmel Highlands area, the valley portion of the Carmel River watershed between the mouth of the river and Carmel Valley Village, in the Cachagua area (also in the Carmel River watershed), and in the Ord Community.

According to the Monterey County General Plan Update completed in 2004, estimates for the Cachagua area indicate that the population is slightly less than 2,000 residents. Development constraints may limit future population growth in this area to about 4,000 residents. According to the Comprehensive Fiscal Analysis of the Proposed Incorporation of Carmel Valley (June 9, 2006), approximately 11,700 people reside in the valley portion of the Carmel River watershed. The 2010 Marina Coast Water District Urban Water Management Plan lists the Ord Community as having 10,762 residents, of which it is estimated that approximately 7,500[10] of these residents are within the geographic boundary of the Monterey Peninsula region with the remainder in the Greater Monterey County planning region.

Population growth in the unincorporated portions of the region (ex Ord Community) over the next 20 years is difficult to estimate. However, population growth in this area may be similar to incorporated portions of the region (i.e. almost level), as development constraints are similar between the two areas.

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[9] Population figure estimated from "Demographic Evaluation of Current Monterey Peninsula Water Management District Director Divisions Using 2010 Census Data" with the following revisions: 1) add 2,000 for Cachagua Valley; 2) add 400 for population in the Carmel River watershed south of the river; note: no estimate made for Tularcitos Creek watershed.

[10] 2010 census tract 141.07 population of 7,088 plus 3/8 of the population in tract 141.04 (pop. = 1,611), which includes dormitories on the CSUMB campus and is divided among the two planning regions.

Most of the population growth in the region over the next 20 years is expected to be in the Ord Community. The Draft Fort Ord Reuse Plan Reassessment, published in October 2012, does not describe future population estimates, but does have this to say about growth:

> The ultimate build out of the former Fort Ord, as guided by the BRP [Base Reuse Plan], is constrained by three primary variables: 1) a cap on the volume of water allocated to base reuse (6,600 acre-feet per year) and availability of an augmented (i.e., reclaimed/desalinated) water supply; 2) a cap on the number of new housing units (6,160); and 3) a cap on new population (37,700).
>
> Since adoption of the BRP, 446 residential units have been constructed (including 65 units under construction at East Garrison). Another 4,549 new residential units have been approved, but not yet constructed. About 1,100 units have been continuously inhabited or rehabilitated since the former Fort Ord was closed. According to the reassessment's Market Study, the existing un-built lots represent an estimated 20 to 30 years of inventory at projected population growth/housing demand rates for Monterey County.

The Ord Community area has recently been the focus of efforts to redirect development away from current open space areas and toward the blighted regions of the Ord Community. As in many areas in California, community attitudes concerning growth are divided. Owners of undeveloped property, business representatives, and construction tradespersons are generally in favor of growth, while existing homeowners and environmentalists are often opposed. Within the California American Water service area[11] (i.e., much of the planning region), the public – as reflected in the positions of local elected officials and voting on ballot measures – appears to support construction or development of existing legal lots of record, but often expresses concern regarding new property subdivisions. In the Ord Community, where Marina Coast Water District is the provider, the Fort Ord Reuse Plan was recently reassessed and a Final Reassessment Plan was prepared in 2013.

Large portions of the planning area are currently dedicated to recreation and conservation through federal, state, regional, and local parks, and through protected privately-owned properties, such as those owned by the Big Sur Land Trust (BSLT) and The Nature Conservancy.

2.6 Economic Conditions and Important Trends

The economic base in the region is made up of tourism, government, education, and the military. More than 80 percent of Monterey Count's visitor services facilities are located in the planning region and account for about $2 billion in economic activity. It is estimated that about 8 million people visit the region each year. Tourism suffered a downturn after 2007 and has slowly rebounded. Anecdotal evidence from hoteliers suggests occupancy rates are down. However, the City of Monterey reports a slight dip in Transient Occupancy Tax revenues for the period 2009 to 2013. Housing prices in the region between 2007 and the present suffered the most in lower cost areas, where home prices plunged more than 50 percent during the housing crash. More upscale areas, such as Carmel, Carmel Valley, Pebble

[11] Within the planning Region, the Monterey District of California American Water includes the cities of Monterey, Carmel-by-the-Sea, Del Rey Oaks, Pacific Grove, Sand City, most of Seaside, and the unincorporated communities of Carmel Valley, Del Monte Forest (Pebble Beach), Carmel Highlands, Robles Del Rio (in Carmel Valley), Rancho Fiesta (in Carmel Valley), Ryan Ranch (Hwy 68 corridor), Bishop Ranch (Hwy 68 corridor), and Hidden Hills/Bay Ridge (Hwy 68 corridor).

Beach, and Monterey saw lesser declines and have begun appreciating to a level last seen at the peak of the housing boom.

Monterey County is projected to see a slightly higher percentage increase in population and housing than in jobs. The region as a whole is expected to see about a 25 percent increase in the number of jobs in the next 20 to 25 years. It should be noted that job growth will likely be limited if unincorporated areas and the cities are constrained by limited water supplies. With the exception of CSUMB and the Ord Community, most areas are expected to see little or no growth in population and housing units.

The region contains some of the most expensive housing in the County in areas along the coast in the Carmel Highlands, Pebble Beach, Pacific Grove, Monterey and further inland in Carmel Valley and Hidden Hills. water supply constraints as one of the factors in contributing to an acute shortage of affordable housing County-wide and described the Monterey Peninsula area as even less affordable than the rest of the County.

Median household incomes are summarized in **Table 2-7**.

Table 2-7: Median Household Income (MHI) by Area [a]

Location	Number of Households	Total Population	MHI
California	12,392,852	37,253,956	$60,883
City of Carmel-by-the-Sea		3,725	$74,489
Carmel Valley Village		4,671	$82,217
City of Del Rey Oaks		1,774	$81,154
City of Monterey		27,827	$61,271
City of Pacific Grove		14,902	$66,730
City of Sand City		234	$55,417
City of Seaside		32,431	$57,713
Del Monte Forest		4,254	$111,453

[a] Based on ACS 2006-2010 data, except California total population (April 1, 2010 estimate)

2.7 Disadvantaged Communities

State IRWM guidelines require that water resources planning identify any disadvantaged communities in the region, the specific critical water-related needs of such communities, and what mechanisms were used in development of the Plan to ensure participation of disadvantaged communities. A "disadvantaged community" is defined by the State of California as a community with an annual median household income (MHI) that is less than 80 percent of the statewide MHI [CA Water Code, Section 79505.5(a)]. ACS 2006-2010 data indicated that the MHI for California was $60,883; therefore, communities with an average MHI of $48,706 or less are considered disadvantaged communities. In addition, the Plan must identify any water-related Environmental Justice concerns for the region and describe how implementation of the Plan addresses Environmental Justice.

When data are analyzed on a census tract by census tract basis, there are four tracts within the region that can be considered disadvantaged. These tracts represent approximately 15 percent of the population in the region and are shown in **Table 2-8** and in **Figure 2-5.**

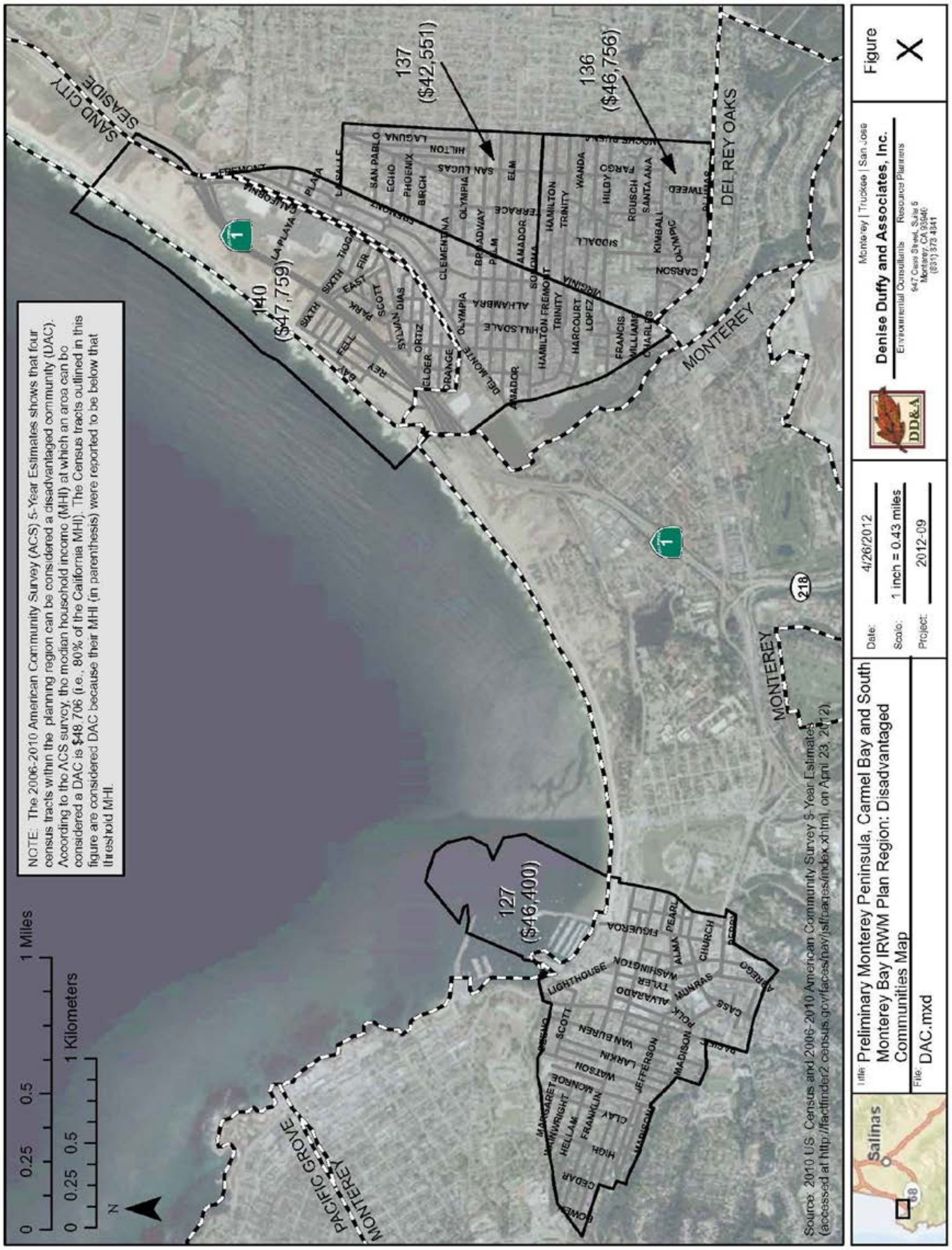
Table 2-8: Disadvantaged Census Tracts[a]

Census Tract	Total Population	Median Household Income
127.00	3,299	$46,400
136.00	4,396	$46,756
137.00	5,131	$34,417
140.00	2,637	$47,759

[a] From 2010 U.S. Census Bureau population data and ACS 2006-2010 income data

The population of these areas is represented in the Stakeholder Group and additional outreach to these groups was conducted prior to each stakeholder meeting for the development of this updated plan (see **Chapter 14, Stakeholder Involvement,** and **Appendix 14-a**). During discussions at stakeholders meetings, no additional critical water-resource related issues were identified that related directly to disadvantage communities or environmental justice concerns.

Figure 2-5: Disadvantaged Communities Map for South Monterey Bay, Monterey Peninsula, and Carmel Bay



Chapter 3 Goals and Objectives

IRWM Plan Standard 3

The Integrated Regional Water Management (IRWM) Plan must clearly present objectives and describe the process used to develop the objectives. Plan objectives must address major water-related issues and conflicts of the region. In addition, objectives must be measurable by some practical means so achievement of objectives can be monitored. The IRWM Plan must contain an explanation of the prioritization or reason why the objectives are not prioritized.

3.1 Monterey Peninsula Regional Goals

3.1.1 Background- 2007 Goals and Objectives

A key step in the IRWM Plan process was for the RWMG to reassess the 2007 IRWM Plan goals and objectives for the 2013 update. Goals are established for broadly outlining the IRWM Plan direction, whereas objectives provide a reasonable basis for decision making, guide work efforts, and may be used to evaluate project benefits. These represent achievable goals, but may not represent the highest function attainable for any particular goal due to present-day legal, financial, and physical constraints. However, an important function of the IRWM Plan is to outline a process for adaptive management, including a process to change goals based on new information and/or conditions.

In 2005, Monterey Peninsula Water Management District (MPWMD) coordinated several stakeholder meetings that focused on creating goals and objectives. Stakeholders appointed a Technical Advisory Committee (TAC) comprised of staff representatives from the Regional Water Management Group (RWMG) and other stakeholders within the IRWM Plan region (Region) including California State University Monterey Bay, Carmel River Watershed Committee, Monterey Bay National Marine Sanctuary, Seaside, Carmel River Steelhead Association, the Planning and Conservation League, and Pebble Beach Company.

After Department of Water Resources (DWR) funded a planning grant for the Region in 2006, based in part on the DWR and State Water Resources Control Board (SWRCB) review of regional goals and objectives, stakeholders were asked to re-evaluate the goals and objectives. The result was a set of regional goals based on statewide priorities, previous water management efforts, stakeholder involvement, and experience in regional issues. Between December 2006 and July 2007, MPWMD coordinated a series of workshops to finalize the goals and objectives for inclusion in the 2007 IRWM Plan.

3.1.2 Goals

The goals for this Plan were based on improving existing water resource conditions in the Region at the time the IRWM Plan was developed and were modified (2012 through 2014) as a result of the consideration of the 2013 DWR Proposition 84 & 1E Guidelines. For this update, MPWMD coordinated additional stakeholder meetings and solicited input via email to reassess the goals and objectives from the November 2007 IRWM Plan in light of locally changed conditions and new guidance from the state and Regional Water Quality Control Board, Central Coast (CCRWQCB or RWQCB). The goals included herein best illustrate the shared regional vision for accomplishing integrated regional water resource plans and other future planning efforts in the area. Regional goals are organized into six general categories: water supply, water quality, flood protection and erosion prevention, environmental protection and enhancement, climate change (added for this IRWM Plan Update), and regional communication and cooperation. The goals for each of these categories are summarized in **Table 3-1**.

Table 3-1: Monterey Peninsula Regional Goals

Water Supply	Water Quality
Improve regional water supply reliability through environmentally responsible solutions that promote water and energy conservation. Protect the community from drought and climate change effects with a focus on interagency cooperation and conjunctive use of regional water resources.	Protect and improve water quality for beneficial uses consistent with regional community interests and the RWQCB Basin Plan through planning and implementation in cooperation with local and state agencies and regional stakeholders.
Flood Protection/Erosion Prevention	**Environmental Protection & Enhancement**
Ensure that flood protection and erosion prevention strategies are developed and implemented through a collaborative and watershed-wide approach and are designed to consider climate change effects and maximize opportunities for comprehensive management of water resources.	Preserve the environmental health and well-being of the Region's streams, watersheds, and the ocean by taking advantage of opportunities to assess, restore and enhance these natural resources when developing water supply, water quality, and flood protection strategies. Seek opportunities to conserve water and energy, and adapt to the effects of climate change.
Climate Change	**Regional Communication**
Adapt the region's water management approach to deal with impacts of climate change using science-based approaches, and minimize the regional causal effects related to water resources.	Identify an appropriate forum for regional communication, cooperation, and education. Develop protocols for encouraging integration and reducing inconsistencies in water management strategies between local, regional, State, and Federal entities. Provide balanced access and opportunity for the public, stakeholders, and DACs to participate in IRWM efforts.

3.1.3 Objectives

Revisions to the objectives were aimed at meeting new guidelines for regions to consider climate change, an increased emphasis on disadvantaged community issues and outreach, new statewide priorities in the 2009 California Water Plan, revisions to the RWQCB Basin Plan, and other regulations and guidance. The plan objectives have been developed and modified by the region's stakeholders iteratively since 2006 through the processes described below. The objectives are more specific than regional goals, and they have consistently addressed major water-related issues and conflicts of the region. Within subsequent chapters of this Plan, the following are presented to assist the Region in achieving the objectives:

- Resource Management Strategies (**Chapter 4**)
- Planning grant projects approved in 2011 (**Chapter 10**)
- IRWM plan implementation projects from a 2013 solicitation on ranking process (**Chapter 6**)

Development of Objectives and Priorities for 2007 IRWM Plan

The process followed by the Stakeholder Group in 2005-2007 for identifying pertinent goals and objectives and then prioritizing regional projects under those goals and objectives consisted of the following key steps.

1. ***Describe water-related issues***. There are several issues that the Region has grappled with for many years including limited water supply, declining habitat for sensitive species, storm water management, groundwater management, flooding, and erosion. Through a community outreach program, workshops, and deliberation with stakeholders, the Water Management Group, TAC and Stakeholder Group identified the specific water-related issues to be addressed by this IRWM Plan.
2. ***Develop List of Objectives***. This effort built upon ongoing planning efforts in the region, including the Carmel River Watershed Action Plan prioritization process, the development of the Monterey Regional Storm Water Management Program, the ongoing water supply planning processes, and the Carmel River Parkway Plan. Like the regional goals, the plan objectives were originally organized under five categories of water supply, water quality, flood protection and erosion prevention, environmental protection and enhancement, and regional communication and cooperation.
3. ***Develop Criteria***. The Stakeholder Group and TAC considered the following criteria in setting regional priorities. The objective would:
    - benefit multiple agencies and stakeholders or large portions of the Region;
    - meet water supply goals, improve or protect environmental resources, and improve existing infrastructure;
    - avoid negative impacts to infrastructure, water supply, or environmental resources; and/or
    - comply with federal or state regulations.
4. ***Develop and Refine Priorities***. The Stakeholder Group developed a draft set of priorities based on individual entity responsibilities, strategic plans, and short and long term goals. At a stakeholder meeting in December of 2006, a TAC was appointed to refine the priorities using the Priority Criteria, review project descriptions, and make recommendations about a prioritized suite of projects to the Stakeholder Group.
5. ***Prioritization.*** The TAC met regularly throughout the first half of 2007 to deliberate and refine priorities and develop a project scoring process. As a result of these workshops, a suite of projects was identified for inclusion in the plan and a process to modify the Plan and project list in the future was determined.

The 2007 IRWM Plan is available on the IRWM website.[1]

[1] www.mpirwm.org

3.1.4 Objective Prioritization Process for the IRWM Plan Update

In July of 2012, a stakeholder meeting was convened to introduce stakeholders to the 2013 IRWM plan update and the newly released Draft IRWM Plan Guidelines (DWR, August 2012; finalized December 2013), and to revisit the 2007 IRWM objectives and priorities for the region in order to make the plan compliant with DWR guidelines. The process of developing and updating objectives considered the following overarching policy documents and laws that apply to the region in addition to considering the new DWR guidelines.

- Central Coast Basin Water Quality Control Plan
- 20 x 2020 Water Efficiency Goals
- Requirements of California Water Code §10540(c)

These overarching policies/regulations are described in the following sections.

Central Coastal Basin Water Quality Control Plan

Central Coastal Basin Water Quality Control Plan, known as the Basin Plan, was updated in June 2011. It is the water quality control plan formulated and adopted by the CCRWQCB. The objective of the Basin Plan is to manage surface and ground water in the Central Coast region to achieve the highest water quality reasonably possible. The Central Coast region includes all of Santa Cruz, Monterey, San Luis Obispo, and Santa Barbara counties, most of San Benito County, and parts of San Mateo, Santa Clara, and Ventura counties. The Basin Plan lists various water uses (beneficial uses), describes the water quality that must be maintained to allow those uses (water quality objectives), and outlines an implementation plan for achieving those standards. In addition, the CCRWQCB established the following water quality planning goals (RWQCB 2011):

1. Protect and enhance all basin waters, surface and underground, fresh and saline, for present and anticipated beneficial uses, including aquatic environmental values.
2. The quality of all surface waters shall allow unrestricted recreational use.
3. Manage municipal and industrial wastewater disposal as part of an integrated system of fresh water supplies to achieve maximum benefit of fresh water resources for present and future beneficial uses and to achieve harmony with the natural environment.
4. Achieve maximum effective use of fresh waters through reclamation and recycling.
5. Continually improve waste treatment systems and processes to assure consistent high quality effluent based on best economically achievable technology.
6. Reduce and prevent accelerated (man-caused) erosion to the level necessary to restore and protect beneficial uses of receiving waters now significantly impaired or threatened with impairment by sediment.

The objectives for the Monterey Peninsula IRWM region promote actions to meet the water quality standards outlined in the Basin Plan, and are consistent with the overarching Basin Plan goals.

20x2020 Water Efficiency Goals

The 20x2020 Water Conservation Plan (20x2020 Plan) sets forth a statewide road map to maximize the state's urban water efficiency and conservation opportunities starting in 2009. It aims to set in motion a range of activities designed to achieve a 20 percent per capita reduction in urban water demand by

2020. These activities include improving an understanding of the variation in water use across California, promoting legislative initiatives that incentivize water agencies to promote water conservation, and creating evaluation and enforcement mechanisms to assure regional and statewide goals are met. The 20x2020 Plan discusses these many activities in detail. As of 2011, CAW had not yet achieved the required per capita reduction in its Monterey County District (Cal-Am, 2012). It should be noted that the baseline year for the conservation goals set in the 20x2020 Plan was 2005. The Region has implemented aggressive water conservation programs since the mid-1980s, which has resulted in the lowest per capita water consumption of any comparable community in the State of California at approximately 58 gallons per person per day. This can be compared to the California statewide average in 2005 of about 200 gallons per person per day (estimates vary depending on the source).

Requirements of CWC §10540(c)

At a minimum, all IRWM Plans must ensure that the Plan objectives are consistent with the overarching goals, as they apply to the Region. The following is from the California Water Code §10541(c), presented to the region's stakeholders at the July 2012 meeting to be addressed in the IRWM Plan:

- Protection and improvement of water supply reliability, including identification of feasible agricultural and urban water use efficiency strategies.
- Identification and consideration of the drinking water quality of communities within the area of the Plan.
- Protection and improvement of water quality within the area of the Plan consistent with relevant basin plan.
- Identification of any significant threats to groundwater resources from overdrafting.
- Protection, restoration, and improvement of stewardship of aquatic, riparian, and watershed resources within the region.
- Protection of groundwater resources from contamination.
- Identification and consideration of water-related needs of disadvantaged communities in the area within the boundaries of the Plan.

Program Preferences and Statewide Priorities by Objectives

In accordance with PRC §75026(b) and CWC §10544, the 2013 DWR Guidelines state that preference will be given to proposals that:

- Include regional projects or programs (CWC §10544).
- Effectively integrate water management programs and projects within a hydrologic region identified in the California Water Plan; the (RWQCB) region or subdivision; or other region or sub-region specifically identified by DWR.
- Effectively resolve significant water-related conflicts within or between regions.
- Contribute to attainment of one or more of the objectives of the CALFED Bay-Delta Program. [*NOTE: This is not applicable to the Monterey Peninsula region, see **Chapter 2**, **Region Description***]
- Address critical water supply or water quality needs of disadvantaged communities within the region.
- Effectively integrate water management with land use planning.

- For eligible Surface Water Flooding Managers funding, projects that: a) are not receiving State funding for flood control or flood prevention projects pursuant to PRC §5096.824 or §75034; or b) provide multiple benefits, including, but not limited to, water quality improvements, ecosystem benefits, reduction of instream erosion and sedimentation, and groundwater recharge.
- Address statewide priorities (see **Table 3-3**, **Statewide Priorities versus 2013 IRWM Plan Objectives**).

At the July 2012 Stakeholder meeting, stakeholders were asked to provide general comments and input to a draft set of goals and objectives revised in accordance with the Draft 2012 Guidelines from DWR and new regional circumstances and conditions. To gather meaningful feedback, the participants were also provided written forms and asked to rank draft objectives as high, medium, or low priorities for the Region. In addition, the Objectives Feedback form was provided to the full list of stakeholders via email to enable those who could not attend the meeting to provide input. The results of the July 25, 2012 stakeholder meeting related to the Objectives Feedback/Prioritization Exercise Results, are included in **Appendix 3-a, Objectives Feedback Results**.

Based upon stakeholder input (including verbal and written comments) and the Objectives Feedback/Prioritization Exercise, the draft objectives were modified and re-ordered. The 2012 objectives review process resulted in twenty-five (25) total objectives, including eight (8) considered “high priority.” The result of the objectives review and prioritization effort is shown in **Table 3-2**.

Table 3-2: IRWM Plan Update Prioritized Regional Objectives

Water Supply (WS)
WS-1. Meet existing water supply replacement needs of the Carmel River system and Seaside Groundwater Basin.*
WS-2. Maximize use of recycled water and other reuse, including gray water systems, and stormwater capture and use.[2] *
WS-3. Seek long-term sustainable supplies for adopted future demand estimates.*
WS-4. Optimize conjunctive use of surface and groundwater.*
WS-5. Evaluate, advance, or create water conservation throughout the Region in compliance with the State's 20x2020 Water Conservation Plan.*
Water Quality (WQ)
WQ-1. Improve ocean water quality, including Areas of Special Biological Significance (ASBS), by minimizing pollutants in stormwater discharges.*
WQ-2. Improve inland surface water quality for environmental resources (e.g. steelhead) and potable water supplies.*
WQ-3. Protect and improve water quality in groundwater basins.*
WQ-4. Meet or exceed water quality standards established by regulatory agencies and stakeholders. *
Flood Protection and Erosion Prevention (FP)
FP-1. Develop regional projects and plans necessary to protect existing infrastructure and sensitive habitats from flood damage, erosion, and sea level rise, in particular, along the South Monterey Bay shoreline and Carmel Valley.*
FP-2. Develop approaches for adaptive management that minimize maintenance and repair requirements (sustainable flood management systems).*
FP-3. Protect quality and availability of water while preserving or restoring ecologic and stream function.*
FP-4. Provide community benefits beyond flood protection, such as public access, open space, recreation, agricultural preservation, and economic development.
Environmental Protection and Enhancement (EV)
EV-1. Protect and enhance sensitive species and their habitats in the regional watersheds; promote the steelhead run.*
EV-2. Identify opportunities to assess, protect, enhance, and/or restore natural resources, including consideration of climate change, when developing water management strategies and projects.*
EV-3. Minimize adverse effects on biological and cultural resources when implementing strategies and projects.*
EV-4. Identify opportunities for open spaces, trails and parks along streams and other recreational areas in the watershed that can be incorporated into projects.
EV-5. Identify and integrate elements from appropriate Federal and State species protection and recovery plans.*
Climate Change (CC)
CC-1. Evaluate adaptation measures and mitigative solutions to climate change effects.*
CC-2. Support increased education, monitoring and research to increase understanding of long-term impacts of climate change in the region.*
CC-3. Support efforts to increase education, research and use of energy conservation measures and alternatives to fossil fuel and non-renewable resources to reduce greenhouse gas emissions associated with water and wastewater facility operations and IRWM projects.*

[2] The underlined text was added based on comments from the city of Pacific Grove (Sarah Hardgrave, January 2013)

Regional Communication and Cooperation (RC)
RC-1. Identify cooperative, integrated strategies for protecting both infrastructure and environmental resources, including from climate change impacts. *
RC-2. Foster collaboration among regional entities as an alternative to litigation.*
RC-3. Identify and pursue additional opportunities for public education, outreach, and communication on water resource management and climate change, including to disadvantaged communities and stakeholders with interests in water management issues.*
RC-4. Build relationships with State and Federal regulatory agencies and other water forums and agencies.
NOTES: These objectives have been revised and renumbered compared to the draft objectives presented and evaluated at the 7/25/2012 Stakeholder Meeting. **High Priority Objectives based upon those objectives receiving the most points during the objectives prioritization exercise in July and August 2012 are presented in gray shading and bold type.** * = Objective is closely aligned with Statewide Priorities (see **Table 3-4**).

3.1.5 Measuring Attainment of Objectives

The IRWM Guidelines require that objectives must be measurable by some practical means to enable monitoring of the achievement of the objectives and thus the success of IRWM Plan implementation. Because the IRWM Plan is implemented primarily through projects, these measures, or “metrics” apply to projects that seek to achieve the objectives. **Table 3-4** suggests potential qualitative and quantitative measurement metrics that will be further developed when projects under the plan have been implemented. Although this Draft Plan attempts to identify the most appropriate measures for a given objective, the suggested measures do not encompass the full breadth of possible ways to measure success in meeting the Plan goals and objectives. See **Chapter 8, Plan Performance and Monitoring** for additional detail about the future process for measuring achievement of goals and objectives.

Table 3-3: Statewide Priorities versus 2013 IRWM Plan Objectives

Statewide Priority Name/Description	Objective
Drought Preparedness. Proposals that contain projects that effectively address long-term drought preparedness by contributing to sustainable water supply and reliability during water shortages. Drought preparedness projects do not include drought emergency response actions, such as trucking of water or lowering well intakes. Desirable proposals will achieve one or more of the following: • Promote water conservation, conjunctive use, reuse and recycling. • Improve landscape and agricultural irrigation efficiencies. • Achieve long term reduction. • Efficient groundwater basin management. • Establish system interties.	WS-1 though WS-5, WQ-2, WQ-3, FP-1
Use and Reuse Water More Efficiently. Proposals that include projects that implement water use efficiency, water conservation, recycling and reuse to help meet future water demands, increase water supply reliability, and adapt to climate change. Desirable proposals include those with projects that: • Increase urban and agricultural water use efficiency measures such as conservation and recycling. • Capture, store, treat, and use urban stormwater runoff (such as percolation to usable aquifers, underground storage beneath parks, small surface basins, domestic stormwater capture systems, or the creation of catch basins or sumps downhill of development) or projects outlined in PRC §30916 (SB 790). • Incorporate and implement low impact development (LID) design features, techniques and practices to reduce or eliminate stormwater runoff.	WS-2, WS-4, WS-5, WS-6, WQ-1, WQ-2, WQ-3,
Climate Change Response Actions. Water Management actions that will address the key Climate Change issues of: assessment of vulnerabilities as a result of climate change; adaptation to climate change; reduction of greenhouse gas (GHG) emissions; and reduce energy consumption. Proposals that contain projects that when implemented address adaptation to climate change effects in an IRWM region. Desirable proposals include those that: • Advance and expand conjunctive management of multiple water supply sources. • Use and reuse water more efficiently. • Water management system modifications that address anticipated climate change impacts, such as rising sea-level, and which may include modifications or relocations of intakes or outfalls. • Establish migration corridors, re-establish river-floodplain hydrologic continuity, re-introduce anadromous fish populations to upper watersheds, and enhance and protect upper watershed forests and meadow systems. Proposals that contain projects that reduce GHG emissions compared to alternate projects that achieve similar water management contributions toward IRWM objectives. Desirable proposals include those that: • Reduce energy consumption of water systems and uses. • Use cleaner energy sources to move and treat water. Proposals that contain projects that reduce not only water demand but wastewater loads as well, and can reduce energy demand and GHG emissions. Desirable proposals include: water use efficiency; water recycling; water system energy efficiency; and reuse runoff.	FP-1, FP-2, CC-1, CC-2, CC-3, EV-2, RC-1, RC-3
Expand Environmental Stewardship. Proposals that contain projects that practice, promote, improve, and expand environmental stewardship to protect and enhance the environment by improving watersheds, floodplains, and instream functions, and to sustain water and flood management ecosystems.	EV-1 through EV-5
Practice Integrated Flood Management. Proposals that contain projects that promote and practice integrated flood management to provide multiple benefits including: • Better emergency preparedness and response. • Improved flood protection. • More sustainable flood and water management systems. • Enhanced floodplain ecosystems. • LID techniques that store and infiltrate runoff while protecting groundwater.	FP-1 through FP-3
Protect Surface Water and Groundwater Quality. Proposals that include: • Protecting and restoring surface water and groundwater quality to safeguard public and environmental health and secure water supplies for beneficial uses. • Salt/nutrient management planning as a component of an IRWM.	WQ-1 through WQ-5
Improve Tribal Water and Natural Resources. Proposals that include the development of Tribal consultation, collaboration, and access to funding for water programs and projects to better sustain Tribal water and natural resources.	RC1-4

Statewide Priority Name/Description	Objective
Ensure Equitable Distribution of Benefits. Proposals that: • Increase the participation of small and disadvantaged communities in the IRWM process. • Develop multi-benefit projects with consideration of affected disadvantaged communities and vulnerable populations. • Contain projects that address safe drinking water and wastewater treatment needs of DACs. • Address critical water supply or water quality needs of California Native American Tribes within the region.	RC-1 through RC-4 WS-1 through WS-4

Table 3-4:
Measuring Attainment of IRWM Plan Objectives

Darker shading represents high priority objectives

Objective	Qualitative Measurement	Quantitative Measurement
Water Supply		
WS-1. Meet existing water supply replacement needs of the Carmel River system and Seaside Groundwater Basin.*	Identification of, and proposals for, implementation of projects and initiatives/programs that will result in achieving water supply replacements for the Carmel River system and Seaside Groundwater Basin.	Measurable increase in water supply replacement amounts (i.e., in acre-feet per year, AFY) for the Carmel River system and Seaside Groundwater Basin.
WS-2. Maximize use of recycled water and other reuse opportunities, such as graywater and stormwater capture and use.*	Identification and implementation of projects and initiatives/programs designed to increase use of recycled water on individual properties as well as by regional wastewater treatment entities.	Measurable increase of use of recycled water in lieu of potable water (AFY); number of individual properties benefitted.
WS-3. Seek long-term, sustainable supplies for adopted future demand estimates.*	Identification and implementation of projects designed to protect, enhance, and increase long-term sustainable supplies for adopted future demand estimates.	Measurable improvements in long-term sustainable supplies for adopted future demand estimates.
WS-4. Optimize conjunctive use of surface and groundwater.*	Identification of projects and initiatives/programs meant to optimize conjunctive use of surface and groundwater.	Acre-feet (AF) of water storage; number of conjunctive management projects developed; reduction in diversions in Carmel Valley Basin to achieve SWRCB limits; reduction in use of Seaside Groundwater Basin native water to legal adjudicated limit.
WS-5. Evaluate, advance, or create water conservation throughout the Region in compliance with the State's 20x2020 Water Conservation Plan.*	Identification of projects and initiatives/programs meant to evaluate, advance, or create water conservation.	Quantitative increase in water conservation; or number of new or enhanced conservation programs/projects.
Water Quality		
WQ-1. Improve ocean water quality, including Areas of Special Biological Significance (ASBS), by minimizing pollutants in stormwater discharges.*	Identification of sources of existing pollutants potential increases in runoff that may impact ocean water quality, including ASBS, and implementation of innovative and effective projects or programs to improve existing runoff conditions.	An increased percentage of projects that include BMP, LID standards, or other alternatives to minimize runoff that may impact ocean water quality. Number of projects or programs implemented to improve existing runoff conditions.

Table 3-4:
Measuring Attainment of IRWM Plan Objectives

Darker shading represents high priority objectives

Objective	Qualitative Measurement	Quantitative Measurement
WQ-2. Improve inland surface water quality for environmental resources (e.g. steelhead) and potable water supplies.*	Identification of needs and opportunities to improve surface water quality for environmental resources. Design and implementation of projects or programs to improve conditions.	Number of projects or programs implemented to improve conditions. Measurable improvement in water quality (i.e., reduced pollutant concentrations) attributed (at least in part) to the implementation of new projects/programs. Pounds of pollutants eliminated from discharges.
WQ-3. Protect and improve water quality in groundwater basins.*	Identification of projects and initiatives/programs designed to protect and improve groundwater quality.	Measurable improvements to groundwater quality (i.e., lowering of salinity, pollutant concentrations) through implementation of projects/programs. Pounds of pollutants eliminated from discharges.
WQ-4. Meet or exceed water quality standards established by regulatory agencies and stakeholders. *	Progress toward meeting established water quality objectives, including TMDLs, and NPDES limits.	Number of projects that benefit water quality of 303(d) listed streams or improve water quality of permitted discharges. Pollutant load reductions in discharges.
Flood Protection and Erosion Prevention		
FP-1. Develop regional projects and plans necessary to protect existing infrastructure and sensitive habitats from flood damage, erosion, and sea level rise, in particular, along the South Monterey Bay shoreline and Carmel Valley.*	Demonstrated progress in eliminating potential for properties to flood damage.	Acreage of property (or square feet of habitable buildings) removed from flood zones identified in flood insurance study updates; reduction in annual losses/damages from flooding in dollars; number of properties removed from mapped flood hazards.
FP-2. Develop approaches for adaptive management that minimize maintenance and repair requirements (sustainable flood management systems).*	Identification of policies and programs that will require all new development to implement adaptive management methods (i.e., LID).	Estimated reduction in annual maintenance/repair costs; presence/absence of LID program; number of projects implementing LID.
FP-3. Protect quality and availability of water while preserving or restoring ecologic and stream function.*	Identification of natural stream/river ecological and hydrological functions and eliminating/minimizing threats to function.	Acres of enhanced or reconnected floodplains; acres of newly created treatment wetland areas; acres of upland enhanced through BMPs, revegetation, number of projects implementing LID.
FP-4. Provide community benefits beyond flood protection, such as public access, open space, recreation, agricultural preservation, and economic development.	Identification of opportunities to provide community benefits and design of projects or programs to provide them.	Number of projects or programs implemented resulting in community benefits (miles of new trails, acres of: 1) new publicly accessible open space; 2) preserved agricultural land; or 3) increased number or appeal of recreational and tourism industry opportunities/benefits).

Table 3-4:
Measuring Attainment of IRWM Plan Objectives

Darker shading represents high priority objectives

Objective	Qualitative Measurement	Quantitative Measurement
Environmental Protection and Enhancement		
EV-1. Protect and enhance sensitive species and their habitats in the regional watersheds; promote the steelhead run.*	Identification, design, and implementation of projects or programs intended to protect and enhance sensitive species and habitats.	Acreage (or lineal feet of stream or river) of conserved, protected and enhanced sensitive species habitats, including length of stream opened during key seasons/months to fish and other aquatic species for migration and watershed areas opened to upland habitat for other species. Measured increases in numbers of species populations.
EV-2. Identify opportunities to assess, protect, enhance, and/or restore natural resources, including consideration of climate change, when developing water management strategies and projects.*	Identification, design, and implementation of projects or programs intended to protect and enhance natural areas.	Increase in area of assessed, protected, enhanced, and/or restored natural areas.
EV-3. Minimize adverse effects on biological and cultural resources when implementing strategies and projects.*	To consider and mitigate potential adverse effects on biological and cultural resources when implementing strategies and projects, or developing alternatives to avoid impacts.	Quantifiable measurement is specific to the project and type of resource affected. At a minimum, a no net loss policy should be implemented for potential adverse effects on sensitive biological and cultural resources (i.e., significant impacts should be mitigated).
EV-4. Identify opportunities for open spaces, trails and parks along streams and other recreational areas in the watershed that can be incorporated into projects.	Identification of opportunities to provide community recreational benefits along streams or in watersheds.	Area, miles of trails, and/or number of projects or programs implemented providing community recreational benefits along streams or in watersheds.
EV-5. Identify and integrate elements from appropriate Federal and State species protection and recovery plans.*	Requirement to integrate Federal and State species protection and recovery plans into design of all projects, programs, or initiatives.	Number of projects implemented integrating Federal and State species protection and recovery plans.
Climate Change		
CC-1. Evaluate adaptation measures and mitigative solutions to climate change effects.*	Requirement to plan for potential future climate change impacts into design of all projects, programs, or initiatives.	Number of projects implemented incorporating consideration of future climate change impacts.

Table 3-4:
Measuring Attainment of IRWM Plan Objectives

Darker shading represents high priority objectives

Objective	Qualitative Measurement	Quantitative Measurement
CC-2. Support increased education, monitoring and research to increase understanding of long-term impacts of climate change in the region.*	Improve access to data, reports on current science, documenting trends in climate change (rain fall, temperature, sea level rise, river flows). Development of clearinghouse of proposed and current monitoring programs related to climate change impacts.	Number of research/monitoring programs implemented to obtain greater understanding of long-term impacts of climate change in the Region, and/or monetary investment in research and monitoring programs.
CC-3. Support efforts to increase education, research and use of energy conservation measures and alternatives to fossil fuel and non-renewable resources to reduce greenhouse gas emissions associated with water and wastewater facility operations and IRWM projects.*	Compile data reports on current science, documenting trends in resource conservation and alternative energy sources. List of proposed additions for current monitoring programs to decrease resource demands of potential projects.	Number of research/monitoring programs implemented to decrease resource demands of potential projects in the Region, and/or monetary investment in research and monitoring programs.
Regional Communication		
RC-1. Identify cooperative, integrated strategies for protecting both infrastructure and environmental resources, including from climate change impacts. *	Meetings between local, regional, state, and federal entities to identify and resolve infrastructure and environmental resources problem areas.	Number and success ratio increase in proposed projects that have incorporated integrated strategies for protecting both infrastructure and environmental resources.
RC-2. Foster collaboration among regional entities as an alternative to litigation.*	Meetings convened between regional entities and stakeholders to discuss and plan regional water initiatives and/or resolve water-related conflicts. Positive indication of public support for implementation of water-related projects and/or programs that demonstrate collaborative efforts.	Number of projects, programs, or initiatives successfully designed, permitted, or implemented that promote integrated planning, improved communication between agencies & interest groups, and development of projects meeting the IRWM Plan goals.
RC-3. Identify and pursue additional opportunities for public education, outreach, and communication on water resource management and climate change, including to disadvantaged communities and stakeholders with interests in water management issues.*	Implementation of programs to educate the public about water resources, with an emphasis on high priority geographic areas or demographic groups.	Number of presentations and outreach events which increase public education about water resources issues and needs; number of diverse, typically under-represented groups attending stakeholder meetings.
RC-4. Build relationships with State and federal regulatory agencies and other water forums and agencies.	Meetings convened and agreements reached between State and Federal regulatory agencies and other water agencies to facilitate the permitting, planning, and implementation of water-related projects.	Number of projects, programs, or initiatives successfully designed, permitted, or implemented as a result of improved relationships and communication with state and federal regulatory agencies.

Chapter 4 Resource Management Strategies

IRWM Plan Standard 4
The Integrated Regional Water Management (IRWM) Plan must document the range of [Resource Management Strategies (RMS)] considered to meet the IRWM objectives and identify which RMS were incorporated into the IRWM Plan. The effects of climate change on the IRWM region must factor into the consideration of RMS. RMS to be considered must include, but are not limited to, the RMS found in Volume 2 of the [California Water Plan (CWP)] Update 2009.

Following the development of IRWM Plan Objectives, the next step in the integrated planning process was to choose the appropriate RMS[1] to meet the IRWM planning objectives. As required by the Guidelines, all strategies recommended in the Department of Water Resources IRWM guidelines were initially considered for inclusion in the plan, but not all strategies were found to be feasible or applicable to this region. Once the strategies were considered, they were evaluated based on how they could, in combination or individually, align with the planning objectives. This section describes the strategies contained in this IRWM Plan.

The CWP Update, Volume Two (2009), defines a resource management strategy as a project, program, or policy that helps local agencies and governments manage their water and related resources. For example, urban water use efficiency and pricing policies with incentives for customers to reduce water use are strategies. New water storage to improve water supply, reliability, and quality is another strategy.

4.1 Resource Management Strategy Consideration

4.1.1 Strategy Consideration Process

As shown in **Table 4-1**, all required strategies were considered to meet IRWM plan standards. Appropriate water management strategies for this plan were identified based on a review of strategies, actions and opportunities identified in local plans and in discussions at stakeholder workshops. The strategies listed in **Table 4-1** were each considered based on their applicability to the planning Region and their ability to fulfill the planning objectives. Integrated planning must include several RMS to achieve regional objectives. However, it was also understood that not all of the strategies considered would necessarily be included in the plan. This chapter summarizes the consideration and integration of the RMS.

[1] In the 2007 MP IRWM Plan, the term "water management strategies" was used, rather than the term "resource management strategies" that is used herein. This plan update changed terminology for consistency with 2012 Proposition 84 &1E IRWM Guidelines (DWR, 2012 amended Dec. 2013).

Table 4-1: Resource Management Strategies Incorporated in the IRWM Plan

Resource Management Strategies by CWP Management Outcome	Included in 2007 Plan	Included in 2013 Plan Update	Considered as Req. to Meet Min. Plan Standards
Reduced Water Demand			
Agriculture Water Use Efficiency		X	X
Urban Water Use Efficiency	X	X	X
Crop Idling for Water Transfers			X
Irrigated Land Retirement			X
Rainfed Agriculture			X
Improve Operational Efficiency and Transfers			
Conveyance – Delta	X	X	X
Conveyance – Regional/Local	X	X	X
System Reoperation		X	X
Water Transfers	X	X	X
Waterbag Transport/Storage Technology	X		X
Increase Water Supply			
Conjunctive Management & Groundwater Storage	X	X	X
Desalination	X	X	X
Precipitation Enhancement		X	X
Recycled Municipal Water	X	X	X
Surface Storage –CALFED			X
Surface Storage – Regional/local	X	X	X

Dewvaportation or Atmospheric Pressure Desalination		X	X
Fog Collection		X	X
Improve Water Quality			
Drinking Water Treatment and Distribution	X	X	X
Groundwater Remediation/Aquifer Remediation		X	X
Matching Quality to Use		X	X
Pollution Prevention	X	X	X
Salt and Salinity Management		X	X
Urban Runoff Management	X	X	X
Improve Flood Management			
Flood Risk Management	X	X	X
Practice Resources Stewardship			
Agriculture Lands Stewardship		X	X
Economic Incentives		X	X
Ecosystem Restoration	X	X	X
Forest Management	X	X	X
Recharge Area Protection		X	X
Water-Dependent Recreation	X	X	X
Watershed Management	X	X	X

4.2 Strategies from the *2009 California Water Plan Update*

4.2.1 Reduced Water Demand

The intent of this category of RMS is to reduce water demand. Improvements in efficiency will translate into a more sustainable demand for the Region. The management strategies that were considered are listed below. Those marked with an asterisk were not included in the plan; section 4.3 includes a discussion on items not included. Those included in the plans are described in detail below.

- Agricultural Water Use Efficiency
- Urban Water Use Efficiency
- Crop Idling for Water Transfers*
- Irrigated Land Retirement*
- Rainfed Agriculture*

Agriculture Water Use Efficiency

Water use efficiency and conservation measures serve to reduce water use, reduce energy consumption and therefore emissions of pollutants and greenhouse gas, reduce wastewater and potentially polluted runoff, and reduce the economic and environmental costs associated with water use and water treatment. The Region's agricultural uses are limited to a few small pockets of privately owned vineyards, located primarily in the Cachagua Valley, and small scale farming operations located along the Carmel River main stem. Water use efficiency and conservation measures strategies are already common practice in agricultural areas. Common water conservation best management practices (BMP) implemented in the region include, for example, use of a time clock/pressure switch, water flowmeters, leakage reduction, sprinkler improvements, pre-irrigation reduction, reduced sprinkler spacing, micro irrigation systems, land leveling/grading, and soil moisture sensors. Small farming operations occupy a small fraction of land in Carmel Valley and rely almost exclusively on the Carmel River alluvial aquifer for irrigation water; however, this accounts for a minor amount of water use in the IRWM planning region. Thus, promoting agricultural water use efficiency is not critical for helping the region meet its goal of improved water supply reliability.

Urban Water Use Efficiency (Conservation)

Given the legal and physical constraints to water supply in the Region and the demonstrated effectiveness of conservation, urban water use efficiency is considered an important ongoing strategy for the region, especially in the area of landscape and outdoor irrigation uses and is a proven strategy in reducing reliance on limited local water supplies. The Monterey Peninsula area has one of the lowest per capita water consumption levels of any urban area in California and is aggressively pursuing a water conservation program that includes education and conservation incentives.

Urban water use efficiency measures have been widely implemented throughout much of the region, including, for example, plumbing retrofits, surveys of large landscape areas, development of water efficient landscape guidelines, high-efficiency washing machine rebates, public information campaigns, school programs, residential ultra-low-flow flush toilet replacement programs, other appliance retrofit rebates, commercial, industrial, and institutional audits to identify water conservation opportunities, and internal water distribution system audits. Although many planning regions around the state should achieve substantial benefits from implementing urban water use efficiency and conservation programs in the future, the benefits of an aggressive conservation program for the Monterey Peninsula region will be incremental in comparison to other regions around the state, rather than substantial. It is expected that the region can achieve an annual reduction of at least 25 AFY for the foreseeable future. This strategy is considered an important means for helping the region meet its water supply objectives.

4.2.2 Improve Operational Efficiency and Transfers

The following RMS were considered to achieve the CWP management outcome of improved operational efficiency and transfers. This management outcome aims to create a new water sources, and supplement, increase allocations of, or better utilize, existing water sources within the region. The following RMS to improve operational efficiency and transfers were considered; however, several identified with (*) were not chosen, as discussed in Section 4.3. Those included in the plan are discussed in more detail below.

- Conveyance – Delta*
- Conveyance – Regional/local
- System Reoperation
- Water Transfers
- Waterbag Transport/Storage Technology*

Conveyance – Regional/Local

Conveyance includes both natural watercourses (including groundwater aquifers) and constructed facilities. The agencies managing the water supply in the Region have considered and implemented this strategy on an ongoing basis in the Carmel River and Seaside Basins. After considering many options to replace and augment water supplies within the Region, it is felt that the existing water supplies in the Region must be augmented with desalinated water in order to provide a reliable and sustainable supply of water. A small amount of desalinated water is currently produced in Sand City for distribution to the Region. Larger facilities are proposed in Marina and at Moss Landing to supply the Region and are in the review process, both of which require substantial conveyance infrastructure.

System Re-operation

System re-operation entails changing existing operation and management procedures for reservoirs and conveyance facilities in order to increase benefits from these facilities and optimize operations. An example of system re-operations was when CAW ceased diversions at the Sleepy Hollow/Carmel Valley Filter Plant site and instead began diverting more water via wells in the lower portions of Carmel Valley (i.e., the northwestern most portion); thereby allowing more water to remain in the Carmel River for habitat. The ongoing Aquifer Storage and Recovery (ASR) Program is another re-operation project (also a conjunctive use project) wherein winter flows from the Carmel River (subterranean stream) are diverted when flows exceed a specific quantity and these excess waters are conveyed through the existing potable water supply system for injection into the Seaside Groundwater Basin (SGB). Additional optimization of existing infrastructure will require significant upgrades in production, treatment, and pipeline capacity at certain points in the system. Although some of these improvements are in the design stage, the California Public Utilities Commission (CPUC) must review and approve such projects. Other projects, such as an expansion of ASR and reservoir dredging, are under consideration, but no new feasible projects have emerged to date.

Water Transfers

A water transfer is defined in the Water Code as a temporary or long-term change in the point of diversion, place of use, or purpose of use due to a transfer or exchange of water or water rights. Water transfers typically occur in five ways:

1. Transferring water from storage that would otherwise have been carried over to the following year;
2. Pumping groundwater instead of using surface water delivery and transferring the surface water rights;
3. Transferring previously banked groundwater either by directly pumping and transferring groundwater or by pumping groundwater for local use and transferring surface water rights;
4. Making water available by reducing the existing consumptive use through crop idling or crop shifting or by implementing water use efficiency measures; or
5. Making water available by reducing return flows or seepage from conveyance systems that would otherwise be irrecoverable. [2]

Intra-regional transfer of potable water is already a proven strategy between the Carmel River Basin (CRB) and the SGB and is expected to be a significant component in resolving both regional supply and water quality issues in the SGB. One-way inter-regional transfer of wastewater currently occurs from the Monterey Peninsula to the Salinas Valley MRWPCA plant, along the Salinas River. Importation of highly treated wastewater (recycled water) back into the Region from this plant is proposed to provide additional water for injection and recovery in the SGB aquifers (the Monterey Peninsula Groundwater Replenishment [MPGWR] Project). Intra-regional transfer of recycled water currently occurs between the mouth of the Carmel River (from the CAWD treatment plant) to irrigate golf course areas in Pebble Beach.

4.2.3 Increase Water Supply

The CWP management outcome to increase water supply can be achieved through programs and projects that provide a new water supply that would, first and foremost, replace a portion of existing water diversions in the Carmel River Basin and meet the requirement to ramp down production in the SGB in order to improve the hydrologic balance and water quality of the basin. Additional supplies would be required for new water entitlements. The dependence on rainfall to replenish water-bearing aquifers and lack of surface storage puts the Region at risk of severe cutbacks in water use during drought periods lasting two or more years. Increased recycling and reuse of municipal wastewater and conjunctive use of storm water and/or other surface water may help to diversify the water supply sources. Securing a reliable water supply is one of the highest priorities in the Region and is critical to reducing impacts to the environment such as seawater intrusion and low surface flows for environmental needs.

Several water supply projects are currently being pursued by local agencies and California American Water Company to directly improve water supply reliability, eliminate unlawful diversions from the Carmel River, and reduce the potential for seawater intrusion in the SGB. In these projects, surplus surface and recycled water (Carmel River winter flows, advanced treated wastewater, and dry weather

[2] This list is a generalized statement about water transfers; each region is different and some of these means are not appropriate for the Monterey Peninsula IRWMP Region.

flows and storm water, potentially) can be used to recharge the SGB. Water injected into the SGB during winter can be extracted at a later time and reduce diversions from the Carmel River Basin during the dry season.

The following RMS (listed below) are intended to provide additional water resources to the region and were considered for inclusion in this IRWM Plan; however, some strategies were not chosen to be included in this plan (identified with an *) for reasons discussed in section 4.3. Those that are included are described in detail, below.

- Conjunctive Management & Groundwater Storage
- Seawater or Brackish Water Desalination
- Precipitation Enhancement
- Recycled Municipal Water
- Surface Storage – CALFED*
- Surface Storage – Regional/local
- Dewvaporation or Atmospheric Pressure Desalination
- Fog Collection

Conjunctive Management & Groundwater Storage

Optimizing conjunctive use of the Carmel River Basin and the SGB is critical for the region's water supply as well as for the quality of both the surface and groundwater in the region. The region lacks sustainable surface water storage and use of the Carmel River Aquifer to extract water is currently restricted. The SGB is an effective storage and extraction medium within the region. However, production of native water from this basin is subject to use restrictions as a result of a recent adjudication in the basin. Therefore, while conjunctive use is an important aspect of water supply planning, there are limitations to using this strategy.

Because the Region relies on groundwater production and subterranean alluvial streamflow for virtually all of its water supplies, a sound groundwater management strategy is both critical and necessary. In the Carmel River Basin, the State Water Resources Control Board (SWRCB) determined that it has jurisdiction over the water flowing in the Carmel River Aquifer, which supplies about 70 percent of potable water for the Region. SWRCB has set a requirement of reducing diversions from that aquifer by approximately 75 percent over the historical usage, by 2017 (SWRCB Order No. WR 95-10 and WRO 2009-0060).

In the SGB, which supplies about 20 percent of the potable water in the Region, the Superior Court of California adjudicated rights in the basin in 2006 and instituted a schedule for bringing the groundwater budget into balance by 2021. The Court's decision plays a key role in how this strategy is implemented overall in the Region.

Groundwater management is a key strategy in the ongoing ASR Project, and other regional projects included in this plan. Projects to reduce stormwater discharges to ASBS may also incorporate groundwater recharge, or reuse, if capture and treatment is feasible.

Desalination

Desalination has been used in the Region and surrounding area at a small scale, with plants located in the Monterey Bay Aquarium, Sand City, and City of Marina. While a large scale plant has yet to be built and operated, desalination continues to be investigated as a water supply to satisfy requirements for replacement water supplies and to help protect the region from drought. This strategy is being actively pursued by both public and private entities in the Region. However, recent proposals have focused on locating facilities outside of the Region. Land-based desalinating facilities would require locating treatment, pumping, and pipeline facilities outside of the Region to deliver water to the area and would require modifications to existing infrastructure within the Region. Sea-based facilities, which would be located several miles offshore and would require significant infrastructure upgrades at the coast and within the Monterey Bay National Marine Sanctuary (MBNMS), have been investigated but have not moved forward.

Desalination could be combined with other water supply projects within the Region, such as ASR and injection of advanced, or highly-treated, recycled water in the SGB, to meet the Region's potable water supply needs.

Precipitation Enhancement

Precipitation enhancement, commonly called "cloud seeding," artificially stimulates clouds to produce more rainfall than they would naturally. Cloud seeding injects special substances, typically silver iodide, into the clouds to enable the raindrops to form more easily. Cloud seeding has been practiced in California since the 1950s. The MCWRA used precipitation enhancement as a resource management strategy from 1990 to 1995 and again in 2004. MCWRA retains this strategy in its portfolio as an option for future implementation. Precipitation enhancement has not been used historically within the planning Region, but remains an option for the region to consider in providing additional water on a cost-effective basis.

Recycled Water for Municipal or Environmental Benefits

Recycling of 800 AFY of wastewater from the CAWD plant for Pebble Beach golf course irrigation has proven to be effective in reducing potable water demand. Releasing up to 300,000 gallons/day of tertiary-treated water to the Carmel River Lagoon that would otherwise be discharged to Carmel Bay is also being considered as a method to augment the lagoon during the summer to enhance aquatic environments. However, recycled water from the CAWD plant on the Carmel River may not meet all of the stringent water quality requirements under the Clean Water Act for discharges to the Lagoon, which is considered waters of the United States. Efforts are currently underway to explore ways to use this water at the lagoon and comply with all requirements for surface water discharges. MPWMD and MRWPCA have jointly proposed developing a project to produce 3,500 AFY of highly treated recycled water from the Regional Treatment Plan for injection into the SGB to meet replacement water supply needs.

Surface Storage – Regional/local

Enlarging the capacity of Los Padres Reservoir (e.g., dredging or building a higher spillway) or construction of a new reservoir is limited by economic, safety, and environmental constraints and is not considered to be feasible at this time. Maintenance dredging of the Los Padres Reservoir to retain existing storage capacity has been considered as an option, but no definitive analysis or proposal has been carried out. Removal of Los Padres Dam was identified in an October 2012 Draft Recovery Plan for Steelhead (NMFS, 2013) as a critical action for recovery of the species in the Carmel River. In general, other areas in the Region are either environmentally sensitive or are urban areas that are not suitable for surface storage.

Dewvaporation or Atmospheric Pressure Desalination

Dewvaporation is a specific process of humidification-dehumidification desalination. Brackish water is evaporated by heated air, which deposits fresh water as dew on the opposite side of a heat transfer wall. The energy needed for evaporation is supplied by the energy released from dew formation. Heat sources can be combustible fuel, solar or waste heat. The technology of dewvaporation is still being developed, and thus far the basic laboratory test unit is capable of producing up to 150 gallons per day. The technology for dewvaporation is still too new to be of significant value for the IRWM Plan region.

Fog Collection

There has been some interest in fog collection for domestic water supply in some of the dry areas of the world near the ocean where fog is frequent. Some experimental projects have been built in Chile, including the El Tofo project, which yielded about 10,600 liters per day from about 3,500 square meters of collection net (about 3 liters per day per square meter of net). Because of its relatively small production, fog collection is limited to producing domestic water where little other viable water sources are available. Monterey County’s coastal location is ideally suited for fog collection; however, as long as other viable water sources exist, fog collection will be considered a low-priority strategy for the region. However, like dewvaporation, the RWMG remains open to its potential use as a resource management tool in the future.

4.2.4 Improve Water Quality

The CWP management outcome to improve water quality is very important for integrated planning. Projects that include these aspects of water management are anticipated to be high priority for the region:

- Drinking Water Treatment and Distribution
- Groundwater Remediation/Aquifer Remediation
- Matching Quality to Use
- Pollution Prevention
- Salt and Salinity Management
- Urban Runoff Management

Drinking Water Treatment and Distribution

Providing a reliable supply of safe drinking water is the primary goal of municipal water supply systems in the region. Critical to achieving that goal is ensuring a safe raw water supply and well-maintained water treatment facilities. Beyond the treatment plant, a high level of water quality must be maintained as the water passes through the distribution system to customer taps. Contaminants can enter the distribution system, or water quality may deteriorate within the distribution system, for example, as a result of microbial growth and biofilm, nitrification, corrosion, water age, effects of treatment on nutrient availability (contributing to microbial growth and biofilm), and sediments and scale within the distribution system. Improvements to water treatment and distribution facilities are continually needed as infrastructure ages, populations grow, water quality stressors increase (such as seawater intrusion and chemical contaminants), and water quality standards become more stringent. This is considered an ongoing and critical resource management strategy for the region.

As water supplies change in the Region, water and recycled water treatment plants may need to be built depending on the quality and source of water supplies.

Groundwater Remediation/Aquifer Remediation

Groundwater remediation removes contaminants that affect beneficial uses of groundwater. Passive groundwater remediation allows contaminants to biologically or chemically degrade or disperse in situ over time, while active groundwater remediation involves either treating contaminated groundwater in situ or extracting contaminated groundwater from the aquifer and treating it. Since groundwater is the primary water supply source for most of the region, and since the groundwater basin is stressed by both natural and human-caused contaminants, including nitrates, seawater, and arsenic, groundwater remediation is an important resource management strategy for the region.

Matching Quality to Use

An example of matching water quality to use is a water supplier choosing to use a deeper, cleaner aquifer for municipal water, which requires less treatment before delivery, over a more shallow, more contaminated aquifer or over a surface supply. Benefits would include a reduced need for treatment and potentially fewer disinfection byproducts for the water user. Recycled water can also be treated to a wide range of purities that can be matched to different uses. In the Monterey Peninsula IRWM region, water is currently reclaimed and treated for golf course irrigation purposes. The potential exists to treat wastewater with an advanced treatment to enable indirect potable reuse as is proposed by the MP GWR project.

Pollution Prevention

Non-point source pollution control is important for maintaining surface and groundwater quality in this biologically sensitive region. Several entities within the Region are implementing a storm water management program in the urban portions of the Region in compliance with Phase II requirements of the National Pollution Discharge Elimination System for storm water.

Salt and Salinity Management

Salts are materials that originate from dissolution or weathering of the rocks and soil, including dissolution of lime, gypsum, and other slowly dissolved soil minerals. “Salinity” describes a condition where dissolved minerals (of natural or anthropogenic origin) that carry an electrical charge are present. In February 2009, the SWRCB adopted a Recycled Water Policy that aims to promote and increase the use of recycled water. The policy requires local stakeholders, such as local water and wastewater entities and members of the public, develop salt and nutrient management plans for groundwater basins. The purpose of the plans is to protect groundwater from accumulating concentrations of salt and nutrients that would degrade the quality of groundwater and limit its use. Historical strategies for mitigating the impacts of excess salinity include desalination as well as salt dilution and displacement. For example, agricultural operations typically displace soil salts by applying more irrigation water than the crop is able to take up to flush salts out of the root zone and relocate them in a lower part of the soil profile. The salt and nutrient management plans are intended to go beyond these historical strategies (which essentially address impacts) by evaluating the initial sources and loading of salts and nutrients in a groundwater basin, and work to manage excessive loading on a regional scale. Salt and salinity management has taken on greater prominence among the Region’s RMS and the Monterey Peninsula IRWM region has prepared a salt and nutrient management plan for the SGB as required by the SWRCB’s Recycled Water Policy.

Urban Runoff Management

Storm water runoff is described by the Environmental Protection Agency as "That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, underflow, or channels or is piped into a defined surface water channel or a constructed infiltration facility (Washington Department of Ecology, 1992)." These types of flows can be contaminated with pollutants that are generated through a multitude of sources, but are typically lumped into two categories—urban and agricultural runoff.

Typical pollutants detected in urban and suburban runoff include trash, metals, detergents, pesticides, sediment, nutrients and pathogens. Agricultural activities, including animal grazing, can produce nitrates, other nutrients, pathogens, and unnatural turbidity levels in nearby water bodies. The effects of storm water runoff can be seen when beaches are closed or in the case of foam coffee cups and plastic bags that wash into storm drains and mounds of trash that pile onto local beaches during storm events. Or they can be less noticeable, such as when runoff creates toxic conditions for wildlife.

According to the MBNMS, volunteer monitoring in several Monterey Bay area cities has shown that urban runoff contains some of these pollutants and may be contributing to increased mortality among marine mammals. The effects are not restricted to the environment, and can affect public health and cause economic losses from repeated beach closings and water quality warnings resulting from pathogens leaked from failing infrastructure or from human or animal wastes in the watersheds.

The RWQCB approved the Monterey Regional Storm Water Management Plan (MRSWMP) and issued a Phase II NPDES permit for storm water discharges within the Region in Sept 2006. BMP contained in MRSWMP should lead to an improvement in the future of near-shore water quality along the coast and in streamside areas affected by storm water discharges.

At present, requirements concerning discharges to the Carmel Bay and Pacific Grove Area of Special Biological Significance (ASBS) are under discussion and study. Pacific Grove has completed two phases of a project to divert a portion of dry season flows away from the Pacific Grove ASBS, and the City of Monterey completed an alternatives analysis in 2006 and an engineering report and Draft EIR in 2013 for ceasing discharges in ASBS from Monterey, Pacific Grove, and Pebble Beach.

This IRWM Plan contains several projects in the planning stages for determining the feasibility of capturing and/or managing storm water. Project scopes include investigating enhanced infiltration of runoff in local watersheds combined with diversion of discharges to the sanitary sewer system for treatment and recycling. When fully implemented, these projects may supply water for irrigation at local parks and open space areas or treated water would be injected or allowed to percolate into local aquifers to improve water quality and increase water quantity. See **Chapter 7, Impacts and Benefits,** for detailed project descriptions.

4.2.5 Improve Flood Management

The CWP management outcome to improve flood management is achieved in the following RMS.

Flood Risk Management

The Monterey County Water Resources Agency is responsible for flood management throughout the unincorporated portions of Monterey County. Flood protection along the Carmel River and in the Canyon Del Rey watershed is a significant challenge and an important aspect of surface water related planning in those areas. Portions of the Carmel Valley floodplain have the highest repetitive loss rate in the County (defined as two or more flood insurance claims in a ten-year period). The March 10, 1995 flood (estimated peak magnitude of 16,000 cubic feet per second or about a 70-year return flood) damaged 700 residences and 68 businesses and caused the evacuation of most people in the floodplain. In addition, two 80-foot spans of the Highway 1 Bridge across the Carmel River were washed away. Projects to reduce flooding in Carmel Valley are expected to be a high priority in the Region.

The Lower Carmel River Restoration and Floodplain Enhancement and the Ecosystem Protection Barrier project incorporate flood management improvements. There may also be flood management benefits from projects in the Seaside Basin to reduce stormwater flows to Monterey Bay and from projects in the Cities of Pacific Grove and Monterey to reduce stormwater flows to ASBS.

In the six Monterey Peninsula Cities and in Pebble Beach, flooding problems appear to be localized and typically affect far fewer residents and structures than in most of the unincorporated areas. However, storm drain systems in these areas discharging to ASBS are often overwhelmed by high flows, presenting a significant challenge in reducing or ceasing wet weather discharges to ASBS.

4.2.6 Practice Resources Stewardship

Practice Resources Stewardship is an important aspect of water related planning and the following related RMS are included in this plan:

- Agricultural Lands Stewardship
- Economic Incentives (Loans, Grants and Water Pricing)
- Ecosystem Restoration
- Forest Management
- Recharge Area Protection
- Water-Dependent Recreation
- Watershed Management

Agriculture Lands Stewardship

Agricultural lands stewardship broadly means the conservation of natural resources and protection of the environment on agricultural lands. Examples of agricultural lands stewardship include windbreaks, irrigation tailwater recovery, filter strips, grassed waterways, contour buffer strips, conservation tillage, noxious weed control, riparian buffers, streambank protection, and the use of cover crops and other soil-building and stabilization practices.

The primary agricultural land uses within the planning region are range lands (in addition, a handful of small-scale viticulture and farm lands) and thus the IRWM Plan may have limited benefits for including this RMS. One example of an ongoing program that implements this RMS is the Environment Quality Incentives Program (EQIP) that is currently being implemented by the Natural Resources Conservation Service (NRCS).

EQIP provides financial and technical assistance to agricultural producers in the State of California (NRCS 2012). In the Carmel River Watershed, the NRCS works primarily with rangelands. Through this yearly program, the NRCS assists landowners with the implementation of BMP tailored to address each site’s concerns. The NRCS assists with practices that improve soil, water, plant, animal, air and related resources on agricultural land and non-industrial private forestland (NRCS 2012). Examples of activities in the Carmel River Watershed that are implemented through the EQIP include fencing off riparian areas, installing troughs out of the streams, and pasture and hay planting.

Economic Incentives

Economic incentives include financial assistance, water pricing, and water market policies intended to influence water management. Examples of economic incentives include water rates and rate structures, free services, rebates, and the use of tax revenues to partially fund water services. As opposed to incentives, fines are a type of economic disincentive that can be used to discourage undesirable water user behavior. Economic incentives, such as plumbing retrofits, washing machine rebates, and residential ultra-low flow flush toilet replacement programs, have been used and continue to be used at different times by water suppliers in the region. This strategy is a particularly good option for encouraging urban water use efficiency and for assisting disadvantaged communities in attaining water services, facilities, and appurtenances. CAW and MPWMD have implemented this RMS for many years in the region to reduce urban water use. CAW, which supplies about 95 percent of potable water use, uses a tiered water rate structure that has significant financial incentives to minimize water use.

Ecosystem Restoration

The Lower Carmel River Restoration and Floodplain Enhancement project is one project that directly incorporates ecosystem restoration by allowing river flows to occupy areas of the floodplain that are currently in agricultural use and protected from most floods by a levee. Other projects effect ecosystem restoration indirectly, such as the projects in the Seaside Basin to increase percolation into the aquifers and reduce dependence on Carmel River sources.

State and Federal species recovery plans for steelhead and the California red-legged frog describe several important resource areas to enhance and conserve including habitat along the Carmel River, its tributaries, and at the Carmel River Lagoon. Several projects in this IRWM Plan are proposed that will assist in restoring streamside habitats in the Carmel River watershed and will include monitoring in these areas for improvements in the populations of sensitive species.

Protection of the MBNMS and State designated Areas of Special Biological Significance are also of key importance. As described in the Water Quality Objectives, the six Minimum Control Measures being implemented as part of the MRSWMP will improve near-shore water quality. However, the level and type of protection for ASBS is currently under discussion between RWQCB 3 and the ASBS dischargers in the planning Region.

Forest Management

Part of the Carmel River Watershed is located within the Los Padres National Forest and Ventana Wilderness. Other forest areas within the IRWM planning area include Del Monte Forest. Protecting forests that support the watershed within the IRWM planning areas is an important aspect of water related planning. Projects associated with this IRWM Plan may not directly contribute to changes in forest management or land uses. Currently, Federal, State, and local policies for management of forestlands are considered effective for the purpose of protecting water resources. Climate change is expected to directly affect forests through increased drought stress, making trees more vulnerable to insect attack; wildfires are also likely to increase in frequency, size, and severity as climate warms. These stresses on forests will affect their capacity to naturally regulate streamflow and buffer water quality. Portions of streams that are now perennial may become intermittent with the resulting loss of riparian zones, aquatic habitats, and other beneficial uses of water that depend on perennial flows.

Some forest areas are habitat for threatened and endangered species of plants and animals in the Region. Several projects in this IRWM Plan are proposed that will assist in restoring habitats associated with the Carmel River watershed and will include monitoring in these areas for improvements in the populations of sensitive species.

Recharge Area Protection

The recharge area protection has specific goals: 1) ensure that areas suitable for recharge continue to be capable of adequate recharge rather than covered by urban infrastructure, such as buildings and roads; and 2) prevent pollutants from entering groundwater in order to avoid expensive treatment that may be needed prior to potable, agricultural, or industrial beneficial uses. There are currently no areas within the IRWM planning region that are specifically designated as "recharge protection areas," though there are many areas of open space and wetland that could be considered areas of natural recharge. In particular, the areas overlying the SGB have sandy qualities that enable efficient percolation of stormwater. Much of the Region is either somewhat arid rolling hills in the rain shadow of the Santa Lucia range or very rugged terrain with sedimentary deposits in canyon bottoms or low-gradient areas. There may be areas along Carmel River that would allow for the development, restoration, or enhancement of wetlands (in public lands adjacent to the lower Carmel River), in the Canyon Del Rey watershed, and in small streams within the Del Monte Forest. Projects, such as the Carmel River Lagoon and Lower Carmel River Floodplain Restoration and Enhancement project to provide excess flood capacity and increase wetland areas, thus increasing water recharge.

Water-Dependent Recreation

The Region has wide appeal to those who enjoy sport fishing, kayaking, sailing, hiking, camping, surfing, cycling, photography, or other water-related activities. Recreation and public access are important aspects of water resource planning and are integral to the economic base of the Region, particularly as related to access in the Carmel River watershed and to the coast. While public access to the San Clemente Reservoir is currently prohibited, access to the Los Padres National Forest and the Ventana Wilderness is allowed at Los Padres Dam and Reservoir, offering some of the most breathtaking settings for outdoor recreation in the State. Maintaining and expanding access to beaches, as required by the California Coastal Act, and to other recreational areas will continue to be an important consideration in future water resources projects.

Watershed Management

The Carmel River Watershed can be managed for recreation, water supply, water quality, and environmental habitat considerations. Watersheds within the Seaside Basin can be managed for water supply, water quality, and may have some environmental habitat and recreation components. Other watersheds that drain directly to the Pacific Ocean (e.g., within Pebble Beach and the Cities of Carmel-by-the-Sea, Pacific Grove and Monterey) can be managed for recreation, water quality, and environmental habitat. All of these watershed planning strategies should be included in the planning process as it relates to surface and groundwater supply.

4.3 Strategies considered but not included in the IRWM Plan

The following RMS from the 2009 CWP were considered but are not recommended for inclusion in the MP IRWM Plan for the reasons provided below. This section is based on stakeholder feedback from the October 24, 2012 stakeholder meeting.

Conveyance – Delta

Since the California Delta does not extend to the IRWM Planning region, Delta conveyance improvements are not an option. Importation of water from the Delta is not viable as evidenced by previous alternative screening analyses conducted between 1996 and 2009[3]. Therefore, this resource management strategy is not applicable and will not be included in the IRWM Plan.

Crop Idling for Water Transfers

Due to the small amount of agricultural land uses within the Region, there are no significant opportunities for this resource management strategy to be pursued. Also, there is no financial incentive for growers to employ this strategy in the Region. Therefore, this resource management strategy will not be included in the IRWM Plan.

Irrigated Land Retirement

For the reason stated in the preceding strategy, there are no significant opportunities for this resource management strategy to be pursued and therefore, will not be included in the IRWM Plan.

Rainfed Agriculture

For the reason stated in the preceding strategy, there are no significant opportunities for this resource management strategy to be pursued and therefore, will not be included in the IRWM Plan.

Surface Storage –CALFED

Since the California Delta does not extend to the IRWM Planning region, the CALFED Bay-Delta Program is not an option. Therefore, this resource management strategy is not applicable and will not be included in the IRWM Plan.

Waterbag Transport/Storage Technology

Due to the lack of practicability of using Waterbag Transport/Storage Technology as a sustainable water source in the IRWM planning region, the IRWM Plan did not consider this resource management strategy as a viable option. Importation of water using waterbag or similar storage is not viable as evidenced by previous alternative screening analyses conducted between 1996 and 2009 (MPWMD, 2000).

4.4 How RMS are Implemented in the Plan

Projects chosen for inclusion in the IRWM Plan represent a broad mix of the RMS (listed above in section 4.2). The RWMG encourages stakeholders to develop projects that employ a diverse mix of RMS by offering additional points to projects that demonstrate diversity as part of the project ranking process. In future IRWM Plan project solicitations, projects will continue to be proactively sought to ensure a

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[3] Previous alternative analyses evaluating various water supply options include: MPWMD, Draft Supplemental EIR on the New Los Padres Dam and Reservoir Project, 1998; CPUC/EDAW, Plan B Component Screening Report, August 2000; the CPUC/RMC Carmel River Dam Contingency Plan Final Report, July 2002; MCWD/FORA, Regional Urban Water Augmentation Project Alternatives Analysis, March 2003; MPWMD, Monterey Peninsula Water Supply Project, Draft EIR, December 2003; and CPUC/ESA, Coastal Water Project EIR, December 2009.

diverse mix of RMS for the region's water management portfolio. A strong diversification will not only ensure robust solutions to current water management issues but will provide resiliency to help the region deal with uncertain future circumstances.

Table 4-2 demonstrates how projects included in the IRWM Plan (out of seven ranked projects and five concept proposals) will implement RMS. The following list represents the RMS most widely used:

- Watershed Management (9 Projects and Proposals)
- Pollution Prevention (7 Projects and Proposals)
- Urban Runoff Management (6 Projects and Proposals)
- Ecosystem Restoration (5 Projects and Proposals)
- Flood Risk Management (3 Proposals)
- Recycled Municipal Water (2 Projects and Proposals)
- Matching Water Quality to Use (2 Proposals)
- Agriculture Lands Stewardship (2 Projects)
- Water-Dependent Recreation (2 Proposals)

While all RMS described in Section 4.2 were encouraged for inclusion in each project, some of these strategies were, ultimately, not included in any of the projects or proposals:

- Agriculture Water Use Efficiency
- System Reoperation
- Water Transfers
- Seawater or Brackish Water Desalination
- Precipitation Enhancement
- Dewvaporation or Atmospheric Pressure Desalination
- Fog Collection
- Groundwater Remediation/Aquifer Remediation
- Salt and Salinity Management
- Recharge Area Protection

Table 4-2: 2013 IRWM Plan Resource Management Strategy Implementation

Resource Management Strategies	Agriculture Water Use Efficiency	Urban Water Use Efficiency	Conveyance - Regional/Local	System Reoperation	Water Transfers	Conjunctive Management & Groundwater Storage	Seawater or Brackish Water Desalination	Precipitation Enhancement	Recycled Municipal Water	Surface Storage – Regional/local	Dewvaportation or Atmospheric Pressure Desalination	Fog Collection	Drinking Water Treatment and Distribution	Groundwater Remediation/Aquifer Remediation	Matching Quality to Use	Pollution Prevention	Salt and Salinity Management	Urban Runoff Management	Flood Risk Management	Agriculture Lands Stewardship	Economic Incentives	Ecosystem Restoration	Forest Management	Recharge Area Protection	Water-Dependent Recreation	Watershed Management
Ranked Projects	**Reduced Water Demand**		**Improve Operational Efficiency and Transfers**			**Increase Water Supply**							**Improve Water Quality**						**Improve Flood Manage-ment**	**Practice Resources Stewardship**						
Carmel Bay ASBS Project									X							X		X								X
Carmel River Integrated Watershed Restoration Project																						X				X
Carmel Valley Livestock & Land Program																X				X		X				X
Carmel Watershed Roads Erosion Assistance Program																X				X						X
Incorporation of the Peninsula in the Central Coast Action Tracke		X														X		X								X
Del Monte List Station Upgrades																X										
Ecosystem Condition Profile for the Carmel River Watershed using the Level 1-2-3 Framework.																						X	X			X
Concept Proposals																										
Enhancing Urban Water Conservation Incentive Programs Throughout the Region		X													X	X		X			X					
Dredge Laguna Grande and Public Agency Roberts Lake										X									X				X			X
Causeway Component Project																		X	X			X			X	X
Environmental Protection Barrier																		X	X			X			X	X
Groundwater Replenishment			X			X			X				X		X	X		X								

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4.5 Resource Management Strategies and Climate Change

As noted above, the RWMG selected strategies based primarily on the IRWM Plan goals and objectives. Climate Change adaptation and mitigation is one of the six goals of the Plan, and as such, was explicitly factored in to the RWMG's selection of RMS.

The RWMG supports and encourages the implementation of "no regret" adaptations to the effects of climate change. Such adaptations are those that make sense in light of the current water management context for the region and also help in terms of effects of climate change. Examples of "no regret" strategies include increasing water use efficiency, water supply sustainability, water recycling, matching quality to use, practicing increased integrated flood management, and enhancing ecosystems and their ability to provide multiple benefits to the region. The RWMG generally encourages the implementation of "no regret" strategies through the IRWM Plan and gives higher priority to these strategies in the project ranking process by providing additional points under the "Climate Change" categories.

Chapter 15, Climate Change, presents an in-depth overview of climate change and its expected consequences for the Region. The section includes a preliminary adaptation strategy based on the climate change risk assessments conducted by the RWMG and stakeholder input (see **Table 16-8**, **Adaption Response Strategies to the Effects of Climate Change**). The recommended adaptation and response strategies address, among other things, impacts of sea level rise on coastal resources and coastal groundwater basins, impacts to water supply due to changes in rainfall, and the potential for increased flooding due to higher storm flow events. Adaptation and response strategies include, for example:

- Prepare fire reduction strategies to protect watershed lands using ecologically sustainable strategies
- Implement adaptation strategies to conserve California's biodiversity
- Integrate land use and climate adaptation planning
- Promote community resilience to reduce vulnerabilities
- Implement water conservation and supply management efforts
- Manage watersheds, habitat, and vulnerable species
- Prepare a regional sea level rise adaptation strategy
- Educate, empower, and engage citizens regarding risks and adaptation
- Establish regional policies to protect critical habitats
- Support essential data collection and information sharing

The RMS selected for this Plan, in particular the "no regret" strategies, are consistent with and will help carry out these adaptation and response recommendations for addressing climate change impacts. In addition to addressing climate change impacts, the IRWM Plan supports greenhouse gas emissions reduction and climate change mitigation activities, as discussed in **Chapter 15 Section 15.6, Mitigation of Greenhouse Gas Emissions Strategy**.

Chapter 15 of this IRWM Plan provides a more in-depth discussion regarding climate change mitigation and greenhouse gas (GHG) emissions reduction. A full GHG emissions reduction strategy for this region is expected to be created by Monterey County and AMBAG in the near future to meet State mandates (Assembly Bill 32). In the meantime, several key strategies and actions are recommended in **Chapter 15 Section 6.1**, **Greenhouse Gas Reduction in Projects and Programs** for Project Proponents, water resource managers, land use managers, and other stakeholders in the region based on strategies listed in the Climate Change Handbook for Regional Water Planning (US Environmental Protection Agency Region 9 and DWR, 2011). The recommended GHG reduction and climate mitigation actions will be further evaluated by the RWMG, with input from stakeholders, to define possible next steps, responsible entities, and funding resources.

Chapter 5 Integration and Coordination

IRWM Plan Standard 5 (Integration)
An IRWM Plan must contain structures and processes that provide opportunities to develop and foster integration.

IRWM Plan Standard 15 (Coordination)
The IRWM Plan must include: • Identification of a process to coordinate water management projects and activities of participating local agencies and local stakeholders to avoid conflicts and take advantage of efficiencies (CWC §10541.(e)(13)). • Identification of other neighboring IRWM efforts and the way cooperation or coordination with these other efforts will be accomplished and a discussion of any ongoing water management conflicts with adjacent IRWM efforts. • Identification of areas where a State agency or other agencies may be able to assist in communication, cooperation, or implementation of IRWM Plan components, processes, and projects, or where State or federal regulatory decisions are required before implementing the projects.

The Integration standard in the Proposition 84/1E, IRWM Program Guidelines ensures that Regional Water Management Groups (RWMG) create a system that fosters integration. The IRWM Plan must demonstrate that the RWMG is forming, coordinating, and integrating separate efforts in order to function as a unified effort. Integration may occur on many levels, which are discussed in this section: 1) stakeholder/institutional integration; 2) resource integration; and 3) project integration. The processes, structures, and procedures that foster integration are also described, sometimes implicitly, in other chapters of this IRWM Plan (including Governance, Stakeholder Outreach, Data Management, and Project Review).

5.1 Stakeholder and Institutional Integration

IRWM Plans are required to contain a governance structure that enables participation from a diverse stakeholder group to participate. The California Water Code (CWC) §10541(h)(2) ensures that IRWM plans are developed collaboratively to balance interests and engage a variety of stakeholders, regardless of their ability to contribute financially. This type of integration has been provided through the Monterey Peninsula IRWM planning region (Region) by the governance structure, including composition of the RWMG and the process for stakeholder participation.

5.1.1 Governance

Organizations have come together to form the Monterey Peninsula RWMG for the purposes of IRWM planning and project implementation. These entities include government agencies, nonprofit organizations, water service districts, private water companies, and groups representing agricultural, environmental, and community interests:

- Big Sur Land Trust
- City of Monterey

- Monterey Peninsula Water Management District
- Monterey County Water Resources Agency
- Monterey Regional Water Pollution Control Agency
- Marina Coast Water District
- Resource Conservation District of Monterey County

The RWMG is made up of diverse organizations with varying expertise, perspectives, and authorities regarding water management. There is no one leadership position on the RWMG, and no hierarchy of decision-making. All major IRWM planning decisions are decided by consensus at the stakeholder meetings. Each RWMG organization is allowed to offer support, assistance, and comments or input regardless of their financial contribution to the Plan or to other RWMG activities. As such, in both its composition and rules of governance, the RWMG lays the foundation for an integrated approach to IRWM planning.

5.1.2 Stakeholder Involvement

Outreach efforts to include stakeholders in the development of the IRWM Plan have targeted specific entities as well as the general public. An initial stakeholder email list, with about 175 names, was developed by brainstorming every known organization that could be interested in the process or product. The current list includes about 250 individuals representing over 200 agencies, organizations, and interest groups. The list continues to expand as new stakeholders become involved.

Stakeholders have played an important role in the decision-making process throughout the development of this IRWM Plan. Together, stakeholders and the RWMG represent all of the major water resource management authorities in the region—as well as neighboring IRWM regions—and provide broad and fair representation of water supply, water quality, wastewater, stormwater, flood control, watershed, municipal, environmental, agricultural, and regulatory interests throughout all geographic areas of the planning region. Stakeholder organizations include such entities as the following:

- Water suppliers and water service districts
- Wastewater agencies
- Water quality regulatory entities
- Watershed groups
- Flood control agencies
- Federal, state, county and municipal governments
- Environmental non-profit organizations
- Agricultural organizations
- Business organizations
- Disadvantaged communities
- Other community organizations
- Universities and research institutions
- Native American/Tribal representatives
- Elected officials
- Other interested individuals

All of the stakeholder groups necessary to meet the objectives of the IRWM Plan are included on the stakeholder list and can be seen in **Appendix 1-d.**

The RWMG ensures public involvement in its decision-making processes through various means, including regular email updates to stakeholders regarding the IRWM planning process, a regularly updated website, public comment periods on all major IRWM Plan "milestones," and occasional public workshops.

Through these efforts to develop a broad, diverse, and inclusive stakeholder base and to promote the active participation of all stakeholders in the planning effort, the Monterey Peninsula RWMG ensures stakeholder/institutional integration in the IRWM planning process.

5.2 Resource Integration

The term "resource integration" is definitionally multiplicitous. It can refer to the combining of multiple participant/agency resources that aid the regional planning effort, including the sharing of data, differing expertise, or technical capacity. Resource integration can also mean the consideration of different resources or resource management strategies—including both man-made and natural water resource infrastructure—as components of the water system being managed in the IRWM planning effort. This section describes how the RWMG promotes integration in both of these ways.

5.2.1 Sharing Information and Expertise

Between the RWMG members and stakeholders, the combined knowledge, expertise, and technical capacity within the Region is extensive. The RWMG members lend their expertise and unique perspectives throughout the planning process, and call in outside expertise from stakeholders, as needed. For example, in the early stages of IRWM Plan development, water management and natural resource specialists from throughout the Region were asked to provide their knowledge and opinions about the water resource "issues and conflicts." Outside experts were asked to provide input on technical aspects of project applications during the project review process, as needed. The RWMG expects to involve outside experts and specialists to an even greater extent in the IRWM planning process with the intent of forming a "hub" for climate change planning in the broader Monterey County and Region.

Another way in which the RWMG promotes integration is through data sharing. **Chapter 9**, **Data Management** describes the data management system for the Region. Due to the Monterey Peninsula IRWM Plan's lack of an ongoing and secure funding source for data management, the RWMG has opted to use an existing State of California database framework developed by the California Surface Water Ambient Monitoring Program and the California Environmental Data Exchange Network. Wetland and riparian habitat conditions will be measured and documented using the California Rapid Assessment Methods and groundwater data will reside in GeoTracker using the Groundwater Ambient Monitoring and Assessment (GAMA) database. Thus, the intent and design of the Monterey Peninsula IRWM Plan data management system focuses on a localized approach to data collection and management with the uploading of data into statewide databases. These databases include web tools for dissemination, which will easily allow for the sharing of data between stakeholders and Project Proponents in the planning region.

In the future, the RWMG hopes to make use of a new online data tool to track IRWM Plan implementation projects. The Conservation Action Tracker database, described in **Chapter 8, Plan Performance and Monitoring**, is a data system for tracking land-use management improvements in the Region. It is an online tool that will allow Project Proponents to register and update information on conservation projects across the Region in order to track efforts and improve stakeholder ability to evaluate collective impacts and effectiveness. The Conservation Action Tracker is being implemented by the Central Coast Resource Conservation Districts and project partners of the IRWM Plan.

5.2.2 Integration of Resource Strategies

Implementing projects that promote both natural and man-made water resource infrastructure, is yet another way in which the RWMG promotes integration. **Table 4-1 (Resource Management Strategies Incorporated in the IRWM Plan)** identifies the strategies incorporated in this plan and demonstrates how the proper and "healthy" functioning of both systems are equally important. To this end, the RWMG encourages stakeholders to develop projects by offering additional points to projects that demonstrate such diversity as part of the project ranking process. The integration of resource management strategies not only ensures robust solutions to current water management issues but will enable the region to become more resilient to, and mitigate, uncertain future circumstances, including the impacts of climate change.

5.3 Project Integration

One advantage of regional planning lies in the ability to address the similar objectives of local organizations with regional programs. IRWM planning decisions can lead to existing projects being combined or augmented with new projects. The resources to implement multiple smaller efforts may benefit from economies of scale when similar local interests can be satisfied by a regional project.

The RWMG encourages stakeholders in the Region to form partnerships and to collaborate on projects that meet regional needs and produce regional benefits. The RWMG also promotes project integration during the project review process for each IRWM Plan project solicitation. During every project solicitation, a Project Review Committee comprised of RWMG members reviews each project (both implementation projects and concept proposals) for potential integration opportunities, with an aim of combining discrete project elements or entire projects to create regional programs. Through this integration process, the RWMG helps coordinate activities within the IRWM planning region in order to avoid redundancies, increase efficiencies, and to create projects with multiple benefits.

For future IRWM Plan project solicitations, the RWMG may consider hosting informal stakeholder meetings for Project Proponents and other stakeholders to discuss current projects and brainstorm new project ideas. These casual gatherings would be conducive to "mingling" and would promote an organic and fluid exchange of ideas. The ultimate intent is to increase project integration and to enhance opportunities for coordination of activities, collaboration, and partnerships throughout the region.

5.4 Inter-Regional Integration and Coordination

The following integrated projects and programs are being implemented in both the Monterey Peninsula region and other IRWM Regions.

5.4.1 Central Coast Areas of Special Biological Significance Regional Dischargers Monitoring Program

Pacific Grove and Monterey have been implementing an integrated regional monitoring program known as Central Coast Areas of Special Biological Significance Regional Dischargers Monitoring Program. The program involves regional agencies representing several other IRWM regions: Caltrans, California State Parks and Recreation Department, and the County of San Mateo.

There are 34 state-designated Areas of Special Biological Significance (ASBS) along the California Coast; this includes two located in the Monterey Peninsula IRWM region. On March 20, 2012, the State Water Resources Control Board (SWRCB) adopted a General Exception to the California Ocean Plan for Areas of

Special Biological Significance Waste Discharge Prohibition for Storm Water and Nonpoint Source Discharges, with Special Protections (ASBS Special Protections). The ASBS Special Protections can be summarized generally to eliminate dry weather runoff, ensure that wet weather runoff does not alter natural water quality in the ASBS, and that adequate monitoring be conducted to determine if natural water quality and the marine life beneficial use is protected. The ASBS General Exception and Special Protections documents are available online.[1]

The ASBS Special Protections require water quality monitoring, and provide for the option of creating regional monitoring programs. In early 2013, the Central Coast ASBS Regional Monitoring Program was established through a Memorandum of Agreement for all dischargers on the Central Coast, covering an area from Big Sur, in Monterey County, to Pt. Reyes, in Marin County. The responsible parties include: the Cities of Carmel, Monterey and Pacific Grove, the Counties of Marin, Monterey and San Mateo, Caltrans, the Pebble Beach Company, Stanford University Hopkins Marine Station and the Monterey Bay Aquarium.

The results of the Central Coast ASBS Regional Monitoring will establish the "natural water quality" objectives to be met by the ASBS Special Protections. The Scope of Work for the Central Coast ASBS Regional Monitoring Program was been developed by responsible parties discharging storm water into ASBS in conjunction with the State and Regional Water Boards. The monitoring includes water quality sampling of all separate storm sewer system (MS4) outfalls over 18" in diameter that discharge stormwater to an ASBS, as well as receiving water quality monitoring at outfalls over 36" in diameter, reference site monitoring, and other regional elements such as rocky intertidal and bioaccumulation monitoring.

The Monterey Regional Water Pollution Control Agency (MRWPCA) agreed to act as Program Administrator on behalf of the group in the Memorandum of Agreement (MOA). The MOA is based on the existing Monterey Regional Stormwater Program (MRSWMP). The ASBS Special Protections are being incorporated into the NPDES MS4 Stormwater Permits; therefore, the MRWPCA's role as the Program Administrator is an extension of its role in the MRSWMP.

5.4.2 Inter-Regional Coordination between Monterey Peninsula and Greater Monterey County Regions

As part of the 2012 Department of Water Resources grant for the Monterey Peninsula Region, the Greater Monterey County RWMG completed an interregional planning project about the IRWM "transition zone." The border where the Greater Monterey Region meets the Monterey Peninsula Region is atop the Seaside Groundwater basin. A summary report, titled "Draft Ord Inter-Regional Planning Summary Report" is contained in **Appendix 5-a;** the report describes the relationship between the regions, identifies resource challenges, and outlines areas of potential coordination between the regions.

Along this border, the 45-square-mile Ord Community is a geographical transition zone containing areas and resources that are managed by many agencies, including some that are in both IRWM Regional Water Management Groups. Fundamental challenges are: 1) determining which regional IRWM Plan proposed projects should be described in each IRWM Plan; 2) prioritizing projects in each region; 3) how

[1] http://www.waterboards.ca.gov/water_issues/programs/ocean/asbs.shtml

to cooperate between regions in order to ensure that Ord Community projects do not fall into a "no man's land" between the regions; and 4) moving projects forward that benefit both regions.

The following inter-regional water supply-related projects and studies that are described in detail in the Draft Summary Report were considered relevant to both the Monterey Peninsula and the Greater Monterey County regions and are related to the water supply issues of the regions:

- Monterey Peninsula Water Supply Project
- Monterey Peninsula Groundwater Replenishment Project
- Proposed Salinas and Carmel River Basins Study (includes San Luis Obispo County IRWM Region)
- Regional Urban Water Augmentation Project
- Future wastewater recycling and water quality projects
- Surface water/recycled water storage
- Storm water capture and reuse

The Project Summary report concluded that the Monterey Peninsula Groundwater Replenishment Project, the Ord Community Water Supply solution (i.e., RUWAP or another solution), and the Reclamation Basin Study hold the most promise for a truly integrated water supply management effort with multiple benefits that would involve inter-regional cooperation between the Monterey Peninsula and the Greater Monterey County region. In the case of the Basin Study, the inter-regional coordination would extend to the San Luis Obispo IRWM Region. Other projects can provide a significant opportunity for stakeholders in both IRWM planning regions to collaborate and coordinate on water management projects with potential long-term benefits for both regions.

5.5 Overview of Coordination Efforts

The coordination of IRWM-related activities and efforts between the RWMG and project proponents and stakeholders in the IRWM planning region occurs in several ways. The IRWM website[2] is the "go to" place for project proponents and stakeholders to learn about the IRWM planning effort, read the latest news, review projects that are included in the IRWM Plan, and find resources about related efforts in the region, including other Central Coast area IRWM Plans. In addition, the IRWM Plan Coordinator sends email notices to all stakeholders and project proponents whenever anything "newsworthy" occurs, such as milestone decisions for the IRWM Plan or planning process, solicitation of new projects for the IRWM Plan, the ranking of implementation projects for inclusion in the Plan, or the release of new IRWM Program Guidelines or Proposal Solicitation Packages (PSPs).

Secondly, the RWMG has been working with the Central Coast Resource Conservation Districts (RCDs) to develop and utilize a new database as a way to track water resource projects within the Region. The Conservation Action Tracker database, described in the Plan Performance and Monitoring Section of this IRWM Plan, is a data system for tracking land-use management improvements in the Central Coast region. It is an online tool that will allow project proponents to register and update information on conservation projects across the region in order to track efforts and improve stakeholders' ability to evaluate collective impacts and effectiveness. The Conservation Action Tracker is being implemented by the Central Coast RCDs and project partners of the IRWM Plan.

[2] http://mpirwm.org/

Finally, project coordination occurs during each new IRWM Plan project solicitation. The Project Review Committee reviews projects submitted for the plan and grant applications (both implementation projects and concept proposals) for potential integration opportunities, with an aim of combining discrete project elements or combining entire projects to create regional programs. Through the integration process, the RWMG helps coordinate activities within the IRWM planning region in order to avoid redundancies, increase efficiencies, avoid conflicts, and to create projects with multiple benefits.

5.5.1 Coordination Between the Six Central Coast IRWM Regions

Some of the Central Coast IRWM regions have common/overlapping water-related interests, but most water issues are more effectively managed within each of the individual regions. Representatives from each of the six IRWM regions within the Central Coast Funding Area meet periodically to discuss issues related to IRWM planning and funding considerations. Discussions regarding regional cooperation began in February 2007, with the lead agencies for each of these planning regions agreeing to a set of principles to guide the funding region in seeking Proposition 50 funds.

For the purposes of coordinated planning, the Monterey Bay National Marine Sanctuary compared and summarized the six IRWM Plans in the Central Coast Funding Area (MBNMS 2008). The report found many commonalities in water management objectives and issues, though distinct differences exist. Three out of the six regions receive at least some imported water (the Pajaro River Watershed region receives about 23 percent of its water supply from the Central Valley Project and both the San Luis Obispo County and Santa Barbara County regions each receive a small portion of their water supply from the State Water Project).

The Greater Monterey County, Monterey Peninsula, and Northern Santa Cruz County IRWM regions are all dependent on local rainfall and runoff for their water supply, with no connections to water sources outside of their respective regions. Groundwater is an important water supply source for all six regions, and all but the Monterey Peninsula region experience a significant problem with seawater intrusion. Agriculture is a major land use in all of the six Central Coast IRWM regions. Water quality issues are similar across all of the regions, though to varying degrees. The most significant and serious water quality problems tend to be seawater intrusion, nitrates, sediment, nutrients, pesticides, and other contaminants (with the exception of the Monterey Peninsula region, which seems to experience fewer water quality problems than the other regions).

The regions have similar goals and objectives regarding water supply, water quality, flood management, and environmental protection and enhancement, the exception being minor differences in specific priorities. All regions aim to improve water supply reliability and protect against drought; almost all of the regions contain objectives regarding maximizing water conservation and recycled water use. Similarly, all regions aim to protect and improve water quality (including surface water, groundwater, stormwater, wastewater, recycled water, and/or coastal waters), and to meet or exceed all applicable regulatory standards. Furthermore, all regions aim to identify opportunities for enhancement and/or restoration of natural resources and to minimize adverse effects from water management activities.

Commonalities are also evident in the types of high priority projects chosen for IRWM grant funding. The differences reflect region-specific needs and issues: the Northern Santa Cruz County region seems to place greatest emphasis on water supply strategies; Pajaro River Watershed on groundwater management strategies; Monterey Peninsula on water quality strategies; San Luis Obispo County on water quality and water supply strategies; Santa Barbara County equally across several strategies (mainly, water quality, water supply, wastewater treatment, and environmental protection); and the Greater Monterey County region on water supply/groundwater management, water quality, and environmental protection strategies (as reflected by the number of objectives under each goal category).

Table 5-1 provides a summary of shared interests between the six Central Coast IRWM regions. The table also shows potential opportunities for interregional projects and programs. Representatives from the six IRWM regions continue to communicate on an ongoing basis regarding IRWM planning efforts and water-related issues on the Central Coast, as well as potential opportunities for interregional projects such as those listed below.

Table 5-1: Central Coast IRWM Regions: Shared Interests and Opportunities for Interregional Coordination

Objective	Key Issues	Strategies	Potential Project Examples
Water Quality	**Agriculture Water Quality:** High concentrations of nutrients, pesticides and sediment are known pollutants in certain watersheds with agricultural development.	• Nutrient management • Irrigation management • Education • Integrated pest mgmt • Food safety efforts	• Permit Coordination • Watershed Working Groups • Ranchette Series Model • Expand Regional Mobile Lab
	Urban Water Quality: High concentrations of nutrients, indicator bacteria and metals are known pollutants in watersheds with urban development.	• Reduce runoff • Education • Integrated pest mgmt • Best management practices	• Permit Coordination • Low Impact Development (LID) • First Flush monitoring • Green Business Program
	Special Protected Areas: All planning regions along the coast have areas either designated as Marine Protected Areas, Critical Coastal Areas or Areas of Special Biological Significance.	• Education • Watershed assessments • Monitoring	• Coast and Oceans Regional Round Table • California Coastal Commission (CCC) • Critical Coastal Areas Program • Historical Ecology
	Sediment and Erosion: Erosion from roads, agriculture and unstable stream banks carry pollutants and are detrimental to aquatic habitat and organisms.	• Irrigation management • Stream bank stabilization • Redesign of rural roads • Education	• RCD Rural Roads program • Roads Maintenance Guide • Implementation of • Stormwater Management Plans (SWMPs)

Objective	Key Issues	Strategies	Potential Project Examples
	Data Coordination and Management: A coordinated effort of data synthesis, assessment, management and accessibility is important to determine effectiveness of efforts.	• Make data • comparable, • accessible, and useful • Develop consistent • evaluation tools	• Synthesis, Analysis and Management (SAM) Program • Upload of data to the Surface Water Ambient Monitoring Program (SWAMP) • Regional Web Information Station • Central Coast Wetland Group
Water Quality/ Water Supply	**Groundwater Management:** Groundwater is an important source of water for much of the Central Coast, but is threatened or already affected by saltwater intrusion, salinity, and overdraft in many areas.	• Conjunctive management • Recharge area protection	• Pajaro Watershed • Desalination Feasibility Study • RWQCB LID Strategy
Water Supply	**Water Availability:** Water needs exceed available supply throughout the Central Coast for municipal, domestic, and agricultural use as well as environmental protection. Expected water demand will increase in the future.	• Desalination • Water Recycling	• Regional Planning Approach • Research • Explore new technologies • Reclaimed water • Information exchange • Import advanced technology
		• Expand conservation programs • Expand rebate programs	• Regional conservation programs
		• Recharge, restoration, • and enhancement	• Wastewater mgmt to restore naturally functioning systems • Seaside Aquifer Storage and Recovery (ASR)
Ecosystem Protection	**Fisheries Enhancement:** Many Central Coast streams provide habitat for federally threatened or endangered species such as coho, steelhead, and the red-legged frog.	• Promote, improve or • re-establish habitat	• Removing fish passage barriers • Watershed assessments • Habitat restoration

Objective	Key Issues	Strategies	Potential Project Examples
Flood Management	**Flood Management:** All regions have areas prone to flooding and development within flood plains.	• Flood management	• Wetland restoration • Improve existing levees • Hydromodification • Central Coast Wetland Group • Stream gauges

An additional issue that is particularly suited to an interregional approach is climate change and the potential impacts on water management systems on the Central Coast. Some preliminary attempts have been made to initiate a Central Coast region-wide climate change impact analysis. Sharing information and resources, coordinating efforts, and potentially creating a region-wide database would increase efficiencies, save money and staff time, and most likely result in increased coordination, collaboration, and communication between the regions regarding climate change projects, actions, and overall planning. The Central Coast IRWM regions will continue to discuss the possibilities for collaborating on climate change planning for the Central Coast, as well as coordinating on other potential projects and programs mentioned above.

5.6 Coordinating with Agencies

RWMG is composed of a diverse mix of agencies, organizations, and educational institutions. Their participation enables the RWMG to conduct the IRWM planning effort in close coordination with the agency's mission and helps avoid potential regulatory conflicts during planning and implementation. The Monterey Peninsula RWMG members include:

- Big Sur Land Trust
- Local and Regional Agencies
- City of Monterey
- Monterey Peninsula Water Management District
- Monterey County Water Resources Agency
- Monterey Regional Water Pollution Control Agency
- Marina Coast Water District
- Resource Conservation District of Monterey County

In addition, the RWMG has engaged in extensive coordination with federal, state, and local agencies for the planning process and for implementation of projects included in the IRWM Plan. The major federal, state, and local agencies that have been involved are described below.

5.6.1 Federal Agencies

The following coordination activities with federal agencies would occur during plan implementation.

National Oceanographic and Atmospheric Administration Monterey Bay National Marine Sanctuary

The Monterey Bay National Marine Sanctuary (MBNMS) is an active participating member of the RWMG as well as a project proponent for several implementation projects in the IRWM Plan (including "Watershed Approach to Water Quality Solutions," which is currently being implemented through Round 1 IRWM Implementation Grant funds). The MBNMS's representative on the RWMG helps coordinate the IRWM planning process with the MBNMS Water Quality Protection Program, and works to ensure that projects included in the IRWM Plan are consistent with MBNMS regulations and programs. The MBNMS works with project proponents and other stakeholders in the Region to assist with water quality information and monitoring and to promote implementation of the MBNMS's Action Plans.

US Army Corps of Engineers

The Army Corps (Corps) is involved in the IRWM planning process primarily in its capacity as a permitting agency. A §404 Permit from the Corps, pursuant to Section 404 of the Clean Water Act, may be required for construction associated with some projects in the IRWM Plan.

US Department of Agriculture Natural Resources Conservation Service

The RWMG coordinates with the Natural Resources Conservation Service (NRCS) through the implementation of agricultural water quality and water conservation projects through the IRWM Plan. For example, the Resource Conservation District of Monterey County will collaborate with the NRCS on the Carmel River Integrated Watershed Restoration Program, Carmel Valley Livestock & Land Program, and the Carmel Watershed Rural Roads Erosion Assistance Program. NRCS conservation and engineering staff will participate in field trials and will provide equipment, lab resources, time and critical technical guidance to the RCD project team.

US Fish and Wildlife Service

The US Fish and Wildlife Service (USFWS) serves as an advisor to the RWMG and is largely involved in the IRWM planning process in its capacity as a permitting agency. The USFWS also provides technical assistance to project proponents. For example, the USFWS will be providing technical program guidance, site assessment, and property owner assistance to the RCD of Monterey County on the Livestock and Land Program and will be partnering with the RCD with a stockpond-improvement grant to meet shared program goals.

US Environmental Protection Agency

MCWRA received grant funding from the US Environmental Protection Agency (EPA) to complete a regional water management plan for the Salinas Valley. That plan has evolved and has been expanded into this IRWM Plan for the Region. The US EPA is signatory to the MBNMS Water Quality Protection Program Memorandum of Agreement (MOA).

US Forest Service

Wildfire management is an issue of critical importance to water and natural resource managers in the Region, particularly given the region's dependence on surface water and reservoir storage, the predominance of high quality ecological habitats in the region, and the prediction of increased fires as a result of climate change. The RWMG coordinates with the US Forest Service as part of the FireScape Monterey planning effort. FireScape Monterey is a planning effort that promotes protection of both life and property affected by wildfire and healthy resilient ecosystems through collaborative stewardship. FireScape Monterey was initiated and is co-led by the US Forest Service, in collaboration with 27 organizations and local residents, and focuses in the Big Sur Coastal Range with the potential to expand throughout Monterey County.

5.6.2 State Agencies

The following coordination activities with state agencies would occur during plan implementation.

California Coastal Commission

The California Coastal Commission is an active participant in the Monterey PeninsulaIRWM planning process, regularly attending and participating in the monthly RWMG meetings and providing “in-house expertise” on all matters related to the County’s Local Coastal Program (LCP) and other statewide coastal issues. LCPs are basic planning tools used by local governments to guide development in the coastal zone, in partnership with the Coastal Commission. Monterey County’s LCP was completed in 1987, adopted by the Monterey County Planning Department and approved by the Coastal Commission, and consists of four plans for the County’s designated coastal areas: the North County Land Use Plan, the Del Monte Forest Land Use Plan, the Carmel Land Use Plan, and the Big Sur Coast Land Use Plan. Several projects in the IRWM Plan are located within the coastal zone. for example, the Environmental Protection Barrier (EPB) and the Scenic Road Protection are the key components for the long term solution for sandbar management, fisheries habitat protection, and flood control of the Carmel lagoon and neighborhood.

California Department of Fish and Wildlife

The California Department of Fish and Wildlife (CDFW) has been involved in the IRWM planning process in an advisory capacity, as well as on an individual project basis through the California Environmental Quality Act (CEQA) permitting. For example, MPWMD has worked closely with the CDFW on issues associated with the Carmel River, including coordination for Stream Alteration Agreements and issues associated with endangered species that may be impacted by projects along the river.

California Department of Transportation

California Department of Transportation (Caltrans) is involved in the IRWM planning process mainly through project implementation. For example, the Big Sur Land Trust, MPWMD, and the County of Monterey have been working with Caltrans to implement the State Route 1 Causeway project, one of three components of the proposed Carmel River Floodplain Restoration and Environmental Enhancement Project. See **Appendix 6-a**.

California Department of Water Resources

The Monterey Peninsula RWMG cooperates with the Department of Water Resources (DWR) on all aspects of the IRWM planning process in accordance with the IRWM Program Guidelines. The Monterey Peninsula’s regional representative at DWR regularly attends the monthly RWMG meetings, and is the grant manager for the Round 1 IRWM Planning Grant and Implementation Grant. The IRWM Plan Coordinator communicates with the DWR regional representative on a regular basis regarding requirements of the program. In addition, MCWRA and other regional stakeholders have been in extensive contact with DWR’s Division of Safety of Dams (DSOD) regarding the removal of the San Clemente Dam.

California Natural Resources Agency

The RWMG coordinates with the California Natural Resources Agency mainly through its involvement with the Agency’s California Adaptation Strategy process. The California Adaptation Strategy summarizes climate change impacts in California and recommends adaptation strategies. Cal-Adapt is a web-based tool developed by the California Natural Resources Agency and the California Energy Commission that enables city and county planners, government agencies, and the public to identify potential climate change risks in specific areas throughout California. In developing the Climate Change section for this IRWM Plan, the RWMG reviewed the California Adaptation Strategy and utilized Cal-Adapt to determine climate change impacts in the Monterey Peninsula region and to develop a preliminary adaptation strategy for the region. The RWMG will continue to stay involved in the California Natural Resources Agency's California Adaptation Strategy process to help shape the IRWM Plan as more climate change tools and data are generated.

California Regional Water Quality Control Board, Region 3

The Regional Water Quality Control Board (RWMG) has made a concerted effort to incorporate the RWQCB's Water Quality Priorities as well as other Regional Board directives and initiatives into the IRWM Plan and planning process. Many of the IRWM Plan projects address priorities of the Central Coast Basin Plan and the RWQCB's Water Management Initiative chapter, as well as other regional plans such as the Central Coast Regional Toxic Hot Spot Cleanup Plan. RWMG members and project proponents work closely with the RWQCB on an individual basis to develop various plans and to implement projects. For example, MPWMD has worked closely with the RWQCB in development of the Salt and Nutrient Management Plan and other programs, including non-point source, total maximum daily loads, and other management programs.

California State Parks

California State Parks serves as an advisor to the RWMG and also coordinates with the RWMG through the FireScape Monterey planning process. The RWMG is proposing two projects that will be located within the California State Parks jurisdiction including, for example, the Environmental Protection Barrier (EPB) and the Scenic Road Protection are the key components for the long term solution for sandbar management, fisheries habitat protection, and flood control of the Carmel Lagoon and neighborhood. EcoState Parks is consulted each time a proposed project lies within its jurisdiction.

California State Water Resources Control Board

The State Water Resources Control Board (SWRCB) serves in an advisory capacity to the RWMG; in turn, the RWMG works to ensure that projects included in the IRWM Plan comply with State Board regulations. MCWRA has been in extensive contact with the SWRCB Division of Water Rights regarding groundwater overdraft and seawater intrusion issues. In addition, the RWMG is proposing to implement several projects through the IRWM Plan that address SWRCB priorities including the Nonpoint Source Pollution Control Program that are addressed by the following projects:

Carmel Bay Area of Special Biological Significance Project. This project seeks to protect and maintain coastal water quality in the Carmel Bay ASBS through a series of new and modified best management practices designed to improve both stormwater and non-stormwater discharges from Pebble Beach and to comply with the State Water Resources Control Board's ASBS Special Protections.

Carmel Watershed Rural Roads Erosion Assistance Program. Rural roads have been identified as a significant source of sediment input into the streams and rivers draining to the Monterey Bay in the Water Quality Protection Program for the Monterey Bay National Marine Sanctuary Action Plan IV: Agriculture and Rural Lands along with other documents.

Carmel Valley Livestock & Land Program. The purpose of this program is to achieve immediate and lasting reductions in nutrient, sediment and pathogen pollution to surface and ground waters and enhance wildlife habitat through implementation of BMPs on livestock facilities and rangelands in Carmel Valley and elsewhere in the IRWM region.

5.6.3 Coordination with Local Agencies, Governments, and Districts

The following coordination activities with local agencies, governments and districts would occur during plan implementation.

County of Monterey

The RWMG works with various County of Monterey departments on projects that involve land use planning or development permits. Project proponents for implementation projects included in the IRWM Plan have coordinated with the Public Works, Planning Department, or Redevelopment Agency on regulatory requirements and information gaps for their projects. Project proponents are required to ensure that their projects are consistent with the Monterey County General Plan and with local ordinances.

Fort Ord Reuse Authority

The Fort Ord Reuse Authority (FORA) is responsible for the redevelopment of the former Fort Ord military base, a 28,000-acre facility now known as the Ord Community. Following a competitive selection process in 1997, the FORA Board approved the Marina Coast Water District (MCWD), a RWMG member, as the purveyor to own and operate the water and wastewater collection systems on the former Fort Ord. Through MCWD's connection with FORA, the RWMG remains informed of the latest developments in the Ord Community, an important "border region" between the Greater Monterey County and Monterey Peninsula IRWM regions.

Monterey County Health Department

The Monterey County Health Department is responsible for implementing and enforcing the California Safe Drinking Water Act to ensure small public water supply systems deliver a reliable and adequate supply of water that is pure, wholesome, and potable to the users at all times. As the permitting agency for public water systems in Monterey County, the Health Department is integrally involved with water resource management decisions in the Region. Besides its role as a permitting agency, the Monterey County Health Department is a good source for water quality data and information, and provides assistance to water users to help them comply with regulations and resolve water quality and quantity problems.

Monterey County Parks Department and Monterey Peninsula Regional Park District

The Monterey County Parks Department and Monterey Peninsula Regional Park District are involved in the IRWM planning process. These entities are consulted any time there is a project that will occur on their property and are included on the distribution list for IRWM events.

Monterey County Water Resources Agency

The MCWRA is an active participating member of the RWMG, and a project proponent for several projects included in the IRWM Plan. The MCWRA is responsible for managing, protecting, and enhancing water supply and water quality, as well as providing flood protection, in the County of Monterey. As such, the MCWRA has produced many of the water resource and flood management plans that have been used as a basis for this IRWM Plan. The MCWRA also provides expertise for the RWMG on all matters related to water supply and flood management in the county.

Municipalities

Several local municipalities are actively involved in IRWM planning including the cities of Monterey, Seaside, Pacific Grove and Carmel. Project proponents with implementation projects in the IRWM Plan are required to ensure that their projects are consistent with General Plans and local ordinances (as applicable). Staff from the City planning or public works departments are consulted by project proponents for technical advice and guidance regarding development projects within City boundaries.

Resource Conservation Districts

The RCD of Monterey County is both a participating RWMG member and a project proponent for projects included in the IRWM Plan. The RCD also assists other project proponents in the region with data compilation and outreach to landowners, and provides "in-house expertise" on matters related to agriculture and water quality management measures. As noted in **Section 5.6.2** above, the RWMG is coordinating with the Central Coast RCD to utilize the new Conservation Action Tracker database as a way to track water resource projects within the Monterey Peninsula IRWM region. The Conservation Action Tracker database is a data system for tracking land-use management improvements in the Central Coast region. It will be implemented by the Central Coast RCDs and project partners of the Monterey Peninsula IRWM Plan.

Transportation Agency for Monterey County

The Transportation Agency for Monterey County (TAMC) is involved in the IRWM planning process mainly through project implementation. Project proponents will coordinate with TAMC as needed on various aspects of implementation."

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Chapter 6 Project Review Process

IRWM Standard 6

The IRWM Plan must contain a process or processes to select projects for inclusion in the IRWM Plan. The selection process(es) must include the following components:

- Procedures for submitting a project to the RWMG
- Procedures for review of projects considered for inclusion into the IRWM Plan. These procedures must, at a minimum, consider the following factors:
    - How the project contributes to the IRWM Plan objectives
    - How the project is related to resource management strategies selected for use in the IRWM Plan
    - Technical feasibility of the project
    - Specific benefits to DAC water issues
    - Environmental Justice (EJ) considerations
    - Project costs and financing
    - Economic feasibility, including water quality and water supply benefits and other expected benefits and costs
    - Project status
    - Strategic considerations for IRWM Plan implementation
    - Contribution of the project in adapting to the effects of climate change in the region
    - Contribution of the project in reducing GHG emissions as compared to project alternatives
    - Whether the Project Proponent has adopted or will adopt the IRWM Plan
    - For IRWM regions that receive water supplied from the Sacramento-San Joaquin Delta, how the project or program will help reduce dependence on the Sacramento-San Joaquin Delta for water supply (not applicable to Monterey Peninsula Region)
- Procedures for displaying the list(s) of selected projects

Review factors must be evaluated for each project and compared for all projects in a systematic manner. The results should be used to promote and prioritize projects in the selection process, while keeping in consideration the unique goals and objectives of the IRWM Region.

6.1 Procedures for Submitting a Project for Inclusion in the IRWM Plan

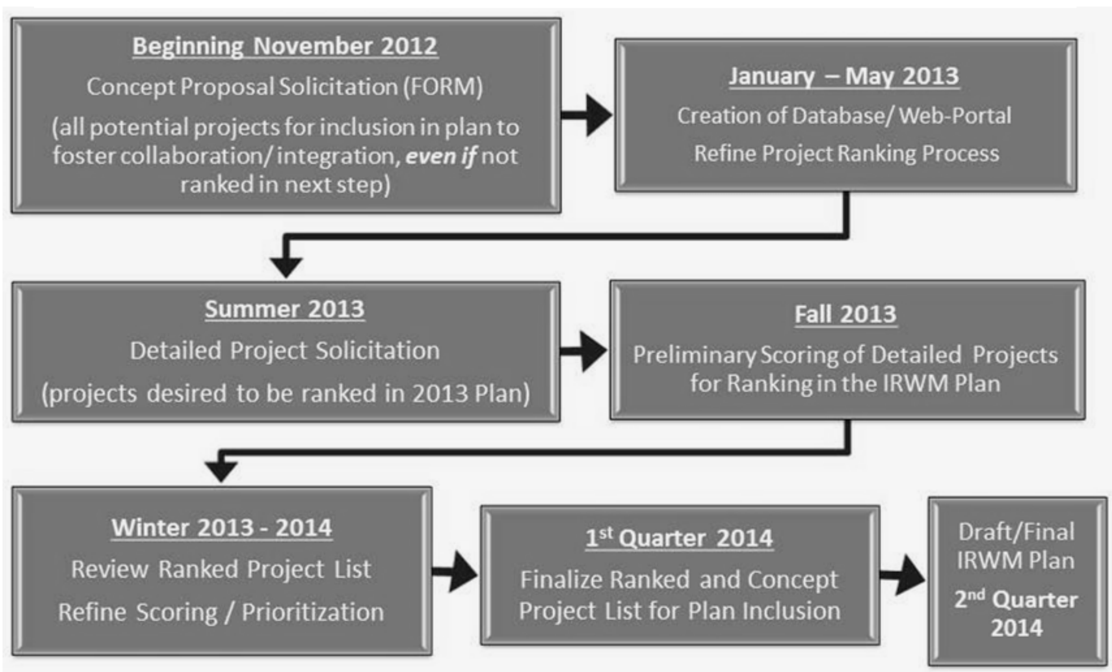
Prioritization of projects is a required element of an IRWM Plan and aids regional decision-making on issues such as project sequencing and quantitative allocations of limited financial, economic, social, and natural resources. Consistent with IRWMP standards, projects that utilize multiple water management strategies, meet Regional priorities, accomplish multiple objectives, and are feasible score higher and are more likely to move forward during implementation of the Plan.

This IRWM Plan incorporates a process to include a large number of stakeholder-sponsored projects with the potential for significant cost; however, given the scope and cost of some of the projects, it is unlikely that all projects can be fully funded by both local and State IRWM funds in the immediate future. Project sponsors may need to seek alternative funding sources in order to close funding gaps.

For the 2007 IRWM Plan, the Stakeholder Group and Technical Advisory Committee developed a system to compare and prioritize projects with vastly different characteristics. A 100-point system was used to evaluate the suite of selected projects, with each project evaluated both against other projects and on whether a project would meet measurable regional objectives. Project characteristics that were deemed more important to the Region were allocated more points. Points were awarded in four different categories – water management strategies, objectives, regional priorities, technical and financial feasibility, and readiness to proceed. The result was an evaluation that describes both the strengths and weaknesses of each project and the project package as a whole. The categories and distribution of points used during project evaluation is outlined in section 6.1.2 and 6.1.3.

The Regional Water Management Group (RWMG) solicited projects for inclusion in the 2013 Update to the Integrated Regional Water Management (IRWM) Plan with a goal of creating a comprehensive project list that included concept proposals and projects that were prioritized and ready to implement. The projects included in this IRWM Plan are consistent with Plan objectives. All projects were required to undergo a thorough review process before they could be formally included in the IRWM Plan. **Figure 6-1** shows an overview of the process.

Figure 6-1: Project Solicitation Process for 2013 IRWM Plan (Update)



For inclusion in the plan, Project Proponents were required to first complete a short concept proposal form. Proposals that met eligibility criteria were included in the IRWM Plan Update and were moved to Step 2, allowing their project to be ranked (or prioritized). Concept proposals were required to meet the following minimum eligibility criteria to be included in the IRWM plan. The concept proposal will:

- assist the Monterey Peninsula region in achieving at least one of its IRWM Plan objectives,
- implement at least one of the region's Resource Management Strategies,
- provide water resource benefits to the region, and
- be consistent with Proposition 84 IRWM Guidelines and Department of Water Resources standards and requirements.

The concept proposal form was available for download starting in the first quarter of 2013 and could be completed and emailed to the MPWMD by accessing a PDF file located on the MP IRWM website. As of approximately March 1, 2013, the new website[1] was ready and the on-line form was available. Projects

[1] www.mpirwm.org

and proposals included in the 2007 Monterey Peninsula IRWM Plan were not automatically included in the 2013 IRWM Plan unless a concept proposal form was completed. The Project Proponent was required to follow specific steps in order to submit a project:

- complete a concept proposal for each project
- ensure the project information was up to date
- respond to requests for information within the established deadline
- request that a project be removed if it was no longer being pursued

Projects submitted to the plan as concept proposals are contained in **Appendix 6-a**.

6.1 Project Review Procedure

6.1.1 Detailed Project Solicitation and Scoring/Ranking (Step 2)

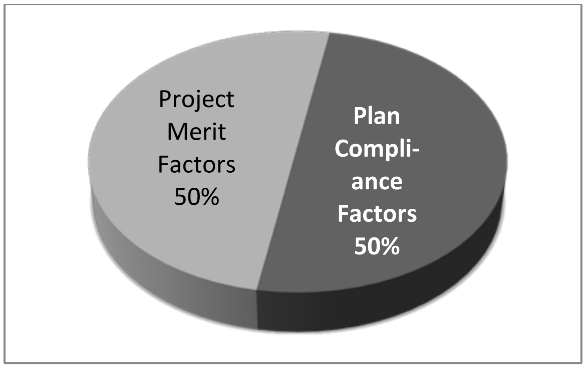
Project Proponents were not required to complete Step 2 in order to be included in the IRWM Plan. However, a detailed project submittal was required to be completed in order to be eligible for inclusion in an implementation grant application to the IRWM Grant Program and to be ranked in the plan.

Step 2 included submittal of detailed project information using a web-based "Project Solicitation Form" as described below that allowed detailed objective scoring and results in an overall ranked or prioritized list of projects. Projects were added to the Project List by the Project Proponent(s) and in the first quarter of 2014, stakeholders were provided an opportunity to comment on the ranked list of projects through an email announcement of their availability on the mpirwm.org website. In the case of multi-entity projects, a lead entity or "Project Proponent" was required to be designated. For projects to be ranked and prioritized, Project Proponents were required to complete and submit the detailed Project Solicitation Form available at www.mpirwmp.org no later than July 19, 2013.[2] To remove a project, the Project Proponent was required to submit a written request for removal to the RWMG. The request for removal must include: the project title, consent to remove the project from all project lists, and the reason for removal of the project. In the event of multi-entity projects, all entities must agree in writing to a project's removal from the IRWM Plan. However, no projects were removed during the project ranking process or preparation of this plan update.

Each project was ranked based on a score developed from answers on the Project Solicitation Form, which included a methodology for scoring that is summarized below. Two categories of factors were included in the scoring: (1) factors related to how well the project complied with the IRWM Plan, such as policy consistency and ability to assist the region in meeting its goals, and (2) factors related to the individual merits of the project, such as feasibility, readiness to proceed, and costs. Scores from each of these categories comprised one-half of the overall project score as shown in **Figure 6-2**. A detailed description of project scoring criteria, factors, relative weighting, and raw scoring is provided below.

[2] Detailed Project Solicitation forms were available at the MP IRWMP website March 1, 2013.

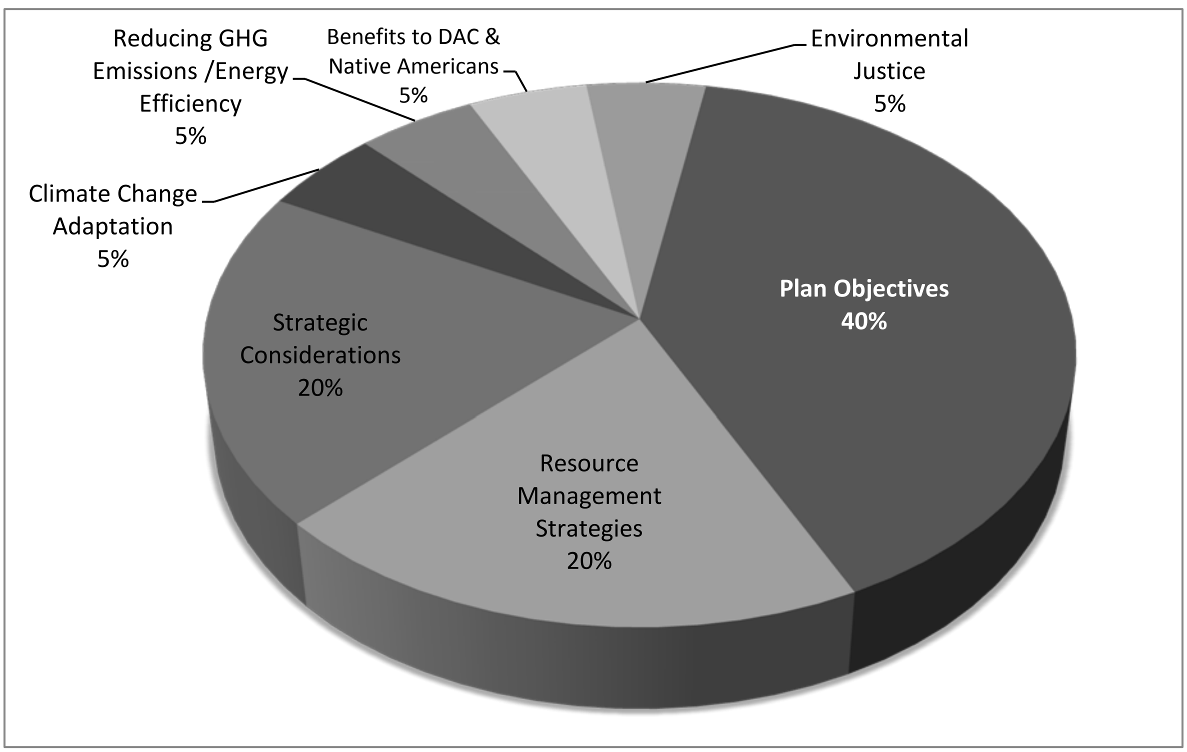
Figure 6-2: Relative Weighting: Plan Compliance vs. Project Merit Factors



6.1.2 IRWM Plan Compliance Factors (50% of total score)

Within the Plan Compliance category, projects were scored based upon the following specific factors and the relative weighting is shown in **Figure 6-3**. Following each factor, (in *italics)* is the methodology used to assign raw scores to projects based upon the project information submitted in the Project Solicitation Form. The appropriate weighting factor was applied to the raw score to give a weighted score to be used in the overall ranking.

Figure 6-3: Relative Weighting of Plan Compliance Factors



- **How the project contributed to the IRWM Plan Objectives** (40% of Plan Compliance Factors)
    - Number of objectives and high priority objectives that the project addressed

      Up to 53 points: Each project received one (1) point for meeting each of 26 objectives (26 max points). Plus, up to an additional 3 points could be received if specific metrics of each of the nine (9) high priority objectives were met.
- **How the project related to Resource Management Strategies** (20% of Plan Compliance Factors)
    - Number of different California Water Plan Management Outcome Categories and number of strategies that the project included.

      Total of up to 35 points, including 1 point per RMS, plus one point for every CWP management outcome category.
- **Strategic considerations for IRWM Plan implementation and project merit** (20% of Plan Compliance Factors)
    - Inter-Regionalism: Did the project involve active inter-regional collaboration or partnerships?

      5 points: project addresses inter-regional issues
    - Partnerships: How many entities were actively partnering to implement the project?

      5 points: project involved three or more partners that included both government agencies and NGOs; or

      2 points: project involved two or more partners: 0 points: project involved only one entity (no partnerships).
    - Monitoring and reporting of project performance: Would the project establish and document achievement of the performance criteria?

      5 points: project presents a plan for monitoring/reporting performance
    - Integration with land use planning: Was the project consistent with local plans, ordinances, and standards? Did the project integrate with local land use and water planning? Did the project increase coordination between water resources agencies and land use planners?

      5 points: if "yes" to all three questions; 3 points if "Yes" to 2 questions; 1 point for "yes" to one question
- **Specific benefits to critical disadvantaged community (DAC) and/or Native American tribal communities' water issues** (5% of Plan Factors)
    - Did the proposed project provide specific benefits to solve critical DAC water issue(s)?

      Yes: 5 points
- **Environmental Justice considerations** (5% of Plan Factors)
    - Did the project redress inequitable distribution of environmental burdens and/or improve access to environmental goods?

      Yes: 5 points
- **Contribution to climate change adaptation** (5% of Plan Factors)

- o Would the project contribute to regional adaptation to projected climate change impacts? Does the project propose to implement one or more of the recommendations from the document: "*Evaluation of Erosion Mitigation Alternatives for Southern Monterey Bay*" (Monterey Bay Sanctuary Foundation and the Southern Monterey Bay Coastal Erosion Working Group, May 2012)?

  5 points: one point for every adaptation strategy implemented

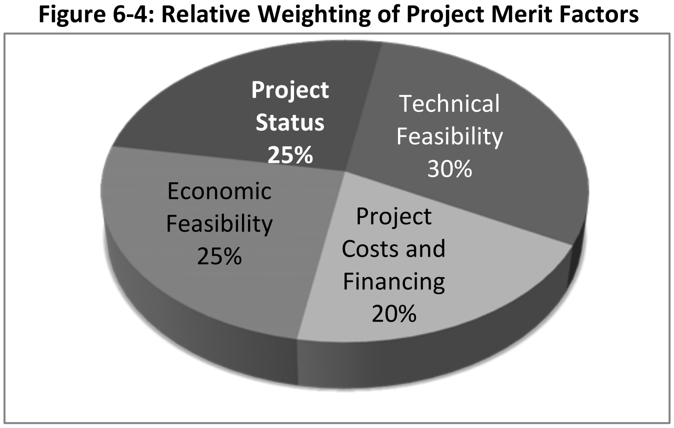
- **Contribution of the project in reducing Greenhouse Gas Emissions as compared to project alternatives** (5% of Plan Factors)
  - o Compared to project alternatives, would the project reduce regional GHG emissions and/or improve energy efficiency?

5 points: one point for every GHG mitigation strategy implemented

6.1.3 Project Merit Factors (50% of total score)

Within the Project Merit category, projects were scored based upon the following specific factors with the relative weighting shown in **Figure 6-4**. Similar to the plan compliance factors, the ***italic*** text describes the proposed methodology used to assign raw scores. These factors are based upon the project information submitted in the Project Solicitation Form (and prior to applying the weighting agreed upon at the October 24, 2012 stakeholder meeting).

Figure 6-4: Relative Weighting of Project Merit Factors



- **Technical Feasibility** (30% of Project Merit Factors)
  - o Was a common and widely accepted technology with well-documented results being used?
  - o Were geologic conditions, hydrology, ecology, and other system aspects adequately described?
  - o Were there significant data gaps?
  - o Were there sufficient technical data to indicate the project is likely to result in success?
  - o Was there enough information to support the project's estimated benefits?

  30 points: technical feasibility was documented in a project-specific pilot study or previous phase or has a documented track record of success

  -- OR score for each of the following –

  10 points: technology proposed has been established as effective in similar situations;

10 points: project site conditions were documented (geology/soil, ecology, hydrology, land use, public utilities;

10 points: project partners have experience with similar projects (e.g., similar site, similar technology).

- **Project Costs and Financing** (20% of Project Merit Factors)
  - ***10 points:*** A project cost estimate was prepared and documented in the Project Form.
  - ***10 points:*** There was an identified revenue source of at least 25% match funding.
- **Economic Feasibility** (25% of Project Merit Factors)
  - ***15 points:*** Project benefits and costs were defined at a level of detail that would allow cost-effectiveness analysis or benefit-cost analysis **-- OR –** ***project is a DAC project.***
  - ***10 points:*** Project had a cost-effectiveness or benefit-cost ratio greater than 1.
- **Project Status** (25% of Project Merit Factors)
  - What steps in project planning were completed?
    - Feasibility Studies and Conceptual Plans
    - CEQA/NEPA Completed
    - Local Cost Share Confirmed
    - Right-of-way / Land Acquisition
    - Permits Acquired
    - Construction Drawings Complete & Bids Acquired

  (*4 points for each of the above criterion met for a possible total of 24 points)*

6.2 Procedures for Communicating Selected Projects

This plan and the mpirwm.org website contains the projects that were submitted to the plan, including concept proposals aimed at increasing collaboration and integration and projects that were submitted using the detailed solicitation form to be ranked. The project ranking process was developed in collaboration with the stakeholders, vetted through the RWMG members, and is described in this chapter. An email announcement of the availability of the preliminary project rankings was sent to RWMG members and stakeholders on January 14, 2014. The email and attachments are included in **Appendix 6-b.** The full detail of the projects submitted to the plan for ranking is in **Appendix 6-c**. The Monterey Peninsula IRWM website (www.mpirwm.org) contains information on the upcoming solicitations for grant programs and how to include projects in future plan updates. **Table 6-1** shows the results of the project ranking process.

Table 6-1: Results of Project Prioritization

"Raw Scores" (Shaded Cells) were populated with the project information from Relevant Project Solicitation sheets within this file

"Weighted Scores" automatically calculate based on the Stakeholder-vetted Scoring and Weighting Table presented at the Feb. 6, 2013 stakeholder meeting.

IRWM PLAN COMPLIANCE CRITERIA

Projects	Objectives: Raw Score (Max 53)	Objectives: Weighted Score	Resource Management Strategies: Raw Score (Max 35)	Resource Management Strategies: Weighted Score	Strategic Considerations: Inter-Regionalism Raw Score (Max 5)	Strategic Considerations: Partnerships Raw Score (Max 5)	Strategic Considerations: Monitor / Report Raw Score (Max 5	Strategic Considerations: Land Use Integ. Raw Score (Max 5)	Strategic Considerations: Weighted Score	Benefits to DAC & Native Americans: Raw Score (Max 5)	Benefits to DAC & Native Americans: Weighted Score	Environmental Justice: Raw Score (Max 5)	Environmental Justice: Weighted Score	Climate Change Adaptation: Raw Score (Max 5)	Climate Change Adaptation: Weighted Score	Reduction in GHG: Raw Score (Max 5)	Reduction in GHG: Weighted Score	Plan Compliance Total Weighted Score
Carmel Bay ASBS Project	23.2	19.9	6.0	3.9	5.0	2.0	5.0	5.0	19.4	0.0	0.0	0.0	0.0	5.0	5.7	2.0	2.3	**51.2**
Carmel River Integrated Watershed Restoration Program	20.4	17.6	2.0	1.3	0.0	5.0	5.0	1.0	12.5	0.0	0.0	0.0	0.0	1.0	1.1	0.0	0.0	**32.6**
Carmel Valley Livestock & Land Program	19.8	17.1	4.0	2.6	5.0	5.0	5.0	3.0	20.5	0.0	0.0	0.0	0.0	3.0	3.4	0.0	0.0	**43.6**
Carmel Watershed Rural Roads Erosion Assistance Program	12.6	10.9	4.0	2.6	0.0	5.0	5.0	1.0	12.5	0.0	0.0	0.0	0.0	1.0	1.1	0.0	0.0	**27.1**
Incorporation of the Peninsula in the Central Coast Action Tracker	16.1	13.9	4.0	2.6	5.0	5.0	5.0	5.0	22.8	0.0	0.0	0.0	0.0	4.0	4.6	2.0	2.3	**46.1**
Del Monte Lift Station Upgrades	4.8	4.2	1.0	0.7	0.0	2.0	5.0	3.0	11.4	5.0	5.7	0.0	0.0	0.0	0.0	0.0	0.0	**21.9**
Ecosystem Condition Profile for the Carmel River Watershed	19.5	16.8	3.0	2.0	0.0	5.0	5.0	1.0	12.5	0.0	0.0	0.0	0.0	2.0	2.3	0.0	0.0	**33.5**

PROJECT MERIT CRITERIA

Projects	Technical Feasibility: Raw Score (Max 30)	Technical Feasibility: Weighted Score	Project Cost and Financing: Raw Score (Max 10)	Project Cost and Financing: Weighted Score	Economic Feasibility: Score (Max 25)	Economic Feasibility: Weighted Score	Project Status: Raw Score (Max 24)	Project Status: Weighted Score	Project Merit Total Score	**GRAND TOTAL PROJECT SCORE**	**PROJECT POINT %**
Carmel Bay ASBS Project	30.0	34.2	20.0	22.8	0.0	0.0	8.0	9.4	**66.4**	**117.6**	**18%**
Carmel River Integrated Watershed Restoration Program	30.0	34.2	0.0	0.0	0.0	0.0	0.0	0.0	**34.2**	**66.8**	**10%**
Carmel Valley Livestock & Land Program	30.0	34.2	20.0	22.8	0.0	0.0	0.0	0.0	**57.0**	**100.6**	**15%**
Carmel Watershed Rural Roads Erosion Assistance Program	30.0	34.2	0.0	0.0	0.0	0.0	0.0	0.0	**34.2**	**61.3**	**9%**
Incorporation of the Peninsula in the Central Coast Action Tracker	30.0	34.2	20.0	22.8	0.0	0.0	22.0	26.0	**83.0**	**129.1**	**19%**
Del Monte Lift Station Upgrades	30.0	34.2	20.0	22.8	0.0	0.0	0.0	0.0	**57.0**	**78.9**	**12%**
Ecosystem Condition Profile for the Carmel River Watershed	30.0	34.2	10.0	11.4	10.0	11.4	20.0	23.6	**80.6**	**114.1**	**17%**

Chapter 7 Impacts and Benefits

IRWM Standard 7

The IRWM Plan must contain a discussion of potential impacts and benefits of Plan implementation. This discussion must include both impacts and benefits within the IRWM Region, between regions, and those directly affecting Disadvantaged communities (DAC), EJ related concerns, and Native American Tribal communities

7.1 Qualitative Impacts and Benefits

The anticipated impacts and benefits of individual projects in the Monterey Peninsula Integrated Regional Water Management Plan (IRWM Plan) differ greatly. Some projects will provide local benefits (perhaps critical to a local population), others regional benefits. Some will focus in just one resource area, for example, water supply, while other projects will integrate different resource areas, such as water supply, water quality, environmental restoration, and recreation. However, combined over time, the projects implemented through the IRWM Plan will provide multiple benefits across the entire Monterey Peninsula planning region (Region)—and on a variety of resource areas: water supply, water quality, flood management, environmental enhancement, regional coordination, recreational benefits, and special benefits for disadvantaged communities. At the same time, the projects will achieve the overarching goals and objectives of the Plan.

The tables below describe the impacts and benefits anticipated from each of the ranked projects included in the IRWM Plan. **Table 7-1** includes the projects proposed for implementation in the IRWM Plan, listed in order of their project ranking. Note that the impacts and benefits listed in the tables are descriptive rather than quantitative, and are intended to give the reader a general understanding of the types of anticipated impacts and benefits. An in-depth impact and benefit analysis will be required for every project that is included in an IRWM grant application package, prior to submitting an IRWM grant proposal to the Regional Water Management Group (RWMG).

Since this IRWM Plan is still in the early stages of implementation and only a few projects have been, or are ready to be implemented, these lists serve as a general benchmark. Over time, as more and more projects are implemented, the impacts and benefits will be reviewed and this chapter of the IRWM Plan will be updated as part of the normal plan management activities. These updates will reflect changes to this chapter from any data gathered, and any additions or changes to the implementation projects listed in the IRWM Plan.

Table 7-1: Impacts and Benefits: Proposed Projects Included in the IRWM Plan

Project	Sponsor	Direct Qualitative Benefits	Direct Qualitative Impacts
Carmel Bay ASBS Project	Pebble Beach Community Services District	Benefits of this project will include helping to maintain high coastal water quality in Carmel Bay ASBS through a series of new and modified best management practices designed to improve both stormwater and non-stormwater discharges from Pebble Beach. The project will also protect marine life and increase recycled water supply	Possible impacts of this project include dust, noise, traffic, and other impacts related to use of construction equipment for installation and retrofitting of storm water infrastructure components of the project. One-time greenhouse gas (GHG) emissions and temporary disturbance of habitat from construction may occur.
Carmel River Integrated Watershed Restoration Program	Resource Conservation District of Monterey County	This project will control erosion, improve water quality and restore fish and wildlife habitat in coastal watersheds and wetlands including in the Carmel Bay ASBS. Habitat restoration will also include state and federally listed steelhead habitat.	No direct impacts are anticipated for this project.
Carmel Valley Livestock & Land Program	Resource Conservation District of Monterey County	Benefits of this project will include reductions in nutrient, sediment and pathogen pollution to surface and groundwater thus improvements to water quality and enhanced wildlife habitat, including in the Carmel Bay ASBS.	Incorporation of the BMPs discussed as part of this plan may temporarily disturb wildlife habitat, or result in impacts to sensitive plant communities.
Carmel Watershed Rural Roads Erosion Assistance Program	Resource Conservation District of Monterey County	Benefits of this project include reduction in sedimentation to waterways, improved water quality, and enhanced steelhead and wildlife habitat including in Carmel Bay ASBS.	No direct impacts are anticipated for the project.
Incorporation of the Peninsula into the Central Coast Action Tracker	Central Coast Wetlands Group at Moss Landing Marine Labs	This project will provide a comprehensive location of all Monterey Peninsula IRWM Plan area projects with detailed information on all projects components.	No direct impacts are anticipated for the project.
Del Monte Lift Station Upgrades	City of Seaside	Benefits of this project include reduced accidental discharges to Roberts Lake and increased water supply and pumping volume.	Impacts from this project would be temporary and a result of construction activities associated with the proposed upgrades to the Del Monte Lift Station. Construction impacts would include noise and increased GHG emissions from construction.
Ecosystem Condition Profile for Carmel River Watershed with Level 1-2-3 Framework.	Central Coast Wetlands Group at Moss Landing Marine Labs	This project will enhance watersheds, improve water quality, and restore habitat, through improved understanding of the Carmel River Watershed and ability to prioritize issues affecting the watershed.	No direct impacts are expected because the project consists of primarily research and watershed planning.

7.2 How Projects Achieve IRWM Plan Goals and Objectives

Implementation of the projects included in this Plan will lead to numerous benefits including:

- **Increased water supply reliability.** Water supply and water quality projects, including conjunctive use projects, will protect or enhance current supplies while providing a sustainable source to meet future demand. Some projects will utilize improved management techniques to make better use of existing sources (in particular the Carmel ASBS Project and the Del Monte Lift Station project).
- **Water quality improvement.** Water quality in storm water discharges to the ocean and to Areas of Special Biological Significance will be enhanced as a result of implementing the suite of projects in this IRWM Plan. Similarly, several projects that include storm water best management practices will help control sedimentation throughout the Carmel River watershed. Additionally, the threat of seawater intrusion will be reduced in the Seaside Groundwater Basin and non-point source (NPS) pollutants discharges will be reduced.
- **Public Protection.** Working with regional entities toward water supply solutions will minimize fiscal impacts to utility ratepayers. Implementation of flood control projects will reduce costly impacts to personal and commercial property and will protect human life. Improvement of water quality, especially at coastal beaches, will reduce threats to personal health and the marine environment.
- **Protection of Beneficial Uses.** The suite of projects in this Plan has the potential to provide and protect numerous recreational, aquatic life, habitat, and agricultural uses.

Implementation of the projects described in this Plan may also have quantitative and/or qualitative impacts if the projects are managed improperly. These impacts may include increased project costs to agencies and rate payers; delayed construction of planned facilities leading to delayed water supply and other benefits; increased negative impacts on surface water or groundwater quality; and limited operational flexibility, especially in times of drought, leading to increased water rationing and associated pressure on water users and the environment. Impacts may also include limited future economic growth.

To ensure that project implementation is consistent with this Plan and that negative impacts are minimized or avoided, a framework for a program-wide project monitoring and assessment plan has been developed. This monitoring plan (**Chapter 8, Plan Performance and Monitoring**) will work within the institutional structure responsible for project implementation (**Chapter 5, Integration and Coordination**) and in conjunction with the adaptive management process outlined in **Chapter 8**.

Table 7-2 summarizes the anticipated qualitative benefits and impacts associated with the projects in this Plan. In addition, the local agencies in the Monterey Peninsula Region stringently apply the California Environmental Quality Act (CEQA) and must comply with regulations pertaining to environmental resources prior to obtaining permits to implement proposed projects.

Table 7-2: Number of Projects that will Implement the Plan Goals and Objectives

GOALS & OBJECTIVES	NUMBER OF PROJECTS THAT ADDRESS EACH OBJECTIVE (TOTAL = 7 PROJECTS)
Water Supply (WS): Improve regional water supply reliability through environmentally responsible solutions that promote water and energy conservation. Protect the community from drought and climate change effects with a focus on interagency cooperation and conjunctive use of regional water resources.	
WS-1. Meet existing water supply replacement needs of the Carmel River system and Seaside Groundwater Basin.*	1
WS-2. Maximize use of recycled water <u>and other reuse, including gray water systems, and stormwater capture and use</u>.* [See Notes]	1
WS-3. Seek long-term sustainable supplies for adopted future demand estimates.*	1
WS-4. Optimize conjunctive use of surface and groundwater.*	1
WS-5. Evaluate, advance, or create water conservation throughout the Region in compliance with the State's 20x2020 Water Conservation Plan.*	1
Water Quality (WQ): Protect and improve water quality for beneficial uses consistent with regional community interests and the Regional Water Quality Control Board Basin Plan through planning and implementation in cooperation with local and state agencies and regional stakeholders.	
WQ-1. Improve ocean water quality, including Areas of Special Biological Significance (ASBS), by minimizing pollutants in stormwater discharges.*	6
WQ-2. Improve inland surface water quality for environmental resources (e.g. steelhead) and potable water supplies.*	7
WQ-3. Protect and improve water quality in groundwater basins.*	1
WQ-4. Meet or exceed water quality standards established by regulatory agencies and stakeholders. *	2
Flood Protection and Erosion Prevention (FP): Ensure that flood protection and erosion prevention strategies are developed and implemented through a collaborative and watershed-wide approach and are designed to consider climate change effects and maximize opportunities for comprehensive management of water resources.	
FP-1. Develop regional projects and plans necessary to protect existing infrastructure and sensitive habitats from flood damage, erosion, and sea level rise, in particular, along the South Monterey Bay shoreline and Carmel Valley.*	0

GOALS & OBJECTIVES	NUMBER OF PROJECTS THAT ADDRESS EACH OBJECTIVE (TOTAL = 7 PROJECTS)
FP-2. Develop approaches for adaptive management that minimize maintenance and repair requirements (sustainable flood management systems).*	4
FP-3. Protect quality and availability of water while preserving or restoring ecologic and stream function.*	3
FP-4. Provide community benefits beyond flood protection, such as public access, open space, recreation, agricultural preservation, and economic development.	1
Environmental Protection and Enhancement (EV): Preserve the environmental health and well-being of the Region's streams, watersheds, and the ocean by taking advantage of opportunities to assess, restore and enhance these natural resources when developing water supply, water quality, and flood protection strategies. Seek opportunities to conserve water and energy, and adapt to the effects of climate change.	
EV-1. Protect and enhance sensitive species and their habitats in the regional watersheds; promote the steelhead run.*	5
EV-2. Identify opportunities to assess, protect, enhance, and/or restore natural resources, including consideration of climate change, when developing water management strategies and projects.*	3
EV-3. Minimize adverse effects on biological and cultural resources when implementing strategies and projects.*	6
EV-4. Identify opportunities for open spaces, trails and parks along streams and other recreational areas in the watershed that can be incorporated into projects.	2
EV-5. Identify and integrate elements from appropriate Federal and State species protection and recovery plans.*	3
Climate Change (CC): Adapt the region's water management approach to deal with impacts of climate change using science-based approaches, and minimize the regional causal effects related to water resources.	
CC-1. Evaluate adaptation measures and mitigative solutions to climate change effects.*	3
CC-2. Support increased education, monitoring and research to increase understanding of long-term impacts of climate change in the region.*	0
CC-3. Support efforts to increase education, research and use of energy conservation measures and alternatives to fossil fuel and non-renewable resources to reduce greenhouse gas emissions associated with water and wastewater facility operations and IRWM projects.*	0

GOALS & OBJECTIVES	NUMBER OF PROJECTS THAT ADDRESS EACH OBJECTIVE (TOTAL = 7 PROJECTS)
Regional Communication and Cooperation (RC): Identify an appropriate forum for regional communication, cooperation, and education. Develop protocols for encouraging integration and reducing inconsistencies in water management strategies between local, regional, State, and Federal entities. Provide balanced access and opportunity for the public, stakeholders, and DACs to participate in IRWM efforts.	
RC-1. Identify cooperative, integrated strategies for protecting both infrastructure and environmental resources, including from climate change impacts. *	6
RC-2. Foster collaboration among regional entities as an alternative to litigation.*	6
RC-3. Identify and pursue additional opportunities for public education, outreach, and communication on water resource management and climate change, including to disadvantaged communities and stakeholders with interests in water management issues.*	5
RC-4. Build relationships with State and Federal regulatory agencies and other water forums and agencies.	5

NOTES: These objectives have been revised and renumbered compared to the draft objectives presented and evaluated at the 7/25/2012 Stakeholder Meeting. The underlined text on WS-2 was added based upon comments submitted by the City of Pacific Grove after the Stakeholder Meeting (S. Hardgrave, personal communication, January 2014)
High Priority Objectives based upon those objectives receiving the most points during the objectives prioritization exercise in July and August 2012 are presented in gray shading and bold type.
* = Objective is closely aligned with Statewide Priorities (see **Table 7-3**, below).

7.3 Project Benefits Identified by Stakeholders

The Project Proponent for each proposed project or program submitted an application that summarizes the benefit that could result in implementation.

The Carmel Bay ASBS Project: The proposed project will help maintain the high coastal watery quality within the Carmel Bay ASBS, thereby protecting resident marine life and the Bay's many other beneficial uses. Both local residents and visitors to Pebble Beach and Carmel will benefit from these water quality improvements and the increased recycled water supply provided by diversions of stormwater and non-stormwater to the sanitary sewer system for reuse.

Carmel River Integrated Watershed Restoration Program: Specific physical benefits will be dependent upon the actual projects selected for the program. The program-specific benefits will include increased readiness of local projects, increased coordination among resource agencies, and overall improved communication among watershed partners.

Carmel Valley Livestock and Land Program: This project has water quality, watershed enhancement, habitat improvement and water conservation benefits. Benefits include strengthening of public/private partnerships to address environmental challenges, reduced surface water nutrient and bacteria concentrations (improved water supply quality), improved fish and wildlife habitat with emphasis on stockpond-associated amphibians (such as California red-legged frog and California tiger salamanders), animal health and public safety, site specific improved flood protection, and educational opportunities.

Carmel Watershed Rural Roads Erosion Assistance Program: Actual physical benefits will depend upon the sites selected and the severity of their drainage and erosion concerns. The primary benefits will be public safety for those using improved roads, soil stabilization along the roads and their drainage outlets, reduced sediment deposition downslope and in adjacent waterways, and protected habitat on the stabilized slopes and impacted streams.

Incorporation of the Peninsula in the Central Coast Action Tracker: The project will support a streamlined process to track all surface water quality management efforts using a standard set of qualifiers that will aid local governments and the IRWM to report the cumulative efforts of partner institutions. The geographic tools will support local watershed planning efforts and help provide the necessary data needed to estimate cumulative water quality value to individual drainages from a disparate set of efforts including LID on private properties, stormwater infrastructure maintenance and upgrades, street sweeping, drainage enhancements and creek restoration. Additional tools being developed by SCRCD can be integrated into this tracking effort to begin to estimate the cumulative load reduction of combine actions. Reporting tools will aid municipalities to better report on actions taken to regulatory agencies and grant administrators.

Del Monte Lift Station Upgrades: The project will help prevent the accidental discharge of pollutants to a natural water body. Benefits of this project include reduced accidental discharges to Roberts Lake and increased water supply and pumping volume. The project is located in Census Tract 140, which is a disadvantaged community. The project will directly benefit residents within the DAC by preventing discharge of wastewater to a publicly owned and frequented recreation area.

Ecosystem Condition Profile for the Carmel River Watershed using the Level 1-2-3 Framework: This project has components of watershed enhancement, water quality, and habitat improvement projects. The development of a master stream ecosystem condition profile integrates all the separate efforts to address water quality, supply, and environmental management into one comprehensive plan. Therefore, one of the projects chief benefits is its comprehensive approach and the integration of information into one overarching, easily accessible, management document.

The framework (developed by the Santa Clara Valley Water District) includes recommendations for how to establish Levels of Service (numeric performance targets) for stream ecosystems. These numeric performance targets will allow our regional partners to periodically assess progress towards meeting environmental/habitat objectives and the appropriateness of associated strategies and measurable objectives. These Levels of Service can be established in each watershed by analyzing results of ambient surveys of stream ecosystem conditions.

7.4 Impacts and Benefits to Disadvantaged Communities and Environmental Justice Concerns

All projects included in the IRWM Plan are reviewed for potential impacts to disadvantage communities (DAC) and for potential environmental justice concerns as part of the regular project review process. If a potential impact to a DAC or an environmental justice concern is found, the project will not necessarily be eliminated from the Plan, but the issue will be discussed with the Project Proponent, mitigating factors will be considered, and a decision will then be made as to whether or not the project should remain in the Plan. Currently, no potential impacts to DAC or environmental justice concerns have been found in any of the projects submitted for inclusion in the IRWM Plan.

However, there are not any proposed projects that will directly benefit any DAC by providing water supply or direct assistance for DAC issues. Indirect benefits to DAC are expected to result from the implementation of the IRWM Plan. The following projects included in the IRWM Plan will benefit the Region generally and will potentially benefit communities of the Region identified as disadvantaged:

- Del Monte Lift Station Upgrades [*Note:* this project would reduce pollutant loads in areas used by DACs and potential impacts related to flooding within a designated DAC (Census Tract 140). It will directly benefit residents within the DAC by preventing discharge of wastewater to a public and frequently visited natural area.]
- Incorporation of the Peninsula in the Central Coast Action Tracker [*Note:* Benefits all communities due to improved communication and outreach capability.]

7.5 Potential Adverse Environmental Impacts

Some adverse environmental impacts may also be expected from implementation of the IRWM Plan, though most projects are purposefully developed to minimize environmental impacts. Construction-related impacts may include temporary and localized disturbances to air and water quality, habitat, and other physical factors including the following:

Water Resources. Construction of proposed projects may result in increased erosion and sedimentation of waterways in the vicinity of project sites, temporary changes in the watershed's hydrograph, or other impacts associated with construction activities that may degrade water resources.

Air Quality. Construction-related increases in PM10 (particulate matter on the order of ~10 micrometers or less) and ozone precursor emissions may result from operation of construction equipment, vehicles, and airborne dust during site grading or excavation.

Noise. Construction noise and vibration impacts may result from construction equipment, vehicles, and other activities.

Hazardous Materials. Project construction could result in spills of fuel, lubricants, pesticides, or other substances used in construction equipment.

Biological Resources. Construction associated with proposed projects may result in the direct loss or indirect disturbance of special-status plants and wildlife species that are known to or could occur in the region. Construction-related impacts may also include temporary unavailability and/or degradation of wildlife habitat, and short-term disturbance of wildlife as a result of construction noise. These impacts may result in a reduction in local population size, lowered reproductive success, and/or habitat fragmentation.

Transportation. Construction of proposed projects may result in temporary lane closures, detours, closure of transit stops, and the addition of construction trucks and equipment on the surrounding roadway system. Construction may potentially increase delays and congestion.

7.6 Fostering Benefits through Regional and Inter-Regional Coordination

The benefits of this IRWM planning effort go beyond the environmental benefits that are realized with project implementation. One of the benefits of the IRWM planning process is that it provides water resource managers with a framework for effectively integrating water management programs and projects within the Region and for achieving regional water resource goals. Through the IRWM planning process, the RWMG endeavors:

- To improve and maximize coordination of individual public, private, and non-profit agency plans, programs and projects for mutual benefit and optimal gain within the Region;
- To help identify, develop, and implement collaborative plans, programs, and projects that may be beyond the scope or capability of individual entities, but which would be of mutual benefit if implemented in a cooperative manner;
- To foster coordination, collaboration and communication between stakeholders and other interested parties, to achieve greater efficiencies, enhance public services, and build public support for vital projects; and
- To realize regional water management objectives at the least cost possible through mutual cooperation, elimination of redundancy, and enhanced regional competitiveness for state, federal, and private sources of grant funding.

Beyond the Region, the IRWM process creates a network through which the adjacent IRWM regions can collaborate on larger issues. A working example of this is the water management “transition zone” where the Ord Community (former Fort Ord Army garrison) is situated. A portion of the Ord Community is served water from the Salinas Valley Groundwater Basin, which is in the Greater Monterey County region, while approximately one third of the area and water demand for the Ord Community is within the Monterey Peninsula region. For the 2010 DWR Planning Grant solicitation, both regions submitted a proposed scope of work that included addressing inter-regional issues. At the time of this update for the 2013 Monterey Peninsula IRWM Plan, projects are being pursued by both regions that involve regional integration, cooperation, and collaboration in support of the Ord Community water management needs.

The IRWM planning process fosters a spirit of positive collaboration among public, private, and non-profit agencies and organizations within the Region, promotes communication, encourages new partnerships and programs, and ultimately results in increased efficiencies and cost savings. These more “intangible” benefits of the IRWM planning effort should be recognized equally alongside the numerous, significant, on-the-ground environmental and water resource benefits of project implementation.

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Table 7-3: Monterey Peninsula IRWM Plan Objectives

OBJECTIVES.

* = Closely aligned with Statewide Priorities • Bold, highlighted = "High" Priority Objectives

Projects	WS-1. Meet existing water supply replacement needs of the Carmel River system and Seaside Groundwater Basin.*	WS-2. Maximize use of recycled water and other reuse, including gray water systems, and stormwater capture and use.*	WS-3. Seek long-term sustainable supplies for adopted future demand estimates.*	WS-4. Optimize conjunctive use of surface and groundwater.*	WS-5. Evaluate, advance, or create water conservation throughout the Region in compliance with the State's 20x2020 Water Conservation Plan.*	WQ-1. Improve ocean water quality, including Areas of Special Biological Significance (ASBS), by minimizing pollutants in stormwater discharges.*	WQ-2. Improve inland surface water quality for environmental resources (e.g. steelhead) and potable water supplies.*	WQ-3. Protect and improve water quality in groundwater basins.*	WQ-4. Meet or exceed water quality standards established by regulatory agencies and stakeholders.*	FP-1a. Develop regional projects and plans necessary to protect existing infrastructure from flood damage, in particular, along the South Monterey Bay shoreline and Carmel Valley.**	FP-1b. Develop regional projects and plans necessary to protect existing infrastructure and sensitive habitats from erosion (including erosion exacerbated by sea level rise).**	FP-2. Develop approaches for adaptive management that minimize maintenance and repair requirements (sustainable flood management systems).*	FP-3. Protect quality and availability of water while preserving or restoring ecologic and stream function.*	FP-4. Provide community benefits beyond flood protection, such as public access, open space, recreation, agricultural preservation, and economic development.	EV-1. Protect and enhance sensitive species and their habitats in the regional watersheds; promote the steelhead run.*	EV-2. Identify opportunities to assess, protect, enhance, and/or restore natural resources, including consideration of climate change, when developing water management strategies and projects.*	EV-3. Minimize adverse effects on biological and cultural resources when implementing strategies and projects.*	EV-4. Identify opportunities for open spaces, trails and parks along streams and other recreational areas in the watershed that can be incorporated into projects.	EV-5. Identify and integrate elements from appropriate Federal and State species protection and recovery plans .*	CC-1. Evaluate adaptation measures and mitigative solutions to climate change effects.*	CC-2. Support increased education, monitoring and research to increase understanding of long-term impacts of climate change in the region.*	CC-3. Support efforts to increase education, research and use of energy conservation measures and alternatives to fossil fuel and non-renewable resources to reduce greenhouse gas emissions associated with water and wastewater facility operations and IRWM projects.*	RC-1. Identify cooperative, integrated strategies for protecting both infrastructure and environmental resources, including from climate change impacts. *	RC-2. Foster collaboration among regional entities as an alternative to litigation.*	RC-3. Identify and pursue additional opportunities for public education, outreach, and communication on water resource management and climate change, including to disadvantaged communities and stakeholders with interests in water management issues.*	RC-4. Build relationships with State and Federal regulatory agencies and other water forums and agencies.
	Water Supply (WS)					Water Quality (WQ)				Flood Protection & Erosion Prevention (FP)					Environmental Protection & Enhancement (EV)					Climate Change (CC)			Regional Communication and Cooperation (RC)			
Carmel Bay ASBS Project	✓	✓	✓	✓		✓	✓		✓				✓		✓	✓	✓						✓	✓		✓
Carmel River Integrated Watershed Restoration Project						✓	✓				✓	✓	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓	✓
Carmel Valley Livestock & Land Program						✓	✓	✓	✓		✓		✓		✓		✓		✓				✓	✓	✓	✓
Carmel Watershed Roads Erosion Assistance Program						✓	✓				✓	✓					✓			✓			✓	✓	✓	
Incorporation of the Peninsula in the Central Coast Action Tracker					✓	✓					✓	✓				✓				✓			✓	✓	✓	✓
Del Monte List Station Upgrades						✓	✓								✓		✓									
Ecosystem Condition Profile for the Carmel River Watershed using the Level 1-2-3 Framework.							✓				✓	✓			✓	✓	✓	✓	✓				✓	✓	✓	✓

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Chapter 8 Plan Performance and Monitoring

IRWM Standard 8

The IRWM Plan shall contain performance measures and monitoring methods to ensure the objectives of the Plan are met. Therefore, the IRWM Plan must describe a method for evaluating and monitoring the RWMG's ability to meet the objectives and implement the projects in the IRWM Plan.

The Plan Performance and Monitoring standard in Proposition 84/1E Integrated Regional Water Management (IRWM) Program Guidelines is to ensure the objectives of the plan are met by accomplishing the following:

- The Regional Water Management Group (RWMG) is efficiently making progress towards meeting the objectives of the IRWM Plan;
- The RWMG is implementing projects listed in the IRWM Plan; and
- Each project in the IRWM Plan is monitored to comply with all applicable rules, laws, and permit requirements.

This chapter addresses the first two guideline requirements; the third is addressed as part of the project review process, described in **Chapter 6, Project Review Process**. Each project submitted for inclusion in the IRWM Plan is carefully reviewed by the Regional Water Management Group (RWMG) to ensure that it complies with all applicable rules, laws, and permit requirements before it can be approved for inclusion in the Plan. Every three to five years, the RWMG will conduct a Plan Performance Review to evaluate the IRWM Plan's progress and ensure that the IRWM Plan continues to be compliant with all applicable rules, laws, and permit requirements.

This chapter outlines the general process that is used for IRWM Plan performance and project monitoring. Project-specific details are available on the MP IRWMP website[1] following each Plan Performance Review.

8.1 Plan Performance Measure and Monitoring Methods

The Plan Performance Review will be prepared by the IRWM Plan Coordinator, or in the absence of a Coordinator, by a subcommittee of the RWMG. Progress toward meeting Plan objectives is directly tied to the implementation of projects. The implementation of projects, along with associated monitoring data, will be tracked using a Data Management System (DMS) that takes advantage of database systems developed by statewide efforts. Because the IRWM Plan does not have an ongoing secure funding source for data management, the RWMG has opted to utilize existing database frameworks including those developed by the California Surface Water Ambient Monitoring Program (SWAMP) and by the California Environmental Data Exchange Network (CEDEN). Projects will be tracked on mpirwm.org website and potentially using the Central Coast Conservation Action Tracker website. Wetland and riparian habitat conditions will be measured and documented using the California Rapid Assessment Methods (CRAM), and groundwater data will reside in GeoTracker using the Groundwater Ambient Monitoring and Assessment (GAMA) database (see **Chapter 9, Data Management**, for a detailed description). The IRWM Plan Coordinator will work closely with the Data Management Coordinator (or in absence of a Data Management Coordinator then a subcommittee of the RWMG) to track project implementation.

Two tables will be generated with each Plan Performance Review that addresses the first two requirements of the standard: 1) the RWMG is implementing projects listed in the IRWM Plan; 2) the RWMG is efficiently making progress towards meeting the objectives of the IRWM Plan. The first table will simply list all of the projects in the IRWM Plan, their implementation status, and funding source. Projects that have been fully implemented will be highlighted. **Table 8-1** is an example of the table that will be completed as part of the implementation review.

Table 8-1: Status of Project Implementation

Project Proponent & Project Title	Funding Source		Date of Implementation/Status
	IRWM funds $	Other funds $ (source)	

The second table will be used to chart the progress of projects that have been implemented or are in the process of being implemented. The table will be populated by a Conservation Action Tracker database, a data system for tracking land-use management improvements in the Central Coast region. It is an online tool that will allow Project Proponents to register and update information on conservation projects across the region in order to track efforts and improve stakeholders' ability to evaluate its collective effectiveness. The Conservation Action Tracker will be implemented by the Central Coast Resource Conservation Districts (RCD) and project partners of the IRWM Plan.

Table 8-2, below, is an example of the table that will be completed during each Plan Performance Review. The measurability criteria for objectives (see **Chapter 3, Goals and Objectives**) will be documented through the Conservation Action Tracker to help track the extent to which projects are achieving Plan objectives and implementing the IRWM Plan. Results will be brought to the RWMG for review and discussion.

Table 8-2: Progress toward Achieving IRWM Plan Objectives

Objectives	Qualitative Measurement	Quantitative Measurement
WATER SUPPLY OBJECTIVES		
WS-1. Meet existing water supply replacement needs of the Carmel River system and Seaside Groundwater Basin.* WS-2. Maximize use of recycled water **and other reuse, including gray water systems, and stormwater capture and use** WS-3. Seek long-term sustainable supplies for adopted future demand estimates. WS-4. Optimize conjunctive use of surface and groundwater. WS-5. Evaluate, advance, or create water conservation throughout the Region in compliance with the State's 20x2020 Water Conservation Plan.		
Project title(s) here	List how project is meeting IRWMP objective qualitatively	List how project is meeting IRWMP objective quantitatively, if possible
ETC.		
WATER QUALITY OBJECTIVES		
WQ-1. Improve ocean water quality, including Areas of Special Biological Significance (ASBS), by minimizing pollutants in stormwater discharges. WQ-2. Improve inland surface water quality for environmental resources (e.g. steelhead) and potable water supplies. WQ-3. Protect and improve water quality in groundwater basins. WQ-4. Meet or exceed water quality standards established by regulatory agencies and stakeholders.		
Project title(s) here	List how project is meeting IRWMP objective qualitatively	List how project is meeting IRWMP objective quantitatively, if possible
ETC.		
FLOOD PROTECTION OBJECTIVES		
FP-1. Develop regional projects and plans necessary to protect existing infrastructure and sensitive habitats from flood damage, erosion, and sea level rise, in particular, along the southern Monterey Bay shoreline and Carmel Valley. FP-2. Develop approaches for adaptive management that minimize maintenance and repair requirements (sustainable flood management systems). FP-3. Protect quality and availability of water while preserving or restoring ecologic and stream function. FP-4. Provide community benefits beyond flood protection, such as public access, open space, recreation, agricultural preservation, and economic development.		

Objectives	Qualitative Measurement	Quantitative Measurement
Project title(s) here	List how project is meeting IRWMP objective qualitatively	List how project is meeting IRWMP objective quantitatively, if possible
ETC.		
ENVIRONMENT OBJECTIVES		
EV-1. Protect and enhance sensitive species and their habitats in the regional watersheds; promote the steelhead run. EV-2. Identify opportunities to assess, protect, enhance, and/or restore natural resources, including consideration of climate change, when developing water management strategies and projects.* EV-3. Minimize adverse effects on biological and cultural resources when implementing strategies and projects. EV-4. Identify opportunities for open spaces, trails and parks along streams and other recreational areas in the watershed that can be incorporated into projects. EV-5. Identify and integrate elements from appropriate Federal and State species protection and recovery plans.		
Project title(s) here	List how project is meeting IRWMP objective qualitatively	List how project is meeting IRWMP objective quantitatively, if possible
ETC.		
REGIONAL COMMUNICATION OBJECTIVES		
RC-1. Identify cooperative, integrated strategies for protecting both infrastructure and environmental resources, including from climate change impacts. RC-2. Foster collaboration among regional entities as an alternative to litigation. RC-3. Identify and pursue additional opportunities for public education, outreach, and communication on water resource management and climate change, including to disadvantaged communities and stakeholders with interests in water management issues. RC-4. Build relationships with State and Federal regulatory agencies and other water forums and agencies.		
Project title(s) here	List how project is meeting IRWMP objective qualitatively	List how project is meeting IRWMP objective quantitatively, if possible
ETC.		
DISADVANTAGED COMMUNITIES OBJECTIVES		
Objective 1:		

Objectives	Qualitative Measurement	Quantitative Measurement
Project title(s) here	List how project is meeting IRWMP objective qualitatively	List how project is meeting IRWMP objective quantitatively, if possible
ETC.		
CLIMATE CHANGE OBJECTIVES		
CC-1. Evaluate adaptation measures and mitigative solutions to climate change effects. CC-2. Support increased education, monitoring and research to increase understanding of long-term impacts of climate change in the region. CC-3. Support efforts to increase education, research and use of energy conservation measures and alternatives to fossil fuel and non-renewable resources to reduce greenhouse gas emissions associated with water and wastewater facility operations and IRWM projects.		
Project title(s) here	List how project is meeting IRWMP objective qualitatively	List how project is meeting IRWMP objective quantitatively, if possible
ETC.		

During each Plan Performance Review, the information in the above table will be updated and new projects will be added. The table will be accompanied by a narrative, which will summarize the overall progress toward achieving IRWM Plan goals and objectives and describe areas that need further attention. The analysis will include data submitted to the statewide databases and information provided in the Conservation Action Tracker tool. Based on this analysis, the RWMG will evaluate how to fill the gaps and help achieve regional goals.

Table 8-3: Resource Management Strategy Evaluation

Resource Management Strategy	Metric
Ecosystem restoration	Acreage or lineal measurement of riparian corridor restored, increase in species count and abundance.
Environmental and habitat protection and improvement	Acreage or lineal measurement of riparian corridor improved, increase in species count, number of fish migration barriers removed.
Water supply reliability	Annual-acre-feet of water production, percent of demand met under adverse conditions (drought or other emergency).
Flood management	Residential, commercial or industrial acreage or number of structures protected, lineal measurement of floodway capacity improved.
Groundwater management	Annual Acre-feet of pumped groundwater compared to sustainable yield, Annual Acre-feet of water recharged, groundwater levels compared to protective.
Recreation and public access	Acreage of open space and lineal measurement of trails created.
Storm water capture and management	Number of Best Management Practices installed, reduced volume of storm water discharge to ASBS, pounds per year of pollutant reduction in surface water, beach closure reductions.
Water conservation	Decrease in Annual Acre-feet/household of water demand.
Water quality protection and improvement	Improved water quality parameters in the MBNMS, improved Carmel River water quality parameters, Annual Acre-feet net extracted groundwater (below/above) sustainable yield, water quality analyses.
Water recycling	Annual Acre-feet increase of recycled water.
Wetlands enhancement and creation	Acreage of wetlands created or enhanced.
Conjunctive use	Annual Acre-feet of water used conjunctively, e.g. diversions to Aquifer Storage Recovery.
Land use planning	Acreage of land managed, protected, or enhanced to protect beneficial uses of water.
Non-point Source pollution control	Total Suspended Solids pollutant reduction, pounds/year of sediment reduction, number of Best Management Practices installed, beach closure reductions.
Watershed planning	Acreage of watershed protected or enhanced acreage of land with improved management activities, number of recommendations incorporated from the RWQCB Watershed Management Initiatives.
Water and wastewater treatment	Annual Acre-feet increase of water and wastewater treatment capacity.

8.2 Project-Specific Monitoring Plans

8.2.1 Current Monitoring and Data Collection

If a project within this plan requires monitoring, the Project Proponent is responsible for both development of the project-specific long-term monitoring plans and for all monitoring activities. There may be cases where project-specific monitoring will not apply, such as land acquisition, infrastructure upgrades, or installation of purple pipe for reclaimed water.

There are two levels of development for the project monitoring plan. First, a general outline of monitoring requirements and design will be included in a project proposal for inclusion in the IRWM Plan; second, the monitoring plan and quality assurance project plan will be included in the scope of work in a funding proposal, and must be approved by the appropriate State agency or agencies prior to monitoring taking place for a given project.

Projects Proponents should be familiar with the relevant state and regional monitoring programs (SWAMP, CEDEN, CRAM, GAMA and CAT, see p. 8-1 and **Chapter 9, Data Management)**.

The project-specific monitoring plan requirements will vary based on the type of project being implemented. All projects must adhere to certain state guidelines for monitoring in order to be implemented through the IRWM Plan:

- Projects that involve surface water quality must meet the criteria for and be compatible with SWAMP.
- All projects that involve groundwater quality must meet the criteria for and be compatible with GAMA.
- All projects that involve wetland restoration must meet the criteria for and be compatible with the State Wetland and Riparian Area Monitoring Plan or Carmel River Area Management Plan.

Any projects that do not fall into one of the above categories must, at minimum, address the following:

1. Clearly and concisely (table format) describe what is being monitored for each project. Examples include photo monitoring, water depth, flood frequency, and effects the project may have on habitat or particular species (before and after construction), etc.
2. Measures to remedy or react to problems encountered during monitoring. An example would be to coordinate with the Department of Fish and Game if a species or its habitat is adversely impacted during construction or after implementation of a project.
3. Location of monitoring (map).
4. Monitoring frequency.
5. Monitoring protocols/methodologies, including who will perform the monitoring.
6. Procedures to ensure the monitoring schedule is maintained and adequate resources (budget) are available to maintain monitoring of the project throughout the scheduled monitoring timeframe.

Through project-specific monitoring efforts, the Conservation Action Tracker, and measurable objectives, the RWMG intends to demonstrate over time that the IRWM Plan is meeting its goals and objectives. Note that the Plan Performance Review includes an adaptive management process that will enable the RWMG to respond to lessons learned from the project monitoring efforts and to utilize new information, particularly as new data regarding climate change impacts and vulnerabilities for the Monterey Peninsula region become available. With this information, the RWMG may choose to modify IRWM Plan objectives, the measurability of those objectives, the use of resource management strategies, or the project review process; and these decisions will, in turn, dictate the types of projects that will be prioritized and implemented in the future.

Chapter 9 Data Management

IRWM Plan Standard 9

The IRWM Plan must describe the process of data collection, storage, and dissemination to IRWM participants, stakeholders, the public, and the State. Data in this standard may include but is not limited to technical information such as designs, feasibility studies, reports, and information gathered for a specific project in any phase of development including the planning, design, construction, operation, and monitoring of a project.

The IRWM Plan adopted in 2007 includes a component to create a publically available web site to access the IRWM Plan and documents associated with water resources planning and management in the region. This publically available tool fosters stakeholder outreach and interaction between stakeholders, including land use planning bodies within the region; the GIS mapping and collaboration tool is provided for grant applications, project planning, project monitoring, and coordination with local, state and federal agencies. The IRWM-Document Management System (DMS) portal software solution helps manage, facilitate and share all data collected by stakeholders involved in water and environmental resources of the State of California. This portal is open to all federal, state, county and local organizations. In addition, this is a collaboration tool that will allow stakeholders to share information with other agencies

9.1 Data Needs and Collection

As part of the 2014 IRWM Plan, a data management system (IRWM DMS) that collects, stores, and shares data was developed to provide regional information to IRWM stakeholders, the public, and State and Federal agencies. Data collected includes IRWM project information, reports and documents, plans and environmental studies. In addition, project documents including designs, feasibility studies, and reports are included and stored in the two locations. The two locations for data storage and retrieval are the IRWM Program and DMS site located on the Monterey Peninsula Water Management District website[1] and the Monterey Peninsula IRWM GIS-enabled project website.[2] Both provide a forum for the sharing information, publicizing meeting dates, agendas, meeting minutes, and/or annual reports.

9.1.1 Existing Data

The current Monterey Peninsula Integrated Regional Water Management Plan, November 2007, is on the MPWMD website.[3] A partial listing of the types of regional documents available on the Monterey Peninsula IRWM website[4] includes the following folders of information:

[1] http://mpirwm.org
[2] http://www.mpirwm.org/Pages/GISRegions.aspx
[3] http://www.mpwmd.dst.ca.us/Mbay_IRWM/MontereyPeninsulaIRWMP20071119.pdf
[4] http://www.mpirwm.org/IRWM_Library/Forms/AllItems.aspx

- Meetings
- ASBS Documents
- Canyon Del Rey
- Carmel Bay-Carmel River SB-Laggon
- Carmel River Watershed
- Central Coast RWCQB Documents
- Climate Change Guidance
- Coastal Plans
- Concept Proposal - 2013
- DWR Guidance Documents
- Fisheries - General
- Flooding
- Well/Geologic Report
- Local Land Use Plans
- Maps
- Ocean - Marine Regulations
- Fort Ord Inter-regional
- Other Regional Documents
- Quarterly Reports
- San Clemente Dam Construction
- Seaside Groundwater Basin
- Stormwater drains
- Wastewater - Septic Infrastructure
- Water Reclamation - Recycling
- Water Supply
- Report Appendices
- Canyon Del Rey Study 1977
- Draft Stakeholder Public Outreach
- Draft RWMG MOU
- DWR Funding Summary
- IRWM Plan Update Schedule 29Mar2013
- IRWM MOU
- Login Help
- Monterey Peninsula IRWMP 20071119
- Monterey Peninsula IRWMP 20071119 Exec Summary
- Planning Grant Agreement w/ sig page
- Project Solicitation
- Resos Adoption
- Stakeholder Contact Info
- Update

9.1.2 Data Needs

An informal review of data needs was done prior to beginning work on the Monterey Peninsula IRWM Plan Update (2014). Although not comprehensive, three categories were identified as topics that need data and supplemental information. These topics include Seawater intrusion in the Seaside Groundwater Basin, Residential and Commercial Water Demand, and Environmental Water Demand. Seawater intrusion has become an important issue since the Seaside Groundwater Basin was adjudicated in 2006 and pumping has been reduced. Extensive water quality and water level monitoring has been implemented, but the true dynamics of Seawater intrusion is still unclear. Since a majority of the residential and commercial water production and delivery is through a private company (California American Water Company) much of the consumption data is unavailable. Limited estimates and modeling have been done to quantify the water demand in the region. Environmental water demand estimates are ongoing and various modeling efforts are underway to better understand the interaction of surface flow, subsurface flow and water extraction. As information and data become available, a better understanding of the environmental water demand and requirements can be expected. A "Getting Started" tab was expanded to include a "Document Library" with meeting information and other regional and project documents. Much of the data gathered has been referenced in the IRWM Plan 2014 Update.

9.1.3 Development of the Web-based Project Database

The following section describes data collection tool development and includes the following: approach for developing the DMS and GIS IMS, the attributes of the DMS, and attributes of the GIS IMS.

The web-based IRWM DMS was developed to collect, store, and disseminate project data to monitor progress towards addressing Monterey Peninsula IRWM Plan 2013 regional objectives and targets.

The Monterey Peninsula Water Management District (MPWMD) took the lead to research the different approaches to developing the IRWM DMS. In addition, MPWMD developed and deployed a GIS Integrated Mapping Site (IMS). Workgroup meetings were held to provide instructions to stakeholders on how to use the DMS, sign up and enter project information.

The SharePoint DMS was selected by the MPWMD because it's designed to facilitate the IRWM Stakeholders ability to inventory, review, and integrate projects. The SharePoint DMS site is not only available for data storage and dissemination but also provides a portal to stakeholders for collaborative opportunities. The SharePoint forum provides stakeholders with a mechanism to input and share information about projects, events, and other IRWM regional announcements as well as network with other agencies to collaborate or existing or potential projects. The SharePoint site was developed to streamline this collaborative process and interaction.

The criteria used to develop the IRWM SharePoint DMS include:

- An interface that can be modified to meet IRWM Region data management needs
- Ability to store all edits made by stakeholders on projects
- Ability to track projects of interest
- Make the tool publically available to foster stakeholder outreach and interaction between stakeholders
- Provide assistance for grant applications, project planning, project monitoring, and coordination with local, state and federal agencies.
- Help manage, facilitate and share all data collected by stakeholders involved in water and environmental resources of the State of California.
- This portal will be open to all federal, state, county and local organizations.
- Ease of use by participating agencies and stakeholders with a web-based interface
- Ability to view projects based on objectives, project status, or proponent
- Access project type and location information
- The tool allows for dynamic scoring of potential projects or concept proposal to aid the stakeholder with project development.

Figure 9-1: Pull Down Modules for IRWM Data Management System

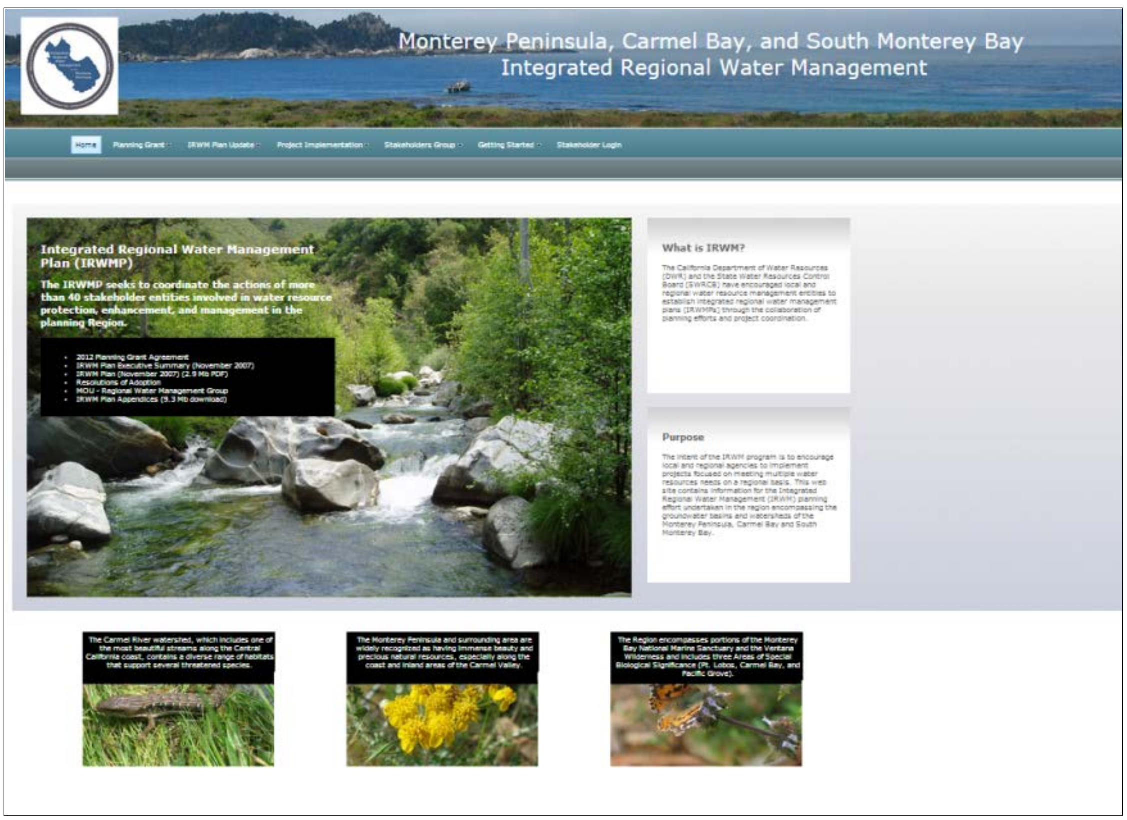
Structure of the IRWM Project DMS

The IRWM SharePoint DMS was developed with several drop-down menus and modules to allow flexibility for expansion of the database and revision of the user interface (UI). The site provides tools that allow public users and Stakeholders the ability to submit announcements for funding opportunities or events, upload new projects, or provide other useful information to keep the public and participants informed about the activities within the IRWM group. An administrative interface also provides tools for the system administrator to approve announcements submitted by the public. The attributes of the UI have been broken out into 7 modules.

The Home Dashboard

The Home Dashboard is the IRWM home page containing the existing Planning grant Agreement the Regional IRWM Plan executive summary and full document, a copy of the Resolution of adoption, MOU for the Regional Management Group and the IRWM Appendices. It's also a place where the public can find a general description of the IRWM and its purpose.

Figure 9-2: Home Page for IRWM Data Management System



Planning Grant

This pull down menu contains the IRWM grant and sub-grantee agreements, CA State Dept of Water Resources quarterly reports and templates and regional project reports.

IRWM Plan Update

This pull down menu contains the 2007 IRWM Plan, the draft 2014 IRWM Plan Update, and schedule for the IRWM Plan update.

Project Implementation

This pull down menu contains the IRWM Project Proposals, Project Prioritization Scoring, and Implementation Grant Proposal and Application information

Stakeholders Group

This pull down menu contains the IRWM group meeting minutes, agendas, and the list of Stakeholders

Getting Started

This pull down menu contains a number of subsections including: info about the IRWM program, modules to submit and edit a concept proposal, submit and edit a project proposal, access to the Planning Region GIS (GIS IMS), GIS data library, Funding Availability schedule, Project Solicitation and Review and messaging for Login help.

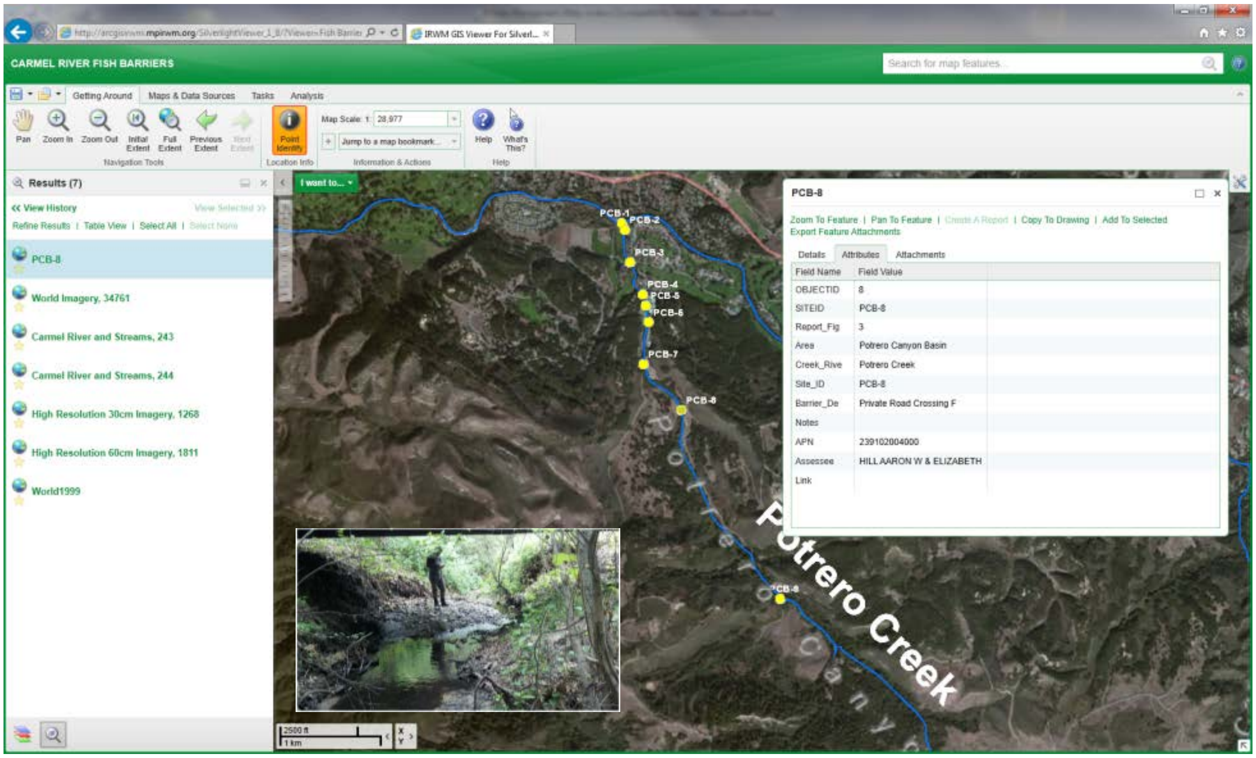
Stakeholder Login

This pull down menu contains stakeholder login window. The Stakeholder login module allows public users to register for an account on the system and request a user login and password. Any individual or organization that wishes to participate as a stakeholder can request and login and password. The system administrator who manages user accounts and user permissions, can customize access permissions allowing for the upload and/or editing of project information. Project Sponsors have access to tools that allow editorial access to project data by a select group of users and collaborators. Registered users can edit their profile information or re-designate a contact person. The login window is used to authenticate the user and then allows access to the DMS to submit and concept proposal, project proposal, grant application, and project data, info and documents.

Structure of the Geographic Information Systems Internet Mapping Site

The GIS Internet Mapping Site (GIS IMS) provides stakeholders in the IRWM planning region with a web-based tool to access relevant data, interact with the IRWM Plan and with each other. The overall success of the IRWM Plan will be dependent upon each Project Sponsor focusing on project completion and dissemination of its data, reports and information. A GIS IMS along with the DMS efficiently distributes project data, reports and information and is an effective tool for display and analysis of geospatial information. The GIS IMS site is part of the main objectives of the IRWM Plan update, including project integration, project review and prioritization, performance and monitoring, data management, technical analysis, integration with local land use planning, and stakeholder involvement and coordination. The full explanation of GIS IMS functionality, tutorial videos and documentation is available for users under the “Getting Started” pull down tab under “Planning Region GIS.”

Figure 9-3: Example of GIS IMS project site: The Carmel Fish Barrier Assessment GIS



Map View

Using the Map View (GIS IMS) project sponsors may submit project information and upload documents and pictures linked to geospatial features (i.e. wells, storm drains, parcels, sample sites, etc) Projects that are submitted are review and then accepted by the system administrator before the project is made available to the public and Stakeholders. Project sponsors can also choose to have their project accessible to a select group using a password authentication. This functionality may be used when a project is in development, prior to public release.

For approved projects, project proponents can select the project location on the map, enter the project address, upload an area map of the project area, or draw the project area on the map interface. Geo-referencing projects allow stakeholders to visualize the regional distribution and types of projects within the whole Region. The Map View can display projects with simple search and sorting tools that provide users the ability to quickly locate project information. In the Map View, a project summary can be accessed by using an "Identify" tool and clicking on the project location on the map.

Query Tools

For the GIS IMS a simple and advance query/search tool allows users to employ standard search queries, perform keyword searches, or perform custom queries from all project data within the GIS IMS. Map tools provide project groupings to be viewed based on varying characteristics such as objective, or proponent and will facilitate collaboration, integration, and identification of multiple benefits.

9.2 Stakeholder Contributions

9.2.1 Stakeholders Data Contribution to the DMS

The SharePoint DMS site is open to anyone interested in joining the Monterey Peninsula IRWM Planning Community. Those interested may sign-up and request username and password. After reviewing and validating the participants contact information, the system Administrator sends a password to the participant. All participants who sign-up on SharePoint will become SharePoint public stakeholders. Public stakeholders can view projects and IRWM plan information. Stakeholders have the ability to submit projects, share projects with other members, and post announcements or events. There are no restrictions on becoming a Stakeholder participant. Technical issues and questions regarding SharePoint can be submitted via the "Help" button located on the IRWM SharePoint DMS and GIS IMS sites.

The process is initiated by a project sponsor by first submitting a "Concept Proposal." The form can be filled out from the "Getting Started" dropdown menu. Once the conceptual project information is submitted into SharePoint DMS the System Administrator reviews the project information. All projects must be water related to be approved by the administrator. Once projects are approved, all IRWMP SharePoint stakeholders will have the opportunity to view concept proposal information. If a stakeholder decides their concept is advanced enough for grant application consideration, the stakeholder can submit a "Project Proposal" on the "Getting Started" dropdown menu. A dynamic scoring tool will inform the stakeholder of its project feasibility according to the CA Dept of Water Resources criteria. Projects will be ranked according to these scores.

Use of the SharePoint database was facilitated by two meeting workshops conducted in 2013. Meetings were publicized to all stakeholders in the Region. Individual training sessions are available upon request. The workshop and training session assures that all interested stakeholders can submit and have access to database information. Stakeholders may contribute data to the IRWM Program website (http://www.mpirwm.org/Pages/default.aspx) by contacting the MPWMD System Administrator listed on the "Contact Us" tab on the website.

9.2.2 Stakeholder Communication

Communication within the IRWM region is accomplished via site announcements and email. Events or meeting information are also posted on the SharePoint DMS site. The IRWM Plan public stakeholder meetings serve as opportunities for networking, in addition to standard communications among groups regarding sections of the IRWM Plan. Grant and funding opportunities are made available through as email updates, special events, forums, educational outreach workshops and project progress update meetings. All of these mechanisms serve to facilitated the ongoing data and information sharing between stakeholders.

9.3 Data Maintenance and Quality Assurance/Control

The IRWM DMS and GIS IMS have been developed to provide relevant regional information to IRWM stakeholders, the public, and the State and Federal agencies. The DMS site (http://www.mpirwm.org/Pages/default.aspx) and the GIS IMS site (http://www.mpirwm.org/Pages/GISRegions.aspx) are the two locations where the data is stored and is controlled by validating the sources of the information. Since the DMS and GIS data are entered by project proponents, it is not possible to validate all of the information. Data from State, regional or local Public agencies are assumed to have at least a moderate level of accuracy. Data is maintained by MPWMD staff and Project Stakeholders and is ongoing and updated on an irregular basis, as the need arises. As concept and project proposals progress, Stakeholders have multiple opportunities to review data and results of associated projects. Through this process and project review process of DWR grant application guidelines, most project data will be vetted for accuracy. The query functionality in the SharePoint DMS and GIS IMS facilitates this process as it allows users to search information, run comparative analysis and create desired report outputs.

The review process is important for the scoring, ranking and prioritization of projects for possible grant funding and application submission. The top projects are ranked based on criteria established and approved by the Stakeholders. Comments and questions from that peer review are recorded and subsequent meetings provide an opportunity to review the project, have a question/answer session, and confirm, to the best of their ability, the project information. Any changes to the project information are done after approval from the Project Sponsor/Stakeholder. When the region submits a DWR grant application, high ranking projects undergo further review for quality control.

9.4 Data Sharing and Compatibility with State Systems

The SharePoint system was developed to help participating State agencies and regional stakeholders locate, share, and collaborate on IRWM Plan 2014 projects and future proposals. The SharePoint DMS is open to anyone interested in the Monterey Peninsula IRWM Planning Region. Due to the number of agencies, the different programs and project goals, much of the collected data may not be readily available in the State formats. For this reason, Stakeholders are encourages to self-regulate their data management procedures and make a best effort to standardize their data so it is compatible with the State Systems. The MPIRWM region provides the information or direction to information for this data standardization. As projects and the 2014 Plan progress tools will be developed to assist in this data standardization effort. A current collaborative opportunity may exist with the Greater Monterey Bay IRWM Region’s effort. They are developing and testing a tool that allows for stakeholders to upload their water quality data in the State format. If successful, the Monterey Peninsula may collaborate and utilize this tool rather than duplicating the effort.

SharePoint DMS Compatibility

California Environmental Data Exchange Network – CEDEN is a system designed to facilitate integration and sharing of data collected by many different participants. The CEDEN data templates are available on the CEDEN website: http://www.ceden.org.

Stakeholders that collect water data including groundwater level wells, water quality stations, surface water stage and flow sites, rainfall/climate observers, or well logs are directed to the CA State Water Data Library (http://wdl.water.ca.gov/) to standardize their data in the appropriate format

Groundwater elevation monitoring data is provided to the state CASGEM Program. Many of the Stakeholders already follow this procedure and upload the data. Stakeholders are directed to the http://www.water.ca.gov/groundwater/casgem/ site to register and provide information if they haven’t already done so.

Any Stakeholder collecting or monitoring surface water quality data, is encouraged to provide the data to Surface Water Ambient Monitoring Program (SWAMP) (http://www.swrcb.ca.gov/water_issues/programs/swamp)

The Groundwater Ambient Monitoring and Assessment program (GAMA) provides a comprehensive assessment of water quality in water wells throughout the State and the Monterey County Environmental Health Department collects and provides most of this information for both domestic and public wells. If Stakeholders propose a project that requires this type of water quality sampling they will be encouraged to coordinate with the Monterey County Environmental Health Department and the GAMA program (http://www.swrcb.ca.gov/gama).

GIS IMS Compatibility

For geospatial data collected by Stakeholders, metadata is also submitted that describes each data sets projection and datum information, dataset description, data lineage. Although not required, Stakeholders are encouraged to follow the FGDC GIS metadata format.

In addition to providing the group with GIS metadata, Stakeholders are encouraged to submit their metadata to the California Environmental Information Clearinghouse (CEIC) at the California Natural Resources Agency (CNRA) portal: http://ceic.resources.ca.gov/.

Integrated Water Resources Information System – The MPIRWM is continual working to integrate the IWRIS REST map services to allow entities to access, integrate, query, and visualize multiple sets of data simultaneously. This will be a long term process and as the technical challenges are overcome, the tools and/or portal will be integrated with the MPIRWM GIS IMS. Information on IWRIS is available at: http://www.water.ca.gov/iwris/

California Environmental Resources Evaluation System – CERES Map Layer Services and CERES Mapper is integrated in the GIS IMS for "mash up" services. The GIS IMS services are being made available for CERES users to integrate or explore the MPIRWM geospatial datasets.

9.5 How Data Management Supports RWMGs Efforts

9.5.1 Sharing Data with State and Federal Agencies

The SharePoint DMS has a query tool that allows State and federal agencies to perform keyword searches, and custom queries for all project data within the DMS. Likewise, similar search and query tools are available in the GIS IMS. GIS Map tools provide users with the ability to display disconnected layers via a "mash up" service and can be viewed based on varying characteristics such as project sponsor, data type, or project status. This functionality facilitates collaboration, integration, and identification of multiple benefits.

The SharePoint DMS has a basic map feature (web part) that uses a GIS service to locate the project areas of interest or boundaries. These GIS datasets allow the State or Federal agencies to visualize the regional distribution of projects within the Region. The State also can print the reports or map views (GIS) with simple search and sorting tools. Tools have been developed to save these outputs in PDF or JPG format, as well. Project summary or detail information can be accessed by clicking on the project name (DMS) or area/location on the map (GIS).

9.5.2 State Databases Compatibility

The data in the SharePoint DMS is dissimilar to monitoring data found in the State databases that include SWAMP, Water Data Library, Groundwater Ambient Monitoring and Assessment (GAMA) program, California Environmental Information Catalog (CEIC), and the California Environmental Resources Evaluation System (CERES). Due to the number of agencies, the different programs and project goals, much of the collected data is not readily available in the State formats. The Region plans to continue with outreach efforts to encourage adoption of the State data format when applicable and the MPIRWM Region is continual evaluating various tools to facilitate the standardization of data collection and data entry. Stakeholders interested in pursuing DWR grants will be required to submit data in the appropriate format as part of their proposal and pending approval from the Regional group.

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Chapter 10 Finance

IRWM Standard 10

The IRWM Plan must include a plan for implementation and financing of identified projects and programs (CWC §10541(e)(8)). The IRWM Plan must also identify and explain potential financing for implementation of the IRWM Plan. The financing discussion must, at a minimum, include the following items:

- List known, as well as, possible funding sources, programs, and grant opportunities for the development and ongoing funding of the IRWM Plan.
- List the funding mechanisms, including water enterprise funds, rate structures, and private financing options, for projects that implement the IRWM Plan.
- An explanation of the certainty and longevity of known or potential funding for the IRWM Plan and projects that implement the Plan.
- An explanation of how operation and maintenance (O&M) costs for projects that implement the IRWM Plan would be covered and the certainty of operation and maintenance funding.

10.1 Introduction

The intent of the Finance standard in the Proposition 84/1E Integrated Regional Water Management (IRWM) Program Guidelines is to ensure that the financing of the IRWM Plan has been considered at a programmatic level by the RWMG, and that the strategy for financing the IRWM Plan is transparent.

The need for funding substantially exceeds the grant funding available through recent bond measures. Most of the cost of developing, maintaining, and implementing an IRWM Plan must be borne by local entities with state grant funding providing a necessary, but relatively small, supplement in funds. With potentially multiple sources of funding being accessed to formulate, maintain, and implement an IRWM Plan, financial documentation is necessary for the RWMG and stakeholders to understand how the plan will be implemented. This chapter provides that information.

The purpose of the Finance IRWM standard is to demonstrate that the Regional Water Management Group (RWMG) has considered financing, not necessarily to document that all funding has been secured- in most cases, substantial uncertainty exists.

10.2 Potential Funding Sources and Mechanisms

The RWMG has identified the following potential alternative, non-IRWM sources of grant funds and other means to help implement projects and programs in the IRWM Plan. Potential funding sources include (where appropriate):

Federal grant programs

US Fish and Wildlife Service grants (such as Coastal Wetlands Conservation grants, Cooperative Endangered Species Conservation grants, Partners for Fish and Wildlife grants), National Fish and Wildlife Federation grants, Economic Development Administration grants, American Recovery and Reinvestment Act of 2009 (ARRA) funds, US Department of Agriculture (USDA) grant programs (such as the Agricultural Water Enhancement Program), Bureau of Reclamation Title XVI funds, USDA Natural Resources Conservation Service Environmental Quality Incentives Program (EQIP) grants.

State grant program

Department of Fish and Game Fisheries Restoration Grant Program funds for watersheds with salmonids present, State Coastal Conservancy funds, State Water Resources Control Board Cleanup and Abatement Account grants, Supplemental Environmental Protection (SEP) grants (from Regional Water Quality Control Board fines).

Proposition 218

The Monterey Peninsula Water Management District (District or MPWMD) implemented a new user fee program, beginning in 2012. Based on the holding in *Pajaro Valley Water Management Agency v. Amrhein* (2007), the CPUC amended the means in which the District could assess and charge taxes, resulting in a budget deficit. In order to fund the development of water supply projects, the District used Proposition 218 to generate revenue in the form of a semi-annual property tax. User fees collected from the annual water supply charge will fund the District's water supply activities, including capital acquisition and operational costs for Aquifer Storage and Recovery (ASR), Groundwater Replenishment (GWR), and related water supply purposes. Funds may be used for water supply management, water demand management, and water augmentation programs related to the provision of water (MPWMD, 2012).

Local funds

The Transportation Agency for Monterey County is the local planning agency for the Monterey County region that programs and distributes state and federal money for local and regional transportation projects. The Transportation Agency is responsible for distributing money for public transit, rail, local street and road maintenance, highway, bicycle and pedestrian facilities. In total, the Transportation Agency distributes between $20 and $30 million per year for transportation (TAMC, 2004).

Private grants

Grants from foundations associated with federal/state programs (such as California State Parks Foundation, Elkhorn Slough Foundation, and Monterey Bay Sanctuary Foundation), other private foundations (such as the Monterey County Agricultural and Historical Land Trust), and corporate gifts.

User Fees

User fees are non-land-based charges made by some water resource agencies where facilities and programs directly benefit the existing customers. For example, within the MPWMD boundary, a user fee is assessed on each connection to the Cal-Am system to pay for mitigation for water extraction and to fund projects that will reduce water use or replace existing unauthorized diversions. The user fee is a fixed percentage of the monthly water bill, which usually includes a base amount for a connection and a variable amount based on the metered usage. User fees for specific services are assessed by other agencies within the Region including MRWPCA and CAWD. Cal-Am rates are set by the California Public Utilities Commission.

Development Impact and Mitigation Fees

Development fees are used by water resource agencies almost universally as a measure to achieve and maintain equity among its past, present and future customers. Development fees are typically charged per connection, measured in equivalent dwelling units ("EDU"). A single connection may encompass more than one EDU. In addition to the connection fee aspect of development fees, agencies may also assess other fees such as the Commercial Acreage Fee (per acre) and Other Service Fee (per acre).

Loans

The Federal Water Pollution Control Act (Clean Water Act or CWA), established the Clean Water State Revolving Fund (CWSRF) program. The CWSRF program offers low interest financing agreements for water quality projects. Annually, the program disburses between $200 and $300 million to eligible projects. Eligible projects can address a number of issues such as wastewater and stormwater treatment, water reclamation, nonpoint source projects, and the implementation of comprehensive conservation management plans (SWRCB, 2014).

General or Capital Improvement Funds: General or capital improvement funds are monies that an agency sets aside for funding general operations and/or facility improvements or upgrades. These funds are usually part of their overall revenue stream and may or may not be project-specific.

Bonded Debt Service

Revenue bonds are issued to pay for new capital in cases where a large facility is needed to support current services and future growth. In this way, a large facility can be paid for by bonded debt service at the time of construction with repayment of the debt service over a 20- to 30-year timeframe. This is a preferred approach to paying for high cost facilities because it avoids the perceived over-collection of fees from past customers that go towards facilities that serve present and future customers. A user fee or rate must be pledged to the project as a bond document covenant in the event that development fees are not adequate to make the required annual payment for the debt service.

Grant Programs

Grant programs at the local, state, or federal level are available to the region from time to time. In the past, the RWMG members have applied for and obtained state and federal funding for studies and projects benefiting the region. These monies typically require that a local matching amount be available to obtain the grant that typically comes from one or more of the funding sources above or from another grant. The matching requirement shows a local commitment to promoting and completing the study or project. A grant is typically administered and contracted by a single agency within the region that works directly with the state or federal granting agency. There are typically higher administration costs for grants since a small portion of the grant also pays for administration of the grant by the state or federal agency. One example of a newer grant program is the America's Great Outdoors (AGO) Initiative. President Obama's AGO program calls for the federal government to be a better partner by focusing on community driven and science-based projects that align efforts and prioritize funding across federal, local, and state governments, as well as nonprofit organizations and the private sector (Department of Interior, 2014).

Land Trusts and other Non-Profit Sources

Land trusts are often used as a way to conserve land and can attract donations from private parties for furthering the mission of a particular trust. Recently, both the Big Sur Land Trust and the Nature Conservancy, another non-profit group, have taken a more active role in water resource management. Local non-profit groups, such as the Carmel River Steelhead Association and the Carmel River Watershed Conservancy, also raise private funds and donate resources and funds to carry out water resource-related activities.

10.3 Certainty/Longevity of Funding the IRWM Plan and Projects

To date, the Monterey Peninsula IRWM planning effort has been funded through a combination of private foundation grant funds, State IRWM Planning Grant funds, contributions from RWMG entities, and in-kind staff time contributed by members of the RWMG. As noted in the **Chapter 1, Governance**, the RWMG has been developed to be a working group: its members are expected to actively participate in all aspects of the IRWM planning process. During the development of this IRWM Plan Update, RWMG members have attended public workshops, reviewed drafts of the IRWM Plan, and participated on various committees to develop elements of the plan.

This work has been accomplished by means of donated staff time, or in some cases volunteered time on the part of the RWMG members. It is also important to recognize the many hours contributed by stakeholders and community members who volunteered their time to review the draft plan, provide comments, and offer technical advice and expertise. Leading this effort—and responsible for drafting this IRWM Plan—is the IRWM Plan Coordinator, a staff member at the Monterey Peninsula Water Management District.

With the completion and final approval of the IRWM Plan, the time and resources required to support the IRWM planning efforts are expected to diminish. While the RWMG met quarterly during the initial development of this Plan, it is anticipated that the continuing IRWM planning process will require fewer (semi-annual) meetings.

In March, 2014 Senate Bill 103, Chapter 11 was enacted, thereby allocating $19M to the Department of Water Resources (DWR) to develop a Water-Energy Grant Program. The DWR will hold two workshops to gather public input before beginning development of the program. The draft Guidelines and proposal solicitation package are scheduled to be released for public comment on July 1, 2014.

The RWMG estimates that after the initial IRWM Plan development, ongoing IRWM planning and “maintenance” for the plan will most likely entail:

- Approximately 2-4 RWMG meetings a year, which will focus on alternative sources of funding for IRWM Plan projects and programs, ongoing water resource issues in the region, integration of projects, ongoing outreach and assistance to DAC, and opportunities for collaboration between RWMG members.
- Project solicitations for the IRWM Plan, which will occur about every 2 years in line with funding cycles.
- Committee work associated with the project solicitations (e.g., project ranking and project review).
- Project monitoring and Plan performance evaluation, which is expected to occur bi-annually.

The RWMG will continue to donate their staff time toward the ongoing planning effort, and that stakeholders will continue to participate actively in the process. Additional funds will be needed to maintain the IRWM Plan and keep the process moving forward: organizing meetings, overseeing project solicitations, coordinating the continued planning process, keeping stakeholders (and RWMG members) engaged, and ensuring that IRWM Plan objectives are being met. The RWMG should explore various means for long-term funding including potential collaboration with other agencies and organizations outside the RWMG that share similar goals and could benefit from IRWM Plan implementation.

10.4 Operation and Maintenance Funding

Ongoing support and financing for operation and maintenance (O&M) of projects implemented from this IRWM Plan is expected to come from many of the same sources used to implement the projects. Support and financing will likely come from local sources, including user rates, fees and assessments.

Funding the O&M of implemented projects will be the responsibility of individual project sponsors. However, it is the intent of the stakeholder group to form a technical review committee to review project proposals and implementation for conformance with the proposed Final Plan for adoption and to offer support for and coordination of grant and funding opportunities.

Table 10-1 summarizes the anticipated and potential sources of funding that will support the projects and programs included in the IRWM Plan. This will include financing for O&M, which is not eligible for grant reimbursement by state grant programs. The table shows the approximate total project cost, the anticipated funding sources, the certainty of obtaining those funds, the O&M finance source, and the certainty of obtaining O&M financing.

Table 10-1: IRWM Plan Financing

Activity Description	Approx. Total Cost	Funding Source & percent of Total Cost	Funding: Certainty/ Longevity	O&M Finance Source	O&M Certainty
Carmel Bay ASBS	$12,000,000	Pebble Beach Company (0.8%/yr)	50 years	Pebble Beach Company	Confirmed
Carmel River Integrated Watershed Restoration Program	$640,000	Project Cost and Financing Information Not Available			
Carmel Valley Livestock and Land Program	$1,192,852	Landowner: 10% IRWM Grant: 75% NRCS: 4% USFWS: 8% NRCS/RCD: 3%	20 years	Landowner (dependent on individual project)	>25% match confirmed
Carmel Watershed Rural Roads Erosion Assistance Program	$640,000	IRWM, National Resource Conservation Service, participating Road Associations	30 years	O&M Funding Information Not Available	
Incorporation of the Peninsula in the Central Coast Action Tracker	$80,000	Previous IRWM Planning Grant for Greater Monterey County IRWM Plan (22%)	20 years	Central Coast Wetlands Group and Greater Monterey County IRWM Plan (3 years of funding)	25% match confirmed
Del Monte Lift Station Upgrades	$984,000	Seaside County Sanitation District	30 years	Seaside County Sanitation District	25% match confirmed
Ecosystem Condition Profile for the Carmel River Watershed using the Level 1-2-3 Framework.	$333,067	IRWM Planning Grant funds	2 years	This is a research project; no O&M cost is anticipated	

Chapter 11 Technical Analysis

IRWM Standard 11
The IRWM Plan must document the data and technical analyses that were used in the development of the Plan.

The purpose of the Technical Analysis standard as stated in the Proposition 84/1E Integrated Regional Water Management (IRWM) Program Guidelines is to explain the technical information, methods, and analyses used by the Regional Water Management Group (RWMG) to understand the water management needs over the planning horizon.

11.1 Technical Information Used in the IRWM Plan

A critical aspect of the regional planning process is the amalgamation of existing plans, reports, and studies to create a comprehensive overview of current water resource conditions in the Region and for developing the IRWM Plan. The background information and technical data—including land use information, population studies and demographic information, economic data, water supply and water use data, environmental resources, and projected water demand—have been derived from a diverse set of documents:

- Research and technical studies by local academic institutions and consultants
- Local Agency Formation Commission (LAFCO) Municipal Services Review Reports
- Department of Water Resources (DWR) Land Use Surveys
- Watershed Assessment and Management Plans
- Monterey County Water Resources Agency (MCWRA) and Seaside Watermaster Groundwater Summary Reports
- Seaside Basin Salt and Nutrient Management Plan (April 2014)
- MCWRA Monterey County Floodplain Management Plan
- Cities and Monterey County General Plans and Specific Area Plans
- Regional Water Quality Control Board (RWQCB) plans, including 303(d) List
- Monterey Bay National Marine Sanctuary (MBNMS) Condition Report and Management Plan
- National Marine Fisheries Services –South-central California Steelhead Recovery Plan
- US Census decennial population data
- US Census/American Community Survey (ACS) five-year economic survey data
- Association of Monterey Bay Area Governments (AMBAG) and Fort Ord Reuse Authority economic reports

The sources listed in **Table 11-1** have been used to describe historic and existing conditions in the IRWM Region, as well as to estimate future conditions—most importantly, future water demand. The table lists the sources of technical information used specifically to develop projected needs. Following the table is a brief description of these technical sources, and an explanation for why this technical information is representative and adequate for developing the IRWM Plan. All documents cited in this IRWM Plan are available to the public upon request. A complete list of documents used in the development of this plan is included in the References section.

Table 11-1: Technical Information Used in the IRWM Plan

Type of Study or Data	Source (Author/Title)	Information Used	Relevant IRWM Plan Sections
Hydrology data collection/reporting	United States Geological Survey	Carmel River data: historic instream flow, runoff amount, water production	Region Description
Service Area Planning	Monterey County Local Agency Formation Commission: Municipal Services Review s	Status of the various service providers (including water and wastewater agencies/districts), jurisdictional boundaries and service area requirements	Region Description
Facilities Planning Report	Carmel Area Wastewater District Capital Improvement Program 20-Year Master Plan	Amount of wastewater from the Carmel Area Wastewater District	Region Description
Hydrology	MPWMD Los Padres Dam and Reservoir - Long-Term Strategic and Short-Term Tactical Plan (January 2014)	Planning-Level Report with summary of recent data Usable surface storage in Los Padres Reservoir and Tributaries	Region Description
Hydrology	Monterey Peninsula Water Management District	Total water production within the Region (1996- 2013)	Region Description
Hydrology	California American Water Company, 2010 Urban Water Management Plan (Sept. 7, 2012)	Cal-Am allowable production from Carmel River and Seaside Basin for 2009- 2021 and statistical and data analysis	Region Description
Species recovery plan	National Marine Fisheries Service. 2013. South-Central California Coast Steelhead Recovery Plan. West Coast Region, California Coastal Area Office ,	Fisheries information relevant to San Jose Creek Watershed and Carmel River Watershed	Region Description and Resource Management Strategies

Type of Study or Data	Source (Author/Title)	Information Used	Relevant IRWM Plan Sections
Monitoring	California Surface Water Ambient Monitoring Program (SWAMP)	Monitoring tool to be used for the continued plan performance and monitoring of IRWM projects and proposals.	Region Description
Monitoring	California Environmental Data Exchange Network (CEDEN)	Monitoring tool to be used for the continued plan performance and monitoring of IRWM projects and proposals.	Plan Performance and Monitoring and Data Management
Monitoring	Central Coast Conservation Action Tracker	Monitoring tool to be used for the continued plan performance and monitoring of IRWM projects and proposals.	Plan Performance and Monitoring and Data Management
Monitoring	California Rapid Assessment Methods (CRAM)	Monitoring tool to be used for the continued plan performance and monitoring of IRWM projects and proposals.	Plan Performance and Monitoring and Data Management
Monitoring	Groundwater Ambient Monitoring and Assessment (GAMA) database	Monitoring tool to be used for the continued plan performance and monitoring of IRWM projects and proposals.	Plan Performance and Monitoring and Data Management
Economic data	US Census Bureau, American Community Survey, 2006-2010	Median household income data (2010) for communities and census tracts in Regionusing five-year economic surveys	Region Description (disadvantaged communities)
Economic data	Fort Ord Reuse Authority, Base Reassessment Plan, including Market Report (EMC Planning and EPS, August 15, 2012)	Economic analysis, including population, jobs and housing data for the former Fort Ord	Region Description (economics)
Historic population trends	US Census Bureau, population data from 1960 to 2010 (US Census website)	Population for urban areas in Region from 1960 to 2010 for estimating population growth, and for calculating using decennial population surveys	Region Description

Type of Study or Data	Source (Author/Title)	Information Used	Relevant IRWM Plan Sections
Population growth	AMBAG, 2008 Regional Forecast	Estimated population growth for urban areas in Region, from 2020 to 2035.	Region Description
Population growth and future water demands	Marina Coast Water District (MCWD) and CalAm's 2010 Urban Water Management Plans	Future population estimates for the MCWD and CalAm Monterey District service areas to use in water supply planning	Region Description
Groundwater use	MCWRA: Ground Water Extraction Summary Reports (GWESR) 1995-2010 and	Historic water use from the Salinas Valley Groundwater Basin: 1995-2010 to establish historic water use trends, to document current water use, and as a basis for estimating future water demand in agricultural and urban water uses	Region Description, Objectives, and Resource Management Strategies
Groundwater use and conditions Technical Memo	Protective Elevations to Control Seawater Intrusion in the Salinas Valley (GeoScience for MCWRA, Nov. 19, 2013)	Description of the Salinas Valley Groundwater Basin and use of surface water permit to enhance groundwater resources.	Region Description and Resource Management Strategies
Groundwater use/management Reports	Seaside Basin Watermaster Reports (including Annual Report for Water Year 2012 – 2013, published December 2013) and Seawater Intrusion Response Report (December 2013)	Records of water injection and extraction monitoring and modeling effort summaries used to summarize historic water use from the Seaside Groundwater Basin through September 30, 2013.	Region Description
Urban water use	Urban Water Management Plans for: 2010 CalAm UWMP (2012), Marina Coast (2010)	Projected water use for urban areas in Region, according to water purveyors as reflected in their Urban Water Management Plans.	Region Description
Land use trends: Monterey County	DWR Land Use Surveys: 1997	Aerial surveys and field verification used to establish land use trends and as a basis for estimating future water demand in the Region-(specifically agricultural vs. urban vs. native land acreages; includes irrigated and non-irrigated lands).	Region Description

Type of Study or Data	Source (Author/Title)	Information Used	Relevant IRWM Plan Sections
Groundwater and surface water modeling	MCWRA: Salinas Valley Integrated Ground and Surface Water Model Update, May 1997, Montgomery Watson	Groundwater Modeling Land use, water use, population trends, and other factors (including crop patterns, conversion of ag land to urban land, water efficiency increases, etc.) were used to conclude that agricultural water demand will most likely decline slightly and that urban water demand will increase considerably in the Salinas Valley over the planning horizon.	Region Description
Seawater intrusion	MCWRA: Memorandum from MCWRA to EPA Region IX, dated July 30, 2010, Subject: Technical Memorandum – SEAWATER INTRUSION, 2010	Groundwater sampling from coastal wells used to document the extent of seawater intrusion in the Salinas Valley Groundwater Basin, as well as the projected intrusion rate to understand future groundwater supply conditions. Mineral content of groundwater at various well locations and depths, resulting in seawater intrusion maps (using isochloride contours).	Region Description
Local projections of changes in climate variables	Cal-adapt Web Tool - http://cal-adapt.org/	Local projections of changes in rainfall, average temperature, evapotranspiration, surface flows. Used to define how various climate variables are projected to change within the IRWM Region and their effect on water resources.	Plan Performance and Monitoring Climate Change
Physical Oceanography	MBNMS Site Characterization, Physical Oceanography, II. Water Masses and Hydrography	Information about the Monterey Submarine Canyon and the oceanographic effects caused by the canyon on the Monterey Bay	Region Description Climate Change
Climate vulnerabilities	Climate Change Handbook, 2011, www.water.ca.gov/climatechange/cchandbook.cfm	Prioritization of potential environmental vulnerabilities and assessment of regional vulnerability to climate change Used to define most critical environmental variables from which to focus Climate Risk Assessment and future studies	Climate Change, Goals and Objectives

Type of Study or Data	Source (Author/Title)	Information Used	Relevant IRWM Plan Sections
Climate risk assessment	International Council for Local Environmental Initiatives (ICLEI) Climate Adaptation Planning Workbook	Identify high risk infrastructure and water resources using ICLEI Risk Assessment protocol	Climate Change, Goals and Objectives
Developing climate adaptation strategies	California Natural Resources Agency's 2009 California Climate Adaptation Strategy	Recommended adaptation actions/strategies and response scenarios for the Region, based on the risk assessment	Objectives, Resource Management Strategies and Climate Change

11.2 Description of Technical Information Sources

The following provides a brief description of the technical sources used to develop projected water management needs in the Region, and an explanation for why this technical information is representative and adequate for developing the IRWM Plan.

11.1.1 Population, Housing, and Jobs Data

U.S. Census Bureau Data: The U.S. Census decennial population data have been derived from the U.S. Census Bureau website.[1] Economic data—in particular, median household income (MHI) and poverty status—have been derived from the American Community Survey (ACS) five-year survey, for 2006-2010. ACS is an ongoing statistical survey by the U.S. Census Bureau, sent to approximately 250,000 addresses monthly (or 3 million per year). It regularly gathers information previously contained only in the long form of the decennial census. MHI was measured in 2010 inflation-adjusted dollars. Disadvantaged Communities (DACs) are defined as communities that had a MHI in 2010 of less than 80 percent the statewide MHI. "Severely DACs" are defined as communities that had a MHI in 2010 of less than 60 percent the statewide MHI. DACs were identified both on the community level and tract level. The U.S. Census data are a trusted and broadly accepted source of population, demographic, and economic data, and the data used in the IRWM Plan are the latest U.S. Census data available. Therefore these data are considered representative and adequate for developing the IRWM Plan.

Association of Monterey Bay Area Governments 2008 Regional Forecast: As required by state law, the regional planning agency AMBAG produces a regional forecast approximately every five years of population, housing, and employment for a region spanning the counties of Monterey, San Benito and Santa Cruz. Each forecast is produced with the best available data and is extensively reviewed by AMBAG's member agencies. The 2008 Regional Forecast provides detailed population, housing and employment projections for every jurisdiction in the Monterey Bay region through 2035. The forecast is developed using professionally accepted forecasting methodologies, and represents the most likely trend in population, housing units, and employment. As such, the forecast is broadly accepted as a basis for supporting official regional planning efforts.

Fort Ord Reuse Authority Economic Forecasts: Recently the Fort Ord Reuse Authority conducted a Base Reuse Reassessment process and in December 2012 published a report (the "Final Reassessment Report"), the purpose of these were to evaluate progress toward implementing the 1997 Base Reuse Plan and explore options related to current and future needs. Appendix B of the Final Reassessment Report included a Market and Economic Analysis report (Economic Planning Systems, August 2012) that identifies the key issues related to Fort Ord's redevelopment over the next decades, with a primary focus on economic trends that are reshaping future land use demand. A baseline estimate of demand for new commercial and residential real estate products is provided, with a high level comparison to projected Fort Ord supply.

11.1.2 Water Supply, Water Use, and Projected Water Demand

Urban Water Management Plans: All urban water suppliers as defined in Section 10617 (including wholesalers), either publicly or privately owned, providing water for municipal purposes either directly

[1] U.S. Census Bureau website: http://factfinder2.census.gov/.

or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet (AF) annually are required to prepare an Urban Water Management Plan (UWMP). The UWMP serves as a long-range planning document for water supply, source data for development of a regional water plan, and a source document for cities and counties as they prepare their General Plans. UWMPs include a description of the service area (including population served), historical and current water demand and water demand projections, an overview of water system supplies (including purchased water, surface water, groundwater, recycled water, desalinated water, and water transfers), water supply reliability and water shortage contingency plans, and conservation master plans, among other topics. UWMPs for the following water districts have been used in the development of this IRWM Plan: Marina Coast (2010), California American Water Company-Monterey District Service Area (2010 published August 2012). Information from these UWMPs has been used to describe water systems and to establish future water demand for urban areas in the Region.

Seaside Basin Watermaster Reports: Adjudication of the Seaside Groundwater Basin occurred in 2006 with a Final Statement of Decision filed on March 27, 2006. The court ordered the formation of a Watermaster and mandated a "physical solution" to the overdraft problem. Since the Seaside Basin Adjudication was completed, the Seaside Basin Watermaster has conducted detail monitoring, data collection, and modeling of the Seaside Basin, and the following reports have been prepared to document the conditions of the basin and to recommend solutions for the overdraft problem (all are available for review at http://www.seasidebasinwatermaster.org/sbwmARC.html):

- Seawater Intrusion Response Plan Seaside Basin, Monterey County, California (HydroMetrics, LLC, 2009
- Seaside Groundwater Basin Modeling and Protective Groundwater Elevations, Prepared for: Seaside Watermaster. (HydroMetrics, LLC, 2009)
- Water Year 2010, Seawater Intrusion Analysis Report, Seaside Basin, Monterey County, California, Prepared for the Seaside Basin Watermaster (HydroMetrics. 2010)
- Water Year 2013 Seawater Intrusion Analysis Report, Seaside Basin, Monterey County, California, Prepared for: Seaside Basin Watermaster. (HydroMetrics WRI, 2013)
- Draft Seaside Groundwater Basin, Salt & Nutrient Management Plan, Prepared for: Monterey Peninsula Water Management District, (HydroMetrics WRI, 2014)

Salinas Valley Groundwater Basin Seawater Intrusion Technical Memorandum: The "Memorandum from MCWRA to EPA Region IX, dated July 30, 2010, Subject: Technical Memorandum – SEAWATER INTRUSION" has been used along with the most recent seawater intrusion maps to provide an understanding of the extent of seawater intrusion in the Salinas Valley Groundwater Basin. The phenomenon of seawater intrusion was first noticed in the early 1930s and was documented in 1946 in Bulletin 52, an investigation of the Salinas Basin (DWR 1946). The MCWRA has implemented several programs aimed at slowing the rate of seawater intrusion, and conducts annual sampling of groundwater wells in the coastal region to monitor the advancement of seawater intrusion. The Coastal Sampling Program includes agricultural wells in the Pressure 180-Foot, 400-Foot, and Deep Aquifers, as well as the East Side Shallow and Deep Aquifers. The MCWRA samples these wells annually during the peak agricultural production season (June through September) when pumping stresses are at their highest. The memorandum and isochloride contour maps used in this IRWM Plan represent the most current information available on seawater intrusion.

MCWRA Ground Water Extraction Summary Reports: The purpose of the GWESR is to summarize data submitted to the MCWRA by well operators on an annual basis from Ground Water Extraction Reports (agricultural and urban), Water Conservation Plans (agricultural and urban), and Water and Land Use Forms (agricultural). The report is intended to present a synopsis of current water extraction within the

Salinas Valley, including agricultural and urban water conservation improvements that are being implemented to reduce the total amount of water pumped. While the MCWRA makes every effort to ensure the accuracy of the data presented in the report, it should be noted that the data is submitted by individual reporting parties and is not verified by Agency staff. The MCWRA maintains strict quality assurance in the compilation, standardization, and entry of the data received. In the 2010 reporting year, the MCWRA received GWESR from 97 percent of the 1846 wells in the Salinas Valley for the 2010 reporting year. Agricultural and Urban Water Conservation Plan submittals for 2011 were 94 percent and 95 percent, respectively. In this IRWM Plan, GWESR are used to establish historic water use trends, document current water use, and as a basis for projecting future water demand in the Salinas Valley Groundwater Basin. The GWESR represents the only reliable source of groundwater extraction information in the region. Therefore these data are considered representative and adequate for developing the IRWM Plan.

Salinas Valley Integrated Ground and Surface Water Model Update (1997): The MCWRA initiated development of the Salinas River Basin Management Plan in 1996 with the specific goals to: stop seawater intrusion; create a long-term balance between recharge and withdrawal in the Salinas Valley Groundwater Basin; and provide a sufficient water supply in the Salinas Valley to the year 2030. The SVIGSM is a hydrologic/operational model that simulates the groundwater and surface water flows and their interaction in the Salinas Valley. The SVIGSM was developed to be the primary analytical tool to analyze the hydrologic and operational impacts of various alternatives presented in the Salinas River Basin Management Plan. The SVIGSM was used to provide a better understanding of the nature of the physical and hydrological processes that govern the groundwater flow system in the Salinas Valley Groundwater Basin, and to analyze the hydrologic impacts of the Salinas Valley Basin Management Plan. Although the SVIGSM was last updated in 1997, it is still considered by MCWRA staff to be the best and most valuable water resource planning tool for managing the Salinas Valley Groundwater Basin, and is therefore considered adequate for use in this IRWM Plan.

Carmel River Surface Groundwater Modeling Project 8: Project 8 of the Integrated Regional Water Management Plan Update is an analysis of the existing modeling efforts on the Carmel River that makes further recommendations based on the current abilities of the Water Management District. The report identified that there is a valuable opportunity for the District staff to develop an integrated surface water/groundwater model to better manage the water resources of the Monterey Peninsula. This work established that the Carmel Valley Simulation Model (the existing CVSIM system) only predicts flow in the Carmel River at 4 locations; in order to better understand and manage the Carmel River and its alluvial aquifer, greater predictability was necessary. In addition, this work identified CVSIM as an operational model that did not physically represent the system as a whole, but rather simulated water demand and pumping without taking into account groundwater flow and its effects on surface water availability.

National Water Quality Assessment Data Warehouse: The United States Geological Survey began the National Water Quality Assessment program in 1991 when it collected chemical, biological, and physical water quality data from 51 basins across the nation. The source data is extracted daily and includes:

- Chemical concentrations in water, bed sediment, and aquatic organism tissues for about 3,000 chemical constituents
- Site, basin, well and network characteristics with many descriptive variables
- Daily stream flow information for fixed sampling sites
- Groundwater levels for sampled wells
- 4,700 surface water sites and 9,500 wells
- 68,000 nutrient samples and 45,000 pesticide samples as well as 13,000 VOC samples
- 2,700 samples of bed sediment and aquatic organism tissues
- Biological community data for fish, aquatic macroinvertebrate, and algae community samples

11.1.3 Watershed and Groundwater Basin Assessments and Management Plans

San Jose Creek Watershed Assessment

In 2012, the RWMG received a Planning Grant to complete a, steelhead-centric, physical watershed assessment that will lead to a prioritized list of watershed management actions for the San Jose Creek watershed. The assessment integrates information from sediment source analysis, hydrologic data, barrier evaluations, and lagoon monitoring. The San Jose Creek Watershed Assessment is included in **Appendix 2-d**.

Carmel River Watershed Planning

The 2004 Carmel River Watershed Assessment[2] identified its highest priority issues to be water quality, declining water quantity, declining riparian habitat for native species, erosion, excessive sediment transport, infiltration, runoff, and flooding. Along with the watershed assessment, the plan identified specific strategies that, if implemented, could improve the Carmel River as a natural and cultural resource. In addition, numerous ongoing technical studies have been occurring related to the Carmel River lagoon, including for the proposed Highway 1 Causeway, Ecosystem Protection Barrier and Coastal Bluff Protection Projects (projects proposed by the Monterey County Resource Management Agency and Public Works Department, Big Sur Land Trust, Carmel River Watershed Conservancy, MPWMD, National Marine Fisheries Service, Carmel River Advisory Committee, among others).

Federal Steelhead Recovery Plan

The federal Endangered Species Act of 1973 requires that the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) develop and implement recovery plans for the conservation and survival of NMFS-listed species. The NMFS completed their Steelhead Recovery Plan in 2013. The goal of the draft Recovery Plan is to prevent the extinction of South-Central California Coast steelhead (*Oncorhynchus mykiss*, or *O. mykiss*) in the wild and to ensure the long-term persistence of viable, self-sustaining populations of steelhead distributed across the South-Central California Coast Steelhead (SCCS) Distinct Population Segment (DPS). It is also the goal of the Recovery Plan to establish a sustainable South-Central California steelhead sport fishery. This report can be accessed online at the NOAA Fisheries West Coast website.[3]

[2] Carmel River Watershed Conservancy, Inc. *Watershed Assessment and Action Plan of the Carmel River Watershed*. California, 2004 (March 31, 2005).

[3] http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/south_central_southern_california_coast/south_cental_southern_california_coast_recovery_plan_documents.html

Seaside Basin Salt and Nutrient Management Plan

State Water Resources Control Board (SWRCB)'s Resolution No. 2009-0011 established a statewide Recycled Water Policy and required preparation of salt and nutrient management plans (SNMP) for each groundwater basin in California by 2014. SNMP are intended to facilitate management of salts and nutrients to optimize recycled water use while ensuring protection of groundwater supply and beneficial uses, agricultural beneficial uses, and human health. The SNMP prepared for the Region is included in **Appendix 2-c**; it identifies sources, transport and fate of salts and nutrients in surface water and groundwater within the Seaside Basin.

The primary objective of the Seaside Basin SNMP is to protect groundwater in the Seaside Basin. To achieve this, programs need to be in place to ensure that water quality regulations are either met or exceeded. This includes activities that can mitigate current problems and evade possible future water quality degradation, such as seawater intrusion.

Stakeholders Involvement is key to success of salt and nutrient planning. The Watermaster Board that includes the City of Seaside, Laguna Seca subarea landowners, Monterey Peninsula Water Management District, City of Sand City, California American Water, City of Del Rey Oaks, Monterey County/Monterey County Water Resources Agency, Coastal subarea landowners, and the City of Monterey. During SNMP development, the Watermaster's Technical Advisory Committee was informed about plan development and was asked to provide direction on key issues.

The SNMP describes regulatory requirements, basin characteristics, including the boundary, physiography, watersheds and hydrology, climate, geologic/hydrogeologic framework, groundwater occurrence, groundwater flow, land uses and land cover, beneficial water uses, surface / storm water quality, groundwater quality, imported water quality, and recycled water quality. It then describes salt and nutrient sources to the basin, both existing and proposed.

The analysis is used to develop strategies to manage salt and nutrient loadings on a sustainable basis in order to maintain a long term supply for the basin's beneficial uses. In the Seaside basin there is a net export of salts and nutrients from the basin because over 2,400 AFY of groundwater is used outside of the basin. Additionally, the bulk of wastewater generated in the basin is exported to a regional plant outside of the basin. Together with injection of Carmel River system water into the basin, these activities improve the groundwater quality of the basin.

For seawater intrusion in the basin, the Watermaster has developed a Seawater Intrusion Response Plan (SIRP) as a contingency plan for responding to seawater intrusion in the Seaside Groundwater Basin, if and when it occurs. Based on the Seaside basin's native groundwater quality and limited number of recycled water projects, managing salt and nutrient loadings on a sustainable basis is feasible with minimal implementation measures. Best Management Practices (BMPs) and public outreach are recommended implementation measures. If necessary, based on future monitoring results, the implementation measures identified in the following sub-sections will be reevaluated and updated measures recommended for future implementation. See **Appendix 2-c** for more information.

The Canyon Del Rey Master Drainage Plan Update

Canyon Del Rey Creek is an ephemeral stream that drains to the Pacific Ocean; the watershed includes portions of Seaside, Del Rey Oaks, Monterey, and unincorporated Monterey County. The MCWRA completed a Master Drainage Plan for the watershed in June 1977. The plan included a hydrologic analysis of existing data, predictions of future flows, a hydraulic analysis of existing facilities, and made recommendations for future improvements. No update of the plan has occurred since completion of the study. Since that time, significant development has occurred, General Plans for cities and unincorporated areas have changed, water quality standards for stormwater runoff have increased, and tools to understand and predict water and sediment flows have improved. The plan is provided in **Appendix 2-e**.

Areas of Special Biological Significance Watershed Planning

See page 12-10, in **Chapter 12, Relation to Local Water Planning,** for details on studies, plans, and monitoring associated with watersheds that drain to Areas of Special Biological Significance.

11.1.4 Land Use Trends

Department of Water Resources Land Use Surveys: DWR land use surveys are typically performed every seven years throughout the state of California and consist of aerial surveys followed by field verification. The main emphasis of DWR's land use surveys is the mapping of agricultural land. Over 70 different crops or crop categories are included in the surveys. Urban and native vegetation (undeveloped) areas are also mapped, though not to the level of detail of agricultural land. The land use surveys are performed using aerial photos and, more recently, satellite imagery to define field boundaries. For this IRWM Plan, land use surveys from 1968-2005 were used to provide an understanding of agricultural vs. urban lands in the Region and as a basis for projecting future land use trends (and therefore, projected water use). The 2005 land use surveys are the latest data available for this Region.

11.1.5 Climate Change

Many climate models have been generated to predict changes in ocean and land temperature, rain frequency and intensity, coastal wave exposure, and sea level rise. Modeling with regional climate models has matured over the past decade to enable meaningful climate vulnerability assessment applications. Cal-Adapt is a web-based climate adaptation planning tool. Cal-adapt allows the user to identify potential climate change risks in specific geographic areas throughout the state. Users can either query by location, or click on an interactive map to explore what climate impacts are projected to occur in their area of interest.

In 2009, California adopted a statewide Climate Adaptation Strategy (CAS) that summarizes climate change impacts and recommends adaptation strategies across seven sectors: Public Health, Biodiversity and Habitat, Oceans and Coastal Resources, Water, Agriculture, Forestry, and Transportation and Energy. The 2009 CAS was the first of its kind in the usage of downscaled climate models to more accurately assess statewide climate impacts as a basis for providing guidance for establishing actions that prepare, prevent, and respond to the effects of climate change. The California Natural Resources Agency, in coordination with other state agencies, is updating the CAS. This update will augment previously identified strategies in light of advances in climate science and risk management options. The update is planned for release to the public as a draft for comment by the end of 2013. For this IRWM Plan, high priority responses along with climate mitigation actions are listed in **Table 15-7, Adaption Response Strategies to the Effects of Climate Change.**

The 2011 Climate Change Handbook for Regional Water Planning, developed cooperatively by DWR, the U.S. Environmental Protection Agency, Resources Legacy Fund, and U.S. Army Corps of Engineers, provides a framework for considering climate change in water management planning. It includes key decision considerations, resources, tools, and decision options to guide resource managers and planners as they develop means of adapting their programs to a changing climate. The handbook uses DWR's IRWM planning framework as a model into which analysis of climate change impacts and planning for adaptation and mitigation can be integrated.

In an analysis prepared for three California state agencies, the Pacific Institute estimates that 480,000 people; a wide range of critical infrastructure; vast areas of wetlands and other natural ecosystems; and nearly $100 billion in property along the California coast are at increased risk from flooding from a 1.4-meter sea-level rise – if no adaptation actions are taken. *The Impacts of Sea-Level Rise on the California Coast* (2009) concludes that sea-level rise will inevitably change the character of the California coast, and that adaptation strategies must be evaluated, tested, and implemented if the risks identified in the report are to be reduced or avoided.

In the Monterey Bay region, a number of communities are integrating climate change adaptation in local planning processes while others are just beginning to grapple with this important issue. To facilitate adaptation to climate change in the Monterey Bay region, the Monterey Bay National Marine Sanctuary (MBNMS) and Center for Ocean Solutions (COS) convened regional decision makers at a one-day workshop, titled "Preparing for the Future: Climate Change and the Monterey Bay Shoreline."

11.3 Data Gaps

Each technical information source that has been used in the development of this IRWM Plan represents the latest or most currently available information available for that source. Each source is broadly considered to be a reliable and acceptable source of information by water resource managers and related professionals in the field. Thus, the information and data that have been used are considered to be representative and adequate for the development of this IRWM Plan.

Nonetheless, some data gaps do exist and are described below.

- *Environmental water needs* ◦ Environmental water needs must be taken into consideration alongside agricultural and urban water needs when considering future water supplies for the Region. Unfortunately, as noted in **Chapter 2, Region Description**, environmental water needs are not well quantified for the Region. The lack of numerical data suggests that environmental water needs may be getting overlooked in water resource planning. Addressing water needs will become more and more critical as ecosystems become increasingly vulnerable to the impacts of climate change. One of the objectives of this IRWM Plan is to "support applied research and monitoring to better understand environmental conditions, environmental water needs, and the impacts of water-related projects on environmental resources." It is the intention of the RWMG to provide quantified data for environmental water needs in future updates of this IRWM Plan.
- *Climate change impact assessment, adaptation and mitigation* ◦ Significant data resources are needed before more accurate vulnerability evaluations can be made. Key data needs that have been identified to date include: 1) a comprehensive coastal elevation map using Light Detection And Ranging (LIDAR) data collected in 2011; 2) a complete inventory of water management infrastructure within the areas identified as vulnerable to the combined impacts of sea level rise and increased rain; 3) an evaluation of future capacity of culverts and tide gates that protect inland wetlands, agriculture, and urban land uses under various sea level rise scenarios; and 4) a cost benefit/effectiveness analysis of coastal protection, adaptation, and retreat options for various categories of coastal infrastructure and land uses.

  At a one-day workshop titled "Preparing for the Future: Climate Change and the Monterey Bay Shoreline," participants that include key stakeholders representing a broad and varied range of interests and individuals representing the Monterey Bay area recommended the following next steps for the region:
  - Improve understanding of local impacts of climate change and develop actionable recommendations for moving forward

  - Design and implement a governance structure for the Monterey Bay region that could aid and coordinate climate change adaptation and related activities
  - Continue the discussion initiated at the workshop by building a regional network of people interested in or working on climate change adaptation
  - Expand the scope of stakeholder involvement to include in-person discussions and engage coastal business owners, landowners and the general public
  - Create a technical advisory group on climate change adaptation for the region
  - Actively use the Internet as a way to connect and educate the regional community
  - Jointly apply for funding to support coastal climate change adaptation work in the region
  - Develop climate change projection data at a scale fine enough to use for local planning
  - Consider a public engagement campaign to help increase awareness about the need for climate adaptation planning and preparation
- *Watershed assessments* ◦ The San Jose Creek Watershed Assessment (Balance Hydrologics, 2014) concludes that future opportunities would provide valuable data: Based on monitoring performed within the scope of this study, the physical attributes of the lagoon will likely not support the same suite of habitat values characterizing other coastal lagoons. Balance suggested that a biological reconnaissance identify the potential uses of the lagoon, such that a more site-specific set of observation can be made. The anomalously dry year in which the necessarily limited study was conducted should be balanced with an additional more thorough coastal dynamic and fluvial study to better answer how often the lagoon will open. Littoral processes and tidal dynamics play a large role in lagoon opening. A recommended study to understand the lagoon cycling and evolution would combine a study of coastal dynamics, hydrologic analysis, and further geologic investigations of the Monastery Beach area. In addition, Balance recommended future efforts to assess the remaining approximately 74 mi of road/trail within the watershed. The assessment(s) should identify and quantify all sources of future erosion and provide recommended treatments to reduce erosion and prevent future sediment delivery. In addition, a prioritized, treatment plan complete with a cost estimate and necessary labor and equipment needs should be a deliverable product. For more information see **Appendix 2-d**.
- *Instream flow modeling* ◦ The Monterey Peninsula Water Management District study Project 8 (see 11.1.2) makes recommendations for future studies and data analysis of the Carmel River and its alluvial aquifer. The District should identify a path forward to replace CVSIM with a model that 1) can simulate the physical processes of the Carmel River Watershed, 2) is built on peer reviewed and industry accepted code, and 3) can be operated and maintained in house for the foreseeable future. Following the recommendations of this study, staff has identified GSFLOW as the model that best meets the outlined requirements and will allow the District to carry out water supply planning, secure future water rights from the Carmel River, and predict the effects of climate change on the resource. MPWMD engaged with a consultant to conduct the new modeling effort. For more information see Section 11.1.2.

Note that all of the data and information contained in this IRWM Plan will be reviewed and updated approximately every five years, depending on available funds, as part of the formal IRWM Plan update. Some data will be reviewed on a more frequent basis; for example, MHI data will be reviewed prior to every Proposition 84 Implementation Grant solicitation, using the ACS five-year survey estimates, in order to determine the status of DACs in the Region.

Chapter 12 Relation to Local Water Planning

IRWM Plan Standard 12
The IRWM Plan must document the local water planning documents on which it is based including: • A list of local water plans used in the IRWM Plan. • A discussion of how the IRWM Plan relates to planning documents and programs established by local agencies. • A description of the dynamics between the IRWM Plan and local planning documents.

12.1 Introduction

The intent of the Relation to Local Water Planning standard in the Proposition 84/1E Integrated Regional Water Management (IRWM) Program Guidelines is to ensure that the Plan is congruent with local plans and that it includes current, relevant elements of local water planning and water management issues common to multiple local entities in the Monterey Peninsula IRWM region (Region). IRWM planning does not replace or supersede local planning; rather, local planning elements are used as the foundation for the regional planning effort. This chapter describes how the Monterey Peninsula Regional Water Management Group (RWMG) coordinates its water management planning activities to address or incorporate all or part of the following actions of its members.

Local Water Plans Used in the IRWM Plan

The following documents were used as references to guide the overall planning efforts of the RWMG and to serve as a resource to guide the stakeholders in water management planning.

Local water supply management planning:

- Groundwater management plans
- Urban water management plans
- LAFCO Municipal Services and Sphere of Influence Reviews
- Flood Protection and Floodplain Management
- Watershed management
- Stormwater management[1]

Additional planning documents were reviewed for water resource considerations. A number of resource documents that were used are not necessarily considered "local water plans," but are critical planning documents directly relevant to the Monterey Peninsula water planning efforts:

- Water Quality Control Plan for the Central Coast Basin Plan
- City and County general planning
- Monterey Bay National Marine Sanctuary Plan
- Federal Steelhead Recovery Planning Emergency response and disaster plans

[1] This includes low impact development (LID) ordinances and regulations

12.2 How Local Resource Plans Relate to the IRWM Plan

The goals and objectives for this Plan have been developed in response to the perceived water resource issues in the Region. The water resource goals for this Plan are provided in **Chapter 3, Goals and Objectives**.

In order to achieve these goals, the RWMG started with a foundational understanding of the Region's water systems, which include not only water supply (groundwater, surface water, recycled water, desalinated water, etc.) but a holistic view of the water systems (watersheds, floodplains, wetlands, and the nearshore and ocean waters). The information used to describe the Region's water system was derived from existing local and regional water resource management plans, which are described in more detail, below.

12.2.1 Water Quality Control Plan for the Central Coast Basin

The Central Coast Regional Water Quality Control Board (RWQCB) relies on its adopted "Water Quality Control Plan for the Central Coast Basin Plan" (Basin Plan) to manage surface and groundwater in order to provide the highest water quality reasonably possible. The geographic scope of the Basin Plan covers a 300-mile long section of the central coast, from Santa Cruz to Santa Barbara, making the area relevant to the IRWMP Plan. The Basin Plan lists beneficial uses and describes water quality objectives to maintain water quality, describes programs, projects, and other actions to achieve the plan's standards, summarizes plans and policies to protect water quality, and describes statewide and regional monitoring programs (CCRWQCB, 2009).

The Central Coast RWQCB implements the Basin Plan by issuing and enforcing pollution standards: 1) waste discharge requirements (non-water body discharges); 2) National Pollutant Discharge Elimination System permits (surface water body discharges) for point source discharges, water-quality based effluent limitations, prohibitions of discharge, and the review and establishment of Total Maximum Daily Loads.

Water bodies in the Basin Plan are designated by one or more beneficial uses:

- Domestic, municipal, agricultural, and industrial supply
- Power generation
- Recreation
- Aesthetic enjoyment
- Navigation
- Preservation and enhancement of fish, wildlife, and other aquatic resource

Monitoring for compliance is accomplished through various programs and agencies: discharger self-monitoring is required under WDRs and NPDES permits; the Central Coast Ambient Monitoring Program (CCAMP)[2], Surface Water Ambient Monitoring Program (SWAMP), and the Groundwater Ambient Monitoring and Assessment (GAMA)[3] Program are used by the RWQCB.

[2] CCAMP is a regionally-scaled water quality monitoring and assessment program to provide scientific information to Regional Board staff and the public, to protect, restore, and enhance the quality of the waters of central California.

[3] GAMA collects data by testing the untreated, raw water in different types of wells for naturally-occurring and man-made chemicals. GAMA compiles these test results with existing groundwater quality data from several agencies into a publicly-accessible internet database, GeoTracker GAMA.

12.2.2 Seaside Groundwater Basin Management

This section provides an overview of the Seaside Groundwater Basin (SGB or Basin) court ordered adjudication, Monitoring and Management & Implementation Plans, Basin Management Action Plan, and Seawater Intrusion Response Plan.

Historical and persistent low groundwater elevations caused by pumping led to concerns that seawater intrusion may threaten the Basin's groundwater resources. In 2006, an adjudication (*Cal-Am v. City of Seaside et al*.) led to the issuance of a Monterey County Superior Court decision that created the Seaside Groundwater Basin Watermaster (Watermaster). The court concluded that groundwater production within the SGB exceeded the "Natural Safe Yield"[4] and therefore a physical solution was established to prevent seawater intrusion and its deleterious effects on the Basin. The Watermaster consists of nine representatives, one representative from each: Cal-Am, City of Seaside, Sand City, City of Monterey, City of Del Rey Oaks, Monterey Peninsula Water Management District and Monterey County Water Resources Agency, and two representatives from landowner groups. In 2012, the Watermaster evaluated water levels in the basin and determined that while seawater intrusion did not appear to be occurring, water levels were lower than those required to protect against seawater intrusion. Water levels were found to be below sea level in both the Paso Robles (the shallower aquifer) and the Santa Margarita aquifers of the Seaside Basin. The threat of seawater intrusion is being reduced through triennial pumping reductions which end in 2021 at the Natural Safe Yield of 3,000 acre-feet per year (AFY).

The Watermaster Technical Advisory Committee (TAC) has modeled several levels of groundwater recharge to the basin and concluded that supplemental water supply (injection well replenishment) is necessary to recover water levels to prevent seawater intrusion. There is a desire to achieve these levels within 20 to 25 years. Estimates of how much injection is required vary, but 750 to 1,000 AFY have been discussed. The Watermaster Board is considering how such a project would be financed and is encouraging local entities such as Cal-Am, MPWMD, and MRWPCA to consider planning for such a water supply project.

In addition to the creation of a Watermaster, the court mandated a Monitoring and Management Plan (M&MP) be developed; the M&MP was completed in May 2006. The purpose of the Seaside Basin M&MP and its associated Implementation Plan (2007) was to establish a logical, efficient and cost-effective work plan to meet the requirements of the Seaside Basin Adjudication. The Implementation Plan contains a description of the phases identified for the Implementation Plan work effort, a detailed scope, budget and schedule of tasks planned, as well as a summary of other projects underway that, in addition to implementation of the M&MP, will develop solutions to the threat of seawater intrusion and establish a maximum perennial yield for the producers who rely on the Seaside Basin for their water supply.

In 2008 and 2009, the Watermaster through their consultant, Hydrometrics, prepared the Seawater Intrusion Response Plan and the Basin Management Action Plan. The Seawater Intrusion Response Plan is the Watermaster's contingency plan for responding to seawater intrusion in the SGB, if and when it occurs. The Seawater Intrusion Response Plan details both the indicators of seawater intrusion, and a list of recommended actions to be taken if seawater intrusion is observed. The Basin Management Action

[4] "Natural Safe Yield" was defined as "the quantity of Groundwater existing in the Seaside Basin that occurs solely as a result of Natural Replenishment" (California American Water v. City of Seaside, et al., Case No. 66343 (Monterey County Superior Court, 2006).

Plan describes the existing condition, identifies supplemental water supplies, groundwater management actions, and other recommendations, including a recommendation for development and use of a hydrogeologic model to evaluate proposed projects that may harm or benefit the project.

12.2.3 Urban Water Management Plans

All urban water suppliers (as defined in California Water Code §10617), either publicly or privately owned, that provide water for municipal purposes (either directly or indirectly) to more than 3,000 customers, or that supply more than 3,000 acre-feet (AF) annually are required to prepare an Urban Water Management Plan (UWMP). The UWMP serves as a long-range planning document for water supply, source data for development of a regional water plan, and a source document for cities and counties as they prepare their General Plans. In addition, the UWMP includes a description of the service area (including population served), historical and current water demand and water demand projections, an overview of water system supplies (including purchased water, surface water, groundwater, recycled water, desalinated water, and water transfers), water supply reliability and water shortage contingency plans, and conservation master plans, among other topics.

For the IRWM planning process, the following UWMPs were used:

- Marina Coast Water District (2012)
- California American Water -Monterey District (2012)

Information from these UWMPs has been used to describe water systems and to establish future urban water demand in the in the IRWM planning region. The City of Seaside Municipal Water System serves fewer than 3,000 connections; therefore, it is not required to prepare a UWMP.

12.2.4 LAFCO Municipal Services Reviews

The Local Agency Formation Commission of Monterey County (LAFCO) produces Municipal Service and Sphere of Influence Reviews (MSR) for urban areas and other planning districts within the county. State law requires that the LAFCO conduct periodic reviews and updates of the Sphere of Influence of each city and district in Monterey County (Government Code §56425(e)). The law also requires that the Commission update information about municipal services before adopting sphere updates (Government Code §56430). The MSR contain information pertinent to understanding the water management and water management needs in the Region: growth and population projections; present and planned land uses in the area, including agricultural and open space lands; description of present and planned public facilities, including water supply, wastewater, stormwater, and flood management infrastructure; and adequacy of public services, including infrastructure deficiencies and needs.

The following MSRs have been used in the development of this IRWM Plan:

- City of Carmel-by-the-Sea (2011)
- City of Del Rey Oaks (2011)
- City of Marina (2011)
- City of Monterey (2011)
- City of Pacific Grove (2011)
- City of Sand City (2011)
- City of Seaside (2011)
- Pebble Beach Community Services District (2007)

- Carmel Area Wastewater District (2006)
- Seaside County Sanitation District (2007)
- Monterey Peninsula Water Management District (2007)
- Marina Coast Water District (2007)

The specific information derived from these MSRs includes population and population growth data, land use, and water resource infrastructure and needs for the cities and planning districts within the Region.

12.2.5 Flood Protection and Floodplain Management

Monterey County Floodplain Management Plan: The MCWRA first developed the *Monterey County Floodplain Management Plan* in 2002 with the goal of creating a plan to minimize the loss of life and property in areas where repetitive losses have occurred, and to ensure that the natural and beneficial functions of the county's floodplains are protected. Updated in 2008, the plan describes the county's flood control system (infrastructure), identifies flood zones defined by the Federal Emergency Management Agency, including maps depicting Repetitive Loss Properties (RLP) and 100-year floodplains, provides a general hazard assessment, assesses the flood hazards of specific waterways in the county in terms of repetitive losses, and provides an implementation plan for flood mitigation and for mitigation of RLPs.

Information from the Floodplain Management Plan has been used in the IRWM Plan to provide the RWMG and stakeholders with an understanding of flooding, flood protection, and floodplain management in the Region. The Flood Protection and Floodplain Management objectives in this IRWM Plan incorporate and are fully consistent with the objectives of the *Monterey County Floodplain Management Plan*. In addition, the Carmel River Lagoon projects in the IRWM Plan will help achieve these objectives through flood risk reduction and restoring ecological function to floodplains.

12.2.6 Watershed Management

Information from current and recent watershed assessments and management plans is included in this IRWM Plan to provide background for the RWMG and stakeholders about local watershed management planning efforts. The goals and objectives of this IRWM Plan are congruent with the various watershed management planning efforts in the Region. In fact, many of the objectives in this Plan were derived from previous watershed assessment and planning efforts.

San Jose Creek Watershed Assessment

In 2012, the RWMG received a Planning Grant to complete a, steelhead-centric, physical watershed assessment that will lead to a prioritized list of watershed management actions for the San Jose Creek watershed. The assessment integrates information from sediment source analysis, hydrologic data, barrier evaluations, and lagoon monitoring.

San Jose Creek flows through a 14.2-square mile, steep, rugged, steelhead-bearing watershed that empties into the Pacific Ocean near the southern head of Carmel submarine canyon. Promoting the steelhead run is one of the regional priorities in the IRWM Plan. Salmonid[5] recovery can only occur if "major limiting factors" are prioritized and addressed, and a resource management or watershed plan

[5] "Salmonid" refers to the family of bony fishes that have the last three vertebrae upturned. This includes salmon, trout, and whitefish; in this instance, it is referring to the South-Central California Coast Steelhead population.

contains the major salmonid-limiting factors for the South-Central California Coast Distinct Population Segment.

The work plan for the IRWM planning grant includes an assessment of the sediment, flows, and steelhead passage barriers in San Jose Creek and also the San Jose Creek lagoon's connectivity to the ocean. Recommended habitat improvements will be included in a formal Watershed Plan.

The findings and recommendations of the San Jose Creek Watershed Study are based on data from an unusually dry year. The anomalously dry year in which the study took place resulted in a more limited study on both sediment transport and the lagoon. Sediment transport in the Creek was observed as low, however long-term sediment yields could be up to two times higher than observed since those periods may be more active than the period of study. This sediment movement, or erosion, is of greatest concern for both long-term restoration and fish habitat. Recommendations for future work were as follows:

- A study to understand the lagoon cycling and evolution
- A qualitative road and trail assessment
- Treatment of identified instream sites

Finally, it is recommended that 14 of the 57 inventoried sites receive treatment to reduce sediment, improve instream habitat, and possibly improve fish migration.

Carmel River Watershed Planning

The 2004 Carmel River Watershed Assessment[6] identified its highest priority issues to be water quality, declining water quantity, declining riparian habitat for native species, erosion, excessive sediment transport, infiltration, runoff, and flooding. Along with the watershed assessment, the plan identified specific strategies that, if implemented, could improve the Carmel River as a natural and cultural resource.

The Watershed Assessment identified threatened species that inhabit the Carmel River Watershed. The current steelhead population is below historic numbers for the Carmel River and is well below populations found in Northern California coastal streams due, in part, to habitat fragmentation and degradation. In addition, the California red-legged frog was found in many areas of the watershed but little is known about its population structure.

Erosion, bank instability, and many other sediment contributors have been accelerated by land development for residential and agricultural purposes. The Watershed Assessment indicated that proper landscaping and restoration of the riparian-wetland habitat could help mitigate these impacts.

Since its adoption in 2004, the Plan has been consulted by stakeholders and water agencies when developing water management policies and projects. Similarly, information in the Assessment was also used throughout this IRWM planning process to form objectives and develop regional priorities. The following objectives align closely with the suggestions presented in the Carmel River Watershed Assessment:

- Meet or exceed water supply requirements set by the SWRCB WRO 95-10 and CDO 2009-0060
- Improve Carmel River water quality for environmental resources and recreational use

[6] Carmel River Watershed Conservancy, Inc. *Watershed Assessment and Action Plan of the Carmel River Watershed*. California, 2004 (March 31, 2005).

- Develop regional projects and plans necessary to protect existing infrastructure and sensitive habitats from flood damage and erosion resulting from the 100-year event
- Protect and enhance sensitive species and their habitats in the regional watersheds
- Minimize adverse effects on biological and cultural resources when implementing strategies and projects

The following regional priorities were developed with input from the Carmel River Watershed Assessment:

- Flooding in the Carmel Valley and the Carmel River Lagoon
- Mitigate stormwater runoff throughout the Carmel River watershed
- Promote the Steelhead run
- Eight action categories in order of sequence to the watershed: flows, groundwater, habitat, sedimentation, steelhead, education, public safety, and water quantity
- A total of 57 actions were recommended in the Action Plan

The Carmel River Watershed Conservancy (CRWC), in collaboration with the Planning and Conservation League Foundation, published a Supplemental Action Plan specifically addressing the plans for the removal of the San Clemente Dam. The original Assessment and Action Plan (2004) identified the San Clemente Dam as a major impediment to fish passage for the South Central Coast Steelhead and a major blockage to transport of sediment and the cobble that the steelhead depend on for healthy spawning grounds. In 2007 CRWC in collaboration with the Carmel River Task Force (CRTF) and utilizing grant funds from the Planning and Conservation League Foundation, published a revised Action Plan that set priorities for action items from the original Action Plan (Carmel River Watershed Conservancy, 2014).

The CRWC, CRTF, the Resource Conservation District of Monterey County, and the Central Coast Watershed Studies Team at CSUMB, is currently preparing a Carmel River Watershed Management Plan. The objectives of the watershed management plan are to assess existing conditions, prioritize limiting factors for steelhead, and identify and prioritize restoration recommendations, which would address these limiting factors and improve physical functions and ecological conditions in the watershed. The plan is anticipated to be completed in 2014.

Salt and Nutrient Management Plans

The SWRCB adopted a Recycled Water Policy in February 2009, which requires local stakeholders, such as local water and wastewater entities, and members of the public to develop salt and nutrient management plans for groundwater basins. The Policy mandates completion of the salt and nutrient management plans by May 14, 2014, although it allows the Central Coast RWQCB to permit a two-year extension (until May 14, 2016) if the stakeholders demonstrate substantial progress toward completion of the plan.

The salt and nutrient management planning effort for the Seaside Groundwater Basin was completed in April 2014. A summary of the SNMP is included in **Chapter 11, Technical Analysis**.

12.2.7 Stormwater Management/Planning

The 1987 amendments to the Clean Water Act, Section 402(p), provide a framework for regulating certain stormwater discharges under the National Pollutant Discharge Elimination System (NPDES) program. Separate permits are required for municipal, industrial, and construction activities.

Since March 10, 2003, municipal stormwater permits for urbanized areas in the Monterey Peninsula Planning Area have been covered under EPA's Stormwater Phase II Final Rule (December 1999), which established application requirements for stormwater permits for additional operators of MS4s in urbanized areas. In 2000, the Cities in the South Monterey Bay area (Monterey, Carmel-by-the-Sea, Del Rey Oaks, Sand City, Seaside, Marina, and Pacific Grove), Monterey County, and the Pebble Beach Company formed a Working Group to develop a stormwater management program and secure a Phase II NPDES permit from the Central Coast RWQCB. The Working Group developed the Monterey Regional Stormwater Management Program (MRSWMP) and permit coverage was issued by the Central Coast RWQCB in September 2006. The MRSWMP is currently being implemented by the participating entities. Under the permit, there are six types of pollution control activities: public education, pollution source identification and abatement, water quality monitoring, land use regulations, construction site regulation and control of municipal operations.

The MRSWMP contains a series of stormwater quality management practices, referred to as "Best Management Practices" (BMP). These BMP are designed to reduce the discharge of pollutants from the municipal separate storm sewer systems to the "maximum extent practicable," to protect water quality, and to satisfy the appropriate water quality requirements of the Clean Water Act.

On February 5, 2013, the State Water Resources Control Board adopted new Phase II permit requirements, mandating that all small local governments submit a Notice of Intent for a new permit by July 1, 2013 and terminating the requirements of the previous permit cycle. The new program requires additional information be added to the existing permit in order for full compliance. In 2013-2014, the MRSWMP management committee will be meeting with staff from the Central Coast Regional Water Quality Control Board, which has the responsibility to oversee permit implementation, to negotiate updates to the MRSWMP in light of the new permit.

Stormwater associated with industrial activities that discharge either directly to surface waters or indirectly through separate municipal storm sewers must be regulated by an NPDES permit (Water Quality Order No. 97-03-DWQ, General Permit No. CAS000001).

Currently, the State Board has adopted a separate statewide general permit for construction activities disturbing an area greater than one acre (Order No. 2012-0006-DWQ, NPDES No. CAS000002). The intentions of this permit are to eliminate or reduce non-stormwater discharges to storm sewer systems and other waters, and to implement and perform inspections of BMPs. State agencies such as CALTRANS, municipal agencies and private construction activities are subject to this permit.

Stormwater management programs and plans are discussed in this IRWM Plan **Chapter 2, Region Description**. Information from these stormwater programs and plans has been incorporated into the IRWM Plan in order to inform the RWMG and stakeholders about local stormwater management as part of the region's water system. The goals and objectives of the IRWM Plan support the stormwater management efforts described in these plans (as indicated in the IRWM Plan objective to capture and manage stormwater runoff).

The Canyon Del Rey Master Drainage Plan Update

Canyon Del Rey Creek is an ephemeral stream that drains to the Pacific Ocean; the watershed includes portions of Seaside, Del Rey Oaks, Monterey, and unincorporated Monterey County. The MCWRA completed a Master Drainage Plan for the watershed in June 1977. The plan included a hydrologic analysis of existing data, predictions of future flows, a hydraulic analysis of existing facilities, and made recommendations for future improvements. No update of the plan has occurred since completion of the study. Since that time, significant development has occurred, General Plans for cities and unincorporated areas have changed, water quality standards for stormwater runoff have increased, and tools to understand and predict water and sediment flows have improved.

The update to the 1977 plan was a cooperative effort between MCWRA, the City of Seaside, and the MPWMD. Other contributing agencies include the City of Monterey and the Monterey Peninsula Regional Park District. The Plan update was completed in 2014.

Balance Hydrologics, Inc. prepared the Canyon del Rey Master Drainage Plan Update project funded by the IRWM Planning Grant. The purpose of the project was to evaluate known drainage problems in the Canyon del Rey watershed and update a 1977 drainage study, especially concerning head-cutting in Canyon Del Rey Creek (the creek or CdR creek) and culvert sedimentation of road drainage facilities. Laguna Grande and Roberts Lakes, located at the terminus of the watershed, continue to experience sedimentation and have a reduced flood control capacity.

The study area is made up of 37 sub-watersheds. The size of these sub-watersheds varies from 8 acres to 1.88 square miles. Significant portions of the watershed to the south of Highway 68 are sparsely developed and contain steep slopes (>25%) rising up to 1,300 feet in elevation with a mix of coastal scrub, pine, and oak woodlands. Most of the runoff to the creek is from this area, which is rated as a fire hazard and thus can undergo episodes with high rates of erosion. The west end of the basin, in the Cities of Monterey, Seaside, and Del Rey Oaks there is a high degree of urbanization and development.

The most recent update of the FEMA Flood Insurance Rate Map (April 2, 2009) shows zones of shallow flooding in the 100-year event that would affect residences and businesses adjacent to the creek between Roberts Lake and the intersection of Highway 68/Highway 218 would be inundated during a 100-year flood. The first Technical Memorandum prepared for this Drainage Plan Update analyzes precipitation and rainfall depth data, to be used for hydrologic modeling.

The second Technical Memorandum summarized the hydrologic modeling. The methodology used incorporates generally accepted best practices for flood analysis, management, and design which can be executed with available information regarding the local rainfall and watershed conditions. Runoff was calculated from precipitation in each sub-watershed using parameters including slope, sub-watershed geometry, percent impervious area, soil type, ground cover, and antecedent moisture.

The highly pervious nature of watershed soils, particularly on the north side of the valley enables the watershed to absorb and retain large amounts of rainfall before substantial runoff is initiated. The HEC-HMS model of the watershed was used to produce runoff rates and volumes for the sub-watersheds, flow results for stream channels, operational data for the storage basins, and performance data for the culverts.

City of Seaside Stormwater Master Plan

The City of Seaside owns, operates, and maintains a storm drain collection system within the city limits, as well as the 90-inch diameter Bay Avenue outfall in Sand City. This system conveys storm runoff out of the city through two ocean outfalls. The purpose of Phase 1 of the Master Plan is to: 1) investigate certain documented existing system deficiencies and develop preliminary improvement projects for inclusion into a potential capital improvement program (CIP); 2) develop a program to meet requirements for operating, maintaining and inspecting the City's storm drainage system; 3) develop a preliminary CIP to address the known system deficiencies and prioritize projects; and 4) prepare a stormwater utility fee study on the basis of the proposed CIP, operations and maintenance, inspection, NPDES commitments and future Stormwater Master Plan study phases. This report was originally developed in 2008 and has been updated in 2013 to reflect new requirements prescribed by the 2013 update of the NPDES Phase II Stormwater Program permit.

This plan was used to complement efforts to update the Canyon Del Rey Drainage Study, which contains a portion of Seaside within the watershed.

12.2.8 Areas of Special Biological Significance

There are 34 State-designated Areas of Special Biological Significance (ASBS) along the California Coast, two of which are located in the Monterey Peninsula IRWM region: Carmel Bay and Pacific Grove. On March 20, 2012, the State Water Resources Control Board adopted a General Exception to the California Ocean Plan for Areas of Special Biological Significance Waste Discharge Prohibition for Storm Water and Nonpoint Source Discharges, with Special Protections (ASBS Special Protections). The ASBS Special Protections can be summarized generally to eliminate dry weather runoff, ensure that wet weather runoff does not alter natural water quality in the ASBS, and that adequate monitoring be conducted to determine if natural water quality and the marine life beneficial use is protected. The ASBS General Exception and Special Protections documents are available online[7].

The ASBS Special Protections require water quality monitoring, and provide for the option of creating regional monitoring programs. In early 2013, the Central Coast ASBS Regional Monitoring Program was established through a Memorandum of Agreement for all dischargers on the Central Coast, covering an area from Big Sur, in Monterey County, to Pt. Reyes, in Marin County. The responsible parties include: the Cities of Carmel, Monterey and Pacific Grove, the Counties of Marin, Monterey and San Mateo, Caltrans, the Pebble Beach Company, Stanford University Hopkins Marine Station and the Monterey Bay Aquarium.

The results of the Central Coast ASBS Regional Monitoring will establish the "natural water quality" objectives to be met by the ASBS Special Protections. The Scope of Work for the Central Coast ASBS Regional Monitoring Program was developed by responsible parties discharging storm water into ASBS in conjunction with the State and Regional Water Boards. The monitoring includes water quality sampling of all separate storm sewer system (MS4) outfalls over 18-inches in diameter that discharge stormwater to an ASBS, as well as receiving water quality monitoring at outfalls over 36-inches in diameter, reference site monitoring, and other regional elements such as rocky intertidal and bioaccumulation monitoring.

The Monterey Regional Water Pollution Control Agency (MRWPCA) agreed to act as Program Administrator on behalf of the group in the Memorandum of Agreement (MOA). The MOA is based on the existing Monterey Regional Stormwater Program (MRSWMP). The ASBS Special Protections are being incorporated into the NPDES MS4 Stormwater Permits; therefore, the MRWPCA's role as the Program Administrator is an extension of its role in the MRSWMP.

The cities of Pacific Grove and Monterey have proposed the ASBS Stormwater Management Project, which includes enhancing Pacific Grove existing dry weather urban runoff diversion system that

[7] http://www.waterboards.ca.gov/water_issues/programs/ocean/asbs.shtml

connects Pacific Grove's storm drain system to the MRWPCA system, to be able to divert some wet weather flows. The City of Pacific Grove has an existing dry weather diversion system that diverts urban runoff from Pacific Grove's storm drain system into the MRWPCA regional wastewater collection system.

The primary goal of the Pacific Grove ASBS Stormwater Management Project is to improve stormwater quality discharged into the ASBS located along the Pacific Grove coastline. Providing an additional source of water supply for recycling is a secondary goal of the project. This project is the most advanced Monterey Peninsula urban runoff project under consideration, with conceptual engineering complete and a Final EIR planned to be certified by June 2014. However, final design of the ASBS Stormwater Management Project is pending the findings of the Central Coast ASBS Regional Monitoring Program that will establish the ASBS water quality parameters and determine treatment requirements, and therefore, is not planned to occur until 2015.

The ASBS Stormwater Management Project would allow the City the flexibility to either direct runoff to a new Point Pinos stormwater facility or to capture runoff and convey it to the MRWPCA Regional Wastewater Treatment Plant in Marina. The design storm for the project is 85th percentile event, defined as a 24-hour storm with a rainfall volume of 0.8 inches. The total volume of wet weather flows to be managed by this project is estimated to be 626 AFY, with approximately 580 AFY 85th percentile or smaller storms.

The ASBS Stormwater Management Project is comprised of five associated sub-projects located primarily in the City of Pacific Grove, with a portion of one project located in the City of Monterey. The five projects include:

- Upgrading and restoring the retired David Avenue Reservoir, adjacent to the intersection of David Avenue, Terry Street, and Carmel Avenue;
- Modifying the Pine Avenue drainage system between 7th Street and 18th Street;
- Modifying the Ocean View Boulevard drainage system from Forest Avenue west to the retired Pacific Grove Wastewater Treatment Plant near Point Pinos;
- Installing a new stormwater treatment system at the former Pacific Grove Wastewater Treatment Plant site, located on the Pacific Grove Golf Links; and
- Upgrading the dry weather diversion system along the Ocean View Boulevard right-of-way from Forest Avenue east to David Avenue to enable the diversion of wet weather flows to the Regional Wastewater Treatment Plant.

The existing dry weather diversion system is sized to convey 200 gpm to the MRWPCA, and includes five pump stations, and over 6,800 feet of conveyance pipeline. The project component to upgrade and expand the existing dry weather diversion system is to increase the capacity of the existing dry weather diversion system to be able to divert up to the 85th percentile wet weather storm to the MRWPCA. The average annual wet weather runoff to the MRWPCA collection system through the last project component listed above is approximately 173 AFY, with an average of the 85th percentile or smaller events generating approximately 143 AFY that would be diverted to MRWPCA.

Table 12-1: Urban Diversion Pump Station Estimated Peak Flows to MRWPCA

Urban Diversion Pump Station	Pumps To:	Summary of Peak Flow tp each Pump Station During 85% Storm Event (gpm)
Lovers Point	Fountain	5
Fountain	MRWPCA	78
Total To MRWPCA		78
Eardley	Berwick	2724
Berwick	Greenwood Park	4526
Greenwood Park	MRWPCA	5356
Total To MRWPCA		5356

The existing pump stations at Eardley, Berwick and Greenwood Park would need to be upsized to accommodate increased flows. Within the Lovers Point and Fountain section of the existing system pipelines are adequate for delivery of the 85% event to the MRWPCA. If the Pine Avenue component is not first constructed, peak flows to the diversion system would increase as it runoff from a larger area of the watershed would be captured.

Engineering elements proposed for stormwater conveyance to the MRWPCA are listed below:

- Upsized Pump Station at Eardley
    - Duplex Dry Pit Pump Station, 1,900 gpm capacity
- Upsized Pump Station at Berwick
    - Duplex Dry Pit Pump Station, 3,500 gpm capacity
- Upsized Pump Station at Greenwood Park
    - Duplex Dry Pit Pump Station, 4,150 gpm capacity
- Storm Drain Conveyance:
    - Pipe-splitting approximately 1,100 LF of pipeline
    - 6x Hydrobrake installations

The Point Pinos Stormwater Treatment Plant project component would further add to the total amount of urban runoff diverted to the Regional Treatment Plant (i.e., to benefit the proposed Groundwater Replenishment Project or other recycled water use). Approximately 417 AFY to 434 AFY of additional wet weather flows would be routed to this project component, which could then potentially be diverted to MRWPCA at the Coral Street pump station if capacity is available in the MRWPCA system to accept the flow rates from the treatment plant.

12.2.9 City and County General Planning

The policies of the General Plans for Monterey County and the cities in the Monterey Peninsula planning region (Carmel-by-the-Sea, Del Rey Oaks, Monterey, Pacific Grove, and Sand City) are generally consistent with the goals and objectives of the IRWM Plan (**Chapter 13, Table 13-1** identifies all General Plans of the Monterey Peninsula).

The introduction to the Monterey County General Plan (2010) Conservation and Open Space element summarizes its overarching goal: *The County's intent is not to alter existing regional, state or federal laws and regulations, but rather to enable greater cooperation among public agencies and the public to share management responsibilities in accomplishing the shared goal of conserving and protecting the resources of the region.*

The theme that links all the General Plans with the IRWM Plan is the preservation of valuable natural resources through environmentally responsible solutions. However, the land use plans have a limited reach where the management of those resources is concerned. Land uses, zoning, in a municipal code can not necessarily accomplish what a collaborative resource management planning document that crosses jurisdictional and political boundaries can aspire to achieve. General Plans express a county's development goals and embody public policy on future land uses. The IRWM fills in the gaps where water supply and water quality may not be covered.

Several area plans may also have specific water use components that are consistent with policies in the Monterey County 2010 General Plan: Cachagua Area Plan, Carmel Valley Master Plan, Carmel Area Land Use Plan, Del Monte Forest Land Use Plan, Greater Monterey Peninsula Area Plan, and Fort Ord Reuse Plan.

12.2.10 Emergency Response and Disaster Plans

Monterey County Multi-Jurisdictional Hazard Mitigation Plan (2007): The Disaster Mitigation Act of 2000 (DMA 2000) (Public Law 106-390) was passed by Congress to emphasize the need for mitigation planning to reduce vulnerability to natural and artificial hazards. For multi-jurisdictional plans, DMA stipulates that the plan be adopted by the participating local governing bodies. The Hazard Mitigation Plan for Monterey County was developed for the Monterey County Office of Emergency Services in 2007 and was adopted by County of Monterey and the cities of Carmel-by-the-Sea, Del Rey Oaks, Gonzales, Greenfield, King City, Marina, Monterey, Pacific Grove, Salinas, Sand City, and Soledad. The plan includes a hazard analysis (including coastal erosion, dam failure, earthquake, flood, hazardous materials event, landslide, tsunami, wildland fire, and windstorm), a vulnerability analysis, and a mitigation strategy.

Emergency response and disaster planning involves water resource planners both in the preparation and mitigation phases. Preparation includes, for example:

- Locating and constructing water supply, wastewater, and other infrastructure in such a way to reduce the effects of earthquakes, floods, tsunamis, and other disasters (Goal 1: Promote disaster-resistant development)
- Helping coastal residents minimize erosion and stabilize slopes (Goal 3: Reduce the possibility of damage and losses due to coastal erosion)
- Participating in California Division of Safety of Dams (DSOD) mapping updates and reviewing and updating County inundation maps regularly (Goal 4: Reduce the possibility of damage and losses due to dam failure)
- Identifying and implementing minor flood and stormwater management projects to reduce damage to infrastructure due to local flooding/inadequate drainage, including the modification of existing culverts and bridges, upgrading capacity of storm drains, stabilization of streambanks, and creation of debris or flood/stormwater retention basins in small watersheds (Goal 6: Reduce the possibility of damage and losses due to floods)

Mitigation includes, for example, mitigating property damage following flood events, plans for ensuring the delivery of water following disaster events, and plans for managing the response effort.

Monterey County, in coordination with all of its incorporated municipalities, is preparing a comprehensive update to its Multi- Jurisdictional Hazard Mitigation Plan. The 2013-2014 plan update process is being led by Monterey County's Office of Emergency Services, with technical assistance from AECOM, and through a collaborative partnership with the National Oceanic and Atmospheric Administration (NOAA), Federal Emergency Management Agency (FEMA), and National Association of Counties (NACo). The process includes an update to all elements in the existing plan to better reflect current conditions, along with the incorporation of new information to help address the potential long-term effects of climate change and sea level rise. The plan update is being guided by a multi-jurisdictional planning team that includes representation from participating communities and other key stakeholders, and will be informed through a sustained public outreach and engagement strategy. The plan update is scheduled to be completed by June 2014.

In support of this effort, Monterey County has been designated a national pilot community for incorporating the data and tools available through NOAA's Digital Coast into local hazard mitigation planning. The Digital Coast is a web-based platform designed to address the needs of local communities and other organizations that manage the nation's coastal resources. As part of this project Monterey County will leverage the data, tools, and training made available through Digital Coast in all aspects of the hazard mitigation plan update.

Upon completion, the plan will serve as a new road map to planning for a safer future in Monterey County. This includes (1) the identification, evaluation, and communication of hazard risks; (2) an assessment local capabilities to reduce those risks; (3) a strategy for implementing specific, achievable, and measurable hazard mitigation actions; and (4) procedures to establish a sustained, long-term process for increasing the resilience of all communities to natural hazards.

Although emergency response and disaster planning is not discussed as a separate topic in this IRWM Plan, several RWMG entities do participate in the multi-jurisdictional hazard mitigation planning effort, and the IRWM Plan incorporates many of the objectives of that effort. Several IRWM Plan projects directly address the goals of hazard preparation and mitigation through such means as infrastructure improvements, erosion control, coastal restoration, and flood risk reduction projects. Also, the MCWRA has adopted a plan for flood mitigation in the *Monterey County Floodplain Management Plan* (see description above in Section 12.2.5)

12.2.11 Monterey Bay National Marine Sanctuary Management Plan

The entire Monterey Bay national sanctuary covers a much broader area than just the local Monterey Bay- extending from Marin County too San Luis Obispo County, it is the largest of the thirteen sanctuaries in the United States. Therefore, its management plan is ambitious: twenty-three action plans over five years (2008-2013). The majority of the action plans are grouped into four main marine management themes: coastal development, ecosystem protection, water quality, and wildlife disturbance. Two additional sections, partnerships and opportunities as well as operations and administration, comprise action plans and strategies addressing how the Sanctuary will function and operate. Successful implementation of each of the action plans relies on partnerships with federal, state, and local agencies in addition to local stakeholders (montereybay.noaa.gov), creating an opportunity for the RWMG to coordinate as an Action Plan Partner. Several members of the RWMG along with other stakeholders in the region are working to implement strategies in the MBNMS Action Plans through the IRWM planning process.

12.3 Dynamics between Local Water Planning and IRWM Planning

12.3.1 Process for Updating Information in the IRWM Plan

Most of the planning documents described above are updated regularly, some on an annual basis, others on a decennial basis. All of the data and information contained in this IRWM Plan will be reviewed and updated periodically, depending on available funds, as part formal Plan updates. Accordingly, the IRWM Plan updates will reflect the latest planning efforts and most recent editions of the local planning documents.

12.4 How Regional Planning Efforts Feed Back to Local Planning Efforts

The flow of information between IRWM planning and local water planning is circular. The IRWM regional planning feeds back into local planning efforts in numerous ways. Most RWMG members are themselves local water planners, and the regional planning that occurs through the IRWM process is brought back to these local planning entities. Likewise, the results of the IRWM planning process impacts the decision-making of other water resource planners and stakeholders involved in the Monterey Peninsula IRWM planning process.

Currently, regional water planning is driven primarily by State orders and Federal Endangered Species Act requirements that are incorporated into the planning processes of both regional entities and local jurisdictions. Orders and regulations from the State Water Resources Control Board, Regional Water Quality Control Board, California Public Utilities Commission, California Coastal Commission, Federal Emergency Management Act, and requirements under the Endangered Species Act significantly affect how, when, and where water resources are used or developed. Local planners must wade through a labyrinth of complex legal documents and requirements enacted at various levels of government in order to determine how to manage resources and plan for the future.

Ideally, the relationship between regional IRWM planning and local water resource management planning will remain dynamic, with a constant exchange of information.

12.5 Resolving Inconsistencies

The IRWM Plan is built upon local plans and planning efforts, and local entities were consulted on IRWM goals and objective, thus, few inconsistencies between the IRWM Plan and local plans exist. If discrepancies are found they will be resolved through direct communication and coordination with the related planning entities. As described in **Chapter 13**, **Relation to Local Land Use Planning**, the RWMG intends to evaluate potential barriers against IRWM Plan implementation and work closely with the regulating agencies, local agencies, and funding entities to resolve issues on a case-by-case basis.

Climate Change Adaptation and Mitigation Strategies in Local Plans

Local water planning agencies are in the beginning stages of incorporating climate change adaptation and mitigation strategies in their local plans. As these strategies develop through local water management planning efforts they will become incorporated into the Monterey Peninsula IRWM Plan with future Plan updates. Please see **Chapter 15**, **Climate Change**, for a full discussion of the RWMG's current climate change recommendations and strategies for the Monterey Peninsula region.

The RWMG has been in communication with water and land use managers in the broader Central Coast region regarding climate change mitigation/GHG reduction efforts throughout the Central Coast. The Climate Change chapter for this IRWM Plan was developed with significant contributions from the Greater Monterey County regions' Climate Task Force, comprised of local scientists, water resource managers, land use managers, and coastal policy experts before the chapter was submitted for inclusion within this Plan. Participating entities on the Climate Task Force included: Central Coast Wetlands Group at Moss Landing Marine Laboratories, Stanford University Center for Ocean Solutions, Monterey Bay National Marine Sanctuary, Santa Cruz County, Association of Monterey Bay Area Governments, Monterey County Planning, California Water Company, Monterey County Water Resources Agency, Stanford University Natural Capital Project, California Department of Water Resources, Santa Cruz County Resource Conservation District, and The Nature Conservancy.

The RWMG will continue to seek partnership with these entities, as well as with other RWMGs in the Central Coast region, and to participate in other regional climate change efforts in order to collectively and proactively address the issue of climate change on the Central Coast.

Chapter 13 Relation to Local Land Use Planning

IRWM Plan Standard 13

IRWM Plans must contain processes that foster communication between land use managers and Regional Water Management Groups (RWMG) with the intent of effectively integrating water management and land use planning. IRWM Plans must document:

- Current relationship between local land use planning, regional water issues, and water management objectives.
- Future plans to further a collaborative, proactive relationship between land use planners and water managers.

13.1 Introduction

The intent of this standard in the Proposition 84/1E Integrated Regional Water Management (IRWM) Program Guidelines is to a) exchange knowledge and expertise between land use planners and water resource managers through the IRWM planning process; b) examine how RWMG and land use planning agencies currently communicate; and c) identify how to improve planning efforts between the RWMGs and land use planning agencies. One of the goals of the *California Water Plan Update (2009)* is to ensure that water managers and land use planners make informed, collaborative water management decisions. Therefore, this standard helps meet this statewide goal.[1]

Every city and county in California must adopt a comprehensive long-term General Plan in accordance with §65300 of the California Government Code (see **Table 13-1** for a list of General Plans within the Monterey Peninsula IRWM Region). There are seven required elements in all General Plans: land use, circulation, housing, conservation, open space, noise, and safety, which provide a broad overview of the issues within a jurisdiction. If deemed necessary, a jurisdiction may create additional elements in a plan that focus on specific issues. Water-related supply and treatment issues are commonly included in the conservation element. Policies that must be addressed in the conservation element include the following:

- Senate Bill (SB) 221 (Bus. and Prof. Code, §11010 as amended; Gov. Code, §65867.5 as amended; Gov. Code, §66455.3 and 66473.7) prohibits approval of subdivisions consisting of more than 500 dwelling units unless there is verification of sufficient water supplies for the project from the applicable water supplier(s). This requirement also applies to increases of 10 percent or more of service connections for public water systems with less than 500 service connections.
- SB 610 (California Water Code [CWC] §10631, 10656, 10910, 10911, 10912, and 10915 as amended; Public Resources Code [PRC] §21151.9 as amended) and Assembly Bill (AB) 901 (CWC §10610.2 and 10631 as amended; CWC §10634) make changes to the Urban Water Management Planning Act to require additional information in Urban Water Management Plans (UWMP) if groundwater is identified as a source available to the supplier. A key provision in SB 610 requires that any project subject to the California Environmental Quality Act (CEQA) and

[1] This introduction has been excerpted from the Proposition 84/1E IRWM Program Guidelines, p. 59-60.

supplied with water from a public water system be provided a water supply assessment, except as specified in the law.

State of California General Plan Guidelines (Governor's Office of Planning and Research 2003) recommends facilitating SB 610 by having strong water elements in local plans that incorporate coordination between land use agencies and the water supply agencies.

Indirect water-related issues may be part of other elements presented in a General Plan. Even with such advances in policy, efforts to link land use decisions and water management decisions a challenge. Land use decisions and water management decisions are often under the purview of different agencies, yet the resources inextricably linked. Often, the relationship among these agencies is characterized as reactive: one agency must act to accommodate a decision the other agency has made. Early communication is vital in changing the relationship from reactive to proactive.

A primary aim of IRWM planning is to solve regional water management issues through diversified water management portfolios and to encourage early communication and coordination with agencies responsible for making land use decisions. This relationship can significantly influence how both water management decisions and land use decisions are made. The importance of open lines of communication between local land use planners and water resource managers is imperative to a successful IRWM effort.

This chapter describes the current relationship between local land use planning entities and water management entities in the Monterey Peninsula IRWM region (Region), and provides suggestions for how that relationship may be improved.

Table 13-1: General Plans of the Monterey Peninsula IRWM Region

General Plan Jurisdiction	Adopted
Carmel-by-the Sea	June 3, 2003
Del Rey Oaks	January 1997
Pacific Grove	October 1994
Monterey	January 2005
Sand City	2002
Seaside	August 5, 2004
Monterey County	October 2010

13.2 Link between Local Land Use and Water Management

This IRWM Plan seeks to solve regional water management issues by having a diversified water management portfolio and by coordinating with land use decision-makers. The IRWM Plan Stakeholder List (**Appendix 5-a**) contains the contact information for representatives of land use decision-making agencies and the RWMG. The relationship between the RWMG and land use decision-makers can significantly influence how both water management decisions and land use decisions are made. Opportunities may exist for the RWMG to provide input to land use planners in the following areas:

- Floodplain management
- Flood control planning
- Groundwater recharge and conjunctive water use
- Treatment and conveyance facilities
- Stormwater and runoff management
- Water conservation efforts
- Watershed management and restoration

In addition, the following are opportunities for land use planners to provide input to RWMG:

- Municipal landscaping programs
- Public access and recreational area management
- Changes in land use that affect water resources
- General plan updates and long-term planning
- Planning review
- Development review
- Water supply for public safety and emergency planning purposes
- Habitat management

These are general examples described in the IRWM Proposition 84 and 1E Guidelines- instances where coordination among land use agencies and the RWMG could result in more efficient IRWM planning and implementation. Resource management crosses jurisdictional boundaries within the region, which increases the probability for collaboration on larger, more costly projects, which requires open lines of communication between land use planners and the RWMG.[2]

13.3 Current Relationship between Local Land Use Planning and Water Management Objectives

This section describes how water resource managers currently communicate with land use planners in the Region. Since communication patterns are similar amongst entities with similar jurisdictions, this section has been organized, for the purpose of structuring this discussion, according to the following general categories:

- Municipalities that supply their own water services
- Municipalities and large communities that do not supply their own water services
- Agencies with regional jurisdiction

The term “water manager” is used in this section to refer both to regulatory water management entities (such as the Monterey Peninsula Water Management District, which is responsible for long-term management of the Seaside Groundwater Basin and the Carmel River aquifer) and those that regulate water quality (the Regional Water Quality Control Board and Monterey County Department of Environmental Health). In addition, water manager refers to those that manage water delivery: water

[2] This introduction has been adapted from the Proposition 84/1E IRWM Program Guidelines, p. 60-61.

purveyors, such as California American Water Company, Marina Coast Water District, and municipalities that supply water within their city boundaries.

The Effects of State Orders to Reduce Carmel River Diversions and Seaside Groundwater Production

In 1995, the State Water Resources Control Board (SWRCB) issued Order No. WR 95-10, which found that Cal-Am was diverting more water from the Carmel River Basin than it was legally entitled to divert. The State Board ordered Cal-Am, instead, to maximize diversions (to the extent feasible) from the Seaside Groundwater Basin (SGB). In addition, a subsequent Cease and Desist Order (SWRCB 2009-0060) issued in 2009 requires Cal-Am to secure replacement water supplies for its Monterey District service area by December 2016 and reduce its Carmel River diversions to 3,376 AFY by the 2016-17 timeframe.

In 2006, the Monterey County Superior Court adjudicated water rights in the SGB and ordered pumping to decrease from about 5,600 acre-feet per year (AFY) to 3,000 AFY by 2024. Cal-Am estimates that it needs 9,752 AFY[3] of replacement water supplies to reduce its Carmel River diversions to the degree required by the Cease and Desist Order and to reduce its pumping in the Seaside Basin in accordance with the Watermaster's pumping mandates.

13.3.1 Municipal Water Suppliers

The City of Seaside is unique from other jurisdictions within the Region in that it has its own municipal water system; however, the system supplies water to only a portion of the city from one well to 3,300 customers adjacent to the Ord Community boundary. Seaside Municipal Water District (SMWD) average demand was estimated at about 300 AFY in 2009. The area served by SMWD is considered "built-out" at this time; therefore, development opportunities and future land use changes are likely to be limited. As a result, land use planning and water resource management has been primarily focused on implementing water conservation measures. Because SMWD's allocation from the SGB will be reduced in the future, the City has been working with the SGB Watermaster and Monterey Peninsula Water Management District (MPWMD) to identify additional replacement water sources.

The remainder of the Seaside area is served either by Cal-Am or MCWD. Interaction between land use planners and water resources managers in those areas is described in the next section.

Where water resource management and land use planning occur "in house," coordination tends to occur naturally through ongoing interdepartmental communications. Discussions are initiated when a developer inquires about a land use project or files an application. Additionally, when a city updates its General Plan, the planners will consider water sources and the expansion of the urban area. Environmental Impact Reports (EIR) per the California Environmental Quality Act (CEQA) and, more recently, Water Supply Assessments, typically provide the instrument for disclosure of information and potential impacts to concerned members of the public and other agencies.

13.3.2 Municipalities and Communities That Do Not Supply Their Own Water Services

In the Monterey Peninsula IRWM Region, California American Water Company (Cal-Am), an investor-owned water utility, and the Marina Coast Water District (MCWD), a special district, are the water suppliers for the majority of the region. Cal-Am serves the cities of Carmel-by the-Sea, Del Rey Oaks, Monterey, Pacific Grove, Sand City, and some unincorporated Monterey County communities. MCWD

[3] Supplemental Testimony of Richard C. Svindland, January 11, 2013, Attachment 1, Application A.12-04-019 (*Application of CAW for Approval of the Monterey Peninsula Water Supply Project and Authorization to Recover All Present and Future Costs in Rates*)"

serves the entire Ord Community, a portion of which is within the planning region, and Marina, which is part of the Greater Monterey County IRWM region.

Where inherent separation exists between the utility (water manager) and the City or unincorporated community (land use planner) that it serves, coordination between the two is somewhat more challenged than in the situation where land use planning and water resource planning occur "in house."

The Monterey Peninsula is unique in California as it is the only the region where a special district (MPWMD) allocates water to nearly all of the land use jurisdictions (allocation to the Ord Community is under a 1993 agreement with the federal government). MPWMD carries out water allocation under CEQA with an EIR that evaluates impacts from the use of water from sources within the MPWMD boundary. The process includes soliciting water demand projections from each jurisdiction, holding public hearings, and setting a limit on use within each jurisdiction. However, each jurisdiction determines how it will best use allocated water.

Cal-Am Service Area

Currently, Cal-Am is prohibited from setting new water meters and intensifying water use under a Cease-and-Desist Order (CDO) from the SWRCB and under an order from the California Public Utilities Commission (CPUC). The SWRCB has ordered cutbacks in production from Carmel Valley and the Superior Court has ordered cutbacks in water use from the SGB. Together, these cutbacks will result in a reduction of nearly 50 percent in available water supplies. Cal-Am reports quarterly to the SWRCB on compliance with the CDO. Within the SGB, the Seaside Watermaster serves to manage water from that basin. Several regional municipalities are represented on the Watermaster including Monterey, Sand City, Del Rey Oaks, and Seaside. Cal-Am, MPWMD, and MCWRA are also represented. The Watermaster meets most months. Basin pumpers are enjoined from overproducing and are subject to fines. The Superior Court has retained jurisdiction over the basin.

Land use planning agencies have been made aware of these limitations and MPWMD has warned that even if a development permit is issued by a land use agency, there may not be water available.

For future planning purposes, "formal" coordination between Cal-Am and land use jurisdictions is currently limited to efforts such as developing Urban Water Management Plans (UWMP), or developing water service agreements (WSA). Some examples of Cal-Am's typical interactions with land use planners include:

- Cal-Am staff works with municipal staff to develop growth projections (population, service counts, water demand) for their UWMP, including the most recent update completed in September 2012.
- To develop Cal-Am's UWMP, Cal-Am staff and consultants used General Plan data and interviewed planning personnel to project future growth and water use.
- Cal-Am Monterey District Manager attends City Council, MPWMD, and Watermaster board meetings.

In addition, for large development projects that require a WSA, Cal-Am must conduct the WSA and submit it to the City prior to development approval. Coordination between Cal-Am and a City or the County is more limited for smaller projects. In those cases, Cal-Am deals directly with the developers after their plans have already been approved by the City or County. Cal-Am staff will review the project to make sure that adequate water supply exists in that part of the system and then will issue a will-serve letter.

Marina Coast Water District

MCWD provides water to the City of Marina and the Ord Community through a contract with the Fort Ord Reuse Authority (FORA). The Ord Community includes lands under the jurisdiction of Marina, Seaside, Del Rey Oaks, Monterey, Monterey County (unincorporated). Each jurisdiction has been allocated water under a federal agreement signed in 1993. Although jurisdictions have identified future needs that are greater than the current allocation, no new water supply project has been built. For planning purposes, MCWD is similar to Cal-Am for the areas it serves. For large development projects, MCWD will prepare a WSA, to be included in a development project's EIR. MCWD requires written proof of a resolution of project approval by the respective jurisdiction in order to begin serving new developments. Potential problems may arise, however, when MCWD and the City (or another land use jurisdiction) disagree on the amount of water that will be required by a project. If the City approves a project based on its lower water use projections, and the higher projections prove to be more accurate, the City may be faced with a serious water shortage and MCWD will be in the position of needing to identify additional water supply. This situation could occur as the economy picks up and those "last units," which received prior approval but have not yet been built because of the economic downturn, finally get built. Upfront coordination between water managers and land use jurisdictions help prevent this situation.

Increased coordination and communication should occur with small development projects as well. For most land use jurisdictions, water supply is not directly allocated to particular parcels. If business development on the small parcels is being promoted without adequate (or accurate) consideration of the potential water use by those businesses (e.g., hotel, laundry facility), a potential "accounting" problem may occur. One suggestion is that water management staff and land use planners work together to develop a parcel map of the region, allocating water to each parcel in some sort of flexible—but quantifiable—manner. Specific allocations of water for small and large projects would remove some of the ambiguity and uncertainty regarding future water use and would help improve long-term water supply security.

13.3.3 Private Wells and Small Water Systems

Portions of the unincorporated areas are served by onsite wells or small water systems, which are regulated by DWR, MPWMD, Monterey County, and by the California Coastal Commission (CCC) for coastal development. Typically, a property owner will apply to the Monterey County Planning Department for a Use Permit for development, and in the coastal zone to the CCC. If the water supply is from an onsite well, DWR and the Health Department (and possibly the CCC) must review the application and issue a permit to drill a well. The application is also referred to MPWMD and MCWRA for action, including a review of potential impacts to the environment and/or other wells. In all cases, there is a CEQA review and although many single wells on single lots can be approved as an exemption, the aforementioned reviews ensure to a fairly high level that water supplies are available and extraction will not cause significant harm.

If a new well yields enough water to support a planned development without significant impacts, the property owner can receive a Use Permit from Monterey County for development and convert a temporary well permit from the CCC to a permanent well for use with coastal development.

More complex situations, such as developing multiple parcels, usually require the lead agency to complete an EIR, which affords additional review by local, state, and in some cases, federal regulators.

13.3.4 Wastewater Service

The Monterey Peninsula IRWM Region has four wastewater service providers. Most of the region, including Pacific Grove, Monterey, Del Rey Oaks, portions of Seaside, Sand City, and some areas of Unincorporated Monterey County are serviced by the Monterey Regional Water Pollution Control Agency (MRWPCA). Within the MRWPCA service area, jurisdictions own and maintain most sewer collection facilities within their jurisdictions, while MRWPCA owns and maintains the sewer main pipeline and regional pump stations that collect the cities' wastewater and convey it to the Regional Treatment Plant in north Marina. Carmel Area Wastewater District (CAWD) services Carmel-by-the-Sea, Pebble Beach, and portions of unincorporated Monterey County in the Carmel area and south to and including Point Lobos and some properties in the Carmel Highlands area. The Seaside County Sanitation District (SCSD) jurisdictional area includes parts of Seaside and Del Rey Oaks from which the SCSD collects wastewater and transmits it to the MRWPCA sewer main that carries it in the MRWPCA treatment plant. MCWD provides wastewater treatment collection in a portion of the Ord Community within the region.

These wastewater districts work with local land use decision agencies to ensure new developments receive wastewater service. As with all public agencies, the local wastewater districts schedule public hearings and community meetings. Many of the wastewater agencies contain technical advisory committees comprised of local professionals, public officials, or local government employees. Several of these wastewater agencies are represented on technical advisory committees that can potentially impact land use. For example, both the CAWD and MRWPCA have representation on the Monterey Peninsula Regional Water Authority Technical Advisory Committee.

13.3.5 Regional Agencies with Integrated Responsibilities

Monterey Peninsula Water Management District

The MPWMD is responsible for integrating the management of water resources throughout the region. The agency has been granted broad powers over use of surface water supplies, recycled water, and groundwater supplies. However, several agencies and Cal-Am are responsible for the distribution of water supplies within the Region and other regulatory agencies, such as Monterey County, MRWPCA, the CPUC, SWRCB, Superior Court, and NOAA fisheries also retain authority over water resources.

Except for the Ord Community, MPWMD requires the issuance of a water distribution system (WDS) permit for creation of a new water service connection or a permit amendment for intensified water usage. The WDS permit, or proof that a permit will be issued, must be obtained before a project can be approved by a land use agency within the IRWM Region. MPWMD staff and board members participate in numerous regularly scheduled meetings, including public hearings to provide clarification as necessary. Many of the committees are comprised of employees of public agencies or elected officials, including land use decision makers. Examples of these regularly scheduled public hearings and meetings include:

- Administrative Committee
- Carmel River Advisory Committee
- Carmel River Task Force
- Community Advisory Committee
- Inter-Agency Review Meeting
- Legislative Advocacy Committee
- Monterey Peninsula IRWM RWMG and as needed, Technical Advisory Committee (TAC)
- Monterey Peninsula Regional Water Authority and associated TAC

- Monterey Peninsula Water Supply Project Governance Committee
- Ordinance No. 152 Citizens Oversight Panel
- Policy Advisory Committee (PAC)/TAC
- Public Outreach Committee
- Rules and Regulations Review Committee
- Water Demand Committee
- Water Supply Planning Committee
- Seaside Basin Watermaster Board/TAC

Monterey County Water Resources Agency

The Monterey County Water Resources Agency—responsible for managing, protecting, and enhancing water supply and water quality as well as providing flood protection in the County of Monterey—is involved in land use planning throughout the unincorporated portions of the county. In a 1993 agreement between MPWMD and MCWRA, MCWRA retained the authority to construct water supply and recycling projects within the region.

MCWRA works in close coordination with the Monterey County Resource Management Agency (MCRMA) (including Planning and Building Divisions), and several other departments/agencies throughout the land use permitting process. MCWRA is primarily responsible for administering Monterey County floodplain, drainage, water conservation, water supply, and well construction regulations. The MCWRA reviews discretionary permits, ministerial permits, and well construction permits. Written comments and recommendations are provided in accordance with established department protocols. The MCWRA also participates in the development of various CEQA documents including initial studies, negative declarations, mitigated negative declarations, and EIRs. As requested, the MCWRA reviews CEQA documents in other jurisdictions and written comments are provided to the lead agency.

The MCWRA also participates in several regularly scheduled meetings, including public hearings to provide clarification, as necessary. Examples of regularly scheduled meetings and public hearings include:

- Inter-Agency Review Meeting
- Inter-Departmental Review Meeting
- Inter-Departmental Coordination Meeting
- General Plan Implementation
- Zoning Administrator
- Planning Commission
- Subdivision and Minor Subdivision Committees
- Board of Supervisors

Other planning related meetings:

- Permit Streamlining Task Force
- Code Enforcement Task Force
- Carmel River Task Force
- Carmel River Advisory Committee
- Monterey Peninsula IRWM Plan TAC
- Monterey Peninsula Regional Water Authority and associated TAC
- Monterey Peninsula Water Supply Project Governance Committee

- Seaside Watermaster Board and TAC
- Floodplain Management Plan Working Group
- Multi-jurisdictional Hazard Mitigation Plan Working Group
- County Service Area 50 Citizens Advisory Committee – Technical Support

The MCWRA is not fully funded to participate in some land use activities (general plan implementation). In turn, this limits communication and coordination in those areas. Essentially, there is more demand for services than there is funding.

On the “land use planning” side, the MCRMA participates in several water resource planning activities throughout the county:

- Technical Advisory Committee member in the Integrated Watershed Restoration Program, and the Carmel River Task Force and Advisory Committee with the Resource Conservation District (RCD) of Monterey County, MPWMD, and other partners
- Central Coast Wetlands Group Monterey Bay National Marine Sanctuary (specifically, on climate change adaptation planning efforts

MCRMA consults with MCWRA on water supply and flood/drainage matters in Monterey County; discretionary permit applications are routinely sent to the MCWRA for review. MCRMA consults with the Monterey County Environmental Health Department regarding water quality issues. In addition, the Monterey County General Plan (2010) is set up so that MCWRA provides advice on water supply, which the Monterey County Board of Supervisors has the discretion to accept or not.

Other Planning Related Forums

In addition, several forums exist throughout the region to bring together land use planners, water managers, natural resource managers, landowners, and other stakeholders for the purposes of planning or conflict resolution related to certain geographic areas or features. These include, the Carmel River Watershed Conservancy, which focuses on Carmel River watershed management; the Monterey Regional Stormwater Management Program, which includes all of the nearby coastal cities (including Marina) and unincorporated Monterey County, and focuses on stormwater issues. In addition, regional planning entities such as the Association of Monterey Bay Area Governments (AMBAG) conduct workshops occasionally where interdisciplinary professionals, including land use planners and water managers, collaborate. MCRMA also conducts sub-regional land use advisory committee meetings that continually include discussion of water supply issues of proposed projects during the project review process conducted by Monterey County.

One current forum that brings together land use planners, water managers, and natural resource managers along with other stakeholders is provided by the Fort Ord Reuse Authority (FORA); the reuse authority is responsible for the planning, financing, and implementation of the conversion of the former Fort Ord to civilian activities. The approved Base Reuse Plan calls for significant commercial economic development, supportive housing, visitor facilities, and related institutional activities aimed at supporting the community after the loss of the 15,000 soldiers and thousands of civilian employees who were in the area when Fort Ord was an active base. Nearly two-thirds of the former base will be preserved and maintained as habitat for endangered species and recreational open space. Working groups have been formed to focus on particular issues related to the Base Reuse Plan, including a Habitat Conservation Plan and Coordinated Resources Management and Planning. A Water and Wastewater Oversight Committee comprised of key staff and representatives of the land use jurisdictions meet on a regular basis to implement water delivery, wastewater services, and stormwater infrastructure on the former Fort Ord. In addition, the committees regularly provide a forum for the discussion of water and land use jurisdiction interactions.

In 2012, a joint powers authority, the Monterey Peninsula Regional Water Authority, was formed: it included a mayor of each city within the area impacted by SWRCB CDO 2009-0060. This authority meets twice per month in a public forum to represent each local jurisdiction's interest in possible solutions to regional water shortage issues. The MPRWA considers input through public comment and through a technical advisory committee comprised of active community members with a technical background and members of water and wastewater agencies.

Cal-Am, working with local agencies, has proposed construction and operation of a Cal-Am owned and operated desalination project, known as the Monterey Peninsula Water Supply Project.[4] The project provides all of the replacement water needed to comply with the CDO and the Seaside Basin Adjudication, or part of the replacement water. The CPUC, as the lead agency for the Monterey Peninsula Water Supply Project, published a Notice of Preparation of an EIR in October 2012 and intends to certify an EIR in the first quarter of 2014.

The Region generally has a high level of coordination between land use planners and water managers relative to other regions of the state based upon the amount of interested members of the public and shared responsibilities among agencies.

13.4 Future Efforts: Land Use Planning and Water Management Collaboration

This section considers potential opportunities for improving communication and coordination between water managers and land use decision makers. As noted previously, a primary aim of IRWM planning is to solve regional water management issues through diversified water management portfolios and early water management and coordination with those responsible for making land use decisions. The importance of open lines of communication between local land use planners and water resource managers is imperative to a successful IRWM effort.

Some specific opportunities to improve coordination between land use decision-makers and water managers have already been mentioned. These suggestions were made by those being interviewed for this chapter, and include:

- involving the water supplier earlier in the development approval process, and requiring a review from the water supplier prior to approval.
- ensuring that the water supplier and the land use decision-maker are in agreement about anticipated water use by any project prior to approval (during the WSA and/or CEQA processes).
- if appropriate to the situation, the water supplier and land use planners could work together to create parcel maps, allocating water to each parcel in a flexible—but quantifiable—manner, and thereby ensuring greater certainty in regards to future water use.

[4] In April 2012, California American Water submitted Application A.12-04-019 (*Application of CAW for Approval of the Monterey Peninsula Water Supply Project and Authorization to Recover All Present and Future Costs in Rates*) to the California Public Utilities Commission that is intended to secure replacement water supplies for the Monterey District associated with the regulatory orders and legal decisions described in this section. The MPWSP includes many of the same elements previously analyzed in the Coastal Water Project EIR (CPUC/ESA, 2009); however, key components, including the seawater intake system and desalination plant, have been relocated and/or modified under the current proposal and the current proposal is for private (Cal-Am) ownership of the intake system, desalination facility and conveyance pipeline.

The RWMG can serve an important function in providing leadership and opportunities for encouraging and promoting increased communication between land use decision-makers and water managers. Potential opportunities include the following:

Regular Joint Planning Meetings: The RWMG can encourage local land use jurisdictions and Cal-Am managers to hold joint planning meetings at regular intervals to improve communication and efficiencies. Joint planning meetings can be held at the staff level and/or by governing boards. Both options provide value in different ways, and both should be encouraged.

Annual Water Resource Planning Forum: At times, individuals in land use and water resource planning organizations may not fully understand the mission, priorities, and issues of the other organizations and agencies. To facilitate understanding, the RWMG could host an annual forum of land use and water resource planning agency/organization directors, where staff presents their agency or organization's mission and programmatic priorities. In a workshop-type forum, staff could discuss overlapping areas of interest, conflict with priorities or objectives, and potential areas for coordination. This type of forum could be conducted as a "retreat," and led by a professional facilitator.

"A User's Guide to the Water and Land Management Organizational Landscape": The RWMG could produce an almanac of the various agencies, organizations and companies that own or have jurisdiction over the land and water. The almanac would contain the entities' mission statements, authority, and jurisdictions, including a map that clearly shows watershed and jurisdictional boundaries. The map would enable individuals to understand how land areas and waterways are connected, how their actions may impact land or water resources, and which entities may have an interest in, or a responsibility for, those resources. For example, when a landowner discharges water to a drainage ditch, he or she will be able to see that it goes downstream into a habitat that a particular conservation agency manages. When a conservation organization wants to remove some culverts to improve water quality, they will be able to see which agency is responsible for maintaining that culvert to protect farmland and houses from flooding. Understanding these connections will help individuals and organizations understand the need for increased coordination, and will help facilitate that coordination, in order to achieve mutual benefits.

Greater Use of Websites for Information Dissemination and Education: Websites provide a great vehicle for keeping the public, other land use planners, and water managers up-to-date on plans, policies, regulations, studies, and related developments. Websites can provide access to meeting agendas and meeting minutes, monthly and quarterly status reports on a variety of water supply and water use issues, and other information that might be useful to both land use planners and water resource managers, as well as to the public in general. The RWMG could encourage both water managers and land use planners in the region to take greater advantage of their websites for the purpose of disseminating and sharing information.

Addressing Funding, Policy, and Regulatory Constraints to IRWM Plan Implementation: Funding decisions at the local, state, and federal level can have profound influence on the projects that are implemented in an IRWM Plan. If funding becomes available, the RWMG intends to investigate appropriate methods to communicate with local, state, and federal managers responsible for funding, policy, and regulations that could affect IRWM Plan implementation. The RWMG will work with local land use planners to resolve conflicts and implement changes as appropriate. Increased communication will lead to increased understanding by land use planners, water managers, and funding agencies of the other agencies' objectives and constraints, and will ultimately lead to win-win solutions for both land use management and water resource management.

Finally, it should be emphasized that while this chapter has focused on the coordination between land use planners and water managers in the IRWM Region, the goal of the IRWM planning effort overall is to improve coordination and communication not only between land use planning and water management, but throughout all aspects of water management—connecting water supply, surface and ground water quality, flood management issues, stormwater runoff issues, water conservation, municipal and agricultural usage, recycled water use and ecological conservation to more comprehensively coordinate the efforts of all the agencies and stakeholders involved.

13.5 Climate Change Adaptation and Mitigation Strategies in Local Plans

As noted in **Chapter 12**, **Relation to Local Water Planning**, local planning agencies are in the beginning stages of adopting climate change adaptation and mitigation strategies in their local plans. Most local land use plans do not address climate change on any level; however, some local plans call for *plans* to address climate change. For example, Policy OS-10.11 in the Monterey County General Plan 2010 states, "Within 24 months of the adoption of the General Plan, Monterey County shall develop and adopt a Greenhouse Gas (GHG) Reduction Plan with a target to reduce emissions by 2020 to the 1990 level to a level that is 15 percent less than 2005 emission levels."

Likewise, the RWMG is in the early stages of addressing climate change as part of the IRWM planning effort. Nonetheless, the Monterey Peninsula IRWM planning effort has included an assessment of vulnerabilities and potential impacts of climate change in the Monterey Peninsula IRWM Region and formulating a mitigation response based primarily upon work conducted by the Greater Monterey County IRWM, RWMG, and other stakeholders. Please see **Chapter 15, Climate Change**, for a full discussion of current climate change efforts in the region.

It should be noted that the Climate Change chapter for this IRWM Plan was developed with significant input and coordination with the Greater Monterey County RWMG and their Climate Task Force, comprised of local scientists, land use managers, water resource managers, and coastal policy experts. Entities on the Greater Monterey County IRWM Climate Change chapter include: Central Coast Wetlands Group at Moss Landing Marine Laboratories, Stanford University Center for Ocean Solutions, Monterey Bay National Marine Sanctuary, Santa Cruz County, Association of Monterey Bay Area Governments, Monterey County Planning, California Water Company, Monterey County Water Resources Agency, Stanford University Natural Capital Project, California Department of Water Resources, Santa Cruz County Resource Conservation District, and The Nature Conservancy. The Monterey Peninsula is geographically surrounded by the Pacific Ocean and the Greater Monterey County IRWM Region and many of the climate change issues, especially impacts to coastal areas, apply to the Monterey Peninsula IRWM Region. The Monterey Peninsula RWMG will continue to coordinate and partner with other RWMGs, and participate in regional climate change efforts in order to collectively and proactively address the issue of climate change on the Central Coast.

Chapter 14 Stakeholder Involvement

IRWM Plan Standard 14
The IRWM Plan must contain the following items: • A public process that provides outreach and an opportunity to participate in IRWM Plan development and implementation to the appropriate local agencies and stakeholders, as applicable to the region, including the following: o Wholesale and retail water purveyors o Wastewater agencies o Flood control agencies (including those agencies who submit applications for Proposition 1E funded SWFM Grants) o Municipal and county governments and special districts o Electrical corporations o Native American tribes o Self-supplied water users o Environmental stewardship organizations o Community organizations o Industry organizations o State, federal, and regional agencies or universities o Disadvantaged community (DAC) members o Any other interested group appropriate to the region • The process used to identify, inform, invite, and involve stakeholder groups in the IRWM process, including mechanisms and processes that have been or will be used to facilitate stakeholder involvement and communication during development and implementation of the IRWM Plan. • A discussion on how the RWMG will endeavor to involve DACs and Native American tribal communities in the IRWM planning effort. • A description of the decision making process including IRWM committees, roles, or positions that stakeholders can occupy and how a stakeholder goes about participating in those committees, roles, or positions regardless of their ability to contribute financially to the Plan. • A discussion regarding how stakeholders are necessary to address the objectives and resource management strategies of the IRWM Plan and are involved or are being invited to be involved in Plan activities. • A discussion of how collaborative processes will achieve equality among interest groups (listed above) in the IRWM process regardless of their ability to contribute financially to the IRWM Plan's development or implementation.

14.1 Outreach for IRWM Plan

In addition to outreach conducted for the 2007 IRWM plan, the Monterey Peninsula IRWM process has fully integrated known stakeholders throughout its development. Along with the Regional Water Management Group (RWMG), over 130 stakeholders were identified and invited to be involved in the planning process, including federal, state, dozens of regional and local agencies, municipalities and special districts, non-profits (environmental, disadvantaged communities, and community groups), academic educational institutions, private companies and landowners, and individuals (see **Appendix 1-d** for the current list of stakeholders).

14.2 Stakeholder Processes

The participating entities in the RWMG, and stakeholders involved in the development of the IRWM Plan continue to identify groups, individuals, entities and other stakeholders who can benefit from participating in the IRWM Plan. Throughout the life-cycle of the IRWM Plan, an outreach effort will continue to identify any additional stakeholders that have not participated in plan development. Outreach may consist of focused mailings, phone calls, advertisements, public notices, and public workshops. The Stakeholder Involvement and Outreach Plan for the 2013 IRWM Plan update is included as **Appendix 14-a**. The agendas, email notifications, presentations, handouts, and meeting notes for the public stakeholder meetings conducted in July 2012, October 2012, and February 2013 and for the update of this plan are provided in **Appendices 14-b through 14-e**.

14.3 Project Specific Outreach

Projects included in the Final IRWM Plan and conducted as part of the 2012 planning grant also contain outreach efforts. See individual project descriptions in **Chapter 6, Project Review Process,** for additional details.

14.4 Environmental Justice and Disadvantaged Communities

There are four census tracts in the Region that qualify as disadvantaged communities. The majority of communities in the Region have a median household income that is higher than the state average, and therefore no disadvantaged communities can be impacted.

Environmental justice is addressed by ensuring that all stakeholders have access to the decision-making process and that minority and/or low-income populations do not bear disproportionately high and adverse human health or environmental impacts. Although only four census tracts in the Region qualify as disadvantaged communities, increases in water or wastewater service rates that could accompany the implementation of several projects discussed herein may potentially affect these communities.

MPWMD coordinated a meeting of the Carmel River Advisory Committee in Cachagua Valley in September 2007 to solicit input on problems and issues in that sub-watershed. Based on input at the meeting, issues include the need for more water conservation measures, a lack of an existing central group or governing structure in Cachagua Valley that might be able to carry out watershed management planning, and the need to increase the water supply to meet demand during drought conditions. A detailed discussion of disadvantaged communities and outreach efforts to address DACs is provided in **Appendix 14-a**.

14.5 Coordination

The Regional Water Management Group and stakeholders have coordinated and conducted outreach with state and federal agencies as shown in **Appendices 1, 2 and 14** during the creation of many supporting documents of this IRWM Plan. It is expected that this will continue with the development of individual projects that are consistent with this Plan. In addition, state and federal agencies will be notified of the completion of the Final IRWM Plan. See also **Chapter 5, Integration and Coordination**.

Chapter 15 Climate Change

IRWM Plan Standard 15

The IRWM Plan must address both adaptation to the effects of climate change and mitigation of GHG emissions. The IRWM Plan must include the following items:

- A discussion of the potential effect of climate change on the IRWM region, including an evaluation of the IRWM region's vulnerabilities to the effects of climate change and potential adaptation responses to those vulnerabilities. The evaluation of vulnerabilities must, at a minimum, be equivalent to the vulnerability assessment contained in the Climate Change Handbook for Regional Water Planning (December, 2011) (http://www.water.ca.gov/climatechange/CCHandbook.cfm).
- A process that considers GHG emissions when choosing between project alternatives.
- The IRWM Plan must include a list of prioritized vulnerabilities based on the vulnerability assessment and the IRWM's decision making process.
- The IRWM Plan must contain a plan, program, or methodology for further data gathering and analysis of the prioritized vulnerabilities.

The Intergovernmental Panel on Climate Change (IPCC) recently stated that evidence of warming is "unequivocal" and that it is "extremely likely" that human influence has been the dominant cause of that warming. The latest observations illustrate the changes that are already underway. The observations show: increasing atmospheric carbon dioxide concentrations, rising air and ocean water temperatures, declines in the extent of arctic ice, and declining pH in ocean waters. (IPCC, Summary for Policymakers for the Fifth Assessment, Sept. 2013)

The Proposition 84/1E Integrated Regional Water Management (IRWM) Program Guidelines state: "California is already seeing the effects of climate change on hydrology (snowpack, river flows, storm intensity, temperature, winds, and sea levels). Planning for and adapting to these changes, particularly their impacts on public safety, ecosystem, and long-term water supply reliability, will be among the most significant challenges facing water and flood managers this century" (p. 68).

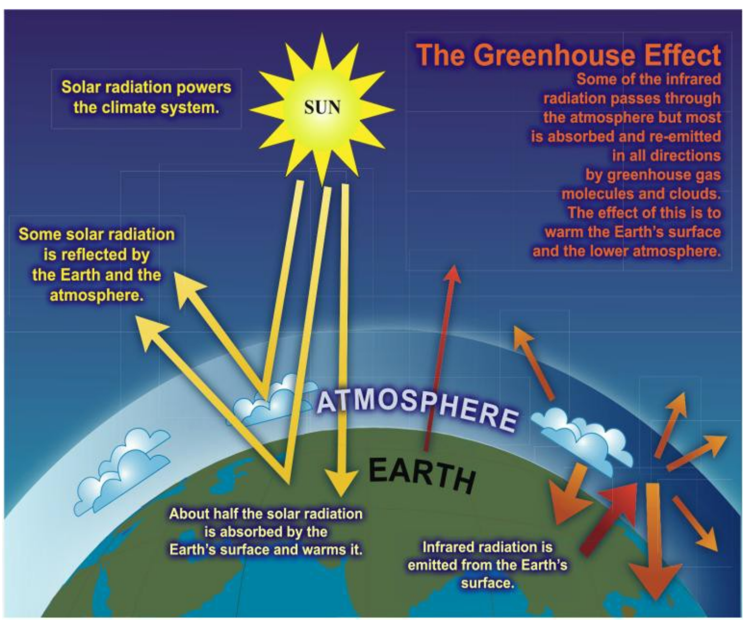
By design, IRWM planning efforts are collaborative and include many entities dealing with water management. These aspects make IRWM a good platform for addressing broad-based concerns like climate change, where multiple facets of water management are affected. The intent of the Climate Change standard in the Proposition 84/1E IRWM Program Guidelines is to ensure that IRWM Plans describe, consider, and address the effects of climate change on their regions and disclose, consider, and reduce when possible greenhouse gas (GHG) emissions when developing and implementing projects. This chapter describes global climate change and its anticipated impacts for the Monterey Peninsula IRWM planning region (Region), including an initial vulnerability analysis and risk assessment, and offers preliminary adaptation measures and climate change mitigation and GHG reduction strategies for the planning region. These strategies will be refined as more climate change data, and more refined analysis tools, become available.

15.1 Global Climate Change: An Overview

Climate change refers to any significant change in measures of climate, such as average temperature, precipitation, or wind patterns over a period of time. Climate change may result from natural factors and/or from human activities that change the composition of the atmosphere and alter the surface features of the land. Such changes vary considerably by geographic location. Over time, the earth's climate has undergone periodic ice ages and warming periods, as observed in fossil isotopes, ice core samples, and through other measurement techniques. Recent climate change studies use the historical record to predict future climate variations and the level of fluctuation that might be considered statistically normal given historical trends.

Significant changes in global climate patterns have recently been associated with global warming, an average increase in the temperature of the atmosphere near the Earth's surface. This gradual warming is the result of heat absorption by certain gases in the atmosphere and re-radiation downward of some of that heat, which in turn heats the surface of the Earth. These gases are called "greenhouse gases" because they effectively "trap" heat in the lower atmosphere causing a greenhouse-like effect. Some GHGs occur naturally and are emitted to the atmosphere through natural processes; others are created and emitted solely through human activities; while the production rate of some naturally occurring GHGs can be increased by human activities (California Natural Resources Agency, 2009).

Figure 15-1: The Greenhouse Effect



Source: Le Treut et al., 2007, p. 115.

The greenhouse effect helps to regulate the temperature of the planet. It is essential to life; without it, our planet would have an average temperature of about 14°F, as opposed to a comfortable 60°F. However, an accumulation of GHGs in the atmosphere is intensifying the greenhouse effect, threatening to raise average temperatures well beyond our "comfort zone." Nearly all climate scientists agree that human activities are to blame for the changing climate. The addition of carbon dioxide, the most prevalent GHG, into the atmosphere as a result of burning oil, natural gas, and coal, in combination with the depletion of our dense forests and wetlands which act as natural carbon dioxide sinks, are leading to an unnaturally high concentration of GHGs that are in turn intensifying the natural greenhouse effect on earth.

The Intergovernmental Panel on Climate Change (IPCC) stated in its 2007 Synthesis Report:

> *Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level. (IPCC 2007a, p. 30)*

Eleven of the twelve years between 1995 and 2006 were the warmest in recorded history. The temperature increase is global and is greater at higher northern latitudes. Average Arctic temperatures have increased at almost twice the global average rate in the past 100 years. In 2007, the IPCC stated that "observations since 1961 show that the average temperature of the global ocean has increased to depths of at least 3,000 meters and that the ocean has been absorbing more than 80 percent of the heat added to the climate system" (Ibid., pg. 5).

The IPCC has linked this increase in global temperature to a wide array of changes to our natural world, including a widespread decrease in the amount of snow cover and thickness and range of glaciers across the globe. Since 1978, the Arctic ice cap has decreased in size by about 3 percent per year with an average summer decrease of 7.4 percent. A 10 percent decrease in global snow cover and earlier spring thaws of rivers and lakes in the northern hemisphere have also been observed. Over the past 50 years, heat waves and serious rain events have been more common and in the past 30 years, there has been an increase in the number of northern Atlantic tropical storms (Ibid.).

The combination of ice melt and the thermal expansion of seawater (due to warmer water temperatures) have led to global sea level rise[1]. Over the period from 1855 (beginning of the tide gauge record) to 2009, global sea level has risen approximately 8 inches (21 cm) (Church and White 2011). During this period, the rate of sea level rise has also increased (Church and White 2006 and 2011; Bindoff et al., 2007). From 1961 to 1993, the global sea level rose at approximately 0.07 inches per year (1.9 mm/ yr) (Church and White 2011). Since 1993, sea level rise has accelerated to a rate of approximately 0.13 inches per year (3.2 cm/yr) (Church and White 2006; IPCC 2007a). The IPCC's 2007 Fourth Assessment Report (IPCC 2007b) projected sea level rise by the end of the century as a result of thermal expansion to range from 7 to 23 inches (18-59 cm). However, recent evidence suggests these values may prove to be underestimates of the potential rise in global sea level. Since the publication of the AR4 in 2007, advances in the understanding of the complexities of ice sheet dynamics have led to improved projections of sea level rise during the 21st century. These studies suggest actual sea level may rise as much as 28 to79 inches (72-190 cm) by 2100 (Vermeer and Rahmstorf 2009; Jevrejeva et al. 2008; Grinsted et al., 2009; and Nicholls et al., 2011).

IPCC scientists predict that the serious consequences of climate change will continue to grow and expand. The rapid and unprecedented increase in surface temperature is accelerating the planet's water cycle, which will make extreme storms and droughts more frequent and severe (U.S. Global Climate Research Program, 2009). These events will likely disrupt and damage food and fresh water supplies. The extreme increases in temperature to come will continue to melt portions of the Greenland ice shelf and cause the oceans to thermally expand, both of which will raise the average level of all oceans. This continuing rise in sea level will have multiple effects, including coastline destruction, the displacement of major population centers, and economic disruption.

[1]This paragraph has been almost entirely excerpted from "Preparing for the Future: Climate Change and the Monterey Bay Shoreline. Summary Report for Participants," a summary report of a December 6, 2011, workshop prepared by Center for Ocean Solutions and the Monterey Bay National Marine Sanctuary. All of the references in this paragraph are cited in the "Preparing for the Future" report.

15.1.1 Federal and State Responses to Climate Change: Legislation and Policy

Scientists consider climate change to be a very serious issue requiring major changes in resource, water supply, and public health management (California Climate Change Center, 2006). The following section describes some of the more significant pieces of legislation and policy that have been enacted by the United States and the State of California in response to climate change.

Federal Response to Climate Change

On April 17, 2009, the EPA Administrator signed Proposed Endangerment and Cause or Contribute Findings for GHGs under Section 202(a) of the Clean Air Act. EPA held a 60-day public comment period, which ended June 23, 2009, and received more than 380,000 public comments. These included written comments and testimony at two public hearings in Arlington, Virginia, and Seattle, Washington. EPA carefully reviewed, considered, and incorporated public comments and has now issued the final findings.

EPA found that six GHGs taken in combination endanger both the public health and the public welfare of current and future generations. EPA also found that the combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to the greenhouse effect and, under Section 202(a) of the Clean Air Act, result in air pollution that endangers public health and welfare. These findings were based on careful consideration of the full weight of scientific evidence and a thorough review of the numerous public comments received on the proposed findings published on April 24, 2009. The findings were effective as of January 14, 2010. The specific GHG regulations EPA has adopted to date are as follows:

- 40 CFR Part 98. Mandatory Reporting of Greenhouse Gases Rule. This rule requires mandatory reporting of GHG emissions for facilities that emit more than 25,000 metric tons of CO_2e emissions per year (EPA 2009). Additionally, the reporting of emissions is required for owners of SF_6- and PFC-insulated equipment when the total nameplate capacity of these insulating gases is above 17,280 pounds.
- 40 CFR Part 52. Proposed Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule. EPA recently mandated that Prevention of Significant Deterioration requirements be applied to facilities that have stationary-source CO2e emissions exceeding 75,000 tons per year. It is not believed that the BMP Update would trigger the Prevention of Significant Deterioration permitting required by this regulation.

State Response to Climate Change

California's first statute on climate change was enacted in 1988 when the State Legislature ordered a report on the impacts of climate change and recommendations to avoid, reduce, and address them. In 2002, the State led the country in becoming the first jurisdiction to require standards for GHG emissions from cars. In 2004, Senate Bill 1107 directed the Secretary of Environmental Protection to coordinate all climate change activities in the state. A climate action team was established comprised of state agency secretaries and department directors. With the passage of California Global Warming Solutions Act of 2006, also known as Assembly Bill (AB) 32, California became the first state to set a binding, economy-wide target for GHGs (California Environmental Protection Agency, 2010).

Executive Order S-3-05: California is a substantial contributor of global GHGs, emitting over 400 million metric tons of carbon dioxide a year (California Air Resources Board, 2007). In June 2005, Governor Schwarzenegger established California's GHG emissions reduction targets in Executive Order S-3-05. The Executive Order established the following goals:

- Greenhouse gas emissions should be reduced to 2000 levels by 2010;

- Greenhouse gas emissions should be reduced to 1990 levels by 2020; and
- Greenhouse gas emissions should be reduced to 80 percent below 1990 levels by 2050.

Global Warming Solutions Act of 2006 (Assembly Bill 32): The State Legislature enacted Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006, which Governor Schwarzenegger signed on September 27, 2006 to further the goals of Executive Order S-3-05. AB 32 states:

> *Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems.*

AB 32 represents the first enforceable statewide program to limit GHG emissions from all major industries with penalties for noncompliance. The foremost objective of California Air Resources Board (CARB), tasked with implementing AB 32, is to adopt regulations that require the reporting and verification of statewide GHG. The initial State goal is to limit GHG emissions to 1990 levels by 2020. In January 2008, a statewide cap for 2020 emissions based on 1990 levels was adopted. In June 2010, CARB prescribed GHG reduction goals to regional governments, including the Association of Monterey Bay Area Governments (AMBAG). These prescriptions are the regional benchmarks from which to track local reductions.

AB 32 includes several specific requirements of the CARB:

1. Prepare and approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions
2. Identify the statewide level of greenhouse gas emissions in 1990 to serve as the emissions limit to be achieved by 2020
3. Adopt a regulation requiring the mandatory reporting of greenhouse gas emissions
4. Identify and adopt regulations for discrete early actions that could be enforceable on or before January 1, 2010
5. Ensure early voluntary reductions receive appropriate credit in the implementation of AB 32
6. Convene an Environmental Justice Advisory Committee (EJAC) to advise the Board in developing the Scoping Plan and any other pertinent matter in implementing AB 32
7. Appoint an Economic and Technology Advancement Advisory Committee (ETAAC) to provide recommendations for technologies, research and greenhouse gas emission reduction measures

Executive Order S-1-07 (2007): On January 18, 2007, California further solidified its dedication to reducing GHGs by setting a new Low Carbon Fuel Standard for transportation fuels sold within the state. The target of the Low Carbon Fuel Standard is to reduce the carbon intensity of California passenger vehicle fuels by at least 10 percent by 2020.

Senate Bill 97 *(2007):* SB 97, enacted in 2007, amended the California Environmental Quality Act (CEQA 2012) statute to clearly establish that GHG emissions and effects of GHG emissions are subject to CEQA. It also directed the Governor's Office of Planning and Research (OPR) to develop CEQA Guidelines to address GHG emissions for approval by the California Natural Resources Agency. The Natural Resources Agency adopted the amendments in January 2010, which went into effect in March 2010. The amendments do not identify a threshold for determining whether a proposed project would have a significant effect on GHG emissions, nor do they prescribe assessment methodologies or specific mitigation measures. The amendments encourage lead agencies to consider many factors in performing a CEQA analysis, but preserve the discretion granted by CEQA to lead agencies in making their own determinations based on substantial evidence. The amendments also encourage public agencies to make use of programmatic mitigation plans and programs when (such as jurisdictional GHG reduction) they perform individual project analyses.

Executive Order S-16-08 *(2008):* Executive Order S-16-08 launched a major initiative for improving the state's adaptation to climate impacts from sea level rise, increased temperatures, shifting precipitation, and extreme weather events. It ordered a California Sea Level Rise Assessment Report to be conducted by the National Academy of Sciences, which was released in June 2012. It also ordered the development of a California Climate Change Adaptation Strategy. The Strategy, published in December 2009, assesses the state's vulnerability to climate change impacts, and outlines possible solutions that can be implemented within and across State agencies to promote resiliency. The Strategy focuses on seven areas: public health, biodiversity and habitat, ocean and coastal resources, water management, agriculture, forestry, and transportation and energy infrastructure.

California Ocean Protection Council Resolution: California Ocean Protection Council (OPC) Resolution, adopted on March 11, 2011, requires the vulnerabilities associated with sea level rise to be considered for all projects or programs receiving funding from the State. The Resolution states: "Given the currently predicted effects of Climate Change on California's water resources, IRWM Plans should address adapting to changes in the amount, intensity, timing, quality and variability of runoff and recharge. Areas of the State that receive water imported from the Sacramento-San Joaquin River Delta, the area within the Delta, and areas served by coastal aquifers will also need to consider the effects of sea level rise on water supply conditions and identify suitable adaptation measures." The OPC resolution and sea level rise guidance can be found on the OPC website[2].

15.2 The Predicted Effects of Climate Change in California

Climate change models predict changes in temperature, precipitation patterns, water availability, and sea levels, and these altered conditions can have severe impacts on natural and human systems in California (California EPA, 2010). Sea levels have risen by as much as seven inches along the California coast over the last century, increasing erosion and pressure on the state's infrastructure, water supplies, and natural resources. The state has also seen increased average temperatures, more extreme hot days, fewer cold nights, a lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow, and both snowmelt and rainwater running off sooner in the year (California Natural Resources Agency, 2009). According to the California Department of Water Resources (DWR, 2009a), more changes related to climate change can be expected by the year 2050 and on to the end of the century:

[2] http://www.opc.ca.gov/council-documents/

- California's mean temperature may rise 1.5°F to 5.0°F by 2050 and 3.5°F to 11°F by the end of the century.
- Average annual precipitation may show little change, but more intense wet and dry periods can be expected with more floods and more droughts.
- Flood peaks will become higher and natural spring/summer runoff will become lower.
- Global sea level projections suggest possible sea level rise of approximately 14 inches (36 cm) by 2050 and a high value of approximately 55 inches (140 cm) by 2100.[3]

In 2009, the Pacific Institute completed one of the first statewide evaluations of the vulnerability of California coastal infrastructure and communities to sea level rise. The study reports:

> *Rising sea levels will be among the most significant impacts of climate change to California. Sea level will rise as a result of thermal expansion of the oceans and an increase in ocean volume as land ice melts and runs off. Over the past century, sea level has risen nearly eight inches along the California coast and general circulation model scenarios suggest very substantial increases in sea level due to climate change over the coming century. (Heberger et al., 2009)*

The Pacific Institute study provides an analysis of coastal resources, human populations, infrastructure, and property that is at risk from projected sea level rise if no actions are taken. The study evaluates how the cumulative impacts of increased watershed flooding, sea level rise, and storm surge can impact coastal areas through increased flooding and coastal erosion.

The study evaluated and mapped areas of the California coast that are vulnerable to flooding with a 55-inch (1.4 meter) increase in sea level rise. **Table 15-1**, below, shows the population vulnerable to flood and erosion from a 1.4-meter sea level rise along the Pacific coast in California, by county. Monterey and Santa Cruz counties were identified as the two counties most vulnerable to flood-related risks of sea level rise in terms of population, due to the low lying areas of the Carmel Valley and on the Monterey Peninsula.

[3] The State of California uses estimates of global sea level rise produced by Ramstorf, 2007 and Cayan et al., 2008 for coastal adaptation planning purposes under Executive Order S-16-08.

Table 15-1: Population Vulnerable to Flood and Erosion from Sea Level Rise

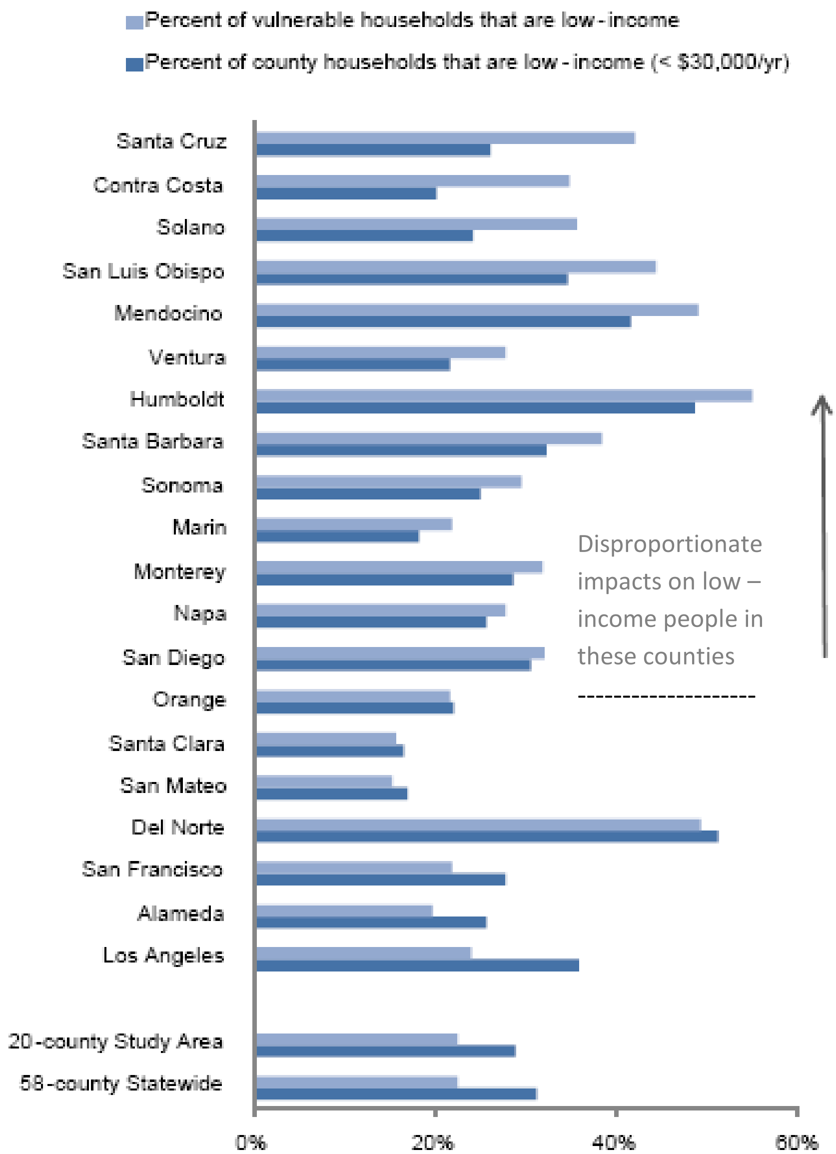
County	Flood-related Risk	Erosion-related Risk
Del Norte	2,600	620
Humboldt	7,800	580
Marin	630	570
Mendocino	650	930
Monterey	14,000	820
San Francisco	6,500	1,200
San Luis Obispo	1,300	1,100
San Mateo	5,900	2,900
Santa Barbara	6,700	2,100
Santa Cruz	15,000	2,600
Sonoma	700	300
Total	63,000	14,000

Source: Pacific Institute (Heberger et al., 2009)

The Pacific Institute study notes that a 1.4-meter sea level rise will put a wide range of critical infrastructure, such as roads, hospitals, schools, emergency facilities, wastewater treatment plants, and power plants, at risk. Throughout California, $100 billion (in year 2000 dollars) in property is at risk of coastal flooding. To help protect against the impacts of sea level rise, the study identified the need to construct, raise, or repair 53 miles of levees and seawalls in Monterey County. The cost to construct the new sea walls was estimated at $650 million, or $12 million dollars a mile (note that this estimate does not include the options of adaptation or retreat). A risk assessment and resource protection prioritization process will need to be completed to identify which resources and infrastructure are most in need of protection.

The Pacific Institute study also evaluated the potential impacts of sea level rise on disadvantaged communities (DAC). Monterey County, along with 12 other coastal counties, is expected to see a disproportionate impact of sea level rise on DAC (**Figure 15-2**).

Figure 15-2: Impact of Sea Level Rise on DACs



Source: Pacific Institute (Heberger et al., 2009). Used by permission.

The changes in sea levels, temperature, and precipitation from global climate change that are anticipated to occur with climate change, as described above, will affect California's public health, habitats, ocean and coastal resources, water supplies, agriculture, forestry, and energy use (California EPA, 2010), and result in increased droughts and flooding. Climate change could also have adverse effects on water quality, which would in turn affect the beneficial uses (habitat, water supply, etc.) of surface water bodies and groundwater. Changes in precipitation could result in increased sedimentation, higher concentrations of pollutants, higher dissolved oxygen levels, increased temperatures, and an increase in the amount of runoff constituents reaching surface water bodies.

Climate change is also expected to have effects on diverse types of ecosystems, from alpine to deep sea habitat. As temperatures and precipitation change, seasonal shifts in vegetation will occur; this could affect the distribution of associated flora and fauna species. As the range of species shifts, habitat fragmentation could occur, with acute impacts on the distribution of certain sensitive species. The IPCC states that "20 percent to 30 percent of species assessed may be at risk of extinction from climate change impacts within this century if global mean temperatures exceed 2°C to 3°C (3.6°F to 5.4°F) relative to pre-industrial levels" (IPCC 2007a). Shifts in existing biomes could also make ecosystems vulnerable to invasive species encroachment. Wildfires, which are an important control mechanism in many ecosystems, may become more severe and more frequent, making it difficult for native plant species to repeatedly re-germinate. In general terms, climate change is expected to put a number of stressors on ecosystems, with potentially catastrophic effects on biodiversity.

The IPCC modeled several possible emissions trajectories to determine what level of reductions would be needed worldwide to stabilize global temperatures and minimize climate change impacts. Regardless of the analytic method used, global average temperature and sea level rise were predicted to rise under all scenarios (Ibid.). For example, the IPCC predicted that the range of global mean temperature change from year 1990 to 2100, given different emissions reduction scenarios, could range from 1.1°C to 6.4°C (2.0°F to 11.5°F). In other words, there is evidence that emissions reductions can reduce the severity of climate change effects but cannot reverse them entirely.

15.3 The Potential Effects of Climate Change in the Monterey Peninsula Region

This section first takes a look at projected changes in climate variables, and then considers the impacts of climate change for the local region.

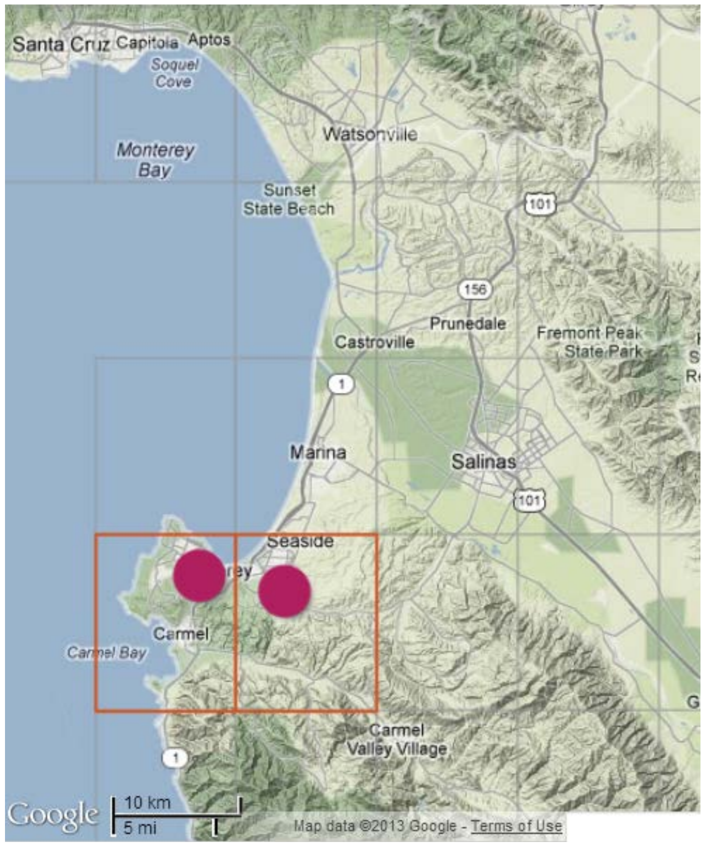
15.3.1 Projected Changes in Climate Variables

Many climate models have been generated to predict changes in ocean and land temperature, rain frequency and intensity, coastal wave exposure, and sea level rise. Modeling with regional climate models has matured over the past decade to enable meaningful climate vulnerability assessment applications (Wang et al., 2004). California has created several web-based interfaces to help local and regional planners "downscale" climate models for local planning purposes. The Cal-Adapt website[4] is one that provides a geographically based climate model interpretation tool that generates predictive changes to climate variables using different IPCC GHG emissions projections. Specifically, emissions scenario A2 (High Emissions Scenario) coincides with a scenario in which no effort is taken to alter present practices, resulting in increasing rates of emissions. Emissions scenario B1 (Low Emissions Scenario) coincides with emission rates associated with global success at curbing emissions as prescribed within international climate treaties.

The Cal-Adapt tool was used to model changes in climate variables that may affect water resources within the Monterey Peninsula IRWM planning area. Two areas of the region, Monterey and Carmel, were used to reflect the climate regime, where a majority of the population resides (**Figure 15-3**). Changes in climate variables are presented for the A2 emissions scenario as a worst-case prediction of potential vulnerabilities. Future analysis will be able to increase climate prediction evaluation for a select set of potential impacts based on this initial investigation.

[4] http://cal-adapt.org

Figure 15-3: Two Climate Regimes Modeled in the Monterey Peninsula IRWM Planning Region



Source: Cal-Adapt (http://cal-adapt.org/)

Temperature Changes: **Table 15-2** shows the projected difference in temperature between a baseline time period (1961-1990) and an end of century period (2070-2090) for the two climate regime areas selected for the Monterey Peninsula IRWM planning region.

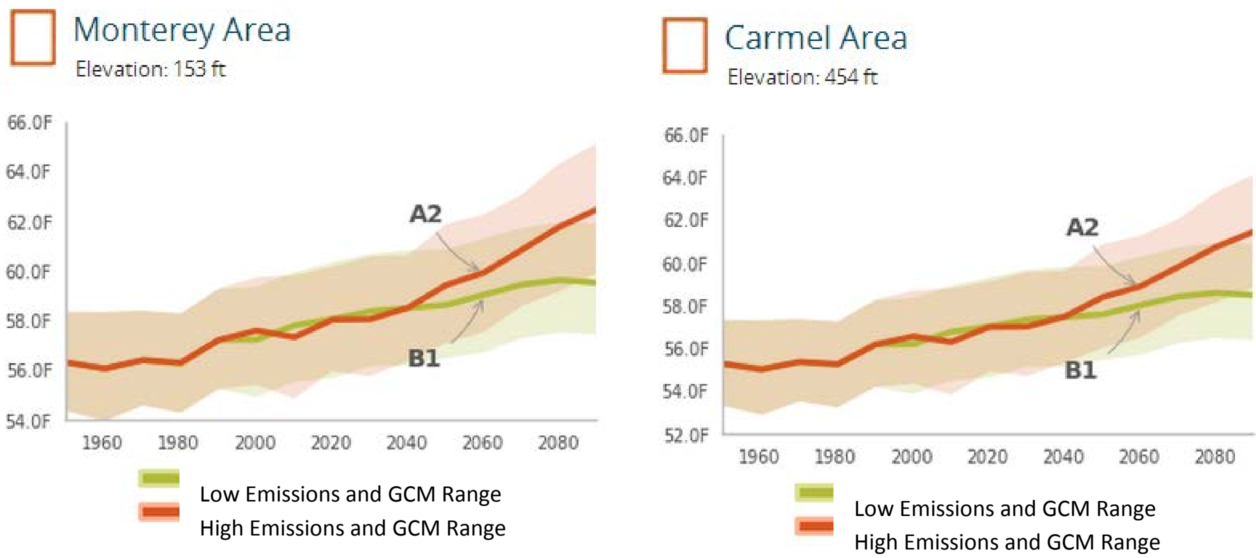
Table 15-2: Projected Increases in Average Temperature

Area	Historical Average	Low-Emissions Scenario (B1)	Change in Temperature	High-Emissions Scenario (A2)	Change in Temperature
Carmel Area	55.4	58.6	+3.2	60.8	+5.4
Monterey Area	57.6	60.8	+3.1	63.0	+5.4

Source: Cal-Adapt web tool (http://cal-adapt.org/)

Projected increases in average temperature are graphed for the Monterey and Carmel area in **Figure 15-4**, below. Projected increases in temperature are similar through 2050 for both the A2 (High Emissions) and B1 (Low Emissions) scenarios. After 2050, temperature increases more rapidly using the high emissions rate scenario.

Figure 15-4: Projected Increase in Temperatures in the Monterey Area (South) [Left] and Carmel Area [Right]



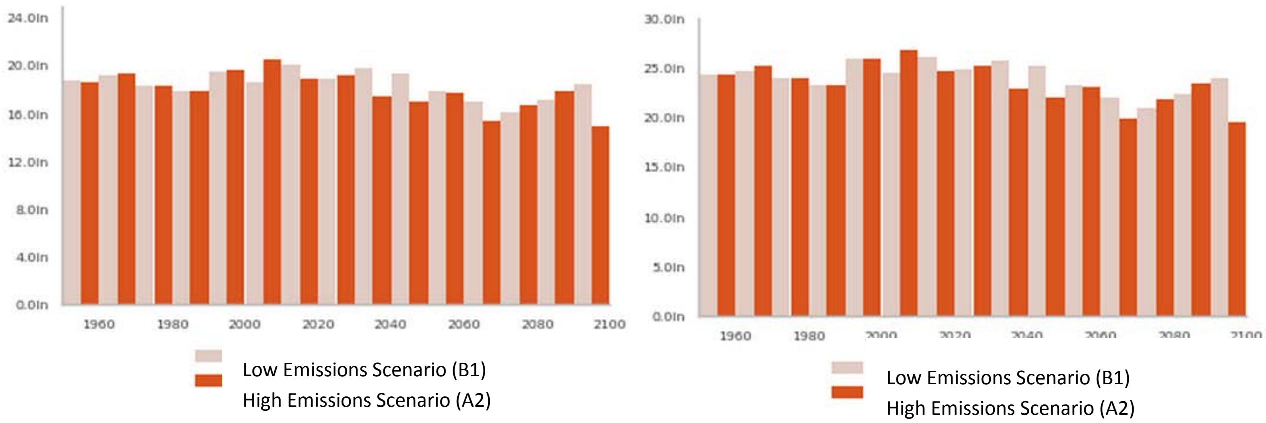
Source: Cal-Adapt web tool (http://cal-adapt.org/)

Rainfall Changes: The Cal-Adapt tool predicts that average rainfall will begin to decline throughout the Monterey Peninsula IRWM planning region with projected decreases of approximately 2-3 inches in the Monterey Area and approximately three inches in the Carmel Area (20 percent) by 2100 (High Emissions Scenario A2). **Figure 15-5** represents the inter-decadal fluctuations in precipitation (integrating historic decadal fluctuations) and the long-term decline in total precipitation for the areas in question. Note, however, that while most climate change scientists agree that precipitation patterns will change, there isn't complete consensus on the direction of the precipitation change, with some climate models suggesting decreases while others suggest increases.

The US Department of the Interior Bureau of Reclamation report (2011) gives an example of the variable predictions of precipitation in California: mean-annual precipitation in the Sacramento and San Joaquin basins will stay generally steady during the 21st century and will be quite variable over the next century, with the authors noting that there is significant disagreement among the climate projections regarding change in annual precipitation over the region. The 2009 California Climate Change Adaptation Strategy (California Natural Resources Agency, 2009) notes that climate models for the state differ in determining where and how much rain and snowfall patterns will change under different emissions scenarios. However, while the precipitation modeling results vary more than the temperature projections, the authors point out that 11 out of 12 precipitation models run by the Scripps Institution of Oceanography for northern California suggest a small to significant (12-35 percent) overall decrease in precipitation levels by mid-century. Finally, a US Geological Survey report (USGS, 2012), using five General Circulation Models (GCM) for two watershed basins in northern California, concludes that precipitation will follow cycles of wetter and drier decadal oscillations during the 21st century.

According to DWR, average annual precipitation throughout the state may show little change, but more intense wet and dry periods can be expected with more floods and more droughts (DWR, 2009). The actual change in precipitation is more difficult to predict on the local level.

Figure 15-5: Projected Average Rainfall in Monterey (Left) and Carmel Area (Right)



Source: Cal-Adapt web tool (http://cal-adapt.org/).

Note: Other climate variables, including evapotranspiration (water loss in plants) and runoff rates from storms, will also increase over time. Average base flow levels in creeks are projected to decline.

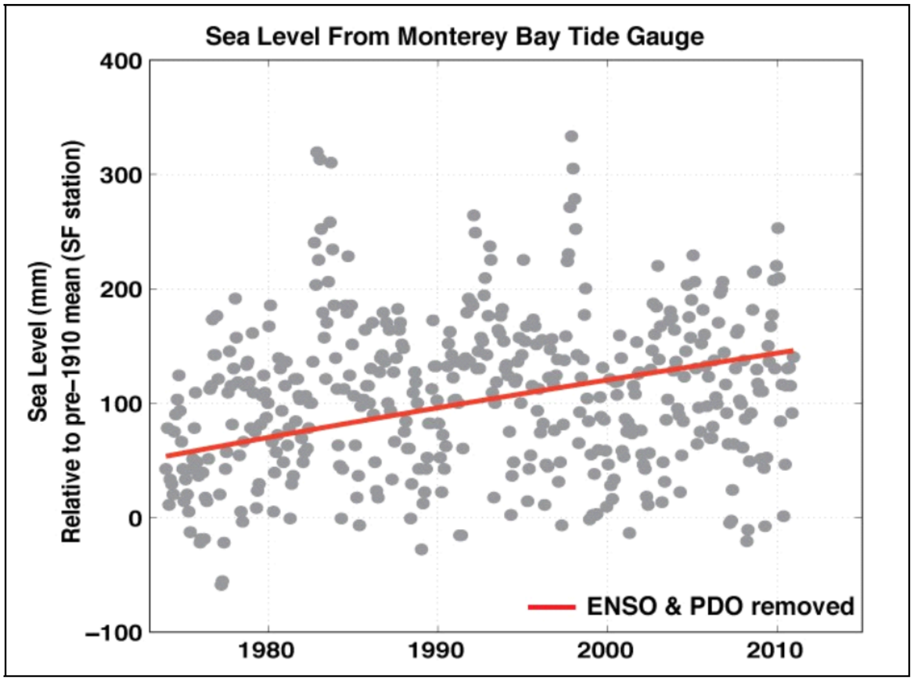
Sea Level Rise: Sea level rise[5] is a complex and dynamic process ultimately controlled by levels of heat-trapping greenhouse gases in the atmosphere. Globally, sea level rise is driven by two primary factors—global ice melt and thermal expansion of seawater—but locally there are numerous processes that can alter the rate, extent, and duration of changes in sea level. As such, accurately predicting sea level over the coming centuries for specific locations is very challenging.

Sea level rose approximately seven inches (18 cm) over the past century (1900–2005) along most of the California coast (Cayan et al., 2008). The local tide gauge at Monterey dates back to 1973 (compared to the San Francisco gauge dating from 1855), but even during this short time period, a trend of sea level rise is evident at the rate of approximately 0.05 inches per year (**Figure 15-6**). Due to local oceanographic conditions, sea level in central California has been relatively stable or even declining over the past several decades. However, when the regional climate patterns that drive local sea level trends shift, the Central Coast will very likely experience a rise in sea level that will correspond to, or may even exceed, the mean global rate of sea level rise (Largier et al., 2010; Ramp et al., 2009; and Bromirski et al., 2011).

Currently, the State of California is using estimates of global sea level rise produced by Rahmstorf (2007) and Cayan et al., (2008) for coastal adaptation planning purposes under Executive Order S-16-08. These projections suggest possible sea level rise of approximately 14 inches (36 cm) by 2050 and up to approximately 55 inches (140 cm) by 2100. However, Cal-Adapt notes recent evidence suggests these values may prove to be underestimates of the possible rise in global sea level.

[5] This section regarding sea level rise has been excerpted from the "Climate Change and Monterey Bay" website (http://www.climatechangemontereybay.org/impacts_main.shtml). Text prepared by Michael Fox, Center for Ocean Solutions. The references in this section are as cited on the "Climate Change and Monterey Bay" website.

Figure 15-6: Sea Level in Monterey Bay from 1976-2010



The Pacific Decadal Oscillation (PDO) is a pattern of change in the Pacific Ocean's climate; El Nino Southern Oscillation (ENSO) is comprised of El Nino (warm ENSO phase) and La Nina (cool ENSO phase) activity.

Monthly records of sea level from the Monterey Bay tide gauge are shown from 1976 to 2010. Monterey has experienced a consistent rise in sea level on the order of 2 - 3 mm/yr (0.07 - 0.1 in/yr) for the past 35 years[6]. The anticipated consequences of sea level rise for the Monterey Bay region are serious and far-reaching, and are discussed below in Section 15.3.2, Predicted Impacts of Climate Change.

Changes in Fog: There is evidence to suggest that yearly coastal fog may be declining. A recent study by Todd Dawson from UC Berkeley and James Johnstone from the University of Washington shows that coastal fog in California has declined more than 30 percent over the past 60 years (Sanders, 2010; Dayton, 2011). With only 60 years of data, it is unclear whether the phenomenon is part of a natural cycle or the result of global climate change[7]. However, a change in coastal fog could have critical implications for the fate of certain ecosystems, in particular coastal redwoods and maritime chaparral, both of which are dependent on fog for their survival. A decline in coastal fog could also lead to increased water use and an increased demand for water supplies in the Region.

California coastal fog is caused by the temperature differential between the cool ocean water and the warmer air. The Monterey Bay area is particularly foggy because of oceanic upwelling of the deep, cold waters of the Monterey submarine canyon. When the cold oceanic water meets the warmer air, the air chills and condenses to form fog. As noted above, one of the effects of global climate change is warmer

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[6] Developed by Brock Woodson for the Preparing for the Future: Climate Change and the Monterey Bay Shoreline regional workshop; see http://centerforoceansolutions.org/preparingforthefuture. Data obtained from the Permanent Service for Mean Sea Level [PSMSL]. Used by permission.

[7] Note that the scientists are working to calibrate tree ring isotope data with actual coastal fog conditions in the past century, and will then be able extrapolate back for 1,000 years or more to estimate climate conditions.

ocean temperatures. The IPCC stated in a 2007 report, "observations since 1961 show that the average temperature of the global ocean has increased to depths of at least 3,000 meters" (IPCC, 2007). Warmer ocean temperatures could mean less fog for coastal California.

Fog occurs primarily in the summer months, when there is little or no rainfall. Fog provides an important source of water for many coastal plant communities by providing soil drip; and some plants, including redwoods and 80 percent of their understory plants, can absorb fog directly through their leaves. Fog also acts to keep moisture in the ecosystem, preventing evaporation and maintaining cooler temperatures. A significant decline in fog could mean an uncertain future for many of the plant communities in the region, including local endemic plants that depend on fog for their survival (Dayton, 2011).

The role that coastal fog plays in preventing evaporation and maintaining cooler temperatures also has important implications for water use and water supply in the Monterey Peninsula region. A decline in coastal fog would change the local coastal climate, resulting in warmer temperatures and increased evaporation during the summer months. This in turn may lead to increased agricultural and landscape water use, putting additional demand on water supplies in the region.

15.3.2 Potential Effects of Climate Change in the Region

Numerous tools are available to assist local water resource managers in evaluating the potential impacts of climate change on local infrastructure and populations. DWR provides a list of potential impacts to water resources associated with changes in climate variables. The State of California has also provided guidance on possible impacts to infrastructure and resources due to changing climate variables. These resources were used to identify local impacts that are most likely to occur in the Region, due to local changes in rainfall patterns, temperature increases, evapotranspiration, storm intensity and runoff rates, and urban and agricultural water use.

Table 15-3, below, represents a "broad brush" consideration of potential impacts to water resources associated with changes in climate variables, based on the State's guidance as applied to the Monterey Peninsula region (adapted from Appendix B of *Climate Change Handbook for Regional Water Planning*). Following this list is a more detailed discussion of key potential impacts of climate change in the Monterey Bay region, as presented at a December 2011 regional workshop report called "Preparing for the Future: Climate Change and the Monterey Bay Shoreline."

Table 15-3: Potential Impacts to Water Resources in the Region

Water Supply and Demand

- Agricultural water use is expected to increase to offset higher temperatures and evapotranspiration.
- Rangelands are expected to be drier.
- Domestic landscaping water needs will be higher.
- Sea level rise and higher groundwater extraction will lead to increased rates of saltwater intrusion.
- Droughts will be more frequent and severe.

Water Quality

- Lower seasonal surface flows will lead to higher pollutant concentrations.
- Changes in storm intensity will increase sediment loading in many systems.
- Channel stability will be impacted from higher storm flows causing additional turbidity.
- Sea level rise will impact current estuary brackish water interface towards more marine systems.

Flooding

- Regional river levees will provide less protection during higher storm flow events.
- Natural creeks and managed conveyance will see higher flow rates leading to increased erosion and flooding.
- Coastal levees and control structures will be undersized to manage the combined influences of higher river flows and sea level rise.

Aquatic Ecosystem Vulnerabilities

- Migration patterns and species distribution will change.
- Invasive species populations will expand.
- Coastal wetland systems are likely to be inundated with increasing frequency, leading to the dieback of tidal marshes (Philip Williams & Associates, 2008b) and the salinization of fresh and brackish marshes.
- Changes in hydrograph (driven by rain pattern changes) will cause increased erosion and habitat loss in creeks and rivers.
- Some locally unique species and communities such as maritime chaparral, coastal prairie, Monterey Cypress, coastal redwoods and giant kelp are susceptible to changes in certain locally favorable climate variables; for example, redwood forest ecosystems and coastal chaparral species are dependent on fog, and productive kelp forests tend to be associated with areas of significant oceanographic upwelling. In addition, ocean acidification may impact marine species. As conditions change, these ecosystems and species may face an uncertain future (see Dayton, 2011).

Hydropower and Reservoir Storage

- Changes in rainfall patterns may be problematic for timing of release from reservoirs.
- More intense rainfall and increased risk of fires in watershed lands can lead to increased sediment loading to reservoirs.

Preparing for the Future: Climate Change and the Monterey Bay Shoreline: On December 6, 2011, the Monterey Bay National Marine Sanctuary (MBNMS) and Center for Ocean Solutions (COS) convened regional decision-makers at a one-day workshop titled "Preparing for the Future: Climate Change and the Monterey Bay Shoreline." The event was the first Monterey Bay regional gathering on climate change adaptation, intended to facilitate a discussion on how to best prepare coastal communities in the Monterey Bay region to adapt to the impacts of climate change. More than 90 people attended from cities and municipalities in Santa Cruz and Monterey Counties, representing city and county staff, state and federal governments, research institutions, nonprofit organizations, private industry, and the public.

Presenters at the workshop focused on impacts of concern for the Monterey Bay region, which include: increased coastal erosion, coastal inundation, storm and wave damage, and saltwater intrusion. Collectively, these impacts will threaten infrastructure, development, marine and coastal ecosystems, and the general welfare of the communities around Monterey Bay. Monterey Bay has variable coastal geology, and as a result, different regions will experience different types and magnitudes of impacts. For example, portions of the sandy beaches and dunes of South Monterey Bay are currently eroding at some of the highest rates in California, while the low-lying land and large flood plains in the central portion of the bay make those areas particularly susceptible to inundation (Abeles et al., 2012).

The following provides information presented at the workshop regarding the anticipated impacts of climate change specifically for the Monterey Bay shoreline area. Note that almost all of the text in this section has been excerpted from one of two sources: the "Climate Change and Monterey Bay" website[8]; and the workshop Summary Report (Abeles et al., 2012), which is also available online[9].

Coastal Erosion: Existing levels of coastal erosion in the Monterey Bay region of 28-244 cm/year causes significant threats to critical infrastructure, property, and natural habitats (Stamski, 2005)[10]. Coastal erosion will increase as global sea levels continue to rise. Higher sea level will allow waves and tides to travel farther inland, exposing beaches, cliffs, and coastal dunes to more persistent erosional forces (Storlazzi and Griggs, 2000). Erosion is not a new issue in California, but rising sea levels threaten to increase the severity and frequency of erosion damage to coastal infrastructure and property. Statewide, a 4.6-foot (1.4 m) rise in sea level has the potential to erode approximately 41 square miles (68 km2) of coastline by the end of the century (Heberger et al., 2009).

The southern portion of Monterey Bay is eroding more rapidly than any other region in the state, with coastal dunes between the Salinas River mouth and Wharf II in Monterey eroding at rates between 1.0 and 6.0 feet per year (0.3-1.8 m/yr) (Heberger et al., 2009; Brew et al., 2011; and Hapke et al., 2009). Even without consideration of accelerated sea level rates, eight oceanfront facilities in South Monterey Bay are at high risk in the next 50 years and will require mitigation measures to prevent their loss (Philip Williams & Associates, 2008a). One statewide study by the California Energy Commission, *Impacts of Sea Level Rise on the California Coast*, found that in Monterey County a total of approximately 4.4 square miles (7 km^2) of coastline is susceptible to erosion, and the maximum distances coastal dunes and sea cliffs are expected to retreat in this region are approximately 1,300 and 720 feet (400 m and 200 m), respectively (Heberger et al., 2009). Loss of this land threatens to place roughly 820 people in Monterey County at risk of losing their homes (Ibid.). In addition to the loss of the protective service, losing these coastal dunes also means the loss of habitat for coastal species. Coastal erosion will have long-lasting impacts on the Monterey Bay region's transportation infrastructure, threatening over 50 miles (~83 km) of highway, roads, and rail throughout the region, including Highway 1 (Ibid.). Important public infrastructure is also vulnerable to erosion. One example is the Monterey Interceptor pipeline that carries raw sewage from the Monterey Peninsula to the treatment plant located north of the city of Marina. Portions of this critical piece

[8] http://www.climatechangemontereybay.org

[9] http://centerforoceansolutions.com/preparingforthefuture

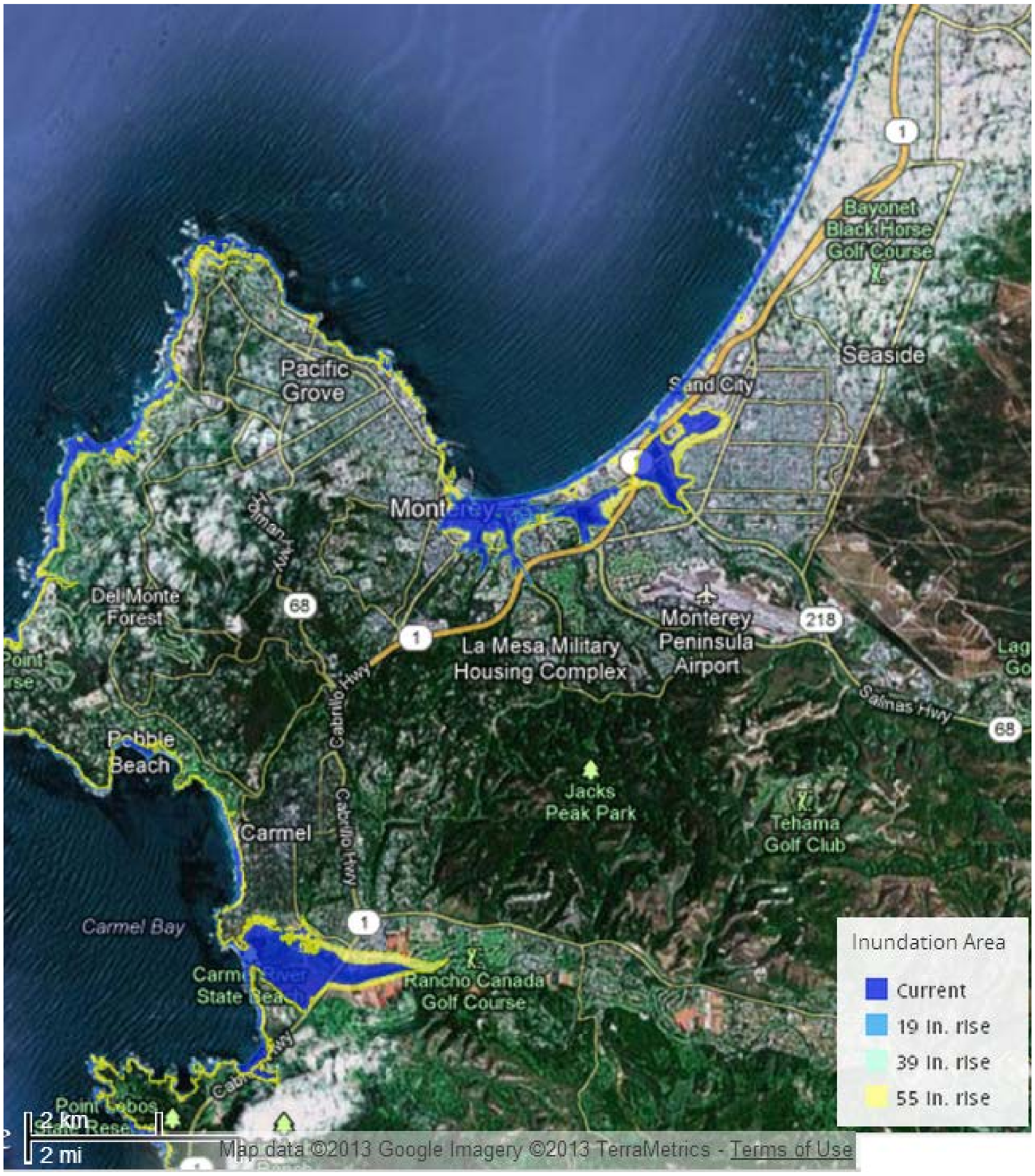
[10] This section on coastal erosion has been excerpted from the "Climate Change and Monterey Bay" website: http://www.climatechangemontereybay.org/impacts_erosion.shtml. Text prepared by Michael Fox, COS. All references included in this section are cited on the website.

of infrastructure run directly beneath the beach, and if undermined, could result in a significant threat to marine resources and public welfare and safety. Other threatened structures include beachfront hotels, condominiums, private residences, and other wastewater pumping stations associated with the Monterey Interceptor pipeline. Given the current rates of erosion, this sewage pipeline faces possible risk of exposure in the next 30 to 50 years (Brew et al., 2011), highlighting the importance of strategic long-term planning efforts.

Coastal Inundation: Coastal inundation occurs when normally dry land becomes covered by water and it is one of the most costly and damaging impacts associated with sea level rise[11]. Low-lying coastal areas of the Monterey Bay region will be exposed to a greater risk of major flooding events, and storm surge, high tides, and waves will travel farther inland (Heberger et al., 2009). Elevated sea levels combined with increases in winter storm intensity and wave heights will make coastal inundation a more serious risk (Storlazzi and Wingfield, 2005; and Wingfield and Storlazzi, 2005).

[11] This section on coastal inundation (except for last two paragraphs) has been excerpted from the "Climate Change and Monterey Bay" website: http://www.climatechangemontereybay.org/impacts_inundation.shtml. Text prepared by Michael Fox, COS. All references included in this section are cited on the website.

Figure 15-7: Predicted Flooding in the South Monterey Bay Area due to Sea Level Rise and Increased Winter River Flows



Source: Cal-Adapt web tool (http://cal-adapt.org/) Map depicting where increased inundation will occur within the Monterey Bay area without adaptation from a 1.4m sea level rise. Source Cal Adapt

Given the large impact zone associated with coastal inundation, a significant portion of transportation infrastructure is at risk. Highways, roads, and railways in Monterey County are susceptible to coastal inundation, and flooding may impact several power generating facilities (Heberger et al., 2009). The low-lying coastal location of many agricultural properties in this region increases the likelihood of significant loss of agricultural land due to storm-induced flooding and salinization with increasing sea level and long-term inundation. Loss of agricultural production in the region will have lasting consequences for the largest sector of the regional economy.

In conjunction with coastal inundation, coastal water quality will likely decline as storm-induced flood waters recede, drawing debris, fertilizers, and other contaminants into the bay. This increased runoff has the potential to increase the frequency and severity of harmful algal blooms (HABs) in the area posing a serious threat to local fisheries and marine mammal populations (Largier et al., 2010).

Coastal inundation also poses a risk to local wetlands. The impact of sea level rise on wetlands is significant for the Monterey Peninsula area, since the region contains several important wetland systems. If the rate of sea level rise exceeds the rate of wetland accretion, or if wetlands cannot transgress (migrate up and inland) large tracts of critically important habitat, such as Carmel River and San Jose Creek, will become permanently submerged by ocean or brackish water. If these wetland systems become submerged with seawater or brackish water, their ability to provide crucial services such as nursery habitat, wave protection, and nutrient and sediment retention will be greatly diminished. There are several other wetland systems that are in contact with the Monterey Bay, including the Del Rey Creek, Roberts Lake/Laguna Grande, and El Estero Lake. All of these systems' tidal interactions are muted due to sand dunes and urban infrastructure. Sea level rise will pose significant threats to these systems as well, but those interactions are less well understood.

The Monterey Peninsula IRWM planning region hosts numerous coastal river and creek mouth lagoon systems that provide a diverse set of environmental benefits and span the entire IRWM planning region. The cumulative impacts of increased rain intensity and flows within coastal watersheds along with increased sea levels and storm wave impacts pose unique threats to these valuable wetland resources. Regional partners have begun to evaluate the potential impacts to these systems, but studies are incomplete and more research is needed.

Seawater Intrusion: Seawater intrusion is caused by two primary processes: overdrafts of coastal wells and sea level rise. As described in the Regional Description of this Plan, the Salinas Valley and Seaside groundwater basins used for water supply in the region have been experiencing overdraft for many years. The Salinas Valley Groundwater Basin is the primary source of water supply to the former Fort Ord area of the Monterey Peninsula planning region. It is estimated that the Salinas Valley Groundwater Basin has an average annual non-drought overdraft of approximately 50,000 acre feet (AF) (Cal Water, 2010a), though during the last drought the annual overdraft was estimated at 150,000–300,000 acre-feet/year (AFY) (Cal Water, 2010b). As a result of this consistent overdraft, groundwater levels in the Salinas Valley Groundwater Basin have dropped below sea level, allowing seawater to intrude from Monterey Bay into aquifers located 180 and 400 feet below ground surface. The East Side and Pressure Subareas of the Salinas Valley Groundwater Basin are most impacted by overdraft (MCWRA, 1997). The hydrologic continuity between the ocean and the aquifers of the Pressure Area caused seawater to intrude these aquifers at a rate of approximately 28,800 AFY (Cal Water, 2010b).

The Seaside Basin underlies an approximately 19-square-mile area at the northwest corner of the Salinas Valley, adjacent to Monterey Bay. The hydrogeology of the Seaside Basin has been the subject of numerous studies beginning with a California Department of Water Resources study in 1974. Monitoring data gathered since 1987 shows that water levels have been trending downward in many areas of the basin. A steep decline since 1995 in the northern coastal portion of the basin, where most of the groundwater production occurs, coincides with increased extraction in that area after the State Water Resources Control Board required Cal-Am to reduce its Carmel River diversions, and instead maximize its pumping in the Seaside Basin.

Continued pumping in excess of recharge and fresh water inflows, pumping depressions near the coast, and ongoing seawater intrusion in the nearby Salinas Valley all suggest that seawater intrusion could also occur in the Seaside Groundwater Basin; however, no seawater intrusion has been observed in existing monitoring wells and modeling and other water quality analyses have not demonstrated seawater intrusion will affect extraction wells in the near term. (Hydrometrics, *Seawater Intrusion Analysis Report*, 2011).

Groundwater is currently extracted from approximately 37 wells by 20 well owners in the Seaside Basin. Cal-Am owns 12 wells and pumps approximately 80 percent of the water produced in the basin. In addition, Cal-Am and Monterey Peninsula Water Management District operate a Seaside Basin Aquifer Storage and Recovery system that stores excess Carmel River water supplies during the wet season in the groundwater basin and recovers the banked water during the following dry season for consumptive use.

The estimated average yield of the existing Aquifer Storage and Recovery facilities is 1,920 AFY, but varies yearly based on rainfall due to the requirement to maintain adequate Carmel River instream flows. Historical and persistent low groundwater elevations caused by pumping have led to concerns that seawater intrusion may threaten the basin's groundwater resources. In 2006, an adjudication process (Cal-Am v. City of Seaside et al., Case No. M66343) led to the issuance of a court decision that created the Seaside Basin Watermaster (Watermaster). The Watermaster consists of nine representatives, one representative from each: Cal-Am, City of Seaside, Sand City, City of Monterey, City of Del Rey Oaks, Monterey Peninsula Water Management District and Monterey County Water Resources Agency, and two representatives from landowner groups. The Watermaster has evaluated water levels in the basin and has determined that while seawater intrusion does not appear to be occurring at present, current water levels are lower than those required to protect against seawater intrusion.

Seawater intrusion has not been documented in the Carmel River alluvial aquifer. Looking forward, seawater intrusion is not anticipated due to the narrow alluvial aquifer near the lagoon and mouth of the Carmel River and the seasonal high river flows that cause the alluvial aquifer to fill annually.

Coastal Storms and Waves: Seasonal patterns of storms and wave intensity are the primary driving forces behind coastal erosion along the California coast[12]. While erosion is a natural process that shapes shorelines and beaches, erosional forces become a hazard when they interact with permanent structures that rely on a stable shoreline. The impacts of storm and wave damage are episodic and have the greatest severity when large storms coincide with high tide events. Despite the gradual day-to-day erosion experienced along the coast, it is the large, episodic erosional events that pose the greatest threat to the Monterey Bay shoreline. Given the recent evidence that suggests storm and wave intensity is likely to increase in this region, these large, episodic erosional events may occur more frequently. Protecting and restoring natural systems to take advantage of their protective services can increase resilience to these coastal impacts. Protecting and restoring these systems will likely provide additional benefits such as improved water quality and increased nursery habitat and recreation areas.

Simulation of Climate Change in the Santa Cruz Mountains*:* A regional study was completed by the US Geological Survey (Flint and Flint, 2012), on how changing climate variables lead to a change in potential evapotranspiration, recharge, runoff, and climatic water deficit within the Santa Cruz Mountains. The coastal mountains in the Monterey Peninsula planning region have a similar geography and climate as the Santa Cruz Mountains and may experience similar climate change impacts; therefore, many of the conclusions from this study apply to Monterey Peninsula IRWM planning region. Hydrologic models predict a reduced early and late wet season runoff; summers are projected to be longer and drier in the future than in the past, regardless of precipitation trends. While water supply could be subject to increased variability (that is, reduced reliability) due to greater variability in precipitation, water demand is likely to

[12] This section on coastal storms and waves has been excerpted from the "Climate Change and Monterey Bay" website: http://www.climatechangemontereybay.org/impacts_storms.shtml. Text prepared by Michael Fox, COS.

steadily increase because of increased evapotranspiration rates and climatic water deficit during the extended summers. This analysis identifies the areas in the landscape that are the most resilient or vulnerable to projected changes and implies greater water demand will occur to maintain current agricultural resources or land cover. Fine-scale modeling identifies areas possibly more resilient to climatic changes in contrast to locations where vegetation is currently living on the edge of its present-day bioclimatic distribution and, therefore, is more likely to perish or shift to other dominant species under future warming.

15.4 Vulnerability and Adaptability of Water Management Systems

The Integrated Regional Water Management Planning Act, CWC §10541(e)(10), states that IRWM plans must include an evaluation of the adaptability to climate change of water management systems in the Region.

As described in **Chapter 2, Region Description**, the stakeholders work to address a number of critical and sometimes conflicting water issues. Great strides have been made to address many of these issues, but challenges remain. Essentially, whatever challenges currently exist for water managers in the Region will be greatly exacerbated—and augmented—by the impacts of climate change. The RWMG has conducted an initial climate vulnerability analysis and risk assessment to help water resource managers evaluate these risks and to consider potential adaptation measures.

15.4.3 Initial Vulnerability Assessment

The State of California and other climate partners have provided numerous tools and several comprehensive guidance documents to evaluate the vulnerabilities of human and natural systems in the face of climate change variables. The RWMG has used a combination of tools to identify priority resources that face the greatest threat from the impacts of climate change. Those impacts were prioritized based on their likelihood and the consequence that those impacts pose on life, property, public resources, and the natural environment of the Monterey Peninsula region; stakeholders from the region were invited to provide input for this prioritization exercise.

Key documents used for this vulnerability assessment include the State guidance *Climate Change Handbook for Regional Water Planning* (US EPA Region 9 and DWR, 2011) and the guidebook *Preparing for Climate Change* (Snover et al., 2007). Both documents outline a process for defining vulnerable infrastructure, land uses, and habitats, for defining the sensitivity of those resources to changes in climate conditions, and evaluating the risk of impacts to those resources. In addition, region-specific guidance has been provided by the Monterey Bay Sanctuary Foundation and the Southern Monterey Bay Coastal Erosion Working Group, (PWA-ESA, Evaluation of Erosion Mitigation Alternatives for Southern Monterey Bay, 2012) and by the Center for Ocean Solutions, Monterey Bay National Marine Sanctuary, and California Coastal Commission (COS/NOAA, December 2011).

The RWMG used several tools to identify resources that are sensitive to changes in climate variables. The website for the International Council for Local Environmental Initiatives (ICLEI) – Local Governments for Sustainability provides an online tool to identify important resources (human and natural) that are susceptible to climate change, and the *Climate Change Handbook* provides a useful checklist for identifying potential water resource specific vulnerabilities. The following is a listing of the vulnerabilities defined in the *Climate Change Handbook* and their applicability to the Monterey Peninsula IRWM planning region.

Table 15-4: Climate Change Vulnerability Checklist for Monterey Peninsula

✔	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
Water Demand					
	Are there major industries that require cooling/process water in your planning region?	Not Applicable	–	–	–
	Does water use vary by more than 50 percent seasonally in parts of your region? - Seasonal water use, which is primarily outdoor water use, is expected to increase as average temperatures increase and droughts become more frequent. - Where water use records are available, look at total monthly water uses averaged over the last five years (if available). If maximum and minimum monthly water uses vary by more than 25 percent, then the answer to this question is "yes". - Where no water use records exist, is crop irrigation responsible for a significant (say >50%) percentage of water demand in parts of your region?	Limited agricultural water demand and high water rates have minimized seasonal water use variation. Not a key vulnerability. Available water use records do not demonstrate variations of more than 25 percent difference between minimum and maximum monthly water use rates.	Low	Medium	Low
	Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops? - Fruit and nut crops are climate-sensitive and may require additional water as the climate warms.	Small relative agricultural demand, thus less overall vulnerability due to crop sensitivity.	Low	High	Low

✔	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
	Do groundwater supplies in your region lack resiliency after drought events? - Droughts are expected to become more frequent and more severe in the future. Areas with a more hardened demand may be particularly vulnerable to droughts and may become more dependent on groundwater pumping.	Water supplies from the Seaside Basin and Carmel River alluvial aquifers lack resiliency in droughts because surface and groundwater supplies are dependent on local precipitation.	High	High	High
	Are water use curtailment measures effective in your region? - Droughts are expected to become more frequent and more severe in the future. Areas with a more hardened demand may be particularly vulnerable to droughts.	Conservation efforts (including rebates and permit requirements) have achieved dramatic water use reductions. Future curtailment will be mandatory without new water supplies; the demand is considered somewhat "hardened" due to existing conservation efforts and local water use permit programs and relatively high rates for water.	High	High	High

✔	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
	Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet? - Changes in snowmelt patterns in the future may make it difficult to balance water demands. Vulnerabilities for ecosystems and municipal/agricultural water needs may be exacerbated by instream flow requirements that are: 1. not quantified, 2. not accurate for ecosystem needs under multiple environmental conditions including droughts, and 3. not met by regional water managers.	Flows in the Carmel River and its tributaries are insufficient to support anadromous fish passage during early summer. Snowmelt patterns are not applicable to the region only rainfall.	High	High	Medium[13]
Water Supply					
	Does a portion of the water supply in your region come from snowmelt?	Not Applicable	–	–	–
	Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?	Not Applicable	–	–	–

[13] Due to impending cease and desist order and Seaside Groundwater Basin Adjudication; see **Chapter 3, Region Description**, for details

✔	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
	Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past? - Coastal aquifers are susceptible to salt intrusion as sea levels rise, and many have already observed salt intrusion due to over-extraction, such as the West Coast Basin in southern California.	The Monterey Peninsula region relies on the Seaside Groundwater basin for a portion of its supply and has the potential to be affected by saltwater intrusion due to ongoing basin overdraft. The Carmel River alluvial aquifer topography and hydrogeology prevents significant seawater intrusion.	High	High	Medium[14]
	Would your region have difficulty in storing carryover supply surpluses from year to year? - Droughts are expected to become more severe in the future. Systems that can store more water may be more resilient to droughts.	The only substantial seasonal storage reservoirs are the Los Padres Reservoir and the Seaside Groundwater Basin, which are being utilized to the extent possible given current water rights to winter flows in the Carmel River and court ordered adjudication pumping restrictions that apply to the Seaside Basin.	Medium	Medium	Medium

[14] Due to Seaside Groundwater Basin Adjudication

✔	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
	Has your region faced a drought in the past during which it failed to meet local water demands? - Droughts are expected to become more severe in the future. Systems that have already come close to their supply thresholds may be especially vulnerable to droughts in the future.	The drought years have resulted in overdraft conditions in the Seaside Groundwater Basin and excess (illegal) diversions from the Carmel River that result in the inability to provide water for environmental beneficial uses. Municipal water demands have consistently been met on an annual average basis, to the detriment of the habitat.	Medium	Medium	Medium
	Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas? - As invasive species are expected to become more prevalent with climate change, existing invasive species issues may indicate an ecological vulnerability to climate change.	The region has significant invasive species issues that reduce water conveyance and water supply in local streams and rivers.	Medium	Medium	High
Water Quality					
	Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion? - Some areas are expected to become more vulnerable to wildfires over time. To identify whether this is the case for parts of your region, the California Public Interest Energy Research (PIER) Program has posted wildfire susceptibility projections as a Google Earth application at: http://cal-adapt.org/fire/.	Increased incidences and severity of wildfires are a risk in mountains surrounding Los Padres reservoir, the Carmel River, and their tributary creeks, resulting in erosion and sedimentation and also greater amount of water use for fire protection.	Medium	Medium	High

✔	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
	Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change? - Warming temperatures will result in lower dissolved oxygen levels in water bodies, which are exacerbated by algal blooms and in turn enhance eutrophication. Changes in streamflows may alter pollutant concentrations in water bodies.	The Monterey Peninsula region relies on groundwater under the influence of surface water (Carmel Valley) that are impacted by water quality issues, and that could be exacerbated by climate change.	Medium	Medium	Low
	Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity? - In the future, low flow conditions are expected to be more extreme and last longer. This may result in higher pollutant concentrations where loadings increase or remain constant.	The Carmel River and its alluvial aquifer have decreasing seasonal flows, which could become more severe.	Medium	Medium	Medium[15]
	Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues? - In the future, flows are expected to decrease. This may result in higher pollutant concentrations where loadings increase or remain constant.	Water supply needs of some beneficial uses cannot currently be met, particularly in the Carmel River.	Medium	Medium	High

[15] See **Chapter 12, Relation to Local Water Planning**, Section 12.1.8, Salt and Nutrient Management Plan

✓	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
	Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation? - While it is unclear how average precipitation will change with temperature, it is generally agreed that storm severity will probably increase. More intense, severe storms may lead to increased erosion, which will increase turbidity in surface waters. Areas that already observe water quality responses to rainstorm intensity may be especially vulnerable.	Increases in water temperatures and erosion may result in worsening estuarine water quality in local lakes and in the Carmel River and Lagoon (NOAA, 2008); however, because the water supply is from groundwater wells in the Carmel River alluvial aquifer and Seaside Groundwater Basin, these shifts are not severe.	Low	Low	Low
Sea Level Rise					
	Has coastal erosion already been observed in your region? - Coastal erosion is expected to occur over the next century as sea levels rise.	Coastal erosion is a significant issue in the Monterey Peninsula region specifically between the northern region boundary and Monterey Harbor and along Scenic Road near Carmel River State Beach	High	High	High
	Are there coastal structures, such as levees or breakwaters, in your region? - Coastal structures designed for a specific mean sea level may be impacted by sea level rise.	Numerous coastal structures and levees are at risk from sea level rise and the associated increased storm surges.	High	High	High

✔	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
	Is there significant coastal infrastructure, such as residences, recreation, water and wastewater treatment, tourism, and transportation) at less than six feet above mean sea level in your region? - Coastal flooding will become more common, and will impact a greater extent of property, as sea levels rise. Critical infrastructure in the coastal floodplain may be at risk. - Digital elevation maps should be compared with locations of coastal infrastructure.	The region includes significant infrastructure and other assets, including water treatment facilities, waste water collection facilities, storm water control structures, a state highway, a major local road, a pedestrian bicycle trail, and a marina, and that are located within six feet of the current high tide line, and therefore are most vulnerable to sea level rise.	High	High	High
	Are there climate-sensitive low-lying coastal habitats in your region? - Low-lying coastal habitats that are particularly vulnerable to climate change include estuaries and coastal wetlands that rely on a delicate balance of freshwater and salt water.	There are low-lying coastal habitats in the region including estuaries, dunes, coastal lagoons and brackish water marshes that play an important role in water quality and biological diversity and are sensitive to changes to the balance of fresh and salt water.	High	High	High
	Are there areas in your region that currently flood during extreme high tides or storm surges? - Areas that are already experiencing flooding during storm surges and very high tides, are more likely to experience increased flooding as sea levels rise.	There are some areas that flood during storm surge events, including along the coast- between the Monterey Harbor and the City of Seaside- and the residential and commercial areas on the north side of the Carmel Lagoon.	High	High	High
	Is there land subsidence in the coastal areas of your region? - Land subsidence may compound the impacts of sea level rise.	Land subsidence exists in coastal areas, making estuarine wetland management difficult and sensitive to sea level rise.	Low	Low	Low

✔	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
	Do tidal gauges along the coastal parts of your region show an increase over the past several decades? - Local sea level rise may be higher or lower than state, national, or continental projections. - Planners can find information on local tidal gauges at http://tidesandcurrents.noaa.gov/sltrends/sltrends	Tidal records suggest ocean levels in the Monterey Bay have been increasing by 1.34 mm/yr over the past few decades[16]. [Note: Updated information will be provided from the State Coastal Conservancy/MP Sanctuary Foundation report to be published in 2014.]	High	High	High
Flooding					
	Does critical infrastructure in your region lie within the 200-year floodplain? DWR's best available floodplain maps are available at: http://www.water.ca.gov/floodmgmt/ - While it is unclear how average precipitation will change with temperature, it is generally agreed that storm severity will probably increase. More intense, severe storms may lead to higher peak flows and more severe floods. - Refer to FEMA floodplain maps and any recent FEMA, US Army Corps of Engineers, or DWR studies that might help identify specific local vulnerabilities for your region. Other follow-up questions that might help answer this question: 1. What public safety issues could be affected by increased flooding events or intensity? For example, evacuation routes, emergency personnel access, hospitals, water treatment and wastewater treatment plants,	Critical infrastructure lies within the 200-year flood plain, including wastewater treatment, collection/conveyance, roadways, and other urban development, including residential land uses. Of particular concern are the coastal areas of Monterey and Seaside, as well as Carmel Valley.	High	High	High

[16] *Updated information will be provided from the State Coastal Conservancy/MB Sanctuary Foundation report to be published in 2014*

✔	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
	power generation plants and fire stations should be considered. 2. Could key regional or economic functions be impacted from more frequent and/or intense flooding?				
	Does part of your region lie within the Sacramento-San Joaquin Drainage District?	Not Applicable.	–	–	N/A
	Does aging critical flood protection infrastructure exist in your region? - Levees and other flood protection facilities across the state of California are aging and in need of repair. Due to their overall lowered resiliency, these facilities may be particularly vulnerable to climate change impacts.	Critical flood control infrastructure is old and undersized in the lower Carmel Valley.	High	High	High
	Have flood control facilities (such as impoundment structures) been insufficient in the past? - Reservoirs and other facilities with impoundment capacity may be insufficient for severe storms in the future. Facilities that have been insufficient in the past may be particularly vulnerable.	Rising sea level will increase the extent of river flooding. Flood control structures of the Carmel Valley have been insufficient in the past (1995 and 1998) to contain flooding. Without active management, several coastal lakes may also overtop, which will flood coastal land uses.	Medium	Medium	Medium

✓	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
	Are wildfires a concern in parts of your region? - Wildfires alter the landscape and soil conditions, increasing the risk of flooding within the burn and downstream areas. Some areas are expected to become more vulnerable to wildfires over time. To identify whether this is the case for parts of your region, the California Public Interest Energy Research Program (PIER) has posted wildfire susceptibility projections as a Google Earth application at: http://cal-adapt.org/fire/. These projections are the results of only a single study and are not intended for analysis, but can aid in qualitatively answering this question. Read the application's disclaimers carefully to be aware of its limitations.	Wildfires are a major concern for flooding in coastal and inland mountain ranges.	High	High	High
Ecosystem and Habitat Vulnerability					
	Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues? - Erosion is expected to increase with climate change, and sedimentation is expected to shift. Habitats sensitive to these events may be particularly vulnerable to climate change.	Our region has coastal aquatic systems that are vulnerable to acidification, erosion and sedimentation.	Medium	Medium	Medium
	Does your region include estuarine habitats which rely on seasonal freshwater flow patterns? - Seasonal high and low flows, especially those originating from snowmelt, are already shifting in many locations.	Yes, Carmel Lagoon in particular.	High	Low	High

✓	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
	Do climate-sensitive fauna or flora populations live in your region? - Some specific species are more sensitive to climate variations than others.	The region hosts a number of fauna and flora populations that are particularly vulnerable to climate change, including species that live in estuaries, dunes, maritime chaparral, freshwater and brackish marshes, Monterey Pine and Cypress forests, and kelp forests.	Medium	Low	Medium
	Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region? - Species that are already threatened or endangered may have a lowered capacity to adapt to climate change.	Numerous threatened and endangered species exist in the region.	Medium	Medium	Medium
	Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities? - Economic values associated with natural habitat can influence prioritization.	The region relies on significant aquatic recreational and economic (particularly, tourism and fishing) opportunities along the coast, beaches, and the Monterey harbor and Carmel River and lagoon.	High	High	High
	Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life? - Constrained water quality and quantity requirements may be difficult to meet in the future.	Water quality and quantity concerns affect a number of the region's creeks and rivers- with aquatic life stressors due to inability for surface water flows to meet environmental flow requirements.	High	Medium	High

✔	Climate Change Handbook for Regional Water Planning	Applicable Vulnerabilities for Monterey Peninsula	Severity of Consequences		Occurrence Likelihood
			Environment	Socio-economic	
	Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region? - Storm surges are expected to result in greater damage in the future due to sea level rise. This makes fragile coastal ecosystems vulnerable.	The region coastal estuarian, lagoons, and river mouths as well as beaches and dune complexes that would be affected by changes in storm intensity.	High	Medium	High
	Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change http://www.itsgettinghotoutthere.org/?	Not Applicable	–	–	–
	Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement? - These ecosystems are particularly vulnerable to climate change.	Habitat fragmentation in the region may restrict species migration, and fragmentation may continue if policies are not developed to minimize such actions.	Medium	Low	Medium
Hydropower					
	Is hydropower a source of electricity in your region?	Not Applicable	–	–	–
	Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region?	Not Applicable	–	–	–

15.4.4 Risk Assessment

The results of the vulnerability and risk assessments may lead to a resiliency analysis and adaptation strategy (Atchison, 2011). A vulnerability analysis for the Monterey Peninsula IRWM planning region will help the RWMG select priority planning areas based on the region's potential impacts due to climate change and the associated risks to human health, infrastructure, the economy, and environment. The Monterey Peninsula RWMG conducted this preliminary vulnerability analysis for the Region, following the guidance provided by ICLEI and the State and using an example that was conducted for the Greater Monterey County IRWM Plan and the City of Santa Cruz. A description of the process and the assumptions that went into this analysis are detailed, below. Note that the results of the vulnerability analysis are considered to be preliminary only; the analysis itself will be refined as more tools and more information become available.

Climate preparedness planning relies on the evaluation and prioritization of risks. Risk is determined based on the probability that an impact will occur (*likelihood*) and the significance of that impact (*consequence*) on life, land uses, water resources, the economy, and the environment: *Risk = Consequences x Likelihood.* Since no region has sufficient resources to address all potential impacts of climate change simultaneously, this prioritization process is necessary to address impacts that are most likely and that will result in the greatest detriment to life, the economy, and infrastructure (*consequence*).

15.4.5 Likelihood

The probability that a specific impact will occur, or "likelihood", as defined by ICLEI workbook, is estimated based on the increased chance, or periodicity, that a certain event will occur. **Table 15-5** illustrates how the combined factors of risk and likelihood relate to the determination of priority planning areas. **Table 15-6** illustrates the "Likelihood Rating" of impacts based on the chance of an infrequent impact occurring more often ("recurrent risk") and the chance that a previously unrealized impact could occur ("single event").

Table 15-5: Risk Variables

	Low Likelihood	Medium Likelihood	High Likelihood
High to Extreme Risk	May be priority planning areas	Should be priority planning areas	Should be priority planning areas
Low to Medium Risk	Are unlikely to be priority planning areas	May be priority planning areas	Likely to be priority planning areas

Table 15-6: Probability Variables

Likelihood Rating	Recurrent Risks	Single Event
Almost Certain	Could occur several times per year	More likely than not - probability greater than 50 percent
Likely	May arise about once per year	As likely as not - 50/50 chance
Possible	May arise once in 10 years	Less likely than not but still appreciable - probability less than 50 percent but still notable
Unlikely	May arise once in 10 years to 25 years	Unlikely but not negligible - probability low but noticeably greater than zero
Rare	Unlikely during the next 25 years	Negligible - probability very small, close to zero

15.4.6 Consequence

The consequence of a specific climate change impact occurring is evaluated individually for five different social, economic, and environmental factors:

- Public safety
- Local economy and growth
- Community and lifestyle
- Environment and sustainability
- Public administration

The cumulative consequence from the combined impacts to specific social, economic, and environmental factors is then derived. For example, the consequences of failing to address sea level rise will depend on the potential impacts of that future sea level rise on the five factors listed above, combined. The consequence for each factor is estimated from little or no consequence (0) to serious devastation to infrastructure or significant economic or environmental impacts or loss of life (5).

15.4.7 Risk

The amount of risk involved from a climate change impact depends on both the likelihood and severity of the consequences that may result from that impact. Using the example of sea level rise, risk can be mitigated by reducing the consequence of the flooding or the possibility that flooding will occur at a given ocean height. Risk was determined for the Monterey Peninsula region based on the consequences that are expected to arise from any particular impact occurring within the region. Consequences were evaluated for human well-being, economic stability, environmental health, and the ability of municipalities to respond. The Climate Impact Risk Analysis results, shown in the two columns on the right side of **Table 15-4**, Climate Change Vulnerability Checklist qualify the risk associated with each likely impact.

Note that the results of these analyses are considered by the RWMG to be preliminary only. The RWMG will further evaluate the assessment results and adjust and reprioritize impacts and resulting actions as additional data are made available. It is also important to note that the risk assessment evaluates the likelihood and consequence of a specific environmental condition occurring and that this analysis does not factor in potential inaccuracies in the projected rate of environmental change (e.g., sea level rise) within a given timeframe. Therefore, agencies must consider and balance the relative risks and costs associated with under- and/or overestimating sea level rise and other environmental changes in making decisions.

15.4.8 Top Priority Vulnerabilities for the Region

Priority impacts are defined as those that are more likely to occur and that will lead to significant impacts if they do occur. Priority impacts for the Monterey Peninsula region were determined according to methods described by ICLEI. The climate risk analyses and priority impact assessment indicate the following climate risks to be top priority for the RWMG and other water managers for considering how to adapt the Region's water management systems for climate change impacts:

- *Decreased water supply* due to changes in precipitation, more frequent and severe droughts, increased surface and groundwater consumption, and increased seawater intrusion (due to sea level rise affecting coastal aquifers).
- *Increased flooding and erosion of creeks and rivers* due to more intense storm events (higher river flow rates), and overburdening of conveyance systems, levees, and culverts.
- *Coastal inundation of urban development and other land uses, and impacts to river and wetland ecosystems* due to changes in rainfall patterns, storm intensity, storm surges (due to increased storm frequency and intensity), and sea level rise.

15.4.9 Adaptive Capacity

The Monterey Peninsula region's ability to respond to a given climatic impact enables us to reduce either the likelihood or consequence of an event. The ability to adapt to sea level rise, for example, can occur in many forms, including coastal armoring and protection, the raising of infrastructure, and inland retreat. Mathematically, this adaptive capacity is quantified as a number from 0 to 1, with a value of 0 indicating that adaptation is free and instantaneous and a value of 1 indicating that adaptation is impossible. Each adaptive measure provides a certain level of additional protection for a certain period of time for a certain cost. Significant resources are required to fully evaluate the adaptive capacity of any social-economic factor to a given climatic variable. Numerous engineering (hard) and adaptive planning (soft) measures need to be evaluated and cost benefit analyses must be completed. The RWMG understands the additional need to evaluate and quantify secondary unintended consequences of any adaptive measure to all of the social-economic factors defined within this chapter. Because of the complexity of this process, adaptive capacity was not systematically evaluated by the RWMG. Given adequate funding, the RWMG hopes to conduct such an analysis in the future.

15.4.10 Vulnerability

Where *Risk = Likelihood* x *Consequence*, *Vulnerability = Likelihood x Consequence x Adaptive Capacity*. Vulnerability is the interpretation of the above variables leading to the conclusion: how likely is it that an event will occur, how bad will the impact be, and can we do anything about it? An analysis of the cost and effectiveness of the various adaptive measures must be completed prior to understanding the region's vulnerability to various environmental impacts. An interim step towards completion of an evaluation of the region's vulnerability to future coastal inundation is to consider the 1995 and 1998 El Niño floods, evaluate the likelihood that such events will occur again, and infer the region's adaptive capacity currently (in 2013).

15.5 Initial Adaptation Strategy

The following section describes the RWMG's initial adaptation strategy for addressing impacts to water resources in the Monterey Peninsula IRWM planning area, based on the results of the initial risk assessment described above. This initial adaptation strategy will become more developed over time by the RWMG as more climate change data and analytical tools are generated.

15.5.1 No Action Response

The Proposition 84/1E Guidelines state that decisions about adapting water management systems, as well as mitigating climate change through reductions in GHG emissions, should take into account the risks to the region of no action. The results of a "no action" response have essentially been described by the various climate change scenarios outlined in the sections above. The RWMG considers the "no action" response to be an irresponsible and reckless response, given the predicted consequences of climate change on human life, the local economy, and natural resources in the region. The RWMG is actively pursuing climate change adaptation and mitigation strategies, as described below.

15.5.2 Adaptation Goals and Objectives

The Monterey Peninsula IRWM region's initial adaptation goals and objectives, listed below, have been selected from a comprehensive list of potential actions within the DWR guidance document. The goals are intended to direct focus towards the three priority Prioritized Vulnerabilities, identified above, as well as the water resource goals and objectives defined within the Monterey Peninsula IRWM Plan (see Section D, Objectives). The adaptation goals and objectives form the foundation for the RWMG's initial adaptation strategy for the Monterey Peninsula region. The goals are specific responses to the priority Prioritized Vulnerabilities that can be accomplished by the various IRWM partner agencies and stakeholders and do not need to be managed or actively coordinated by the RWMG. Rather, the Monterey Peninsula IRWM planning effort can serve as a forum to hear about projects aimed to address these goals.

Adaptation Goals: The Monterey Peninsula IRWM Plan recognizes the importance of becoming a climate resilient region. Adaptation goals that could support that intention include:

- Encourage adaptation activities that increase the resiliency of local communities, businesses, and institutions to changes in the climate.
- Minimize the potential for injury of citizens and damage to public and private property from impacts of climate change.
- Increase the resilience of municipal departments to adapt and respond to climate related emergencies.
- Protect natural lands, agricultural areas, and coastal resources from the future threats of climate change to increase the resilience of communities.
- Do not permit the construction of new critical facilities within the 200-year flood plain (per State recommendations).
- Plan for effective adaptation and resiliency that supports proactive steps towards sustainability rather than response through unplanned emergency actions.

Adaptation Objectives

- Implement on-going climate change variable monitoring to inform adaptation and response efforts.
- Develop regional sea level rise resiliency strategies to prepare for impacts to water resource infrastructure and lands, that support the multiple benefits described in the IRWM Plan, and that consider short and long-term economic implications.
- Consider potential climate change impacts to water resources in future land use and regional resource planning of the county and other municipalities.
- Support regional collaborations and planning efforts, and provide information to the public regarding potential climate change impacts and status of response planning.
- Encourage the retrofit or relocation of water infrastructure that is vulnerable, and evaluate changes to water management strategies that are likely to be less effective due to climate change.
- Prioritize the protection of drinking water resources and sensitive water supplies and aquatic ecosystems that support a sustainable region.

15.5.3 Adaptation Actions and Response

To develop an adaptation strategy for the Region, adaptation actions and response scenarios from the California Natural Resources Agency's 2009 California Climate Adaptation Strategy were selected, as applicable to the Monterey Peninsula region. High priority responses along with climate mitigation actions are listed in **Table 15-7**, **Adaptation Response Strategies to the Effects of Climate Change**, below. The "high priority responses" were prioritized by the RWMG and stakeholders according to the risk assessment described above and in accordance with the objectives of the Monterey Peninsula IRWM Plan. This prioritization exercise will better enable IRWM Plan participants to respond to funding opportunities that focus specifically on water infrastructure projects or environmental resource protection, as needed. This prioritized list of adaptation actions is considered a first step toward developing a comprehensive adaptation strategy for the Monterey Peninsula IRWM planning region to address the impacts of climate change. These adaptation and climate mitigation actions will be further evaluated by the RWMG in collaboration with the stakeholders to define next steps, responsible entities, and funding resources to complete adaptation actions. As more tools become available, the RWMG will be able to consider more specific risks to the region due to climate change, better understand the tradeoffs and benefits of different adaptations, and will be able to identify additional adaptations relevant to the region. The adaptation strategy will consider the extent to which existing water management systems in the region—including man-made and natural water systems—are adaptable to climate change impacts and the steps that would need to be taken, along with associated costs, to make those systems more robust. The process will include a cost-effectiveness analysis and a final prioritization of adaptation actions, focusing on specific water management systems throughout the region. In addition, specific consideration will be afforded to strategies that offer multiple benefits.

Table 15-7: Adaption Response Strategies to the Effects of Climate Change

ADAPTATION RESPONSE STRATEGIES TO THE EFFECTS OF CLIMATE CHANGE		
Climate Change Effects	**Adaptation and Response Strategies**	**Initial Actions**
Rangelands are expected to be drier	Prepare fire reduction strategies to protect watershed lands using ecologically sustainable strategies. Implement adaptation strategies to conserve California's biodiversity.	N/A
Domestic landscaping water needs will be higher	Integrate land use and climate adaptation planning	Education Incentive programs Demonstration programs Grey water Xeriscaping Expand water supplies (purple pipe) and storage Aquifer management
Decrease in local rainfall	Promote community resilience to reduce vulnerabilities: Food sustainability Implement water conservation and supply management efforts Manage watersheds, habitat, and vulnerable species	Education Incentive programs Demonstration programs Grey water Xeriscaping
Sea level rise and higher groundwater extraction will lead to increased rates of seawater intrusion	Prepare a regional sea level rise adaptation strategy Promote working landscapes with ecosystem services Integrate land use and climate adaptation planning	Education Incentive programs Demonstration programs Grey water Xeriscaping Expand water supplies (purple pipe) and storage Aquifer management Expand agriculture water conservation programs

Adaptation Response Strategies To The Effects Of Climate Change		
Climate Change Effects	**Adaptation and Response Strategies**	**Initial Actions**
Droughts will be more frequent and severe	Implement adaptation strategies to conserve California's biodiversity Educate, empower, and engage citizens regarding risks and adaptation Integrate land use and climate adaptation planning Promote community resilience to reduce vulnerabilities	Human safety response Education Incentive programs Demonstration programs Grey water Xeriscaping Expand water supplies (purple pipe) and storage Aquifer management Expand agriculture and urban water conservation programs
Lower seasonal surface flows can lead to higher pollutant concentrations	Manage watersheds, habitat, and vulnerable species	Minimize non-point source pollution Buffers
Changes in storm intensity will increase sediment loading in many systems	Prepare fire reduction strategies to protect watershed lands using ecologically sustainable strategies	Erosion control on farms and creeks Buffers
Channel stability will be impacted from higher storm flows causing additional turbidity	Provide guidance on protecting critical creek/river ecosystems and development	Erosion control on creeks Wastewater and stormwater infrastructure vulnerability analysis
Sea level rise will impact current estuary brackish water interface towards more marine systems	Implement adaptation strategies to conserve California's biodiversity	Retain freshwater in watershed Habitat migration Buffers Erosion control
Regional levees will provide less protection during higher storm flow events	Support essential data collection and information sharing Manage watersheds, habitat, and vulnerable species Prepare a regional sea level rise adaptation strategy	Refurbish or expand levees or tide gates (upgrade priority infrastructure) Map/inventory infrastructure

ADAPTATION RESPONSE STRATEGIES TO THE EFFECTS OF CLIMATE CHANGE		
Climate Change Effects	**Adaptation and Response Strategies**	**Initial Actions**
Natural creeks throughout the region and managed conveyance within the Carmel Valley will see higher flow rates leading to increased erosion and flooding	Manage watersheds, habitat, and vulnerable species	Refurbish or expand levees or tide gates(upgrade priority infrastructure) Map/inventory infrastructure
Coastal levees and control structures will be undersized to manage the combined influences of higher flow events and sea level rise	Support essential data collection and information sharing Prepare a regional sea level rise adaptation strategy	Refurbish or expand levees or tide gates(upgrade priority infrastructure) Map/inventory infrastructure/levee locations and WCS, ownership Phase II task 5 activity 3 - ecosystem services - be aware of services available Elevations of levees and sea walls - maybe with PWA-management strategies USGS elevation data
State recommendations suggest no new critical facilities be built within the 200-year flood plain(DWR 2008, DWR 2009b, CNRA2009)	Integrate land use and climate adaptation Planning	Work with Monterey County and cities, Coastal Commission (local jurisdiction)
Migration patterns and species distribution will change	Establish a system of sustainable habitat Reserves	Reduce migration impediments (dams, etc.) Compile data on species distribution Primary focus species - amphibians, waterfowl, salmonids, redwoods, tide water gobies Maintain habitat corridors - contiguous areas Fish and Game - wildlife adaptation plan - vulnerability for key

Adaptation Response Strategies To The Effects Of Climate Change		
Climate Change Effects	**Adaptation and Response Strategies**	**Initial Actions**
Invasive species populations will expand	Habitat/ecosystem monitoring and adaptive management	What are the invasive species and their ranges? Will they expand, be introduced? How are the habitats shifting (awareness)? Ecological adaptation investigation and strategy
Coastal wetland systems are especially vulnerable to the combined influences of climate change	Establish regional policies to protect critical habitats Provide guidance on protecting critical coastal ecosystems and development	Identify critical habitats and ecosystems Integrate ecosystem management Regulatory mechanisms dedicated to protecting future locations of these areas Inventory of wetlands currently
Some locally unique species such as coastal redwoods and giant kelp are susceptible to changes in certain locally favorable climate variables (fog duration, coastal upwelling)	Manage watersheds, habitat, and vulnerable species	Identify how they will be impacted - What are the changes? USGS study outcome - get a better handle on modeling fog changes in climate change

15.5.4 No Regret Strategies

Since the tools to properly assess the risk of any one effect of climate change in the region are currently not well developed, the RWMG encourages the implementation of so-called "no regret" adaptations to general effects of climate change. Such adaptations are those that make sense in light of the current water management context for the region and also help in terms of effects of climate change. Examples of "no regret" strategies include increasing water use efficiency, water supply sustainability, practicing increased integrated flood management, and enhancing ecosystems and their ability to provide multiple benefits to the region. The RWMG generally encourages the implementation of "no regret" strategies through the IRWM Plan and gives higher priority to these strategies in the project ranking process by providing additional points under the "Climate Change" categories.

15.5.5 Next Steps towards Climate Preparedness

Preparing for the Future: Climate Change and the Monterey Bay Shoreline

As noted previously, on December 6, 2011, the MBNMS and Center for Ocean Solutions convened regional decision makers at a one-day workshop titled "Preparing for the Future: Climate Change and the Monterey Bay Shoreline."[10] The event was the first Monterey Bay region-wide gathering on climate change adaptation, intended to facilitate a discussion on how to best prepare coastal communities in the Monterey Bay region to adapt to the impacts of climate change. More than 90 people attended from cities and municipalities in Santa Cruz and Monterey Counties, representing city and county staff, state and federal governments, research institutions and nonprofit organizations. They heard from featured experts and participated in breakout group sessions. Examples of climate change adaptation plans from government jurisdictions around the country were also shared at the workshop. The workshop demonstrated to participants that past experience with storms and strong El Niño conditions provide the Monterey Bay region with concrete examples of what increased sea level and storm intensity may mean for the area's future.

Workshop goals for participants were to:

- Begin Monterey Bay region-wide discussion and collaboration on climate change adaptation
- Understand the latest research on climate change impacts to the Monterey Bay coastline
- Gain a basic understanding of the typical climate change adaptation planning process
- Witness how communities in the Monterey Bay area are already planning for climate change
- Learn about grant opportunities and other resources (tools, assistance) available to support climate change adaptation planning
- Have the opportunity to develop new collaborations and partnerships in climate change adaptation planning

During the workshop, the following themes emerged:

- If Monterey Bay communities start now, they will have time to prepare for the impacts of climate change on their coast. Past storms provide examples of the range of impacts to expect from changes in sea level and storminess as a result of climate change
- A range of tools and resources currently exists for climate change adaptation planning
- Uncertainty in local projections is unavoidable so communities should not wait for perfect information to begin adaptation planning
- There are very real and difficult barriers to making progress in climate change adaptation, including lack of resources, unprecedented regulatory challenges, low perceived

public support, and limited local data; yet by working collaboratively it is possible to overcome these challenges

Participants recommended the following next steps for the region:

- Improve understanding of local impacts of climate change and develop actionable recommendations for moving forward
- Design and implement a governance structure for the Monterey Bay region that could aid and coordinate climate change adaptation and related activities
- Continue the discussion initiated at the workshop by building a regional network of people interested in or working on climate change adaptation
- Expand the scope of stakeholder involvement to include in-person discussions and engage coastal business owners, landowners and the general public
- Create a technical advisory group on climate change adaptation for the region
- Actively use the Internet as a way to connect and educate the regional community
- Jointly apply for funding to support coastal climate change adaptation work in the region
- Develop climate change projection data at a scale fine enough to use for local planning
- Consider a public engagement campaign to help increase awareness about the need for climate

Members of the Monterey Peninsula RWMG participated in the "Preparing for the Future" workshop. RWMG members will continue to stay involved in any "next steps" that result from the "Preparing for the Future" workshop, and will work to coordinate the IRWM planning efforts regarding climate change with this promising Monterey Bay regional effort. The Summary Report for the workshop, along with all workshop presentations, can be downloaded[17].

15.5.6 Pilot Coastal Vulnerability Evaluation

The Natural Capital Project and the Center for Ocean Solutions have worked with the Greater Monterey County (GMC), the RWMG, and its Climate Task Force to assess the effects of coastal adaptation strategies and climate scenarios on the ecosystem services provided by coastal and near shore environments. This work can also be used by the Monterey Peninsula region, as the results are applicable to both regions. Phase I of this project 1) assessed the physical vulnerability of the coast to hazards such as erosion and inundation, and 2) assessed the vulnerability of relevant infrastructure, land use types, and coastal communities. This assessment can be used to identify areas for future analysis and inform project prioritization and funding. Analysis of these vulnerabilities were developed through the use of the Integrated Valuation of Environmental Services and Tradeoffs (InVEST) decision support tool—a family of tools to map and value the goods and services provided by nature. The Coastal Vulnerability[18] model was utilized for Phase I of this project. "The Role of Natural Habitat in Coastal Vulnerability and Adaptation Planning," provides a full description of the assessment in the planning region.

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[17] http://centerforoceansolutions.com/preparingforthefuture.

[18] http://ncp-dev.stanford.edu/~dataportal/invest-releases/documentation/current_release/#marine-models

15.5.7 Future Studies and Data Needs

As recognized in the climate risk assessment, priority actions to address local climate change impacts should focus on the three prioritized vulnerabilities:

- *Decreased water supply*
- *Increased flooding and erosion of creeks and rivers*
- *Coastal inundation of urban development, other land uses, and impacts to coastal river and wetland ecosystems*

The risk assessment process identified many data needs and research studies. The process also identified that the above risks pose specific hardships and challenges to each of the five different social, economic, and environmental factors described previously. The GMC Climate Task Force developed an initial list of response strategies, initial actions, and data needs in response to the risk assessment. These strategies are based on the adaptation actions and response scenarios listed in the California Natural Resources Agency's *2009 California Climate Adaptation Strategy,* and prioritized as described in Section 15.5.3, above. The Monterey Peninsula RWMG has agreed that future research and program funds should be directed towards the three priority climate risk areas above, consistent with the GMC Climate Task Force findings. In addition, future IRWM Plan projects should strive to help fill data gaps and promote the priority response strategies and initial actions. Specifically, the areas listed below should be integrated into future implementation projects.

Land Use

- Integrate land use and climate adaptation planning
- Promote community resilience to reduce vulnerabilities for food sustainability and DACs
- Educate, empower, and engage citizens regarding climate risks and adaptation
- Provide guidance on protecting critical coastal development

Ecosystems

- Implement adaptation strategies to conserve California's biodiversity Support habitat/ecosystem monitoring and adaptive management
- Manage watersheds, habitat, and vulnerable species
- Provide guidance on protecting critical coastal ecosystems

Water Conservation

- Implement water conservation and supply management efforts
    - Support adaptive agricultural protection policies
    - Promote working landscapes with ecosystem services

Coast and Ocean

- Manage watersheds, habitats, and vulnerable species
    - Establish regional policies to protect critical habitats
    - Provide guidance on protecting critical coastal ecosystems and development
    - Promote working landscapes and ecosystem services
- Prepare a regional sea level rise adaptation strategy
    - Complete a regional sea level rise risk assessment periodically
- Support essential data collection and information sharing

Carbon Mitigation

- Expand renewable energy infrastructure that supports water management efforts

The Monterey Peninsula RWMG strongly recommends that these ideas be integrated into project submittals for the following rounds of concept and implementation project proposals for the Monterey Peninsula IRWM Plan.

15.6 Mitigation of Greenhouse Gas Emissions Strategy

The development of a GHG emissions mitigation strategy is a required component of an IRWM Plan. All aspects of water resources management have an impact on GHG emissions, including the development and use of water for habitat management and recreation; domestic, municipal, industrial, and agricultural supply; hydroelectric power production; and flood control. Water management results in the consumption of significant amounts of energy in California and the accompanying production of GHG emissions, especially where water must be pumped from long distances, from the ground, or over significant elevations. According to California Energy Commission November, 2005 *CEC-700-2005-011 California's Water–Energy Relationship Final Staff Report*, 19 percent of the electricity and 30 percent of the non-power plant natural gas of the state's energy consumption are spent on water-related activities, primarily related to end-uses of water- what the customer does with the water. The close connection between water resource management and energy is an important consideration for helping the state meet its GHG emission reduction goals. IRWM Plans can help mitigate climate change by reducing energy consumption, especially the energy embedded in water use, and ultimately reducing GHG emissions.[19]

This IRWM Plan focuses on several sectors of emissions that are most directly linked to water management and that are most likely to not be addressed within other climate/GHG reduction strategies. Emissions sources to be addressed include:

- Emissions in the region for the production and distribution of water, including emissions from privately-owned pumps,
- Emissions from local agency staff fleet and private vehicle emission associated with water project construction and maintenance, and
- Emissions from energy generation that could be mitigated through renewable energy sources.

15.6.1 GHG Reduction in Projects and Programs

A full GHG emissions reduction strategy for the region will be created by Monterey County and AMBAG in the near future to meet California State mandates (Assembly Bill 32). In the meantime, several effective GHG reduction strategies can be presented in the IRWM Plan and the relevant projects may be funded and managed by this working partnership. To address the emissions categories identified above, several key strategies and actions described in the *Climate Change Handbook for Regional Water Planning* can be encouraged by the RWMG through the IRWM planning process, including the following (US EPA Region 9 and DWR 2011):

[19] This introductory paragraph has been excerpted from the Proposition 84/1E Program Guidelines, pp. 71-72.

Emissions from water supply and delivery

- Select energy sources with low carbon content (green electricity purchases)
- Prioritize pump and infrastructure upgrades based on energy efficiency
- Reduce water use by all sectors of the community through conservation and water efficient irrigation
- Install solar PV at remote pump and infrastructure sites and provide incentives for private investment in solar for similar infrastructure
- Schedule pumping to reduce peak hour (12:00-5:00pm) energy use that has the highest carbon content

Staff fleet and commute

- Encourage carpooling
- Invest in energy efficient/low carbon fleet vehicles and fuels
- Encourage efficient driving practices

Emissions from IRWM Plan project construction

- Encourage carpooling within construction contracts
- Encourage use of B20 fuels in construction equipment and other diesel machinery
- Invest in high efficiency pumps and control equipment
- Integrate solar generation in appropriate projects

Renewable energy generation

- Encourage investment in solar and other renewable energy generation options in regional facilities
- Work with regional waste district to increase electricity generation from farm-generated food and animal bio-waste
- Consider hydro-electric generation within current water infrastructure

The RWMG can encourage the reduction of GHG emissions for IRWM Plan implementation projects through the project review and ranking process. The RWMG can also use the IRWM planning process to coordinate with water managers and land use planners throughout the Monterey Peninsula region in order to encourage broader implementation of these and other GHG reduction and climate mitigation actions. The recommended GHG reduction and climate mitigation actions will be further evaluated by the RWMG, with input from stakeholders, to define possible next steps, responsible entities, and funding resources.

15.6.2 Other Climate Change Mitigation/GHG Reduction Activities in the Central Coast Region

The RWMG has been communicating with water managers and land use managers in the broader Central Coast region regarding other climate change mitigation/GHG reduction efforts along the Central Coast. The RWMG will seek to partner in these and similar efforts as opportunities arise. Regional climate change mitigation/GHG reduction programs include the following.

Climate Action Compact

In October 2007, the County of Santa Cruz, the City of Santa Cruz, and the University of California Santa Cruz partnered to create a Climate Action Compact (CAC). The goal of the CAC is to achieve meaningful and measurable progress towards lowering local GHG emissions through the implementation of cooperative programs. To that end, the CAC partners initiated a process to develop actions necessary to accomplish the goals outlined in the compact. In 2011 CAC members reached out to all municipalities within the Monterey Bay region, including the area covered by the Monterey Peninsula IRWM Plan, to join and participate in collaborative GHG reduction efforts. The members pledged to support public, private, and nonprofit partnerships and investments to reach quantifiable reductions in their institutions' GHG emissions (Clark, 2011). In taking this leadership role, the CAC partners pledged themselves to the following:[20]

- Set and present a GHG reduction goal for their respective organizations;
- Identify specific inter-institutional cooperative projects that reduce GHG emissions, stimulate investment in the community, and foster economic development;
- Present a comprehensive GHG reduction action plan for their respective organizations; and immediately invite others from the public, private, and non-profit sectors in the region to join in the effort.

Association of Monterey Bay Area Governments Programs

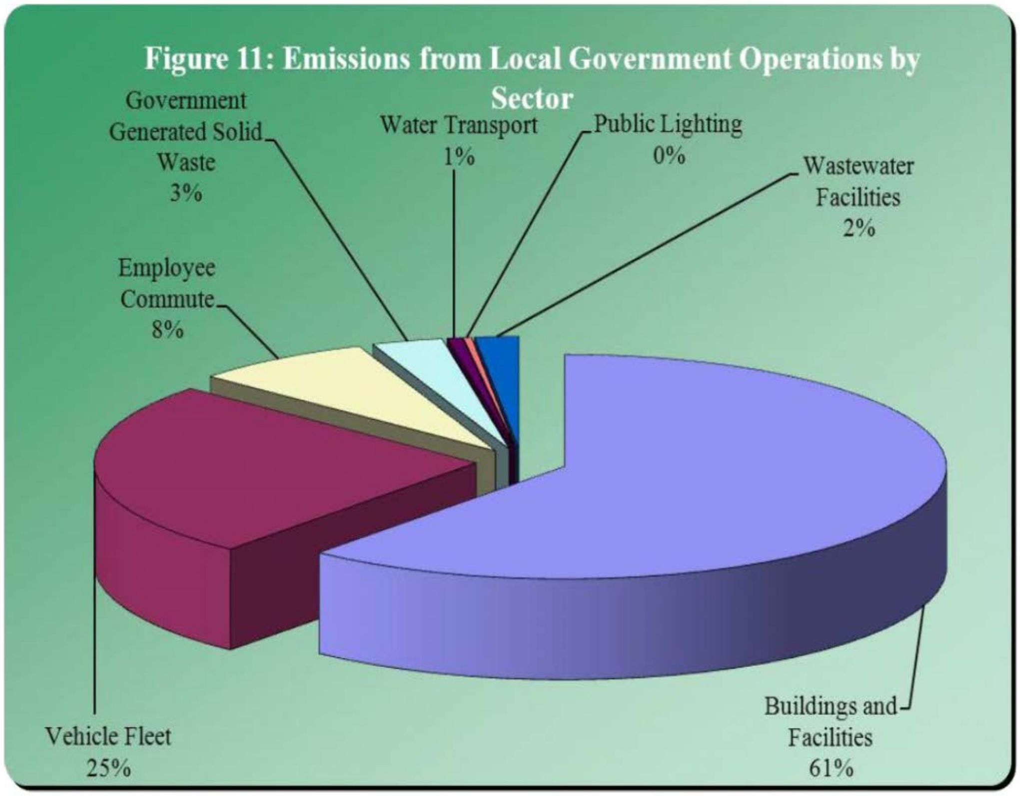
AMBAG has developed regional emission targets in accordance with requirements of Senate Bill 375. AMBAG has also initiated a program in collaboration with the Pacific Gas and Electric Company (PG&E) called "Energy Watch." The Energy Watch Program helps local governments in Monterey, San Benito, and Santa Cruz counties to promote energy efficiency and climate action planning. This collaboration has included preparation of GHG emissions inventories.

In early 2011, the AMBAG Energy Watch Program completed a GHG emissions inventory for Monterey County for the year 2005. The inventory for Monterey County was developed using the "Clean Air and Climate Protection" software developed by ICLEI. The inventory examines emissions by community sector and includes direct and indirect emissions. The study also predicts that under a "business-as-usual" scenario, Monterey County GHG emissions are estimated to grow by approximately 9 percent by the year 2020, which represents an average annual rate of increase of about 0.6 percent per year with the total increase between 2005 and 2020.

In 2010, AMBAG completed a set of GHG inventories for all of its 21 municipal members. The cumulative emissions from the unincorporated areas of Monterey County were quantified for various sectors including municipal (county government) residential and commercial/industrial. For 2005, countywide emissions of CO_2e were calculated to be 1,648,410 metric tons. Of that total, municipal emissions comprised 1.3 percent (21,641 metric tons); and of the municipal emissions total, emissions from municipal supply and distribution of water resources were 0.6 percent (133 metric tons). **Figure 15-8**, below, illustrates emissions from local government operations for Monterey County, by sector. Additional emissions attributable to water management in Monterey County that are not included in this calculation include: emissions from small water purveyors, private well and flood management pump infrastructure, and the emissions associated with water agency fleet and staff vehicles used to manage the vast water resource infrastructure of the region.

[20] Source: City of Santa Cruz CAC website: http://www.cityofsantacruz.com/index.aspx?page=1231 (March 2012).

Figure 15-8: 2005 GHG Emissions from Monterey County Government Operations



Source: AMBAG 2011, Monterey County Greenhouse Gas Emissions Inventory. Used by permission.

Association of Monterey Bay Area Governments Energy, Greenhouse Gas, and Climate Action Planning Programs

The AMBAG Energy Watch completed the following at no cost to the municipal governments:

1. Local Government Operations 2005 Baseline GHG Inventories;
2. Community-wide 2005 Baseline; and
3. Community-wide 2009 GHG Inventories.

AMBAG Energy Watch provides a variety of support services to member jurisdictions who are working to develop, adopt and implement Climate Action Plans:

- General technical support (GHG Inventories, GHG Forecasts, GHG Reduction Measure Identification and Modeling, etc.)
- Legislative and regulatory liaison services
- Educational forums and technical training workshops (GHG Inventory Methodologies, SEEC Climate Action Planning Assistant, PG&E Tableau Data, etc.)
- Energy-related GHG mitigation scenario development and modeling
- Peer review of climate action planning documents

AMBAG Energy Watch is working closely with member jurisdictions to develop comprehensive and cost-effective plans to quantify and reduce residential and non-residential energy consumption and related GHG emissions. AMBAG's Regional Energy Plan Program was a collaborative effort in 2008 to create a comprehensive Energy Efficiency Plan for the Monterey Bay Area, encompassing AMBAG's areas of service in the Monterey, San Benito, and Santa Cruz Counties.

15.6.3 Other Local Government Energy, Greenhouse Gas, and Climate Planning

Local governments, in particular, the City and County of Monterey, are in the process of preparing Climate Action Plans and/or Greenhouse Gas Reduction Plans to further address energy efficiency and other activities to reduce GHG emissions.

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Appendices

1-2c (see file 2 for remainder)

1-a: Memorandum of Understanding (2008)

1-b: Draft MOU for the 2013 Update

1-c: Resolutions of Adoption [*pending approval by RWMGs*]

1-d: Current Stakeholders List

1-e: Notice of Intent (April 16, 2012)

2-a: California American Water Company Service Area Map

2-b: Land Use Designations

2-c: Seaside Basin Salt and Nutrient Management Plan

Appendix 1-a

Memorandum of Understanding (2008)

Memorandum of Understanding for Integrated Regional Water Management in the Monterey Peninsula, Carmel Bay, and South Monterey Bay Region

1. PURPOSE

The purpose of this Memorandum of Understanding (MOU) is to recognize a mutual understanding among entities in the southern Monterey Bay area regarding their joint efforts toward Integrated Regional Water Management (IRWM) planning. That understanding will continue to increase coordination, collaboration and communication for comprehensive management of water resources in the cities and unincorporated portions of the Monterey Peninsula, Carmel Bay, and South Monterey Bay Region (Region).

2. RECITALS

A. The State of California desires to foster Integrated Regional Water Management (IRWM) planning and encourages local public, non-profit, and private (for profit) entities to define planning regions appropriate for managing water resources and to integrate strategies within these planning regions.

B. Water resources management authority in the Region is currently distributed among various public agencies with a range of legal powers and regulatory responsibilities. These public agencies have definite jurisdictional boundaries, whereas sensible water resources planning and management frequently requires actions in multiple jurisdictions. Non-public entities within the Region have considerable interests in cooperating with public entities to protect, manage, and enhance water resources within the Region.

C. Four public entities and one non-profit entity in the Region with responsibility and interests in the management of water resources have agreed to form a Water Management Group for the purposes of developing and implementing projects consistent with the guidelines set by the State of California for IRWM. These entities are: 1.) the Big Sur Land Trust (BSLT), a 501 (c) 3 organization; 2.) the City of Monterey; 3.) the Monterey Regional Water Pollution Control Agency (MRWPCA); 4.) the Monterey County Water Resources Agency (MCWRA); and 5.) the Monterey Peninsula Water Management District (MPWMD).

D. The Water Management Group has defined an appropriate planning Region that takes into consideration jurisdictional limits, powers and responsibilities, and watershed and groundwater basin boundaries. The Water Management Group is taking the lead in overseeing and implementing a detailed IRWM Plan within the planning Region. The Region is generally described as encompassing approximately 347 square miles and consists of groundwater basins and coastal watershed areas contributing to the Carmel Bay and south Monterey Bay. The Region includes coastal watersheds from the southernmost portion of the San Jose Creek watershed north to the northern limit of the Seaside Groundwater Basin. The inland area is bounded by the Seaside Groundwater

Basin to the north and by the Carmel River watershed to the south and east. The western limit of the planning Region generally coincides with the land and Pacific Ocean interface, but includes the Pt. Lobos, Carmel Bay, and Pacific Grove Areas of Special Biological Significance (ASBS) adjacent to the coastal portion of the Region.

The principal groundwater basins in the planning Region are the Seaside Groundwater Basin and the Carmel Valley Aquifer. The Region includes about 38 miles of the coast within the Monterey Bay National Marine Sanctuary, three ASBS, the Cities of Carmel-by-the Sea, Del Rey Oaks, Monterey, Pacific Grove, Sand City, Seaside, and unincorporated portions of Monterey County including the Carmel Valley watershed (255 square miles), Pebble Beach, the Carmel Highlands and portions of the Seaside Groundwater Basin adjacent to Highway 68 (also known as Canyon Del Rey). This description of the planning Region is not intended to be a limitation on projects and resource planning that may be shared between adjacent IRWM planning Regions (e.g., the Salinas Valley IRWM planning Region to the north and east).

E. The entities signatory to this MOU desire to link and integrate efforts to jointly oversee the development and implementation of a comprehensive Integrated Regional Water Management Plan for the Region.

3. GOALS

The goals of the collaborative effort undertaken pursuant to this Memorandum of Understanding are:

3.1 To develop and adopt a comprehensive IRWMP for the Region that will consider the strategies that are required by the State under CWC 79562.5 and 79564 including at a minimum: ecosystem restoration, environmental and habitat protection and improvement, water supply reliability, flood management, groundwater management, recreation and public access, storm water capture and management, water conservation, water quality protection and improvement, water recycling, and wetlands enhancement and creation. Optional additional elements that may be considered include: conjunctive use, desalination, imported water, land use planning, non-point source pollution control, promotion of the steelhead run, surface storage, watershed planning, water and wastewater treatment, and water transfers.

3.2 To develop a comprehensive IRWMP for the Region that incorporates water supply, water quality, flood and erosion protection, and environmental protection and enhancement objectives.

3.3 To improve and maximize coordination of individual public, private, and non-profit agency plans, programs and projects for mutual benefit and optimal gain within the Region.

3.4 To help identify, develop, and implement collaborative plans, programs, and projects that may be beyond the scope or capability of individual entities, but which would be of mutual benefit if implemented in a cooperative manner.

3.5 To facilitate regional water management efforts that include multiple water supply, water quality, flood control, and environmental protection and enhancement objectives.

3.6 To foster coordination, collaboration and communication between stakeholders and other interested parties, to achieve greater efficiencies, enhance public services, and build public support for vital projects.

3.7. To realize regional water management objectives at the least cost possible through mutual cooperation, elimination of redundancy, and enhanced regional competitiveness for State and Federal grant funding.

4. DEFINITIONS

4.1 **Integrated Regional Water Management Plan (IRWMP or IRWM Plan).** The plan envisioned by state legislators and state resource agencies that integrates the strategies, objectives, and priorities for projects to manage water resources proposed by public entities, non-profit entities, and stakeholders within a defined Planning Region. The minimum plan standards are as shown in Appendix A of "Integrated Regional Water Management Grant Program Guidelines, November 2004, Department of Water Resources and State Water Resources Control Board, Proposition 50, Chapter 8," as revised.

4.2 **Integration**. The combining of water management strategies and projects to be included in an IRWMP.

4.3.a **Lead Agency for IRWM Plan Development.** The Monterey Peninsula Water Management District is designated by the Water Management Group to lead the development or implementation of an Integrated Regional Water Management Plan for the Region.

4.3.b **Lead Agency for IRWM Grant Applications.** The Water Management Group may designate any entity in the Water Management Group to be the Lead Agency in making application to the State for grant funds.

4.4. **Non-profit Agency.** A 501 (c) (3) corporation, conservancy, group or other organization involved in water resources management in the Region.

4.5 **Private Agency.** A private or publicly held for-profit corporation or property owner involved in water resources management in the Region

4.6. **Project**. A specific project that addresses a service function.

4.7. **Public Agency**. A state-authorized water district, water agency, water management agency or other public entity, be it a special district, city or other governmental entity, responsible for providing one or more services in the areas of water supply, water quality, wastewater, recycled water, water conservation, stormwater/flood control, watershed planning and aquatic habitat protection and restoration.

4.8. **Region.** The area defined by the Water Management Group (WMG) consisting of watersheds, sub-watersheds and groundwater basins under the jurisdiction of one or more entities within the WMG.

4.9. **Service Function.** A water-related individual service function provided by a private, public, or non-profit entity, i.e. water supply, water quality, wastewater, recycled water, water conservation, stormwater/flood protection, watershed planning, recreational facilities, and habitat protection and restoration.

4.10 **Signatory Entity.** A public, private, or non-profit entity within the Region that is signatory to this MOU.

4.11 **Stakeholder.** A non-signatory public, private, or non-profit agency identified in the IRWM Plan with an interest in water resources management within the Region.

4.12 **Technical Advisory Committee.** The committee organized to advise the Water Management Group and Stakeholders concerning the IRWM Plan. The group is comprised of individuals with technical backgrounds in the fields of marine and freshwater biology, ecology, geology, engineering, hydrogeology, planning, resource conservation, riparian systems, water conservation, and water quality.

4.13 **Water Management Group.** The group of entities that takes the lead in overseeing the development and implementation of the Integrated Regional Water Management Plan within the Planning Region (the Monterey Regional Water Pollution Control Agency, the Monterey County Water Resources Agency, the Monterey Peninsula Water Management District, the City of Monterey, and the Big Sur Land Trust).

4.14. **Water Management Strategies**. Plans for and activities to be considered in an IRWMP include, but are not limited to, ecosystem restoration, environmental and habitat protection and improvement, water-supply reliability, flood management, groundwater management, recreation and public access, storm water capture and management, water conservation, water quality improvement, water recycling, and wetlands enhancement and creation.

5. IRWMP PARTICIPANTS

5.1 **Adopting Entities.** The entities in the Region that participate in the development, adoption, and implementation of the Integrated Regional Water Management Plan for the Region. Each entity intending to carry out a project proposed in the IRWMP must formally adopt the IRWMP or provide written substantiation of acceptance by the governing authority of the entity. For a public agency, adoption of the IRWMP is by formal resolution of the governing body. For a non-profit or for-profit entity, proof of acceptance of the IRWMP by the equivalent of a public agency governing body is required (e.g., by a board of directors or other management entity).

5.2. **Stakeholders**. Entities, such as other public, private, and non-profit entities, business and environmental groups, that are considered valuable contributors to the understanding and management of the Region's water resources.

5.3. **Regulatory Agencies**. These agencies, including, but not limited to, the Central Coast Regional Water Quality Control Board, California Coastal Commission, U.S. Army Corps of Engineers, California Public Utilities Commission, National Marine Fisheries Service (NOAA Fisheries), U.S. Fish and Wildlife Service, and the California Department of Fish and Game, will be invited to participate in the development and implementation of the IRWMP.

5.4 **Water Management Group.** The group of entities that takes the lead in developing and implementing an Integrated Regional Water Management Plan within the Planning Region (the Monterey Regional Water Pollution Control Agency, the Monterey County Water Resources Agency, the Monterey Peninsula Water Management District, the City of Monterey, and the Big Sur Land Trust).

6. MUTUAL UNDERSTANDING

6.1. **Subject matter scope of the IRWMP**. The IRWMP for the Region will include, but is not limited to, water supply, water quality, wastewater, recycled water, water conservation, stormwater/flood control, watershed planning, erosion prevention, and habitat protection and restoration. It is acknowledged that the proposals contained in the IRWMP may be based, in part, on the land-use plans of the member entities local governments such as Cities, Monterey County, and special districts located within the Region. Therefore, the resultant IRWMP will by design have incorporated the land-use plans and assumptions intrinsic to the respective water-related service function.

6.2. **Geographical scope of the IRWMP.** The area for this Memorandum is generally defined as the watersheds and associated groundwater basins contributing to the south Monterey Bay and Carmel Bay as shown in Figure 3-1: Map of Monterey Peninsula Integrated Regional Water Management Planning Region in the IRWM Plan.

The Region includes coastal watersheds from the southernmost portion of the San Jose Creek watershed north to the northern limit of the Seaside Groundwater Basin. The inland area is bounded by the Seaside Groundwater Basin to the north and by the Carmel River watershed to the south and east. The western limit of the planning Region generally coincides with the land and Pacific Ocean interface, but includes the Pt. Lobos, Carmel Bay, and Pacific Grove Areas of Special Biological Significance (ASBS) adjacent to the coastal portion of the Region.

However, it is recognized that the geographic scope represented in the IRWM Plan may be amended to include projects that are implemented cooperatively between IRWM planning regions (e.g., with the Salinas Valley IRWM planning region) and is not intended to be a rigid boundary.

6.3. **Approach to developing the IRWMP**. The Lead Agency will provide a draft IRWMP to the Water Management Group and other public, private, and non-profit entities for review and comment. It will be the responsibility of each entity signatory to this Memorandum to provide the Lead Agency with information described in the draft IRWMP concerning project proposals or to identify the need for a water management strategy for each service function provided by a signatory entity.

In order to be part of a final IRWMP, all proposals for development of water management plans and water development project proposals related to the IRWMP must meet the standards identified in the draft IRWM Plan for the Region.

A technical advisory committee consisting of staff representatives from the Water Management Group, other Stakeholders and such other organizations as may become contributing entities, will review proposed management plans and project proposals for consistency with the draft IRWMP and recommend a prioritized list of projects to be carried out within the Region. The Water Management Group and Stakeholders will meet to review the recommendation made by the TAC.

6.4. **Approval of prioritized project list.** Approval of the prioritized project list should occur by consensus of the Water Management Group and Stakeholders and should be based on the prioritization process described in the IRWMP and the recommendations of the Technical Advisory Committee. However, if a consensus cannot be reached among the Stakeholders and Water Management Group, the Water Management Group may make a final determination of the prioritized project list.

6.5. **Adoption of the IRWMP**. Plan adoption will occur by approval of the governing board of each entity. It should be noted at that the adopted Plan and project list may be amended from time to time as described below.

6.6 **Amendment of IRWMP or Prioritized Project list.** The IRWM Plan and prioritized project list may be amended from time to time. Any member of the Water Management Group or Stakeholders may request that the Lead Agency convene a meeting of the Water Management Group and Stakeholders for the purposes of amending the IRWM Plan or the prioritized project list. However, it is anticipated that the IRWMP or prioritized project list will be amended no more frequently than annually, unless more frequent amendments are required to meet State IRWM standards or grant application cycles. An amended IRWM Plan must be consistent with State IRWM standards as described in Definition 4.1 "Integrated Regional Water Management Plan" and any subsequent revisions by the State to IRWM guidelines.

6.7. **Project Implementation.** Project proponents will be responsible for completing proposed projects and providing project reports to the Lead Agency.

6.8 **Project Monitoring.** The Water Management Group will be responsible for monitoring the implementation of the IRWMP. The technical advisory committee will regularly report to the General Managers and Governing Boards of the Water Management Group regarding progress on the development and implementation of the IRWMP. The Lead Agency will be responsible for coordinating data collection and dissemination.

6.9 **Grant Applications.** The Water Management Group will designate a Lead Agency to apply for grant funds. The Lead Agency for each grant application should have a mission and expertise that is consistent with the purpose of the grant being applied for.

6.10 **Grant Awards and Agreement**. The Lead Agency will be the grantee and administer the grant on behalf of the Water Management Group and Stakeholders.

6.11 **Termination**. An entity signatory to this MOU may withdraw from participation upon 30 days advance notice to the other signatory entities, provided it agrees to be financially responsible for any previously committed, but unmet resource commitment.

6.12. **Personnel resources**. It is expected that the General Managers and/or other officials of each entity signatory to this MOU will periodically meet to insure that adequate staff resources are available to implement the IRWM Plan.

6.13. **Other on-going regional efforts**. Development of the IRWMP is separate from efforts of other organizations to develop water-related plans on a regional basis around Monterey Bay and the Central Coast. As the IRWMP is developed and implemented, work products may be shared to provide other entities and groups with current information.

7. INDEMNIFICATION

7.1 Each Party shall indemnify, defend and hold harmless the other parties, to the extent allowed by law and in proportion to fault, against any and all third-party liability for claims, demands, costs or judgments (direct, indirect, incidental or consequential) involving bodily injury, personal injury, death, property damage or other costs and expenses (including reasonable attorneys' fees, costs and expenses) arising or resulting from the acts or omissions of its own officers, agents, employees or representatives carried out pursuant to the obligations of this Agreement.

7.2 These indemnity provisions shall survive the termination or expiration of this Agreement. Further, each Party will be liable to the other Party for attorneys' fees, costs and expenses, and all other costs and expenses whatsoever, which are incurred by the other Party in enforcing these indemnity provisions.

8. SIGNATORIES TO THE MEMORANDUM OF UNDERSTANDING

We, the duly authorized undersigned representatives of our respective entities, acknowledge the above as our understanding of the intent and expected outcome in overseeing the development and implementation of an Integrated Regional Water Management Plan for the Monterey Peninsula, Carmel Bay, and South Monterey Bay Region.

WATER MANAGEMENT GROUP

Curtis V. Weeks
Signature

Curtis V. Weeks
Printed Name
Monterey County Water Resources Agency

8/14/08
Date

Keith Israel
Signature

Keith Israel
Printed Name
Monterey Regional Water Pollution Control Agency

July 7, 2008
Date

************************************ ************************************

William H. Leahy
Signature

William H. Leahy II
Printed Name
Big Sur Land Trust

6/16/08
Date

Signature

Printed Name
City of Monterey

Date

************************************ ************************************

Darby W. Fuerst
Signature

Darby W. Fuerst
Printed Name
Monterey Peninsula Water Management District

June 9, 2008
Date

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8. SIGNATORIES TO THE MEMORANDUM OF UNDERSTANDING

We, the duly authorized undersigned representatives of our respective entities, acknowledge the above as our understanding of the intent and expected outcome in overseeing the development and implementation of an Integrated Regional Water Management Plan for the Monterey Peninsula, Carmel Bay, and South Monterey Bay Region.

WATER MANAGEMENT GROUP

Signature

Printed Name
Monterey County Water Resources Agency

Date

****

Signature

Printed Name
Monterey Regional Water Pollution Control Agency

Date

****

Signature

Printed Name
Big Sur Land Trust

Date

****

Signature

Fred Meurer
Printed Name
City of Monterey

22 July 08
Date

****

APPROVED BY:

KWH
City Attorney's Office

Approved:

Risk Manager

Signature

Printed Name
Monterey Peninsula Water Management District

Date

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Appendix 1-b

Draft MOU for the 2013 Update

AMENDED

Memorandum of Understanding for Integrated Regional Water Management in the Monterey Peninsula, Carmel Bay, and South Monterey Bay Region

1. PURPOSE

The purpose of this Memorandum of Understanding (MOU) is to recognize a mutual understanding among entities in the southern Monterey Bay area regarding their joint efforts toward Integrated Regional Water Management (IRWM) planning. That understanding will continue to increase coordination, collaboration and communication for comprehensive management of water resources in the cities and unincorporated portions of the Monterey Peninsula, Carmel Bay, and South Monterey Bay Region (Region).

A. **Background and Description of Amendments**. The initial MOU to form a Regional Water Management Group (RWMG) was fully executed on July 22, 2008 by the Big Sur Land Trust (BSLT), a 501 (c) 3 organization, the City of Monterey, the Monterey Regional Water Pollution Control Agency (MRWPCA), the Monterey County Water Resources Agency (MCWRA), and the Monterey Peninsula Water Management District (MPWMD). The MOU formed a Regional Water Management Group (RWMG) for the purposes of developing and implementing projects consistent with the guidelines set by the State of California for IRWM.

Subsequently, the Marina Coast Water District (MCWD) requested approval to become part of the RWMG and signed an amended MOU in June 2011 that includes MCWD as a member of the RWMG. In 2012, the Resource Conservation District of Monterey County (RCD) agreed to become a member of the RWMG.

This amended MOU reflects the addition of MCWD and the RCD as members of the RWMG, describes processes and guidelines for changing the membership of the RWMG, and amends the MOU to meet Proposition 84 standards.

2. RECITALS

A. The State of California desires to foster Integrated Regional Water Management (IRWM) planning and encourages local public, non-profit, and private (for profit) entities to define planning regions appropriate for managing water resources and to integrate strategies within these planning regions.

B. Water resources management authority in the Region is currently distributed among various public agencies with a range of legal powers and regulatory responsibilities. These public agencies have definite jurisdictional boundaries, whereas sensible water resources planning and management frequently requires actions in multiple jurisdictions. Non-public entities within the Region have considerable interests in cooperating with public entities to protect, manage, and enhance water resources within the Region.

C. Six public entities and one non-profit entity in the Region with responsibility and interests in the management of water resources have agreed to form a Regional Water Management Group for the purposes of developing and implementing projects consistent with the guidelines set by the State of California for IRWM. These entities are: 1.) the Big Sur Land Trust (BSLT), a 501 (c) 3 organization; 2.) the City of Monterey; 3.) the Monterey Regional Water Pollution Control Agency (MRWPCA); 4.) the Monterey County Water Resources Agency (MCWRA); 5) the Marina Coast Water District (MCWD); 6) the Resource Conservation District of Monterey County; and 7.) the Monterey Peninsula Water Management District (MPWMD).

D. The Regional Water Management Group has defined an appropriate planning Region that takes into consideration jurisdictional limits, powers and responsibilities, and watershed and groundwater basin boundaries. The Regional Water Management Group is taking the lead in overseeing and implementing a detailed IRWM Plan within the planning Region. The Region is generally described as encompassing approximately 347 square miles and consists of groundwater basins and coastal watershed areas contributing to the Carmel Bay and south Monterey Bay. The Region includes coastal watersheds from the southernmost portion of the San Jose Creek watershed north to the northern limit of the Seaside Groundwater Basin. The inland area is bounded by the Seaside Groundwater Basin to the north and by the Carmel River watershed to the south and east. The western limit of the planning Region generally coincides with the land and Pacific Ocean interface, but includes the Pt. Lobos, Carmel Bay, and Pacific Grove Areas of Special Biological Significance (ASBS) adjacent to the coastal portion of the Region.

   The principal groundwater basins in the planning Region are the Seaside Groundwater Basin and the Carmel Valley Aquifer. The Region includes about 38 miles of the coast within the Monterey Bay National Marine Sanctuary, three ASBS, the Cities of Carmel-by-the Sea, Del Rey Oaks, Monterey, Pacific Grove, Sand City, Seaside, and unincorporated portions of Monterey County including the Carmel Valley watershed (255 square miles), Pebble Beach, the Carmel Highlands and portions of the Seaside Groundwater Basin adjacent to Highway 68 (also known as Canyon Del Rey). This description of the planning Region is not intended to be a limitation on projects and resource planning that may be shared between adjacent IRWM planning Regions (e.g., the Greater Monterey County IRWM planning Region to the north and east).

E. The entities signatory to this MOU desire to link and integrate efforts to jointly oversee the development and implementation of a comprehensive Integrated Regional Water Management Plan for the Region.

3. GOALS

The goals of the collaborative effort undertaken pursuant to this MOU are:

3.1 To implement a comprehensive IRWMP for the Region that will consider the strategies that are required by the State under CWC 79562.5 and 79564 and subsequent modifications required under Proposition 84. Eligible projects must yield multiple benefits and include one or more of the following elements (PRC § 75026.(a)):

- **Water supply reliability, water conservation and water use efficiency**
- **Stormwater capture, storage, clean-up, treatment, and management**
- **Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands**
- **Non-point source pollution reduction, management and monitoring**
- **Groundwater recharge and management projects**
- **Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users**
- **Water banking, exchange, reclamation and improvement of water quality**
- **Planning and implementation of multipurpose flood management programs**
- **Watershed protection and management**
- **Drinking water treatment and distribution**
- **Ecosystem and fisheries restoration and protection**

3.2 To implement a comprehensive IRWMP for the Region that incorporates water supply, water quality, flood and erosion protection, and environmental protection and enhancement objectives.

3.3 To improve and maximize coordination of individual public, private, and non-profit agency plans, programs and projects for mutual benefit and optimal gain within the Region.

3.4 To help identify, develop, and implement collaborative plans, programs, and projects that may be beyond the scope or capability of individual entities, but which would be of mutual benefit if implemented in a cooperative manner.

3.5 To facilitate regional water management efforts that include multiple water supply, water quality, flood control, and environmental protection and enhancement objectives.

3.6 To foster coordination, collaboration and communication between stakeholders and other interested parties, to achieve greater efficiencies, enhance public services, and build public support for vital projects.

3.7. To realize regional water management objectives at the least cost possible through mutual cooperation, elimination of redundancy, and enhanced regional competitiveness for State and Federal grant funding.

4. DEFINITIONS

4.1 **Integrated Regional Water Management Plan (IRWMP or IRWM Plan).** The plan envisioned by state legislators and state resource agencies that integrates the strategies, objectives, and priorities for projects to manage water resources proposed by public entities, non-profit entities, and stakeholders within a defined Planning Region. The minimum plan standards are as shown in Appendix A of "Integrated Regional Water Management Grant Program Guidelines, November 2004, Department of Water Resources and State Water Resources Control Board, Proposition 50, Chapter 8," as revised. Minimum IRWM Plan standards may be revised from time to time by the State of California.

4.2 **Integration**. The combining of water management strategies and projects to be included in an IRWMP.

4.3.a **Lead Agency for IRWM Plan Development.** The Monterey Peninsula Water Management District is designated by the Regional Water Management Group to lead the development or implementation of an Integrated Regional Water Management Plan for the Region.

4.3.b **Lead Agency for IRWM Grant Applications.** The Regional Water Management Group may designate any entity in the Regional Water Management Group to be the Lead Agency in making application to the State for grant funds.

4.4. **Non-profit Agency.** A 501 (c) (3) corporation, conservancy, group or other organization involved in water resources management in the Region.

4.5 **Private Agency.** A private or publicly held for-profit corporation or property owner involved in water resources management in the Region

4.6. **Project**. A specific project that addresses a service function.

4.7. **Public Agency**. A state-authorized water district, water agency, water management agency or other public entity, be it a special district, city or other governmental entity, responsible for providing one or more services in the areas of water supply, water quality, wastewater, recycled water, water conservation, stormwater/flood control, watershed planning and aquatic habitat protection and restoration.

4.8. **Region.** The area defined by the Regional Water Management Group (RWMG) consisting of watersheds, sub-watersheds and groundwater basins under the jurisdiction of one or more entities within the RWMG.

4.9. **Service Function.** A water-related individual service function provided by a private, public, or non-profit entity, i.e. water supply, water quality, wastewater, recycled water, water conservation, stormwater/flood protection, watershed planning, recreational facilities, and habitat protection and restoration.

4.10 **Signatory Entity.** A public, private, or non-profit entity within the Region that is signatory to this MOU.

4.11 **Stakeholder.** A non-signatory public, private, or non-profit agency identified in the IRWM Plan with an interest in water resources management within the Region.

4.12 **Technical Advisory Committee.** The committee organized to advise the Regional Water Management Group and Stakeholders concerning the IRWM Plan. Normally, the group will be comprised of individuals with technical backgrounds in the fields of marine and freshwater biology, ecology, geology, engineering, hydrogeology, planning, resource conservation, riparian systems, water conservation, and water quality. However, stakeholders with interests in a particular aspect of resource or project management, but not necessarily a technical background, may also be considered for inclusion in the TAC.

4.13 **Regional Water Management Group.** The group of entities that takes the lead in overseeing the development and implementation of the Integrated Regional Water Management Plan within the Planning Region. The RWMG consists of the Monterey Regional Water Pollution Control Agency, the Monterey County Water Resources Agency, the Monterey Peninsula Water Management District, the City of Monterey, the Marina Coast Water District, the Resource Conservation District of Monterey County, and the Big Sur Land Trust.

4.14. **Water Management Strategies**. Plans for and activities to be considered in an IRWMP include, but are not limited to, ecosystem restoration, environmental and habitat protection and improvement, water-supply reliability, flood management, groundwater management, recreation and public access, storm water capture and management, water conservation, water quality improvement, water recycling, and wetlands enhancement and creation.

5. IRWMP PARTICIPANTS

5.1 **Adopting Entities.** The entities in the Region that participate in the development, adoption, and implementation of the Integrated Regional Water Management Plan for the Region. Each entity intending to carry out a project proposed in the IRWMP must formally adopt the IRWMP or provide written substantiation of acceptance by the governing authority of the entity. For a public agency, adoption of the IRWMP is by formal resolution of the governing body. For a non-profit or for-profit entity, proof of acceptance of the IRWMP by the equivalent of a public agency governing body is required (e.g., by a board of directors or other management entity).

5.2. **Stakeholders**. Entities, such as other public, private, and non-profit entities, business and environmental groups, that are considered valuable contributors to the understanding and management of the Region's water resources.

5.3. **Regulatory Agencies**. These agencies, including, but not limited to, the Central Coast Regional Water Quality Control Board, California Coastal Commission, U.S. Army Corps of Engineers, California Public Utilities Commission, National Marine Fisheries Service (NOAA Fisheries), U.S. Fish and Wildlife Service, and the California Department of Fish and Game, will be invited to participate in the development and implementation of the IRWMP.

5.4 Regional **Water Management Group.** The group of entities that takes the lead in developing and implementing an Integrated Regional Water Management Plan within the Planning Region.

6. MUTUAL UNDERSTANDING

6.1. **Subject matter scope of the IRWMP**. The IRWMP for the Region will include, but is not limited to, water supply, water quality, wastewater, recycled water, water conservation, stormwater/flood control, watershed planning, erosion prevention, and habitat protection and restoration. It is acknowledged that the proposals contained in the IRWMP may be based, in part, on the land-use plans of the member entities local governments such as Cities, Monterey County, and special districts located within the Region. Therefore, the resultant IRWMP will by design have incorporated the land-use plans and assumptions intrinsic to the respective water-related service function.

6.2. **Geographical scope of the IRWMP.** The area for this Memorandum is generally defined as the watersheds and associated groundwater basins contributing to the south Monterey Bay and Carmel Bay as shown in Figure 3-1: Map of Monterey Peninsula Integrated Regional Water Management Planning Region in the IRWM Plan.

The Region includes coastal watersheds from the southernmost portion of the San Jose Creek watershed north to the northern limit of the Seaside Groundwater Basin. The inland area is bounded by the Seaside Groundwater Basin to the north and by the Carmel River watershed to the south and east. The western limit of the planning Region generally coincides with the land and Pacific Ocean interface, but includes the Pt. Lobos, Carmel Bay, and Pacific Grove Areas of Special Biological Significance (ASBS) adjacent to the coastal portion of the Region.

However, it is recognized that the geographic scope represented in the IRWM Plan may be amended to include projects that are implemented cooperatively between IRWM planning regions (e.g., with the Greater Monterey County IRWM planning region) and is not intended to be a rigid boundary.

6.3. **Approach to developing the IRWMP**. It will be the responsibility of each entity signatory to this Memorandum to provide the Lead Agency with information for the IRWMP concerning project proposals or to identify the need for a water management strategy for each service function provided by a signatory entity.

In order to be included in the IRWMP, all proposals for development of water management plans and water development project proposals related to the IRWMP must meet the standards identified in the IRWM Plan for the Region.

A technical advisory committee consisting of staff representatives from the Regional Water Management Group, other Stakeholders and such other organizations as may become contributing entities, will review proposed management plans and project proposals for consistency with the IRWMP and recommend a prioritized list of projects to be carried out within the Region. The Regional Water Management Group and Stakeholders will meet to review the recommendation made by the TAC.

6.4. **Approval of prioritized project list.** Approval of the prioritized project list should occur by consensus of the Regional Water Management Group and Stakeholders and should be based on the prioritization process described in the IRWMP and the recommendations of the Technical Advisory Committee. However, if a consensus cannot be reached among the Stakeholders and Regional Water Management Group, the Regional Water Management Group may make a final determination of the prioritized project list.

6.5. **Adoption of the IRWMP**. Plan adoption will occur by approval of the governing board of each entity. Each member of the RWMG shall adopt the IRWM Plan or an amended IRWM Plan, when the Plan becomes available. Project proponents named in an IRWM grant application shall adopt the IRWM Plan or amended IRWM Plan prior to submittal of the grant application. It should be noted that the adopted Plan and project list may be amended from time to time as described below.

6.6 **Amendment of IRWMP or Prioritized Project list.** The IRWM Plan and prioritized project list may be amended from time to time. Any member of the Regional Water Management Group or Stakeholders may request that the Lead Agency convene a meeting of the Regional Water Management Group and Stakeholders for the purposes of amending the IRWM Plan or the prioritized project list. However, it is anticipated that the IRWMP or prioritized project list will be amended no more frequently than annually, unless more frequent amendments are required to meet State IRWM standards or grant application cycles. An amended IRWM Plan must be consistent with State IRWM standards as described in Definition 4.1 "Integrated Regional Water Management Plan" and any subsequent revisions by the State to IRWM guidelines.

6.7. **Project Implementation.** Project proponents will be responsible for completing proposed projects and providing project reports to the Lead Agency.

6.8 **Project Monitoring.** The Regional Water Management Group will be responsible for monitoring the implementation of the IRWMP. The technical advisory committee will regularly report to the General Managers and Governing Boards of the Regional Water Management Group regarding progress on the development and implementation of the IRWMP. The Lead Agency will be responsible for coordinating data collection and dissemination.

6.9 **Grant Applications.** The Regional Water Management Group will designate a Lead Agency to apply for grant funds. The Lead Agency for each grant application should have a mission and expertise that is consistent with the purpose of the grant being applied for.

6.10 **Grant Awards and Agreement**. The Lead Agency will be the grantee and administer the grant on behalf of the Regional Water Management Group and Stakeholders.

6.11 **Participation in Regional Water Management Group (RWMG)**. Any qualified stakeholder may petition to become a member of the RWMG. A qualified stakeholder must demonstrate the following: a) an interest, responsibility or authority over multiple resources within the region; or b) a unique interest, responsibility, authority, or asset not shared by any other entity within the RWMG. The RWMG shall consider such a request for a change to the RWMG and shall vote by majority to accept or reject the request.

6.12 **Length of Term in Regional Water Management Group**. Members of the RWMG may change from time to time, depending on the level of resources available to each entity. However, there is no required minimum or maximum length of time required as a member of the RWMG. If an entity withdraws from the RWMG, the remaining entities should attempt to replace the interest, responsibility or authority lost by the withdrawal.

6.13 **Rights of the Parties and Constituencies**: This MOU does not provide any added legal rights or regulatory powers to any of the signatory parties, or to the RWMG as a whole. This MOU does not of itself give any party the power to adjudicate water rights, or to regulate or otherwise control the private property of other parties. This

MOU does not contemplate the parties taking any action that would adversely affect the rights of any of the parties, or that would adversely affect the customers or constituencies of any of the parties.

6.14 **Termination**. An entity signatory to this MOU may withdraw from participation upon 30 days advance notice to the other signatory entities, provided it agrees to be financially responsible for any previously committed, but unmet resource commitment.

6.15. **Personnel resources**. It is expected that the General Managers and/or other officials of each entity signatory to this MOU will periodically meet to insure that adequate staff resources are available to implement the IRWM Plan.

6.16. **Other on-going regional efforts**. Development of the IRWMP is separate from efforts of other organizations to develop water-related plans on a regional basis around Monterey Bay and the Central Coast. As the IRWMP is developed and implemented, work products may be shared to provide other entities and groups with current information.

7. INDEMNIFICATION

7.1 Each Party shall indemnify, defend and hold harmless the other parties, to the extent allowed by law and in proportion to fault, against any and all third-party liability for claims, demands, costs or judgments (direct, indirect, incidental or consequential) involving bodily injury, personal injury, death, property damage or other costs and expenses (including reasonable attorneys' fees, costs and expenses) arising or resulting from the acts or omissions of its own officers, agents, employees or representatives carried out pursuant to the obligations of this Agreement.

7.2 These indemnity provisions shall survive the termination or expiration of this Agreement. Further, each Party will be liable to the other Party for attorneys' fees, costs and expenses, and all other costs and expenses whatsoever, which are incurred by the other Party in enforcing these indemnity provisions.

8. RECORD OF AMENDMENTS

8.1 June 2010 – add Marina Coast Water District to RWMG. Revise Goals, Definitions and MOU terms to reflect Proposition 84 requirements.

8.2 March 2012 – add process to change RWMG, define when plan is to be adopted, revise to Proposition 84 standards

8.3 August 2012 – add Resource Conservation District of Monterey County to RWMG

9. SIGNATORIES TO THE MEMORANDUM OF UNDERSTANDING

We, the duly authorized undersigned representatives of our respective entities, acknowledge the above as our understanding of the intent and expected outcome in overseeing the development and implementation of an Integrated Regional Water Management Plan for the Monterey Peninsula, Carmel Bay, and South Monterey Bay Region.

______________________________ Signature	______________________________ Signature
______________________________ Printed Name **Monterey County Water Resources Agency**	______________________________ Printed Name **Monterey Regional Water Pollution Control Agency**
______________________________ Date	______________________________ Date
***********************************	***********************************
______________________________ Signature	______________________________ Signature
______________________________ Printed Name **Big Sur Land Trust**	______________________________ Printed Name **City of Monterey**
______________________________ Date	______________________________ Date
***********************************	***********************************
David J. Stoldt ______________________________ Signature	______________________________ Signature
_David J. Stoldt______________________ Printed Name	______________________________ Printed Name **Marina Coast Water District**
Monterey Peninsula Water Management District	
__7/8/2013____________________________ Date	______________________________ Date

Signature

Printed Name
Board President, Resource Conservation District of Monterey County

Date

****

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Appendix 1-c

Resolutions of Adoption

Appendix 1-d

Current Stakeholders List

WMG / TAC	Ord Inter-regional	DAC con-tact	CR Task Force	CRAC	Contact	Organization	Website	Sent 4/30	Sent 5/8	Receipt	Reply Message	Rec'd 7/25/12 mtg Notice	Attended 7/25/12 mtg
FEDERAL AGENCIES													
	X				Bridget Hoover	Monterey Bay National Marine Sanctuary	http://montereybay.noaa.gov/	X		X	Remain on List	X	
					Joyce Ambrosius	National Oceanic and Atmospheric Administration Fisheries	http://www.noaa.gov/fisheries.html	X				X	
					Frank Schwing	National Oceanic and Atmospheric Administration Fisheries	http://www.noaa.gov/fisheries.html	X				X	
			x	x	Jacqueline Pearson-Meyer	National Oceanic and Atmospheric Administration Fisheries	http://www.noaa.gov/fisheries.html						
					Dan Martel	U.S. Army Corps of Engineers	http://www.mvd.usace.army.mil/		X			X	
					Jacob Martin	U.S. Fish and Wildlife Service	http://www.fws.gov/	X		X		X	
					Larry Freeman	US Geological Survey	http://www.usgs.gov/	X		X		X	
					Robert LaFleur	USDA Natural Resources Conservation Service	http://www.ca.nrcs.usda.gov/	X				X	
					Shawn Milar	USFWS Coastal Program	http://www.fws.gov/GOMCP/funding.html	X			Remain on List	X	
			X		Jeff Kwasny	US Forest Service	http://www.fs.fed.us/	X			Remain on List	X	
					Gail Youngblood	U.S. Army Corps of Engineers							
					David Eisen	U.S. Army Corps of Engineers							
					Chad Mitcham	U.S. Fish and Wildlife Service	1100 Fiesta Way, Watsonville 95076.						
STATE AGENCIES													
					Jeff Frey	California State Parks	http://www.parks.ca.gov/	X				X	
			X		Mike Watson	California Coastal Commission	http://www.coastal.ca.gov/	X				X	
					Tamara Doan	California Coastal Commission	http://www.coastal.ca.gov/	X				X	
					Trish Chapman	California Coastal Conservancy	http://www.coastal.ca.gov/	X				X	
					Margaret Paul	California Department of Fish & Game: Fisheries	http://www.dfg.ca.gov/	X				X	
					John Shelton	California Department of Fish and Game	http://www.dfg.ca.gov/	X		X	Remain on List	X	
					Jan Sweigert	California Department of Public Health: Drinking Water	http://www.cdph.ca.gov/programs/Pages/DWP.aspx	X				X	
					Michelle Dooley	California Department of Water Resources	http://www.water.ca.gov/	X				X	
					Dane Mathis	California Department of Water Resources	http://www.water.ca.gov/	X		X	Remain on List	X	
					Ernie Taylor	California Department of Water Resources	http://www.water.ca.gov/	X				X	
					Monica Reis	California Department of Water Resources	http://www.water.ca.gov/	X				X	
					Steve Bachman	California State Parks	http://www.parks.ca.gov/	X		X	Remain on List	X	
					Matt Fuzie	California State Parks	http://www.parks.ca.gov/	X				X	
					Anya Spear	California State University Monterey Bay	http://csumb.edu/	X				X	
					Katherine Mrowka, Chief	California State Water Resources Control Board	http://www.swrcb.ca.gov/	X				X	
					Vicky Whitney, Deputy Director, Division of Water Rights	California State Water Resources Control Board	http://www.swrcb.ca.gov/	X				X	
					Connie Anderson	California State Water Resources Control Board	http://www.swrcb.ca.gov/		X	X	Remain on List	X	
					Laleh Rastegarzadeh	California State Water Resources Control Board	http://www.swrcb.ca.gov/						
					Jodi Pontureri (she's on WQPP Committee)	California State Water Resources Control Board	http://www.swrcb.ca.gov/	X				X	
					Pete Riegelhuth	Caltrans	http://www.dot.ca.gov/	X				X	
					Lyn Wickham, Caltrans District 5 Hydraulics	Caltrans	http://www.dot.ca.gov/	X				X	
					Lisa McCann	Central Coast Regional Water Quality Control Board	http://www.swrcb.ca.gov/rwqcb3/	X				X	
					Angela Schroeter	Central Coast Regional Water Quality Control Board	http://www.swrcb.ca.gov/rwqcb3/	X				X	
					Jennifer Epp	Central Coast Regional Water Quality Control Board	http://www.swrcb.ca.gov/rwqcb3/	X				X	
					Matt Keeling	Central Coast Regional Water Quality Control Board	http://www.swrcb.ca.gov/rwqcb3/	X				X	
					Katie McNeill (grant coordinator)	Central Coast Regional Water Quality Control Board	http://www.swrcb.ca.gov/rwqcb3/	X				X	
					Hector Hernandez	Central Coast Regional Water Quality Control Board	http://www.swrcb.ca.gov/rwqcb3/	X		X	Remain on List	X	
REGIONAL AND COUNTY GOVERNMENT/LOCAL AGENCIES, COUNCILS, DISTRICTS, & ADVISORY COMMITTEES (BESIDES WATER)													
					Lisa Lurie	Agriculture Water Quality Alliance	http://awqa.org/	X				X	
					Elizabeth Russell	Association of Monterey Bay Area Governments	http://ambag.org/	X				X	
					Steve Endsley	Fort Ord Reuse Authority	http://fora.org/		X			X	
					Crissy Maras	Fort Ord Reuse Authority	http://fora.org/		X			X	
					Michael A. Houlemard, Jr.	Fort Ord Reuse Authority	http://fora.org/		X			X	
	X				Jonathan Garcia	Fort Ord Reuse Authority	http://fora.org/	X			Remain on List	X	
	X				Jim Arnold	Fort Ord Reuse Authority	http://fora.org/	X				X	
					Janna Faulk	Monterey County Environmental Health	http://www.co.monterey.ca.us/	X				X	
					Roger VanHorn	Monterey County Health Dept., Division of Environmental Health	http://www.co.monterey.ca.us/	X				X	

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					Cheryl Sandoval	Monterey County Health Dept., Division of Environmental Health	http://www.co.monterey.ca.us/	X				X	
					Kate McKenna	Monterey County Local Agency Formation Commission	http://www.co.monterey.ca.us/lafco/	X				X	
					Phil Yenovkian	Monterey County Office of Emergency Services	http://www.co.monterey.ca.us/oes/	X				X	
					Paul Greenway	Monterey County Public Works	http://www.co.monterey.ca.us/publicworks/	X				X	
					Tom Harty	Monterey County Public Works	http://www.co.monterey.ca.us/publicworks/	X		X	Remain on List	X	
					Edward Muniz	Monterey County Public Works	http://www.co.monterey.ca.us/publicworks/	X				X	
					Ogarita Carranza	Monterey County Public Works	http://www.co.monterey.ca.us/publicworks/	X				X	
					Dirk Medema	Monterey County Public Works/Monterey County Service Area 50	http://www.co.monterey.ca.us/publicworks/	X		X	Remain on List	X	
X			X		Paul Robins	Monterey County Resource Conservation District	http://rcdmonterey.org/	X		X	Remain on List	X	X
X			X		Rami Shihadeh	Monterey County Resource Conservation District	http://rcdmonterey.org/	X				X	X
					Carl P. Holm	Monterey County Resource Management Agency	http://www.co.monterey.ca.us/rma/	X		X	Remain on List	X	
					Mike Novo	Monterey County Resource Management Agency	http://www.co.monterey.ca.us/rma/						
					Dawn Mathes	Monterey County Resource Management Agency	http://www.co.monterey.ca.us/rma/						
					Bob Roach (Assistant Ag Commissioner)	Monterey County Weed Management Area	http://www.eventbrite.com/org/42812605	X				X	
					Tim Jensen	Monterey Peninsula Regional Park District	http://www.mprpd.org/	X				X	
					Don Prescott	Monterey Regional Waste Management District	http://www.mrwmd.org/	X		X	Remain on List	X	
					Des Johnston	MPAD							X
					Richard LeWarne	Monterey County Environmental Health	http://www.co.monterey.ca.us/						
WATER / WASTEWATER DISTRICTS, JPAs & PRIVATE WATER SUPPLIERS													
					Jan Shriner	Marina Coast Water District	http://www.mcwd.org/						
					Eric Sabolsice	California American Water	http://www.amwater.com/caaw/	X				X	
			X		Richard Svindland	California American Water Company	http://www.amwater.com/caaw/	X				X	
					Catherine Bowie	California American Water	http://www.amwater.com/caaw/	X				X	
					Barbara Buikema	Carmel Area Wastewater District	http://cawd.org/	X		X	Remain on List	X	
	X				Brian Lee	Marina Coast Water District	http://www.mcwd.org/	X				X	
X	X				Brian True	Marina Coast Water District	http://www.mcwd.org/	X		X	Remain on List	X	X
X	X		X		Robert Johnson	Monterey County Water Resources Agency	http://www.co.monterey.ca.us/rma/	X		X	Remain on List	X	X
					Manuel Quezada	Monterey County Water Resources Agency	http://www.co.monterey.ca.us/rma/	X		X	Remain on List	X	
					Tom Moss	Monterey County Water Resources Agency	http://www.co.monterey.ca.us/rma/						
X	X		X		Henrietta Stern	Monterey Peninsula Water Management District	http://www.mpwmd.dst.ca.us/	X				X	X
				X	Lance Monosoff	Monterey Peninsula Water Management District	http://www.mpwmd.dst.ca.us/					X	
X			X		Joe Oliver	Monterey Peninsula Water Management District	http://www.mpwmd.dst.ca.us/	X				X	
				X	David Laredo	Monterey Peninsula Water Management District	http://www.mpwmd.dst.ca.us/						
					Sara Reyes	Monterey Peninsula Water Management District	http://www.mpwmd.dst.ca.us/						
					Jonathan Lear	Monterey Peninsula Water Management District	http://www.mpwmd.dst.ca.us/	X				X	X
				X	Kevan Urquhart	Monterey Peninsula Water Management District	http://www.mpwmd.dst.ca.us/	X		X	Remain on List	X	
					Mark Dudley	Monterey Peninsula Water Management District	http://www.mpwmd.dst.ca.us/	X				X	X
				X	Thomas Christensen	Monterey Peninsula Water Management District	http://www.mpwmd.dst.ca.us/	X				X	X
					Eric Sandoval	Monterey Peninsula Water Management District	http://www.mpwmd.dst.ca.us/	X				X	
X	X		X	X	Larry Hampson	Monterey Peninsula Water Management District	http://www.mpwmd.dst.ca.us/	X					X
					Bob Holden	Monterey Regional Water Pollution Control Agency	http://www.mrwpca.org/	X				X	
X	X				Brad Hagemann	Monterey Regional Water Pollution Control Agency	http://www.mrwpca.org/	X				X	
					Mike McCullough	Monterey Regional Water Pollution Control Agency	http://www.mrwpca.org/						X
					Christina Baca	Pebble Beach Community Service District	http://pbcsd.org/	X				X	
					J.T. Rethke	Pebble Beach Community- Service District							X
					Mike Niccum	Pebble Beach Community Service District (also, PGUSD)	http://pbcsd.org/		X	X	Remain on List	X	
					Chris Hauser	Santa Lucia Preserve	http://www.santaluciapreserve.com/	X				X	
					Dewey Evans	Seaside Basin Watermaster	http://seasidebasinwatermaster.org/	X		X	Remain on List	X	
MUNICIPALITIES													
					Sharon Friedrichsen	City of Carmel-by-the-Sea	http://ci.carmel.ca.us/carmel/index.cfm	X				X	
					Bob Jacques	Consultant for City of Carmel-by-the-Sea	http://ci.carmel.ca.us/carmel/index.cfm						
					Marc Wiener	City of Carmel-by-the-Sea	http://ci.carmel.ca.us/carmel/index.cfm						
					Dan Dawson	City of Del Rey Oaks	http://www.delreyoaks.org/	X				X	
	X				Edrie de los Santos	City of Marina	http://www.ci.marina.ca.us/	X				X	
X					Jeff Krebs	City of Monterey	http://monterey.org/	X				X	X
					Tom Reeves	City of Monterey	http://monterey.org/	X		X	Remain on List	X	

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					Linda English	City of Monterey	http://monterey.org/	X				X	
					Sarah Hardgrave	City of Pacific Grove	http://www.ci.pg.ca.us/	X		X	Remain on List	X	
					Steve Matarazzo	City of Sand City	http://sandcity.org/	X				X	
					Rick Riedl	City of Seaside	http://www.ci.seaside.ca.us/	X		X	Remain on List	X	
					Tim O'Halloran	City of Seaside and Seaside County Sanitation District	http://www.ci.seaside.ca.us/index.aspx?page=217	X				X	
	X				Leslie Llantero	City of Seaside	http://www.ci.seaside.ca.us/index.aspx?page=217						X
NONPROFIT ORGANIZATIONS & CITIZEN GROUPS													
					Rachel Saunders	Big Sur Land Trust	http://www.bigsurlandtrust.org/	X				X	
X					Bill Leahy	Big Sur Land Trust	http://www.bigsurlandtrust.org/	X				X	
					Joanna Devers	Big Sur Land Trust	http://www.bigsurlandtrust.org/						
					Keith Defiebre	Bike Racing—CCCX Cycling		X				X	
					Philomena Smith	California Native Plant Society, Monterey Chapter	http://montereybay.cnps.org/	X				X	
					David Styer	California Native Plant Society, Monterey Chapter	http://montereybay.cnps.org/	X				X	
					Mary Ann Matthews, Conservation Chair	California Native Plant Society, Monterey County Chapter	http://montereybay.cnps.org/	X		X	Remain on List	X	
					Roger Williams	Carmel River Steelhead Association	http://www.carmelriversteelheadassociation.org/	X		X	Remain on List	X	
					Brian LeNeve	Carmel River Steelhead Association	http://www.carmelriversteelheadassociation.org/	X				X	
					Roy Thomas, President	Carmel River Steelhead Association	http://www.carmelriversteelheadassociation.org/	X		X	Remain on List	X	
					Frank Emerson	Carmel River Steelhead Association	http://www.carmelriversteelheadassociation.org/	X				X	
			X		Lorin Letendre	Carmel River Watershed Conservancy	http://www.carmelriversteelheadassociation.org/	X		X	Remain on List	X	X
					Clive Sanders	Carmel River Watershed Conservancy	http://carmelriverwatershed.org/					X	
					Jack Hammerland	Carmel River Watershed Conservancy	http://carmelriverwatershed.org/	X				X	
					Todd Norgaard	Carmel Valley Association	http://www.carmelvalleyassociation.org/		X		Remain on List	X	
					Sierra Ryan	Central Coast Wetlands Group	http://ccwg.mlml.calstate.edu/	X				X	
					Ken Ekelund	Citizen Watershed Monitoring Network	http://montereybay.noaa.gov/monitoringnetwork/welc	X				X	
					George T. Riley	Citizens for Public Water	http://citizenswater.com/	X				X	X
					Greg Pepping	Coastal Watershed Council	http://coastal-watershed.org/	X		X	Remain on List	X	X
					Donna Meyers	Conserve Collaborate		X				X	
					Laura Dadiw	Del Monte Forest Foundation	http://delmonteforestfoundation.org/		X			X	
					Don Eastman	Del Monte Forest Property Owners	dmfpo.org/about.html		X			X	
					Sherry Bryan	Ecology Action	http://www.ecoact.org/	X				X	
					Bob Sevene	FORT Friends (Fort Ord Recreation Trails Friends, a consolidation of several groups)	http://fortfriends.net/	X				X	
					Gail Morton	Fort Ord Recreation Users	http://www.foru.us/MontereyDowns.html	X				X	
					Margaret Davis	Friends of Fort Ord Warhorse	http://fortordwarhorse.com/?page_id=8	X				X	
					Hannah Schoenthal-Muse	Friends of the River	http://www.friendsoftheriver.org/site/PageServer	X				X	
					Brian Center	Friends of the River	http://www.friendsoftheriver.org/site/PageServer					X	
					Chris Mack	Keep Fort Ord Wild	http://keepfortordwild.org/	X				X	
					Gordon Smith	Keep Fort Ord Wild	http://keepfortordwild.org/	X				X	
					Amy White, Interim ED	LandWatch Monterey County	http://www.landwatch.org/index.html	X				X	
					Renate Robe	Marina Equestrian Center	http://marinaequestrian.org/	X				X	
					Lisa Emanuelson	Monterey Bay Citizen Watershed Monitoring Network	http://montereybay.noaa.gov/monitoringnetwork/welcome.html		X		Remain on List	X	
					Doug Deitch	Monterey Bay Conservancy	http://montereybayconservancy.org/	X				X	
					Artthur McLoughlin	Monterey Bay Youth Camp	http://www.monterey.org/en-us/departments/monter	X				X	X
					Steve Shimek	Monterey Coastkeeper/The Otter Project	monterey-county-water-resources-agency-over-polluted-runoff	X		X	Remain on List	X	
					Sharon Lacalamita	Monterey Search and Rescue Dogs, Inc.	http://mcsard.org/	X				X	
					Darius Rike	MORCA (Monterey Off-Road Cycling Association, a Chapter of IMBA)	http://www.morcamtb.org/	X				X	
					Gary Courtright	MORCA (Monterey Off-Road Cycling Association, a Chapter of IMBA)	http://www.morcamtb.org/	X				X	
			X		Dr. Monica Hunter	Planning and Conservation League	http://www.pcl.org/	X				X	

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					Nancy Isakson	Salinas Valley Water Coalition							
					Christina Fischer, Executive Director	Santa Lucia Conservancy	http://www.slconservancy.org/	X				X	
					Laura Kasa, Executive Director	Save Our Shores	http://saveourshores.org/	X				X	
					Maris Sidenstecker	Save The Whales	http://www.savethewhales.org/	X				X	
					Joel Weinstein	Sierra Club	http://www.sierraclub.org/	X				X	
					Tom Moore, Fort Ord specialist	Sierra Club	http://www.sierraclub.org/	X				X	
					Tony Tersol	Surfrider Foundation	http://surfrider.org/	X				X	
					Sarah Corbin, Central CA Regional Manager	Surfrider Foundation	http://surfrider.org/	X				X	
					Luana Conley	Sustainable Marina (residents group)	http://c4smarina.weebly.com/index.html	X				X	
					Kay Cline	Sustainable Seaside (residents group)		X				X	
			X		Michael Waxer	Step Up 2 Green / Sustainability Academy		X				X	
					Liz Spence	The Nature Conservancy	http://www.nature.org/	X				X	
					Sarah Newkirk	The Nature Conservancy	http://www.nature.org/		X			X	
					Sam Davidson	Trout Unlimited	http://www.tu.org/	X					
					Oona Gaberšek	U.S. Green Building Council	www.og-la.com				Remain on List	X	
					Tom Hopkins, President	Ventana Wilderness Alliance	http://www.ventanawild.org/	X				X	
					Dennis Palm	Ventana Wilderness Alliance	http://www.ventanawild.org/	X				X	
					Mike Splain	Ventana Wilderness Alliance	http://www.ventanawild.org/	X				X	
					Kelly Sorenson, Executive Director	Ventana Wildlife Society	http://ventanaws.org/	X				X	
					Bruce Gordon	Cal Am Water Bill Payer							X
					Bob Steinberg	Citizen							X
					Arleen Hardenstein	MCAR: Member of the Public							X
					Doug Rogers	Interested Citizen							X
					Tom MacDonald	Interested Citizen							
					Bill Carrothers	Interested Citizen							
					Bill Phillips	Interested Citizen							
					Jason Campbell	Interested Citizen							
ACADEMIC INSTITUTIONS / RESEARCH													
					Marc LosHuertos	California State University Monterey Bay: Division of Science & Envir	http://sep.csumb.edu/sep/	X				X	
			X		Pam Krone-Davis	CSUMB	http://csumb.edu/	X				X	
					Marvin Biasotti	Carmel Unified School District	http://www.carmelunified.org/carmelunified/site/default.asp		X		Remain on List	X	
					Dr. Meg Caldwell	Center for Ocean Solutions	http://www.centerforoceansolutions.org/		X			X	
					Brian Anderson	Marine Pollution Studies Lab - UC Davis	http://mpsl.mlml.calstate.edu/	X				X	
					Josh Plant	Monterey Bay Aquarium Research Institute	http://www.mbari.org/	X				X	
					Ken Johnson	Monterey Bay Aquarium Research Institute	http://www.mbari.org/	X				X	
			X		Carol Reeb	Stanford University- Hopkins Marine Station	http://www-marine.stanford.edu/	X				X	
					Dr Fred Watson	The Watershed Institute at CSUMB	http://watershed.csumb.edu/wi/	X				X	
					Vince Voegeli	UC Berkeley Hastings Reserve	http://hastings.berkeley.edu/	X				X	
					Laura Lee Lienk	Watershed Institute at CSUMB	http://watershed.csumb.edu/wi/	X				X	
					Doug Smith	Watershed Institute at CSUMB	http://watershed.csumb.edu/wi/	X				X	
					Jody Hansen	Monterey Peninsula College							
PRIVATE COMPANIES/BUSINESS ORGANIZATIONS													
			X	X	Frank Pierce	Lee & Pierce, Inc.							X
					Thomas Quattlebaum	Pebble Beach Company							
POLITICAL CONTACTS													
					Jane Parker	Supervisor Jane Parker, Mo Co District 4	http://www.janeparker.org/	X				X	
					Dave Potter	Supervisor Dave Potter, Mo Co District 5	http://www.co.monterey.ca.us/d5_supervisor.htm	X				X	
					Larry Parrish	Green Party of Monterey County							
ALL IRWM Key Contacts													
	X				Alison Imamura	Denise Duffy & Associates, Inc./MP IRWMP consultant	http://ddaplanning.com/	X				X	X
	X				Susan Robinson	Greater Monterey County IRWMP	http://ccwg.mlml.calstate.edu/irwmp	X				X	
					John Ricker, Santa Cruz County Environment	Santa Cruz County	http://www.rcdsantacruz.org/	X				X	
					Chris Coburn	Santa Cruz County	http://www.rcdsantacruz.org/	X				X	

Monterey Peninsula, Carmel Bay, and South Monterey Bay Integrated Regional Water Management Plan Update
WORKING DRAFT STAKEHOLDERS LIST (version: Aug 2, 2013)

WMG / TAC	Ord Inter-regional	DAC con-tact	CR Task Force	CRAC	Contact	Organization	Website	Sent 4/30	Sent 5/8	Receipt	Reply Message	Rec'd 7/25/12 mtg Notice	Attended 7/25/12 mtg
					Tracy Hemmeter	Pajaro River Watershed	http://www.pajarowatershed.org/	X		X	Remain on List	X	
					Courtney Howard	San Luis Obispo County: Division of Public Works	http://www.slocity.org/publicworks/index.asp	X				X	
					Matt Naftaly	Santa Barbara County: Santa Barbara County Public Works Department	http://www.countyofsb.org/pwd/	X				X	
					Ross Clark	Central Coast Wetland Group	http://santacruzirwmp.org/	X				X	
					Denise Duffy	Denise Duffy & Associates, Inc./MP IRWMP consultant	http://ddaplanning.com/	X	X			X	X
					Michael Gonzales	Denise Duffy & Associates, Inc./MP IRWMP consultant	http://ddaplanning.com/	X				X	X
					Bryce Ternet	Denise Duffy & Associates, Inc./MP IRWMP consultant	http://ddaplanning.com/	X				X	
CARMEL RIVER TASK FORCE / ADVISORY COMMITTEES, ONLY (others, above, are marked in Column E)													
			X		Marjorie Ingram-Viales	Carmel River Task Force Membership		X					
			X		Shawn Atkins	Carmel River Task Force		X				X	
			X		Jennifer Bodensteiner	Carmel River Task Force		X				X	
			X		John Dalessio	Carmel River Task Force		X				X	
			X		Regina Doyle	Carmel River Task Force		X				X	
			X		Elizabeth Geisler	Carmel River Task Force		X				X	
			X		Seth Gentzler	Carmel River Task Force		X				X	
			X		Paula Gill	Carmel River Task Force		X				X	
			X		Thomas D. House	Carmel River Task Force		X					
			X		Mark Johnsson	Carmel River Task Force		X				X	
			X		Dana Jones	Carmel River Task Force		X				X	
			X		Kathleen Lee	Carmel River Task Force		X					
			X		Lawrence V. Levine	Carmel River Task Force		X					
			X		Chad Mitcham	Carmel River Task Force		X				X	
			X		Nikki Nedeff	Carmel River Task Force		X					
			X		Jacqueline R. Onciano	Carmel River Task Force		X				X	
			X		Peter Perrine	Carmel River Task Force		X				X	
			X	X	Margaret Robbins	Carmel River Task Force		X				X	X
			X		Tanja Gardens	Carmel River Task Force		X				X	
			X		Richard Rosenthal	Carmel River Task Force		X					
			X		Denis Ruttenberg	Carmel River Task Force		X				X	
			X		Enrique Saavedra	Carmel River Task Force		X					
			X		Clive Sanders	Carmel River Task Force		X					
				X	Vincent Frumkin	Carmel River Advisory Committee							
			X		James Sulentich	Carmel River Task Force		X				X	
DISADVANTAGE COMMUNITY ORGANIZATIONS													
		X				Monterey County Housing Authority							
		X				CHISPA							
		X				Foundation for Housing Assistance of Monterey County							
		X				Shelter Outreach Plus/ I Help Program							
		X				Oldemeyer Senior Center							
		X				Monterey Senior Center							
		X				Monterey County Department of Health Services							
		X				Seaside Family Health Center							
		X				Military and Veterans Affairs							
		X				Monterey County Social Services Department							
		X				Monterey County Welfare Department							
		X				Seaside Library							
		X				Monterey Library							
		X				City of Sand City							
		X				City of Seaside							
		X				City of Monterey							
		X			Mel Mason	NAACP						X	
		X			Carlos Ramos	LEAGUE OF UNITED LATIN AMERICAN CITIZENS						X	
		X			Paola Ramos	Environmental Justice Coalition for Water	http://www.ejcw.org/About/overview.htm	X				X	

WMG / TAC	Ord Inter-regional	DAC con-tact	CR Task Force	CRAC	Contact	Organization	Website	Sent 4/30	Sent 5/8	Receipt	Reply Message	Rec'd 7/25/12 mtg Notice	Attended 7/25/12 mtg
		X			LeVonne Stone	Ford Ord Environmental Justice Network	http://foejn.org/	X				X	
		X			Karen McBride	Rural Communities Assistance Corporation	http://www.rcac.org/		X			X	

Appendix 1-e

Notice of Intent (April 16, 2012)

PUBLIC NOTICE

Notice of Intent to Update to the Monterey Peninsula, Carmel Bay, and South Monterey Bay Integrated Regional Water Management (IRWM) Plan

NOTICE IS HERBY GIVEN that the Monterey Peninsula Water Management District (MPWMD), on behalf of the Regional Water Management Group (RWMG), has initiated an update to the existing Monterey Peninsula, Carmel Bay, and South Monterey Bay IRWM Plan (IRWM Plan or IRWMP), dated November 2007, and projects supporting the IRWM Plan update are in progress, in accordance with the requirements in the Department of Water Resources Proposition 84 and 1E Final IRWM Guidelines.

The RWMG, which oversees the development of the IRWM Plan, is comprised of the following five agencies; Big Sur Land Trust, City of Monterey, , Monterey County Water Resources Agency, MPWMD, and Monterey Regional Water Pollution Control Agency. The RWMG is considering the addition of the Marina Coast Water District as a member to the RWMG. MPWMD is leading the effort in the region.

The IRWMP is a document that identifies and plans for the water resource-related needs of the Monterey Peninsula, Carmel Bay, and South Monterey Bay region. The IRWM Plan examines current and future water-related needs, identifies regional objectives for water-related resource management, develops strategies to address identified needs and then presents and evaluates stakeholder proposed projects to meet the regional objectives. The intent of the IRWM Plan is to integrate water management, watershed planning, implementation efforts, and to facilitate regional cooperation with the goal of improving water supply reliability, water recycling, water conservation, recreation and environmental habitat protection. One of the primary objectives of the IRWM Plan is to provide ongoing guidance and prioritization regarding implementation projects and programs for funding consideration under grant programs, including those funded by Proposition 84.

The existing IRWM Plan for the region complies with Proposition 50 IRWM standards. However, these standards have been revised and re-written and the existing IRWM Plan, which was adopted in 2007, must be amended to be in conformance with the new standards specifically, the IRWM Grant Program Guidelines for projects funded by Proposition 84, The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coast Protection Bond Act of 2006 and Proposition 1E, The Disaster Preparedness and Flood Prevention Bond Act of 2006.

To join the IRWM Plan Update notification list or to comment on the project, please submit requests in writing to:

Monterey Peninsula Water Management District
Larry Hampson, District Engineer
5 Harris Court, Building G, P.O. Box 85
Monterey, California 93942-0085
Tel: (831) 654-5620 FAX: (831) 659-2598
E-mail address: larry@mpwmd.net
Web address: www.mpwmd.dst.ca.us/Mbay_IRWM/Mbay_IRWM.htm

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PUBLIC NOTICE Notice of Intent to Update to the Monterey Peninsula, Carmel Bay, and South Monterey Bay Integrated Regional Water Management (IRWM) Plan NOTICE IS HERBY GIVEN that the Monterey Peninsula Water Management District (MPWMD), on behalf of the Regional Water Management Group (RWMG), has initiated an update to the existing Monterey Peninsula, Carmel Bay, and South Monterey Bay IRWM Plan (IRWM Plan or IRWMP), dated November 2007, and projects supporting the IRWM Plan update are in progress, in accordance with the requirements in the Department of Water Resources Proposition 84 and 1E Final IRWM Guidelines. The RWMG, which oversees the development of the IRWM Plan, is comprised of the following five agencies; Big Sur Land Trust, City of Monterey, , Monterey County Water Resources Agency, MPWMD, and Monterey Regional Water Pollution Control Agency. The RWMG is considering the addition of the Marina Coast Water District as a member to the RWMG. MPWMD is leading the effort in the region. The IRWMP is a document that identifies and plans for the water resource-related needs of the Monterey Peninsula, Carmel Bay, and South Monterey Bay region. The IRWM Plan examines current and future water-related needs, identifies regional objectives for water-related resource management, develops strategies to address identified needs and then presents and evaluates stakeholder proposed projects to meet the regional objectives. The intent of the IRWM Plan is to integrate water management, watershed planning, implementation efforts, and to facilitate regional cooperation with the goal of improving water supply reliability, water recycling, water conservation, recreation and environmental habitat protection. One of the primary objectives of the IRWM Plan is to provide ongoing guidance and prioritization regarding implementation projects and programs for funding consideration under grant programs, including those funded by Proposition 84. The existing IRWM Plan for the region complies with Proposition 50 IRWM standards. However, these standards have been revised and re-written and the existing IRWM Plan, which was adopted in 2007, must be amended to be in conformance with the new standards specifically, the IRWM Grant Program Guidelines for projects funded by Proposition 84, The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coast Protection Bond Act of 2006 and Proposition 1E, The Disaster Preparedness and Flood Prevention Bond Act of 2006. To join the IRWM Plan Update notification list or to comment on the project, please submit requests in writing to: Monterey Peninsula Water Management District Larry Hampson, District Engineer 5 Harris Court, Building P.O. Box 85 Monterey, California 93942-0085 Tel: (831) 654-5620 FAX: (831) 659-2598 E-mail address: larry@mpwmd.net Web address: www.mpwmd.dst.ca.us/Mbay_IRWM/Mbay_IRWM.htm Published April 26 & May 1, 2012

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MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

PUBLIC NOTICE

Notice of Intent to Update to the Monterey Peninsula, Carmel Bay, and South Monterey Bay Integrated Regional Water Management (IRWM) Plan

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E-mail address: larry@mpwmd.net
Web address:
www.mpwmd.dst.ca.us/Mbay_IRWM/Mbay_IRWM.htm
Published April 26 & May 1, 2012

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Appendix 2-a

California American Service Area Map

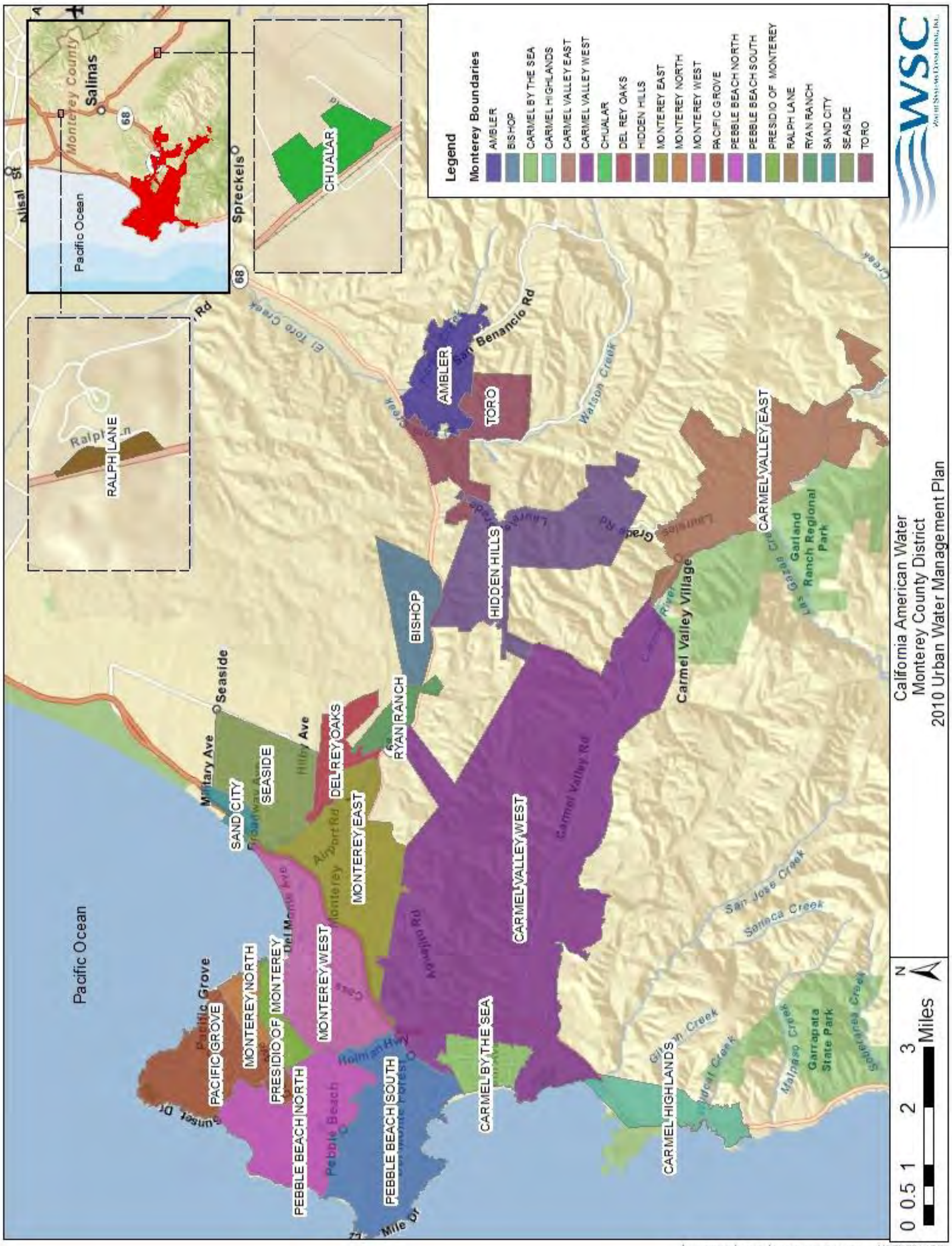


Figure 2-1: Map of California American Water's Central Division - Monterey County District

Appendix 2-b

Land Use Designations

Land Use Designation Maps

I. Monterey County General Plan
   a. Greater Monterey Peninsula Area Plan
   b. Carmel Area Land Use Plan
   c. Del Monte Forest Land Use Plan
   d. Fort Ord Master Plan
   e. Carmel Valley Master Plan

II. Fort Ord Base Reuse Plan

III. City of Seaside General Plan

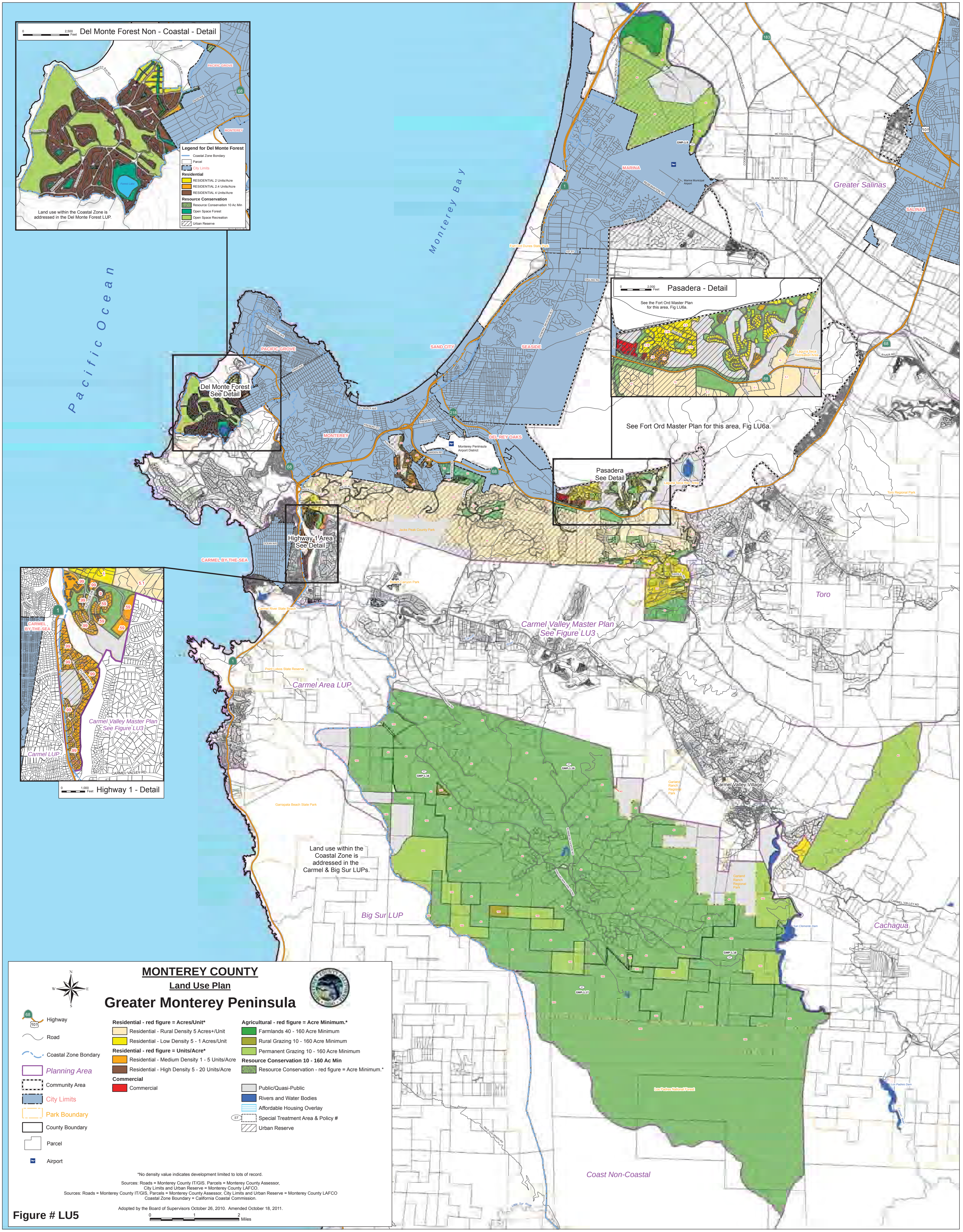
IV. Sand City General Plan

V. City of Del Rey Oaks General Plan

VI. City of Monterey General Plan

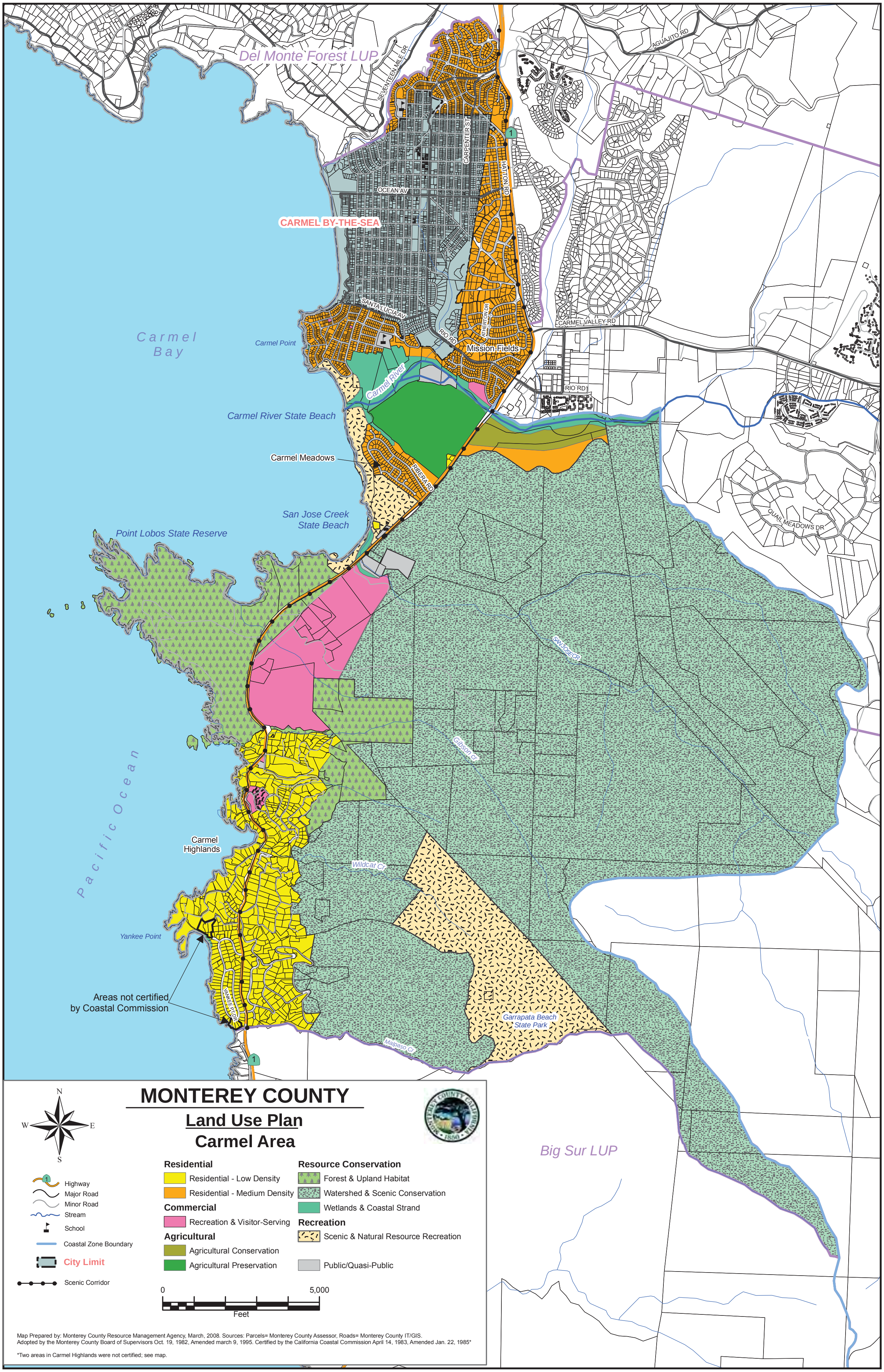
VII. City of Pacific Grove General Plan

VIII. City of Carmel-by-the-Sea General Plan



Del Monte Forest Non - Coastal - Detail
Legend for Del Monte Forest
Coastal Zone Boundary
Parcel
City Limits
Residential
RESIDENTIAL 2 Units/Acre
RESIDENTIAL 2.4 Units/Acre
RESIDENTIAL 4 Units/Acre
Resource Conservation
Resource Conservation 10 Ac Min
Open Space Forest
Open Space Recreation
Urban Reserve
Land use within the Coastal Zone is addressed in the Del Monte Forest LUP.
Pacific Ocean
Monterey Bay
MARINA
SAND CITY
SEASIDE
PACIFIC GROVE
MONTEREY
DEL REY OAKS
CARMEL-BY-THE-SEA
SALINAS
Greater Salinas
Pasadera - Detail
See the Fort Ord Master Plan for this area, Fig LU6a.
See Fort Ord Master Plan for this area, Fig LU6a.
Pasadera See Detail
Del Monte Forest See Detail
Highway 1 Area See Detail
Highway 1 - Detail
Carmel Valley Master Plan See Figure LU3
Carmel LUP
Toro
Carmel Area LUP
Carmel Valley Village
Land use within the Coastal Zone is addressed in the Carmel & Big Sur LUPs.
Big Sur LUP
Cachagua
Coast Non-Coastal
MONTEREY COUNTY
Land Use Plan
Greater Monterey Peninsula
Highway
Road
Coastal Zone Bondary
Planning Area
Community Area
City Limits
Park Boundary
County Boundary
Parcel
Airport
Residential - red figure = Acres/Unit*
Residential - Rural Density 5 Acres+/Unit
Residential - Low Density 5 - 1 Acres/Unit
Residential - red figure = Units/Acre*
Residential - Medium Density 1 - 5 Units/Acre
Residential - High Density 5 - 20 Units/Acre
Commercial
Commercial
Agricultural - red figure = Acre Minimum.*
Farmlands 40 - 160 Acre Minimum
Rural Grazing 10 - 160 Acre Minimum
Permanent Grazing 10 - 160 Acre Minimum
Resource Conservation 10 - 160 Ac Min
Resource Conservation - red figure = Acre Minimum.*
Public/Quasi-Public
Rivers and Water Bodies
Affordable Housing Overlay
Special Treatment Area & Policy #
Urban Reserve
*No density value indicates development limited to lots of record.
Sources: Roads = Monterey County IT/GIS. Parcels = Monterey County Assessor, City Limits and Urban Reserve = Monterey County LAFCO.
Sources: Roads = Monterey County IT/GIS, Parcels = Monterey County Assessor, City Limits and Urban Reserve = Monterey County LAFCO
Coastal Zone Boundary = California Coastal Commission.
Adopted by the Board of Supervisors October 26, 2010. Amended October 18, 2011.
Miles

Figure # LU5



MONTEREY COUNTY
Land Use Plan
Carmel Area
N
S
E
W
Highway
Major Road
Minor Road
Stream
School
Coastal Zone Boundary
City Limit
Scenic Corridor
Residential
Residential - Low Density
Residential - Medium Density
Commercial
Recreation & Visitor-Serving
Agricultural
Agricultural Conservation
Agricultural Preservation
Resource Conservation
Forest & Upland Habitat
Watershed & Scenic Conservation
Wetlands & Coastal Strand
Recreation
Scenic & Natural Resource Recreation
Public/Quasi-Public
0
5,000
Feet
Map Prepared by: Monterey County Resource Management Agency, March, 2008. Sources: Parcels= Monterey County Assessor, Roads= Monterey County IT/GIS.
Adopted by the Monterey County Board of Supervisors Oct. 19, 1982, Amended march 9, 1995. Certified by the California Coastal Commission April 14, 1983, Amended Jan. 22, 1985*
*Two areas in Carmel Highlands were not certified; see map.
Del Monte Forest LUP
CARMEL BY-THE-SEA
Carmel Bay
Carmel Point
Carmel River
Mission Fields
Carmel River State Beach
Carmel Meadows
San Jose Creek State Beach
Point Lobos State Reserve
Pacific Ocean
Carmel Highlands
Yankee Point
Areas not certified by Coastal Commission
Garrapata Beach State Park
Big Sur LUP
OCEAN AV
SANTA LUCIA AV
RIO RD
CARPENTER ST
HATTON RD
CARMEL VALLEY RD
RIO RD
RIBERA RD
QUAIL MEADOWS DR
AGUAJITO RD
SEVENTEEN MILE DR
San Jose Cr
Gibson Cr
Wildcat Cr
Malpaso Cr

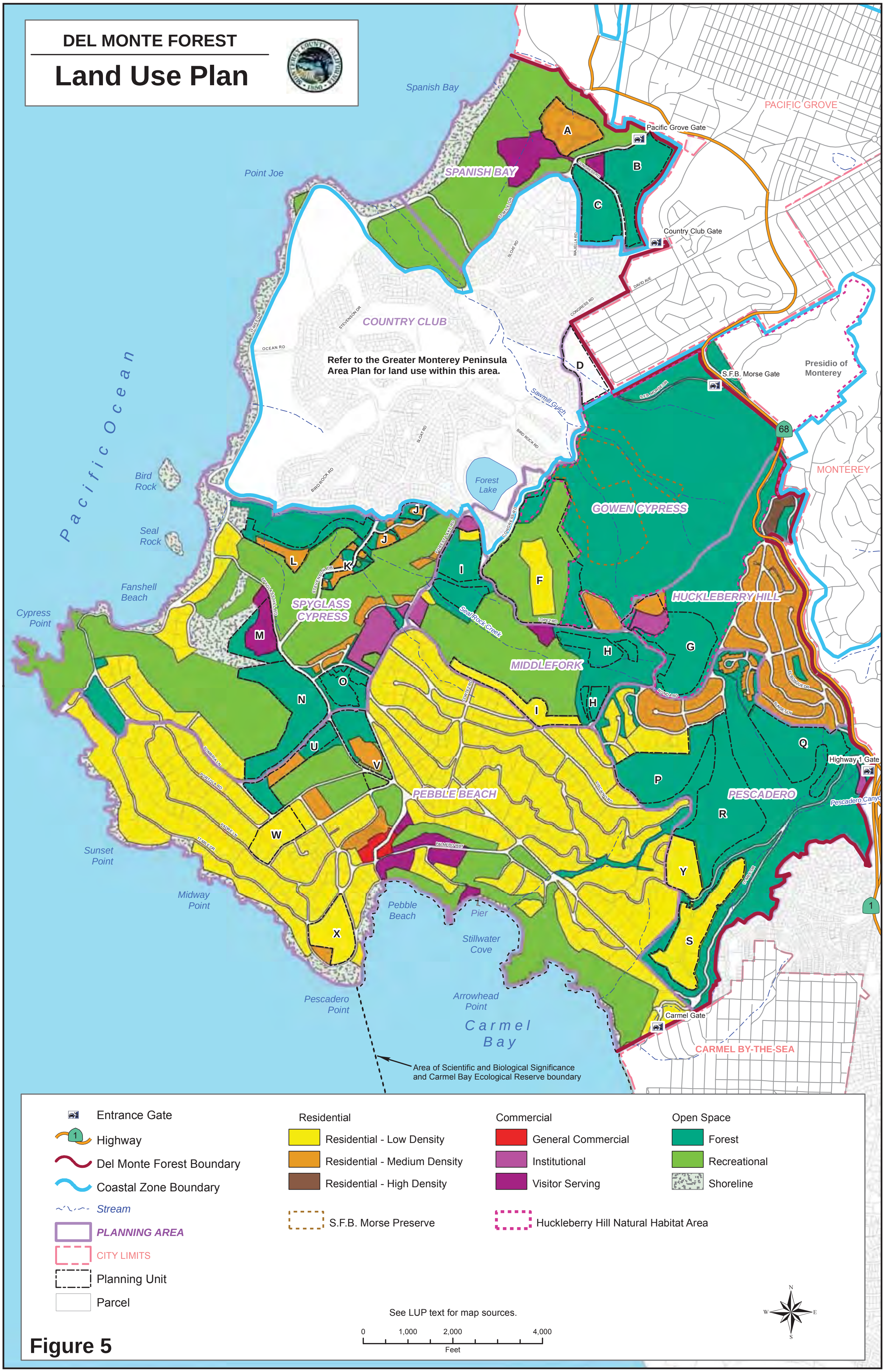
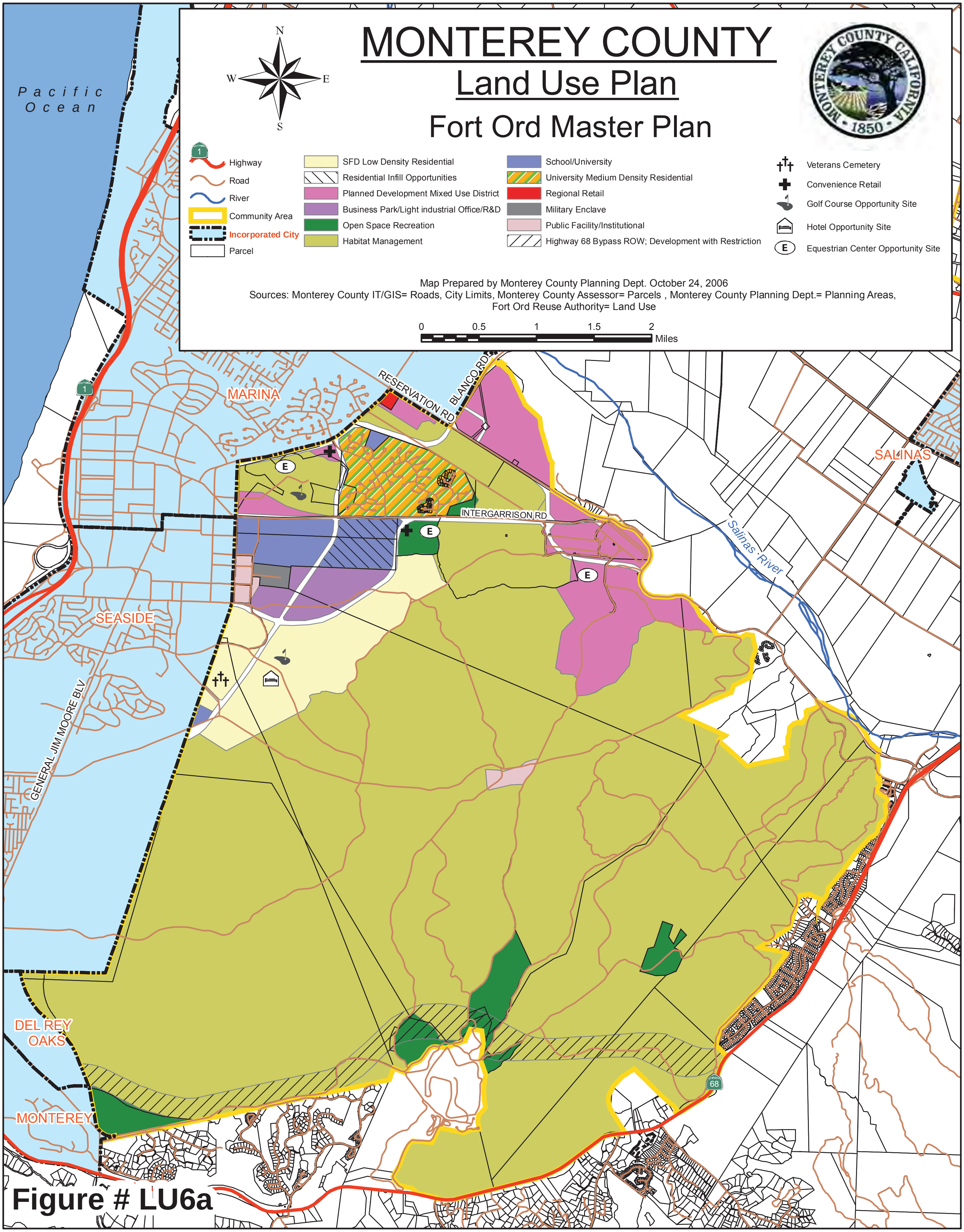
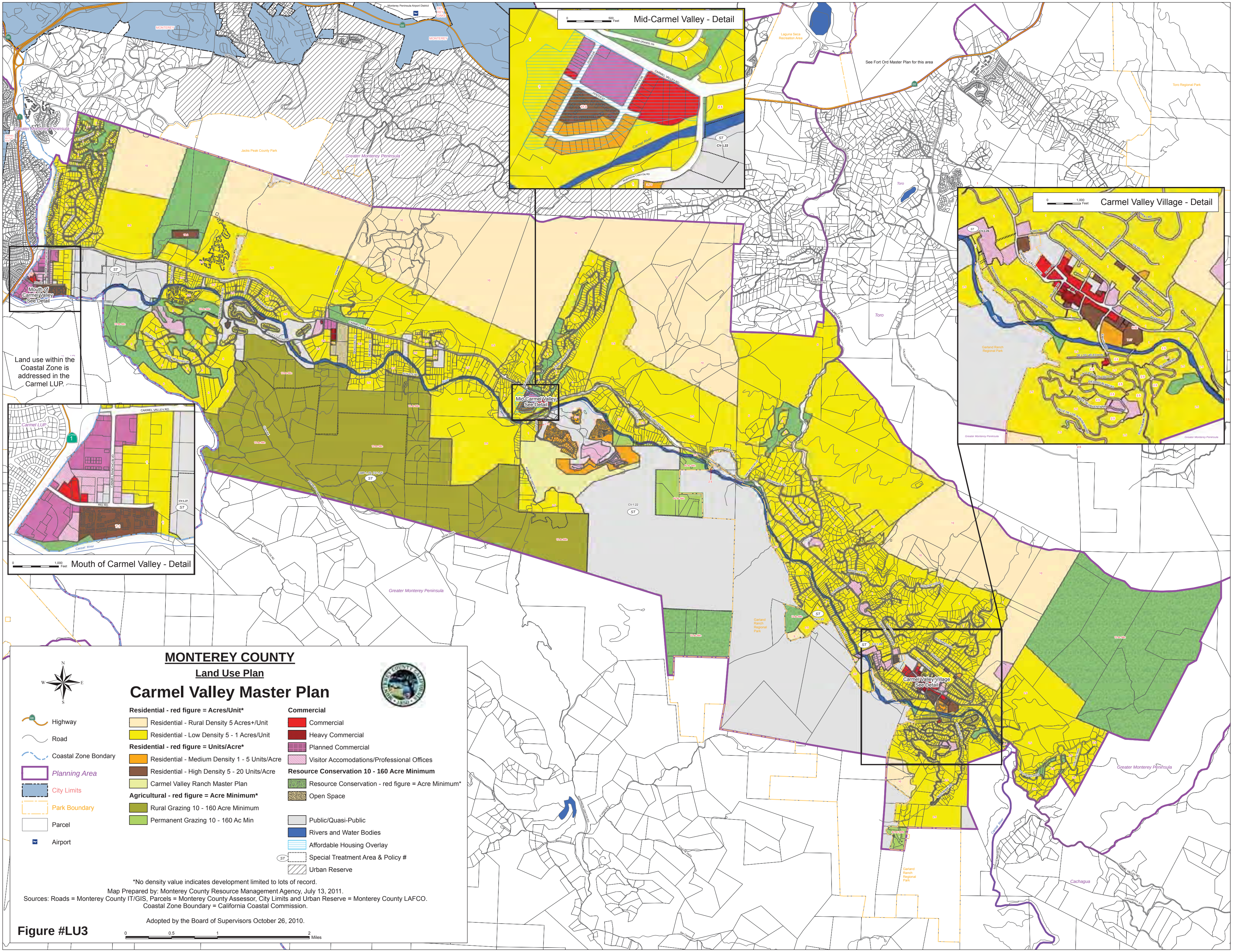

DEL MONTE FOREST
Land Use Plan
Spanish Bay
PACIFIC GROVE
Pacific Grove Gate
Point Joe
SPANISH BAY
A
B
C
Country Club Gate
COUNTRY CLUB
Refer to the Greater Monterey Peninsula Area Plan for land use within this area.
D
S.F.B. Morse Gate
Presidio of Monterey
Sawmill Gulch
68
MONTEREY
Pacific Ocean
Bird Rock
Seal Rock
Forest Lake
GOWEN CYPRESS
Fanshell Beach
Cypress Point
SPYGLASS CYPRESS
HUCKLEBERRY HILL
Seal Rock Creek
MIDDLEFORK
PEBBLE BEACH
PESCADERO
Highway 1 Gate
Pescadero Canyon
Sunset Point
Midway Point
Pebble Beach
Pier
Stillwater Cove
Arrowhead Point
Pescadero Point
Carmel Bay
Carmel Gate
CARMEL BY-THE-SEA
Area of Scientific and Biological Significance and Carmel Bay Ecological Reserve boundary
E F G H I J K L M N O P Q R S U V W X Y
1
Entrance Gate
Highway
Del Monte Forest Boundary
Coastal Zone Boundary
Stream
PLANNING AREA
CITY LIMITS
Planning Unit
Parcel
Residential
Residential - Low Density
Residential - Medium Density
Residential - High Density
S.F.B. Morse Preserve
Commercial
General Commercial
Institutional
Visitor Serving
Huckleberry Hill Natural Habitat Area
Open Space
Forest
Recreational
Shoreline
See LUP text for map sources.
0 1,000 2,000 4,000
Feet
N E S W

Figure 5

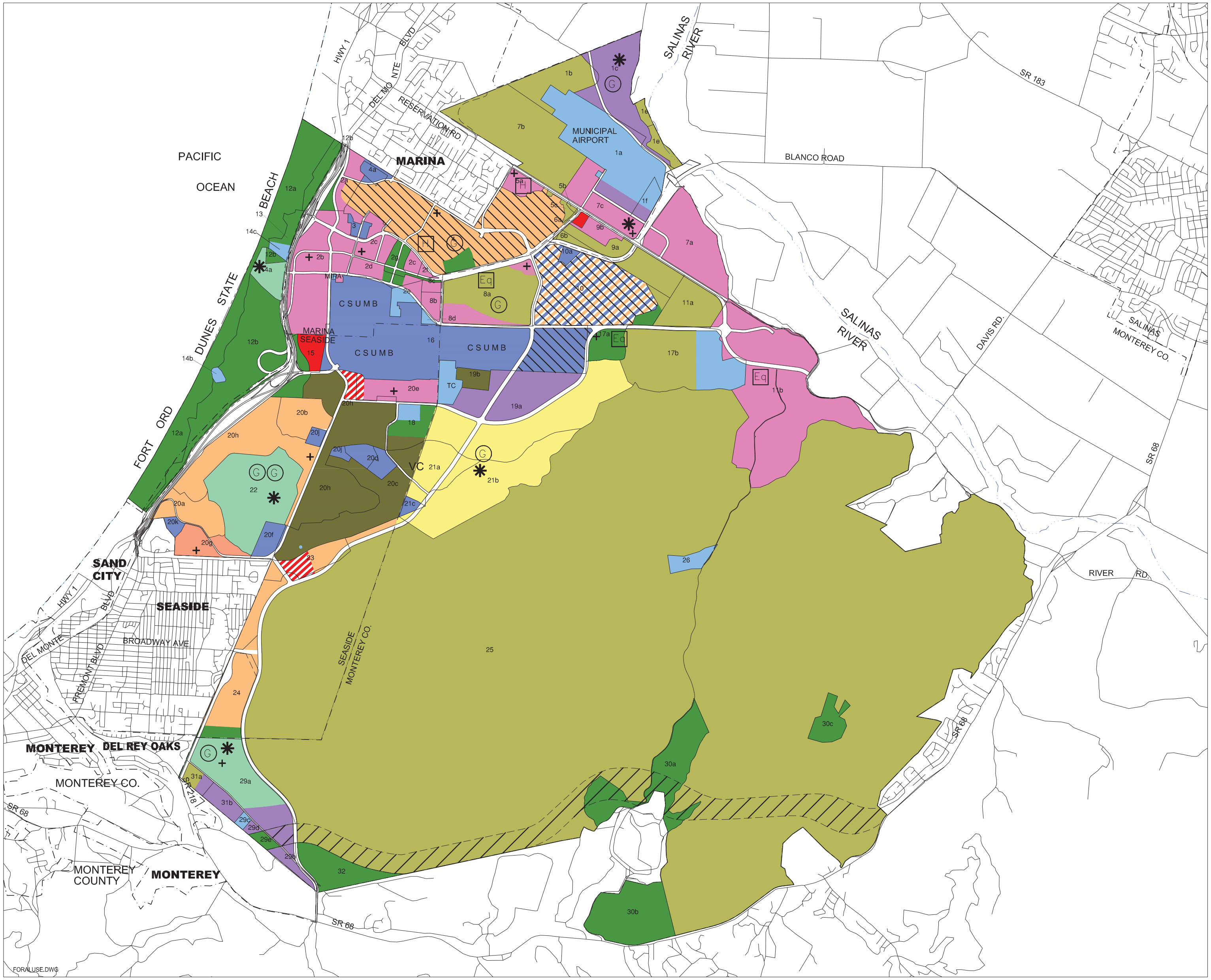


MONTEREY COUNTY
Land Use Plan
Fort Ord Master Plan
N
S
E
W
MONTEREY COUNTY CALIFORNIA 1850
Highway
Road
River
Community Area
Incorporated City
Parcel
SFD Low Density Residential
Residential Infill Opportunities
Planned Development Mixed Use District
Business Park/Light industrial Office/R&D
Open Space Recreation
Habitat Management
School/University
University Medium Density Residential
Regional Retail
Military Enclave
Public Facility/Institutional
Highway 68 Bypass ROW; Development with Restriction
Veterans Cemetery
Convenience Retail
Golf Course Opportunity Site
Hotel Opportunity Site
Equestrian Center Opportunity Site
Map Prepared by Monterey County Planning Dept. October 24, 2006
Sources: Monterey County IT/GIS= Roads, City Limits, Monterey County Assessor= Parcels , Monterey County Planning Dept.= Planning Areas, Fort Ord Reuse Authority= Land Use
0
0.5
1
1.5
2
Miles
Pacific Ocean
MARINA
SALINAS
SEASIDE
DEL REY OAKS
MONTEREY
RESERVATION RD
BLANCO RD
INTERGARRISON RD
GENERAL JIM MOORE BLV
Salinas River
1
68
E

Figure # LU6a



MONTEREY COUNTY
Land Use Plan
Carmel Valley Master Plan
Mid-Carmel Valley - Detail
Carmel Valley Village - Detail
Mouth of Carmel Valley - Detail
Mouth of Carmel Valley See Detail
Mid Carmel Valley See Detail
Carmel Valley Village See Detail
Land use within the Coastal Zone is addressed in the Carmel LUP.
See Fort Ord Master Plan for this area
Greater Monterey Peninsula
Highway
Road
Coastal Zone Bondary
Planning Area
City Limits
Park Boundary
Parcel
Airport
Residential - red figure = Acres/Unit*
Residential - Rural Density 5 Acres+/Unit
Residential - Low Density 5 - 1 Acres/Unit
Residential - red figure = Units/Acre*
Residential - Medium Density 1 - 5 Units/Acre
Residential - High Density 5 - 20 Units/Acre
Carmel Valley Ranch Master Plan
Agricultural - red figure = Acre Minimum*
Rural Grazing 10 - 160 Acre Minimum
Permanent Grazing 10 - 160 Ac Min
Commercial
Commercial
Heavy Commercial
Planned Commercial
Visitor Accomodations/Professional Offices
Resource Conservation 10 - 160 Acre Minimum
Resource Conservation - red figure = Acre Minimum*
Open Space
Public/Quasi-Public
Rivers and Water Bodies
Affordable Housing Overlay
Special Treatment Area & Policy #
Urban Reserve
*No density value indicates development limited to lots of record.
Map Prepared by: Monterey County Resource Management Agency, July 13, 2011.
Sources: Roads = Monterey County IT/GIS, Parcels = Monterey County Assessor, City Limits and Urban Reserve = Monterey County LAFCO.
Coastal Zone Boundary = California Coastal Commission.
Adopted by the Board of Supervisors October 26, 2010.
Figure #LU3
0 0.5 1 2 Miles



EMC Planning Group Inc. Rev.: 7/30 /01 5:45PM

FORT ORD REUSE PLAN

Fort Ord Reuse Authority (FORA)

Land Planning	EDAW, Inc.
	EMC Planning Group, Inc.
Market Analysis	Sedway Kotin Mouchly Group
Transportation Engineering	JHK and Associates
Civil Engineering	Reimer Associates
Fiscal Analysis	Angus McDonald Associates
Habitat Planning	Zander Associates
Public Communications	The Ingram Group
Community Development	Resource Corps International

LEGEND:

- SFD Low Density Residential
- SFD Medium Density Residential
- MFD High Density Residential
- Residential Infill Opportunities
- Hwy 68 Bypass ROW: Development with Restrictions
- Planned Development Mixed Use District
- Business Park/Light Industrial Office/R & D
- Convenience Retail
- Neighborhood Retail
- Regional Retail
- Visitor Serving
- G Golf Course Opportunity Site
- Hotel Opportunity Site
- Eq Equestrian Center Opportunity Site
- Open Space/Recreation
- Habitat Management
- School/University
- University Medium Density Residential
- H Alternative High School Sites
- Public Facility/Institutional
- Military Enclave
- VC Veterans Cemetary

SHEET TITLE:

LAND USE CONCEPT ULTIMATE DEVELOPMENT

0 750 1500 3000 4500

NORTH

SOURCE:
Jones & Stokes, 1995
Reimer Associates, (Re-Projected), 1995
Monterey County, 1995
EDAW, Inc., 1996

FIGURE:
3.3-1

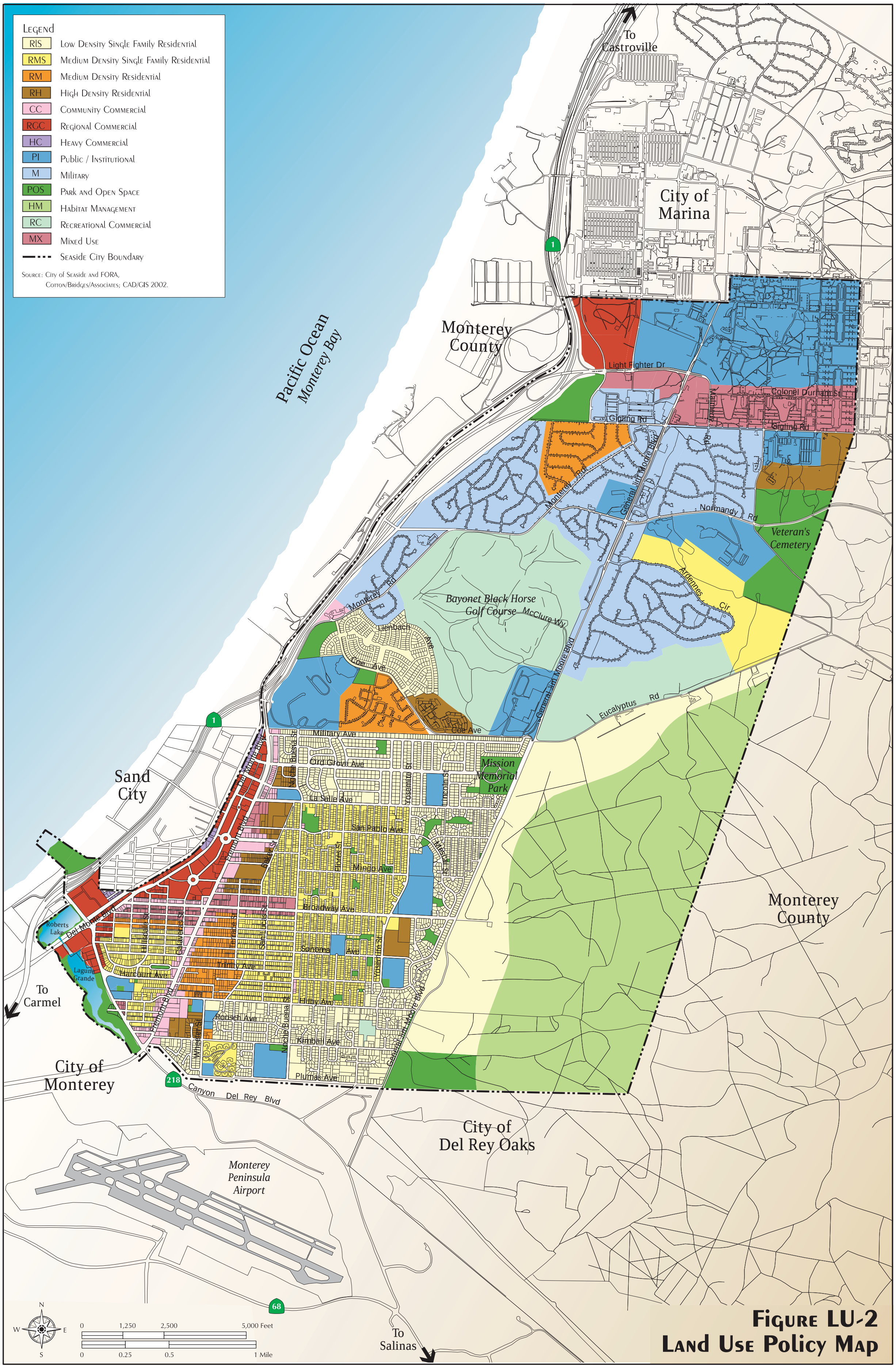


Figure LU-2
Land Use Policy Map


MONTEREY BAY
PR
VSC
VS-R2
R-2
VS-R1
CDI
VSC M
VSC
VSC M
R-3
PF
PR
HP
C-1
HP
HP
C-4
C-4
C-4 (MU-D)
EAST DUNES SPECIFIC PLAN
MU-D
MU-D
SAND DUNES DRIVE
HIGHWAY
DEL MONTE BLVD.
THE AUTO MALL
FREMONT BLVD.
MILITARY AVE
ORD GROVE
PLAYA AVE
LA SALLE
SAN PABLO AVE
ECHO AVE
CALAVERAS ST.
CLEMENTINA AVE
CANYON DEL REY BLVD
AMADOR
SONOMA
PALM AVE
ELM AVE
BROADWAY
OLYMPIA AVE
HILLSDALE ST.
ALHAMBRA ST.
ROBERTS LAKE
UNION PACIFIC RAILROAD
North
LEGEND:
City Limits
Coastal Land Use Classifications
Residential Medium Density (R-2)
Residential High Density (R-3)
Visitor Serving Residential Light Density (VS-R1)
Visitor Serving Residential Medium Density (VS-R2)
East Dunes Specific Plan (Proposed)
Visitor Serving Commercial (VSC)
Light Commercial (C-1)
Heavy Commercial (C-2)
Coastal Dependent Industrial (CDI)
Industrial Manufacturing (M)
Industrial Park (IP)
Public Recreation (PR)
Public Facilities (PF)
Habitat Reserve (HP)
Non-Coastal Land Use Classifications
East Dunes Specific Plan
Regional Commercial (C-4)
Mixed Use Development (MU-D)
Public Facilities (PF)
Habitat Preserve (HP)

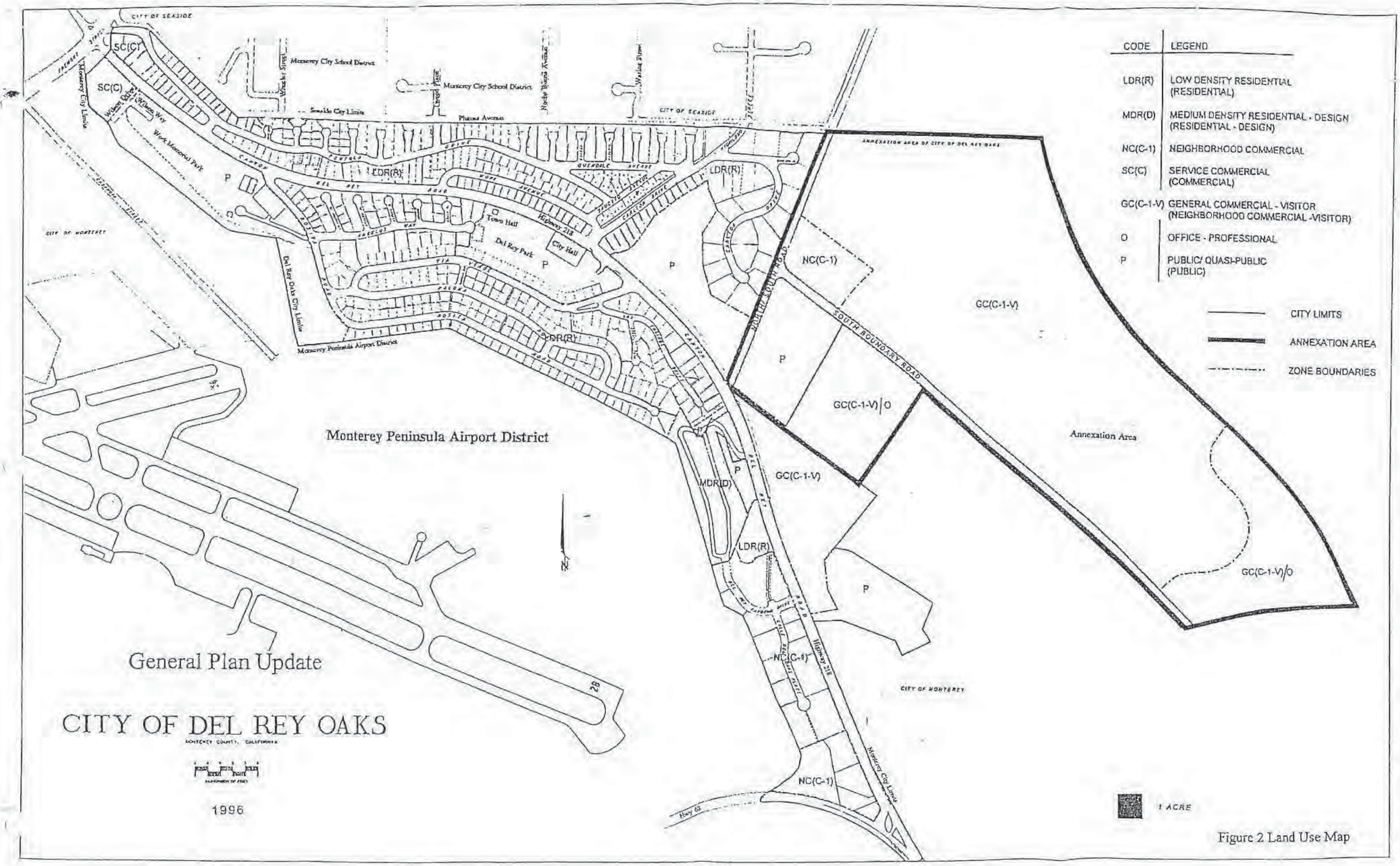
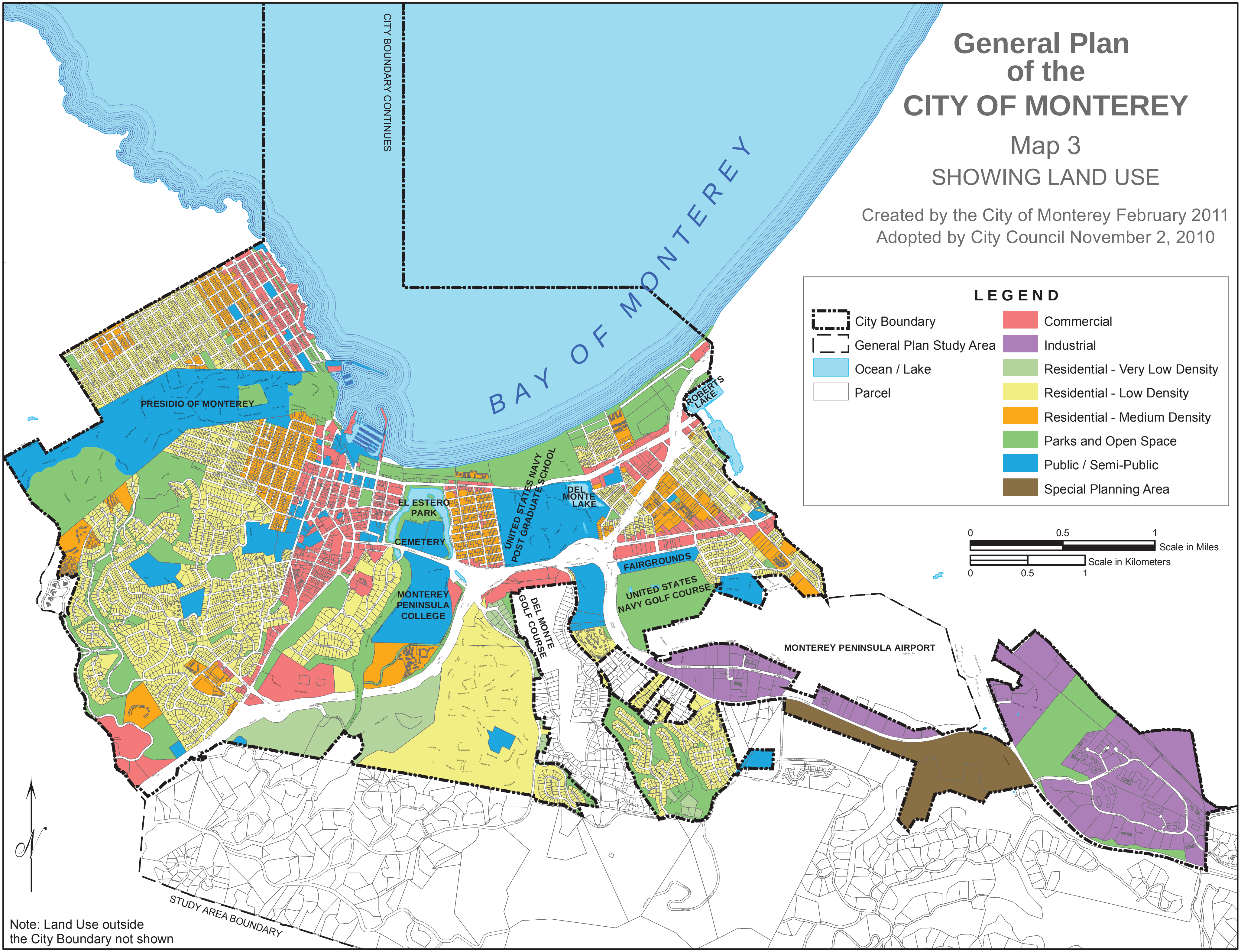


Figure 2 Land Use Map

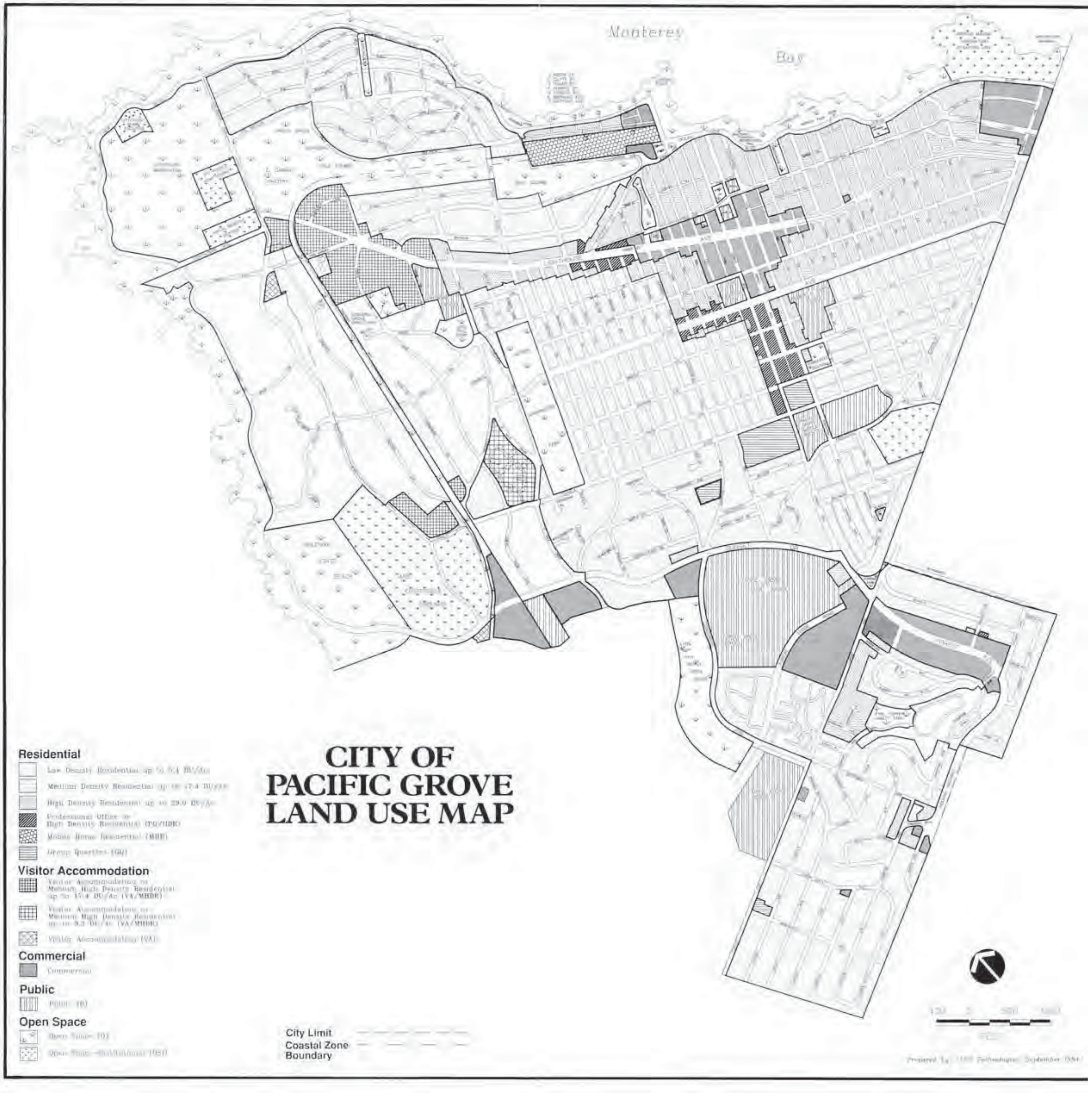
General Plan of the CITY OF MONTEREY

Map 3
SHOWING LAND USE

Created by the City of Monterey February 2011
Adopted by City Council November 2, 2010



Note: Land Use outside the City Boundary not shown



Monterey
Bay
CITY OF
PACIFIC GROVE
LAND USE MAP
Residential
Medium Density Residential up to 17.4 DU/Ac
High Density Residential up to 29.0 DU/Ac
Professional Office or
High Density Residential (PO/HDR)
Mobile Home Residential (MHR)
Visitor Accommodation
Commercial
Commercial
Public
Open Space
City Limit
Coastal Zone
Boundary

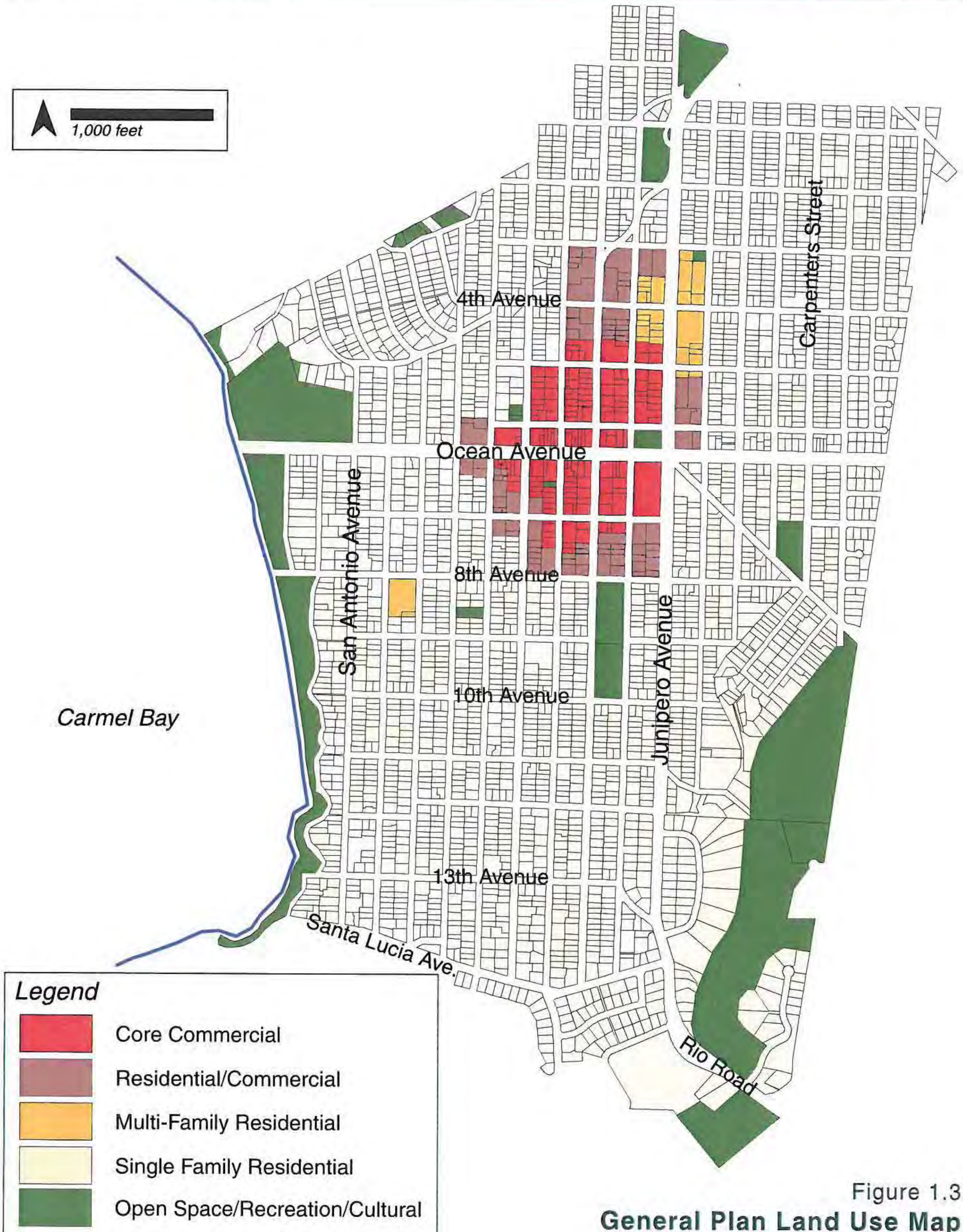


Figure 1.3
General Plan Land Use Map

Appendix 2-c

Seaside Basin Salt and Nutrient Management Plan

DRAFT

Seaside Groundwater Basin
Salt & Nutrient Management Plan

Prepared for:
Monterey Peninsula Water Management District

Prepared by:

HydroMetrics WRI

March 2014

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ABBREVIATIONS

AFY	acre-feet per year
ASR	aquifer, storage and recovery
BMP	best management practices
CCR	California Code of Regulations
CDPH	California Department of Public Health
CEC	chemical of emerging concern
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
DWR	California Department of Water Resources
ET	evapotranspiration
GWRP	Groundwater Replenishment Project
IRWMP	Integrated Regional Water Management Plan
MCL	maximum contaminant levels
MCWD	Marina Coast Water District
mg/L	milligrams per liter
MMP	monitoring and management program
MPWMD	Monterey Peninsula Water Management District
MRSWMP	Monterey Regional Storm Water Management Program
MRWPCA	Monterey Regional Water Pollution Control Agency
NPDES	National Pollutant Discharge Elimination System
POTW	publically owned treatment works
RUWAP	Regional Urban Water Augmentation Project
RWQCB	Regional Water Quality Control Board
SNMP	Salt and Nutrient Management Plan
SVRP	Salinas Valley Reclamation Plant
SWRCB	State Water Resources Control Board
TAC	Watermaster's Technical Advisory Committee
TDS	total dissolved solids
USGS	United States Geological Survey
WDR	waste discharge requirements
WQO	water quality objectives

SECTION 1
INTRODUCTION

1.1 BACKGROUND

As part of State Water Resources Control Board (SWRCB) adopted Resolution No. 2009-0011, which established a statewide Recycled Water Policy, salt and nutrient management plans (SNMP) for each groundwater basin in California are required by 2014. The SNMP are called for to facilitate management of salts and nutrients in a manner that optimizes recycled water use while ensuring protection of groundwater supply and beneficial uses, agricultural beneficial uses, and human health. The SNMP identifies sources, transport and fate of salts and nutrients in surface water and groundwater within the Seaside Basin.

The Seaside Basin SNMP has been prepared in response to the Recycled Water Policy requirement to complete a SNMP by the end of 2014. Its development dovetails with an update to the Monterey Peninsula, Carmel Bay, and South Monterey Bay Integrated Regional Water Management Plan (IRWMP). Funding for the SNMP and IRWMP update is provided by the California State Department of Water Resources (DWR) as part of a Proposition 84 IRWM Planning Grant.

1.2 GOALS

The goals of the SNMP are the same as those identified in the IRWMP in 2007:

> *Protect and improve water quality for beneficial uses consistent with regional community interests and the RWQCB basin plan through planning and implementation in cooperation with local and state agencies and regional stakeholders*.

1.3 OBJECTIVES

Meet or exceed all applicable water quality regulatory standards.
The primary objective of the SNMP is to protect groundwater in the Seaside Basin. To achieve this, programs need to be in place to ensure that water quality regulations are either met or exceeded. This includes activities that can mitigate current problems and evade possible future water quality degradation, e.g., seawater intrusion.

Meet or exceed urban water quality targets established by stakeholders.
Targets set by municipal and industrial stakeholders that are beyond regulatory requirements should be met or exceeded.

Meet or exceed recycled water quality targets established by stakeholders.
In order to promote public and private recycled water demand, it is important that water quality targets set by stakeholders not only meet regulatory requirements but also meet the requirements or expectations of the eventual end-users.

Protect surface waters from contamination
All surface waters in the planning region should be protected from contamination and the threat of contamination. Protecting surface waters that drain to Monterey Bay will protect the Monterey Bay National Marine Sanctuary. The Monterey Regional Storm Water Management Program is currently being implemented to assist in meeting this objective.

Protect the Seaside Basin from contamination and threat of contamination.
The Seaside Basin should be protected from contamination and the threat of contamination. This includes protecting from point-source and non-point-source pollutants and preventing sea-water intrusion.

Minimize impacts from storm water (or urban) runoff through implementation of Best Management Practices or other alternatives.
The discharge of pollutants to waters of the United States from any point source is unlawful unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The planning Region is subject to Phase II NPDES requirements which are intended to address potentially adverse impacts to water quality and aquatic habitat by instituting the use of controls on the unregulated sources of storm water discharges that have the greatest likelihood of causing continued environmental degradation.

1.4 Regulatory Requirements

1.4.1 Basin Plan and Beneficial Uses

The Central Coast Regional Water Quality Control Board (RWQCB) relies on its adopted "Water Quality Control Plan for the Central Coast Basin Plan" (Basin Plan) to manage surface and groundwater in order to provide the highest water quality reasonably possible. The Basin Plan lists beneficial uses and describes water quality objectives to maintain water quality, describes programs, projects, and other actions to achieve the plan's standards, summarizes plans and policies to protect water quality, and describes statewide and regional monitoring programs.

The RWQCB implements the Basin Plan by issuing and enforcing waste discharge requirements (WDR, non-water body discharges) and National Pollutant Discharge Elimination System (NPDES) permits (surface water body discharges) for point discharges, establishment of water-quality based effluent limitations, prohibitions of discharge, and the review and establishment of Total Maximum Daily Loads.

Each water body under the Basin Plan is designated one or more beneficial uses such as domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources. Section 3.9 identifies all beneficial uses in the Seaside Basin.

Monitoring activities to determine compliance with water quality objectives include discharger self-monitoring required under WDRs and NPDES permits, and monitoring undertaken by the RWQCB through its Central Coast Ambient Monitoring Program.

1.4.2 Storm Water Regulations

The 1987 amendments to the Clean Water Act added Section 402(p) provides a framework for regulating certain storm water discharges under the NPDES program. Separate permits are required for municipal, industrial, and construction activities.

Since March 10, 2003, municipal storm water permits for urbanized areas in the Seaside Basin have been covered under EPA's Storm Water Phase II Final Rule (December 1999), which established application requirements for storm water permits for additional operators of MS4s in urbanized areas. In 2000, the cities in the Southern Monterey Bay area (including all those in the Seaside Basin), Monterey County, and the Pebble Beach Company formed a Working Group to develop a storm water management program and secure a Phase II NPDES permit from the RWQCB. The Working Group developed the Monterey Regional Storm Water Management Program (MRSWMP) and permit coverage was issued by the RWQCB in September 2006. The MRSWMP is currently being implemented by the participating entities. Under the permit, there are six types of pollution control activity: public education, pollution source identification and abatement, water quality monitoring, land use regulations, construction site regulation and control of municipal operations.

The MRSWMP contains a series of management practices, referred to as "Best Management Practices" (BMPs). These BMPs are designed to reduce the discharge of pollutants from the municipal separate storm sewer systems to the "maximum extent practicable," to protect water quality, and to satisfy the appropriate water quality requirements of the Clean Water Act.

Storm water associated with industrial activities that discharge either directly to surface waters or indirectly through separate municipal storm sewers must be regulated by an NPDES permit (Water Quality Order No. 97-03-DWQ, General Permit No. CAS000001).

Currently, the SWRCB has adopted a separate statewide general permit for construction activities disturbing an area greater than one acre (Order No. 2012-0006-DWQ, NPDES No. CAS000002). The intentions of this permit are to eliminate or reduce non-storm water discharges to storm sewer systems and other waters, and to implement and perform inspections of Best Management Practices (BMPs). State agencies such as Caltrans, municipal agencies and private construction activities are subject to this permit.

1.4.3 Recycled Water Policy

In an effort to increase availability and reliability of existing supplies, the use of recycled water has been increasing in California. In 2009, the SWRCB adopted the Recycled Water Policy (February 2009) to address long-term water quality issues raised by water reuse. As part of the policy, salt and nutrient management plans (SNMP) for each groundwater basin in California are required by 2014 to facilitate management of salts and nutrients in a manner that optimizes recycled water use while ensuring protection of groundwater supply and beneficial uses, agricultural beneficial uses, and human health. The policy was revised in January 2013 to include Chemicals of Emerging Concern (CECs) monitoring requirements for planned and future intentional recycled water recharge projects.

The Recycled Water Policy states that Salt and Nutrient Management Plans need to be completed by 2014 to facilitate basin-wide management of salt and nutrient from all sources in a manner that optimizes recycled water use while ensuring protection of groundwater supply and beneficial uses, agricultural beneficial uses, and human health.

The RWQCB through its regulation of waste discharges, requires operators of publically owned treatment works (POTW) to develop implementation plans to meet the objectives of the Recycled Water Policy.

1.4.4 Groundwater Basin Adjudication

In 2006, the Monterey County Superior Court (*California American Water v. City of Seaside et al., Case No. M66343*) concluded that groundwater production within the Seaside Basin exceeds the Natural Safe Yield and therefore a physical solution that reduces production to the Natural Safe Yield was established to prevent seawater intrusion and its deleterious effects on the Basin. The adjudication process led to the issuance of the Court Decision (amended in 2007) that created the Seaside Groundwater Basin Watermaster (Watermaster). The Watermaster's role is to administer and enforce the provisions of the Amended Decision (California American Water v. City of Seaside et al., 2007). The Watermaster consists of nine representatives (number of representative in parentheses) from Cal-Am (1), City of Seaside (1), City of Sand City (1), City of Monterey (1), City of Del Rey Oaks (1), Landowner Group (2), Monterey Peninsula Water Management District (1), and Monterey County/Monterey County Water Resources Agency (1).

The threat of seawater intrusion is managed by the Court Decision in part by triennial pumping reductions which end in 2021 at the Natural Safe Yield of 3,000 acre-feet per year (AFY). The Decision required that a monitoring and management plan (MMP) be implemented that was consistent with criteria outlined in the Decision. This MMP was completed in September 2006 and approved by the Court in February 2007 to ensure that the Seaside Groundwater Basin is protected and managed as a perpetual source for beneficial users. The MMP includes groundwater production, groundwater level, and groundwater quality monitoring. Details of the MMP monitoring plan are provided in Section 5.

It should be noted that the adjudicated basin boundary is slightly different than the basin boundary that is used for this SNMP. A discussion of the different boundaries is presented in Section 3.1.

SECTION 2
STAKEHOLDER PROCESS

Stakeholder involvement is key to the success of developing and implementing a SNMP. The stakeholders are those responsible for ensuring the plan is carried out and updated as needed to reflect changing land use and activities within the basin.

2.1 STAKEHOLDER IDENTIFICATION

The Watermaster has a Board that comprises the City of Seaside, Laguna Seca subarea landowners, Monterey Peninsula Water Management District, City of Sand City, California American Water, City of Del Rey Oaks, Monterey County/Monterey County Water Resources Agency, Coastal subarea landowners, and the City of Monterey. These Board members account for most of the stakeholders in the basin. Others that are not as directly represented on the Board include the following golf courses: Nicklaus Club-Monterey (formerly Pasadera Country Club), Laguna Seca Golf Ranch, and Black Horse and Bayonet, which are owned by the City of Seaside.

2.2 STAKEHOLDER INVOLVEMENT

During the course of the SNMP development, the Watermaster's Technical Advisory Committee (TAC) was kept updated on development and asked to provide direction on key issues.

- May 9, 2012 – presentation to TAC on content of SNMP, and information request that will be issued to golf courses and other stakeholders with potential salt and nutrient loading activities.

- February 13, 2013 – TAC input on which basin boundary to use for the SNMP. The topic was referred to the Board who deferred it to the RWQCB's decision.

- January 8, 2014 – presentation to the TAC on SNMP findings and way forward.

- April 2014 – presentation to the Seaside Basin Watermaster TAC and Board to present findings of the SNMP.

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SECTION 3
BASIN CHARACTERISTICS

3.1 BASIN BOUNDARY

The Seaside basin as a subbasin of the Salinas Valley Basin is delineated by the DWR in Bulletin 118 as shown on Figure 1. This delineation of the basin has not been used historically or currently for management purposes. There are more relevant basin boundaries which are discussed below that are used in place of the DWR boundary. The Seaside Basin boundary that is included as Exhibit B of the original adjudication decision (Decision) filed March 27, 2006, is from Figure 2-1 of the CH2MHill 2004 report titled *Hydrogeologic Assessment of the Seaside Groundwater Basin*. Although not stated in that report, the overall basin boundaries, subbasin and subarea boundaries are taken from Plate 1 of the Fugro West, Inc. 1997 (Fugro 1997) report titled *Hydrogeologic Assessment, Seaside Coastal Groundwater subareas, Phase III Update*. The overall basin boundary used in the Fugro 1997 report was in turn based on Figure 3 of the U.S. Geological Survey 1982 report titled *Ground Water in the Seaside Area, Monterey County, California* (Muir, 1982). The northern and eastern boundaries delineated in this report were based on very limited geologic control and groundwater levels. Figure 1 shows the basin boundary used for the adjudication decision.

The overall basin boundaries of the adjudication decision are therefore based on reconnaissance-level analyses published by the USGS in 1982. The basin boundary was revised as part of an updated investigation of the Seaside Basin as described by Yates et al. (2005). Due to this more recent and detailed analysis of boundary conditions by Yates et al. (2005), this boundary is considered as the most current and accurate documented depiction of the basin boundaries and has been used in the Monterey Peninsula IRWMP. Figure 1 shows the difference between the adjudicated and updated boundaries.

Per the Decision, the basin is divided into four subareas. The coastal area west of the former Fort Ord boundary is divided into a Northern Coastal subarea and a Southern Coastal subarea by the extension of the Laguna Seca anticline (Figure 1). Similarly the area east of the former Fort Ord boundary is divided by the Laguna Seca anticline into the Northern Inland subarea and the Laguna Seca subarea.

3.2 BASIN PHYSIOGRAPHY

The Seaside basin is located adjacent to Monterey Bay in Monterey County. It underlies the Cities of Seaside, Sand City, Del Rey Oaks, Monterey, and portions of unincorporated county areas, including portions of former Fort Ord, and the Laguna Seca area. The basin is bounded by the Pacific Ocean to the west, the Salinas Valley to the north, the Toro Park area to the east, and Highways 68 and 218 to the south (Figure 1). An active dune system along the coast dominates the coastal topography, with older less active dunes found inland, mostly within the former Ford Ord open space. This hilly coastal plain, slopes both northwards to the Salinas River Valley and westwards towards the Monterey Bay. Elevations in the basin range from sea level at the coast to 950 feet above mean sea level inland.

3.3 WATERSHEDS AND HYDROLOGY

The groundwater basin contains a number of watersheds defined by the DWR that are part of the Salinas Hydrologic Unit (Figure 2). Pilarcitos Canyon and Corral de Tierra Valley watersheds drain northeast to the Salinas Valley, while the Laguna Seca and Monterey watersheds drain northwest to the Pacific Ocean.

There are few flowing creeks in the basin because of the permeable nature of the soils. The only creek with a defined channel is the Arroyo del Rey which flows intermittently in Canyon del Rey to the south of the basin, roughly alongside Highway 68 and 218 (Canyon del Rey Blvd), and into Laguna Grande Lake, through Roberts Lake and eventually into Monterey Bay through a series of flow control structures. Flow in the creek responds rapidly to rainfall, and is usually dry in the summer months. Creeks in the area have a "flashy" nature and readily lose water to streambed seepage. There are no natural surface water bodies within the basin boundary. Just south of the basin boundary, the coastal man-made lakes: Laguna Grande / Roberts Lake are found (Figure 2). Although these lakes do not fall directly within the basin boundaries, their catchments do include part of the Seaside basin.

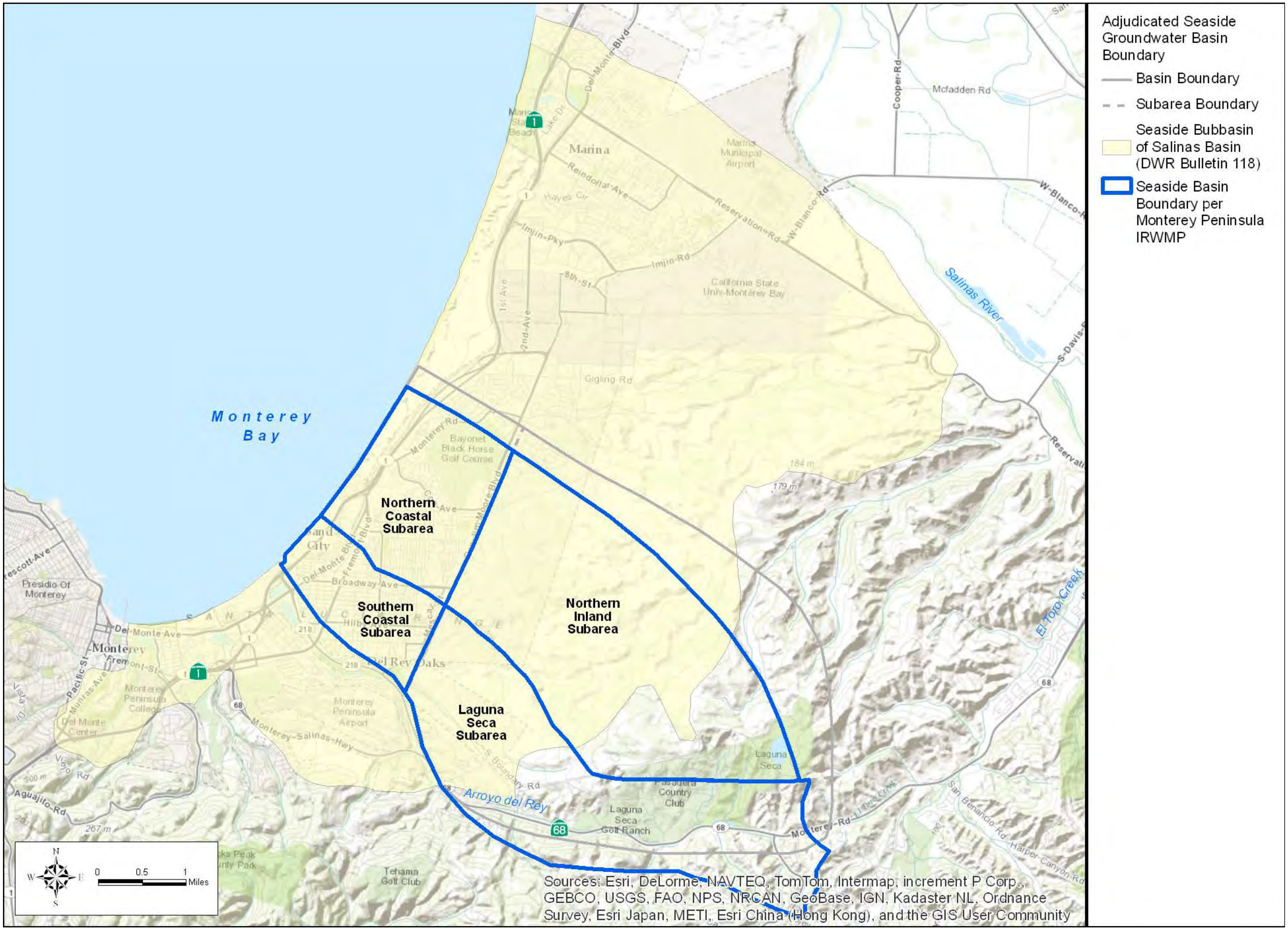


Figure 1: Seaside Groundwater Basin Boundary

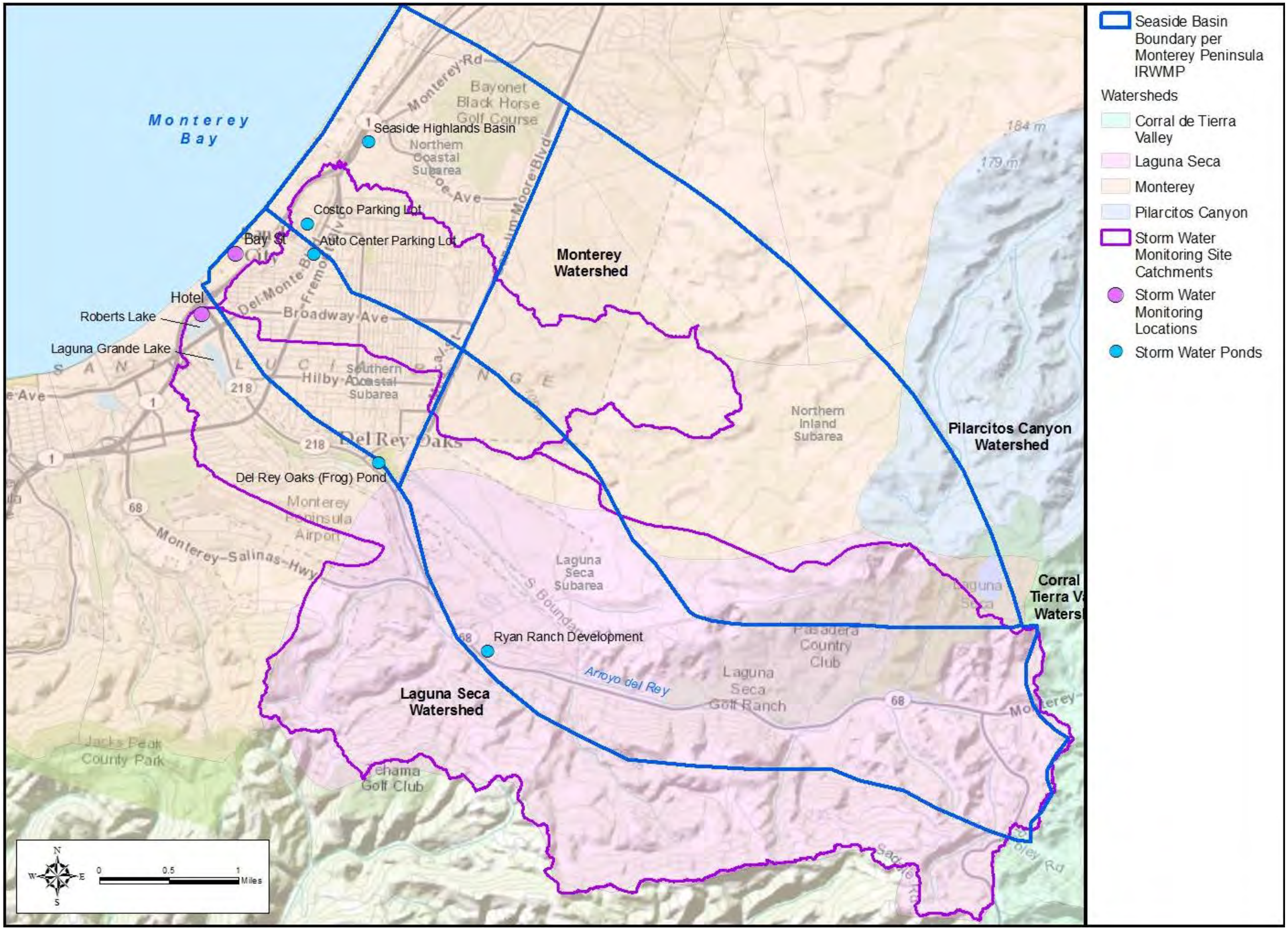


Figure 2: Seaside Groundwater Basin Watersheds and Hydrology

3.4 CLIMATE

The area experiences a Mediterranean-type, semi-arid climate, with warm dry summers and mild winters. Ninety percent of its annual rainfall falls in the months between November and April. There is no long-term weather station in the Seaside basin. The closest long-term climate stations are Monterey Station (045795) and Salinas#2 (047668). The Monterey Station is approximately 3.5 miles to the west of the Seaside Basin, and the Salinas Station approximately seven miles to the northeast (Figure 3). As shown by the isohyetal map on Figure 3, the rainfall across the Seaside basin varies from 14 inches near the Salinas Valley to 20 inches at the southern boundary. An average of the two stations is therefore a good measure of the average rainfall experienced by the basin. Averaging the rainfall from both stations for Water Year 1959 through 2011 gives an average of 16.5 inches per year. The rainfall over this period has ranged from 8 to 41 inches per year. Most years have below average rainfall but the years that are over the average are often at least 10 inches over the average. Figure 3 includes a plot of the annual rainfall from Water Year 1959 to 2011 for each station, and includes a cumulative departure from mean annual rainfall plot for the Monterey Station to show rainfall trends over time. The plot shows there were dry periods between 1959 and 1966, 1984 and 1992, and 1999 and 2004.

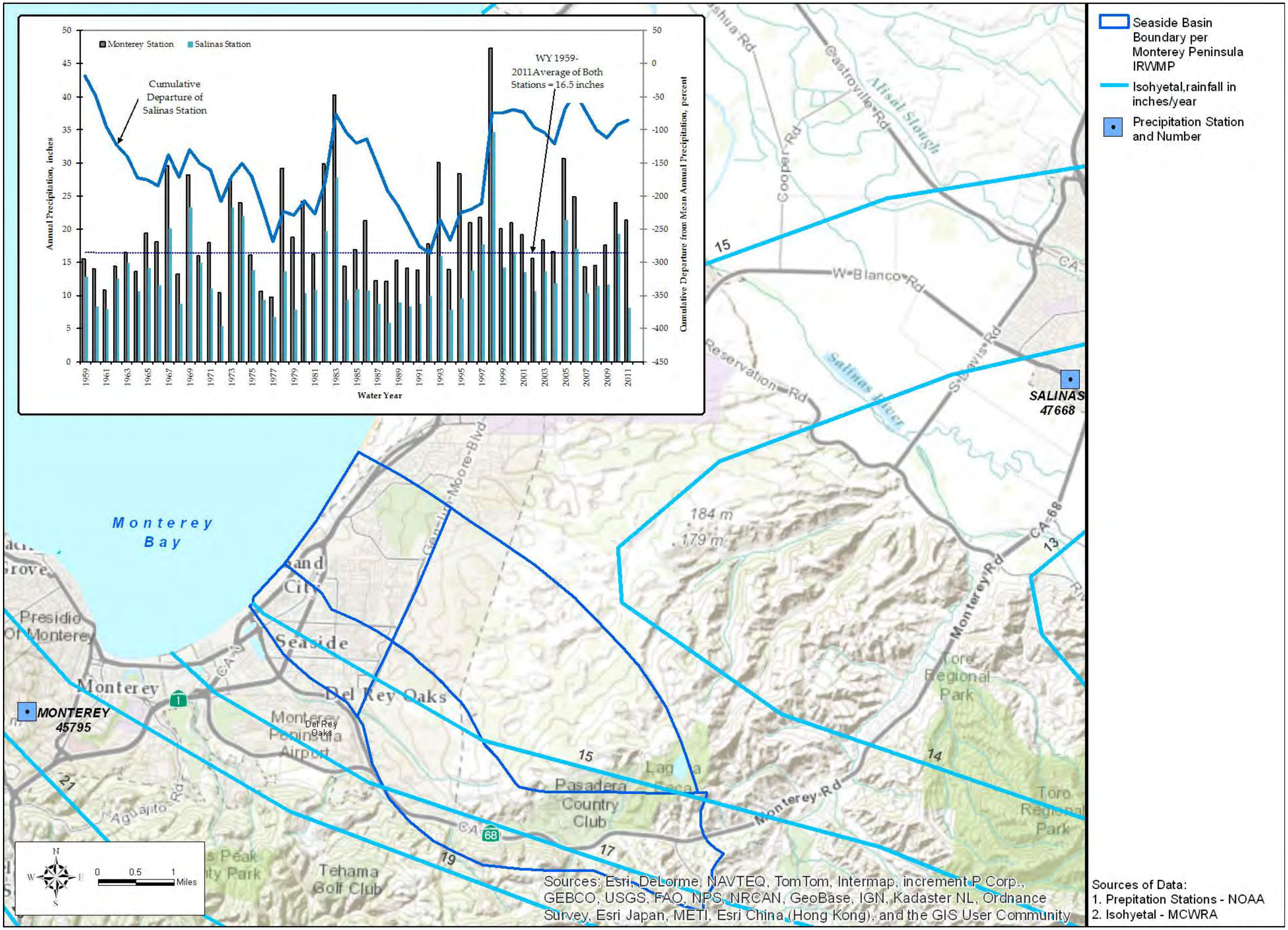


Figure 3: Distribution of Rainfall

3.5 GEOLOGIC/HYDROGEOLOGIC FRAMEWORK

3.5.1 STRATIGRAPHY AND HYDROSTRATIGRAPHY

The Seaside basin consists of a sequence of unconsolidated marine, fluvial and aeolian sediments that overlie relatively impermeable Monterey Formation of Miocene age and older crystalline rocks. The geologic map on Figure 4 shows the surface geology as mapped by Rosenberg (2001).

Conformably overlying the Monterey Formation is Santa Margarita Sandstone, which is also referred to as the Santa Margarita aquifer or deep aquifer. The Santa Margarita Sandstone consists primarily of marine-derived, sedimentary sandstone. Exploratory drilling associated with the Watermaster's sentinel wells suggests that parts of the deep aquifer previously assigned to the Santa Margarita Sandstone in and near the Northern Coastal and Northern Inland subareas consist of generally finer-grained sediments that should be assigned to the Purisima Formation. The only outcrops of Santa Margarita Sandstone (Tsm) within the basin occur along the eastern portion of the Laguna Seca Anticline and at the intersection of the Chupines and Ord Terrace Faults.

The Purisima Formation interfingers with the Santa Margarita Sandstone in the northern portion of the basin. The location of the transition is poorly understood due to a paucity of wells in the area where this transition occurs. The Purisima Formation is similar to the Santa Margarita Sandstone in that it is a marine deposit consisting of poorly indurated, gravels, sands, silts, and silty clay. Where the Purisima Formation is known to occur in the Marina area, it is deeper than 1,500 feet below MSL. There is no Purisima Formation outcrop in the basin.

The geologic unit unconformably overlying the Santa Margarita Sandstone and Purisima Formation is a Tertiary and Quaternary continental deposit locally called the Paso Robles or shallow aquifer. This unit consists of a mixture of continentally-derived gravel, sand, silt and clay sedimentary deposits. The unit is exposed in the foothills of the Laguna Seca subarea. It is an unconfined aquifer that is overlain by the surficial Aromas Sand. The Aromas Red Sands and Older Dune deposits are Quaternary surficial deposits representing the uppermost geologic units in the basin. These deposits are a variety of continental deposits, including: fluvial and coastal terrace, flood-plain, stream alluvium, colluviums and basin deposits (Yates, et al., 2002).

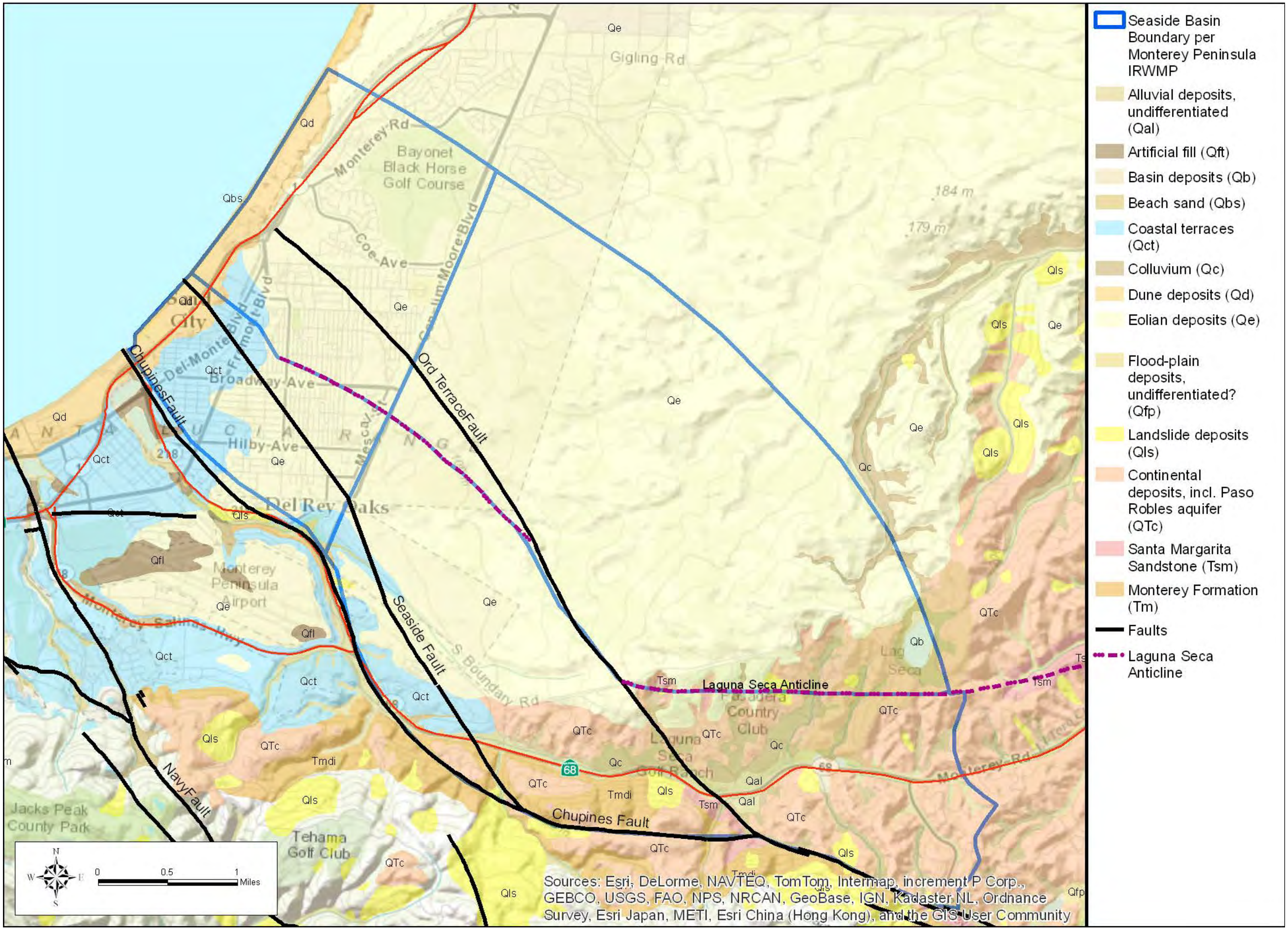


Figure 4: Geology and Faults

3.5.2 STRUCTURAL GEOLOGY

The Chupines Fault zone roughly bounds the southern edge of the basin (Figure 4). The Seaside and Ord Terrace Faults are found running through the basin, north of the Chupines Fault. The northeast side of the each of the faults is typically downthrown. This has resulted in a loss of Santa Margarita Sandstone south of the Seaside Fault, and as a result there is also very little Paso Robles aquifer or alluvial sediments in the area between the Chupines and Seaside Faults. For the conceptual model the faults are considered partial groundwater flow barriers although the offset in geology likely causes more of an impedance to groundwater flow than any fault gouge.

The Laguna Seca Anticline separates the northern and southern subareas of the Seaside Groundwater Basin (Figure 4). This feature—including the segment of the Ord Terrace Fault that offsets the anticline—forms a subsurface hydraulic partial barrier to groundwater flow.

The top of the Monterey Formation is considered non-water bearing due to low yields and poor water quality, and is therefore regarded as the base of the groundwater basin. There is no outcrop of Monterey Formation within the basin. A contour map showing its elevation and topography in basin found in Figure 5. Major features to note are the undulations in the Laguna Seca area due to the Laguna Seca anticline; and the depth of the basin in the north, where it reaches an elevation of 1,200 feet below MSL. Its highest elevation is approximately 500 feet above MSL, which is found at the Laguna Seca Anticline's intersection with the Ord Terrace Fault.

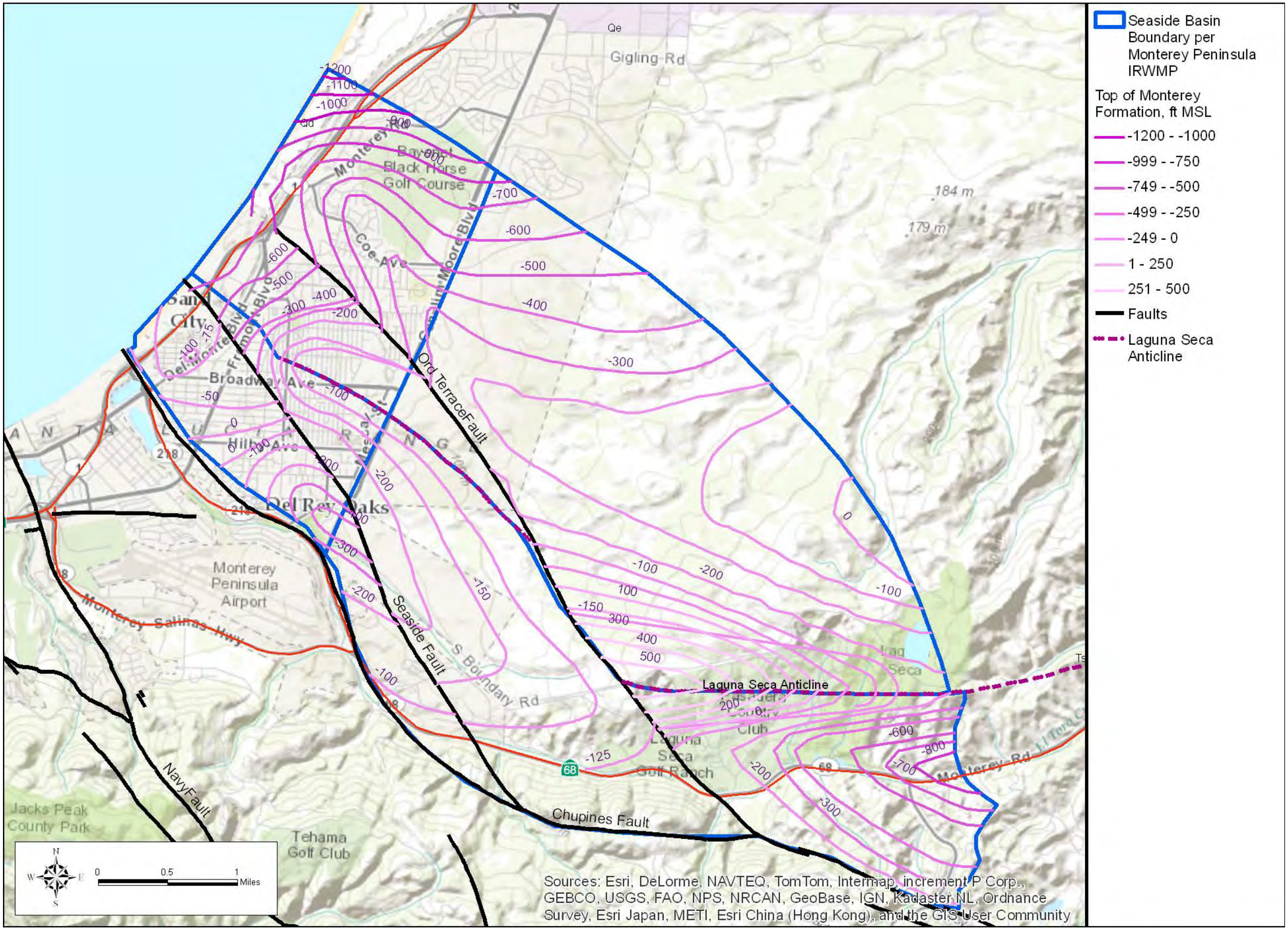


Figure 5: Top of the Monterey Formation (Base of Basin)

3.6 GROUNDWATER OCCURRENCE

3.6.1 GROUNDWATER IN THE AROMAS SANDS

The Aromas Sands and other surficial deposits are unsaturated in many parts of the Seaside basin, and are not extensively pumped for municipal use. Only near the coast are they partly saturated. These sediments are not significant sources of groundwater supply (Yates, et al., 2002).

3.6.2 GROUNDWATER IN PASO ROBLES AQUIFER

The Paso Robles aquifer is an unconfined aquifer that is tapped by production wells. Many of the wells that are screened in the Paso Robles aquifer are also screened in the underlying Santa Margarita aquifer.

The water-bearing characteristics of the Paso Robles aquifer are variable due to the flood plain depositional environment, which formed coarse-grained channel deposits cutting into fine-grained overbank deposits (Yates, et al., 2002). The Paso Robles aquifer is hydraulically linked to the ocean, which increases its susceptibility to seawater intrusion.

3.6.3 GROUNDWATER IN SANTA MARGARITA/ PURISIMA AQUIFERS

The majority of production wells in the basin produce groundwater from the deep or Santa Margarita/Purisima aquifer. Groundwater levels in this aquifer have shown a decline since production started in earnest in the 1990s. This in part has been attributable to pumping restrictions imposed on CAW's Carmel River pumping by the State Water Resources Control Board's Order 95-10.

Due to overlying low conductivity sediments, the Santa Margarita/Purisima aquifer is confined. Based on observed groundwater level behavior in the Santa Margarita aquifer, there appears to be limited leakage from the overlying shallow aquifer and limited connection to the ocean.

The Purisima Formation is less permeable than the Santa Margarita aquifer. However, it is much thicker than the Santa Margarita aquifer, which translates to similar transmissivity values (Feeney, 2007).

3.7 GROUNDWATER FLOW

3.7.1 HORIZONTAL FLOW DIRECTIONS

Figure 6 and Figure 7 show groundwater elevation contours for the shallow (Paso Robles) and deep (Santa Margarita/Purisima) aquifers, respectively. These contours were produced as part of the Water Year 2012 Seawater Intrusion Analysis report for the Watermaster (HydroMetrics WRI, 2012). Both aquifers have pumping depressions: in the Northern Coastal subarea and in the Laguna Seca subarea. In general, groundwater flows from the higher inland areas to the lower coastal areas.

3.7.2 VERTICAL FLOW GRADIENTS

Head differences between shallow and deep monitoring wells can be used to determine vertical hydraulic gradients. The data from paired wells showed that in the 1980's and early 1990's vertical gradients were upwards, or from the deep aquifer to the shallow aquifer; but as groundwater pumping in the Seaside basin increased, the gradients reversed to downwards, or from the shallow aquifer to the deep aquifer.

In the area of Roberts Lake and Laguna Grande in the Southern Coastal subarea, there is a probability that an upwards vertical gradient persists due to the area being a groundwater discharge point. This assumption, however, cannot be confirmed with groundwater elevation data as there are no paired monitoring wells in this area.

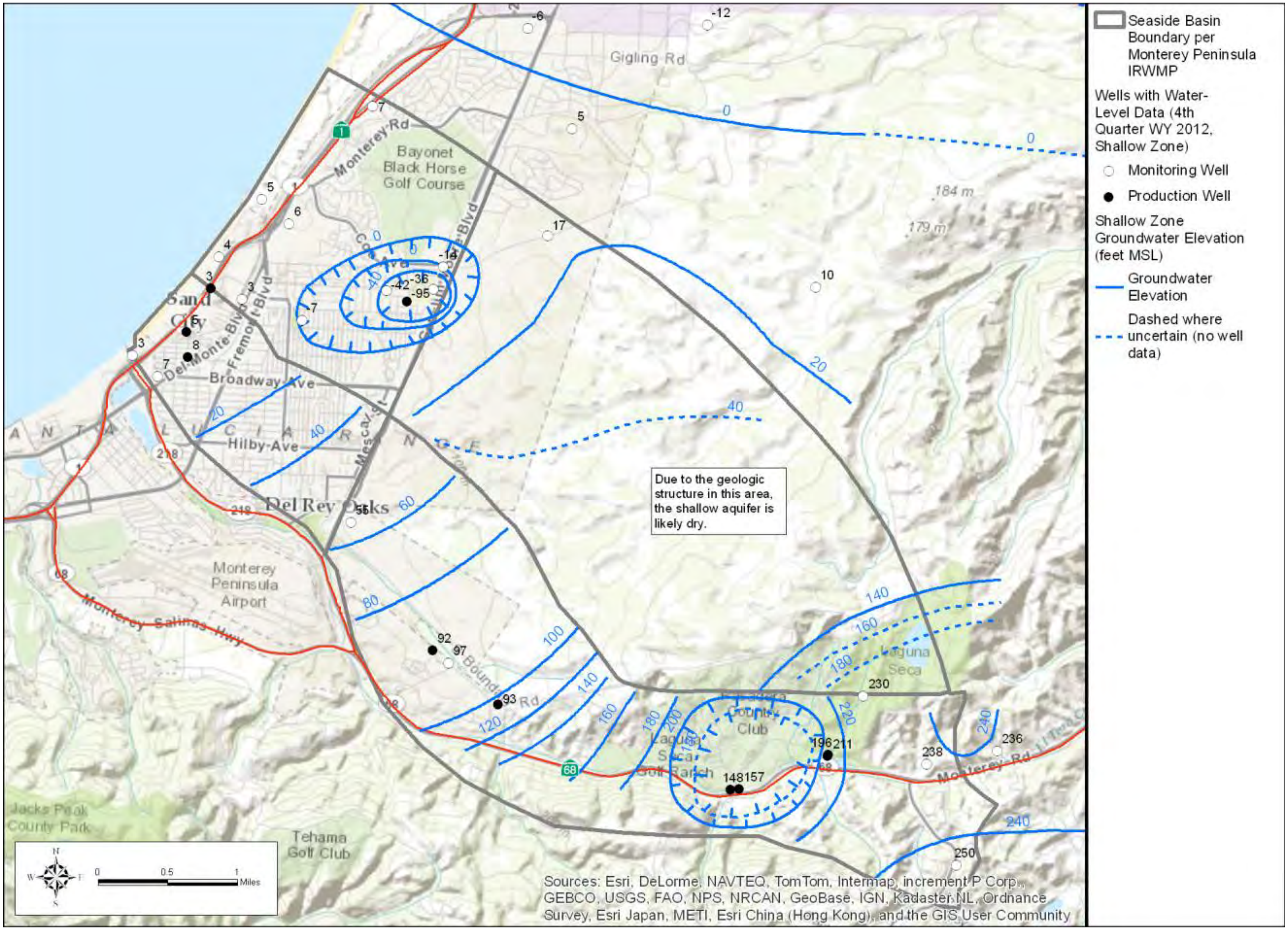


Figure 6: Shallow Groundwater Elevation Map – July/August 2012

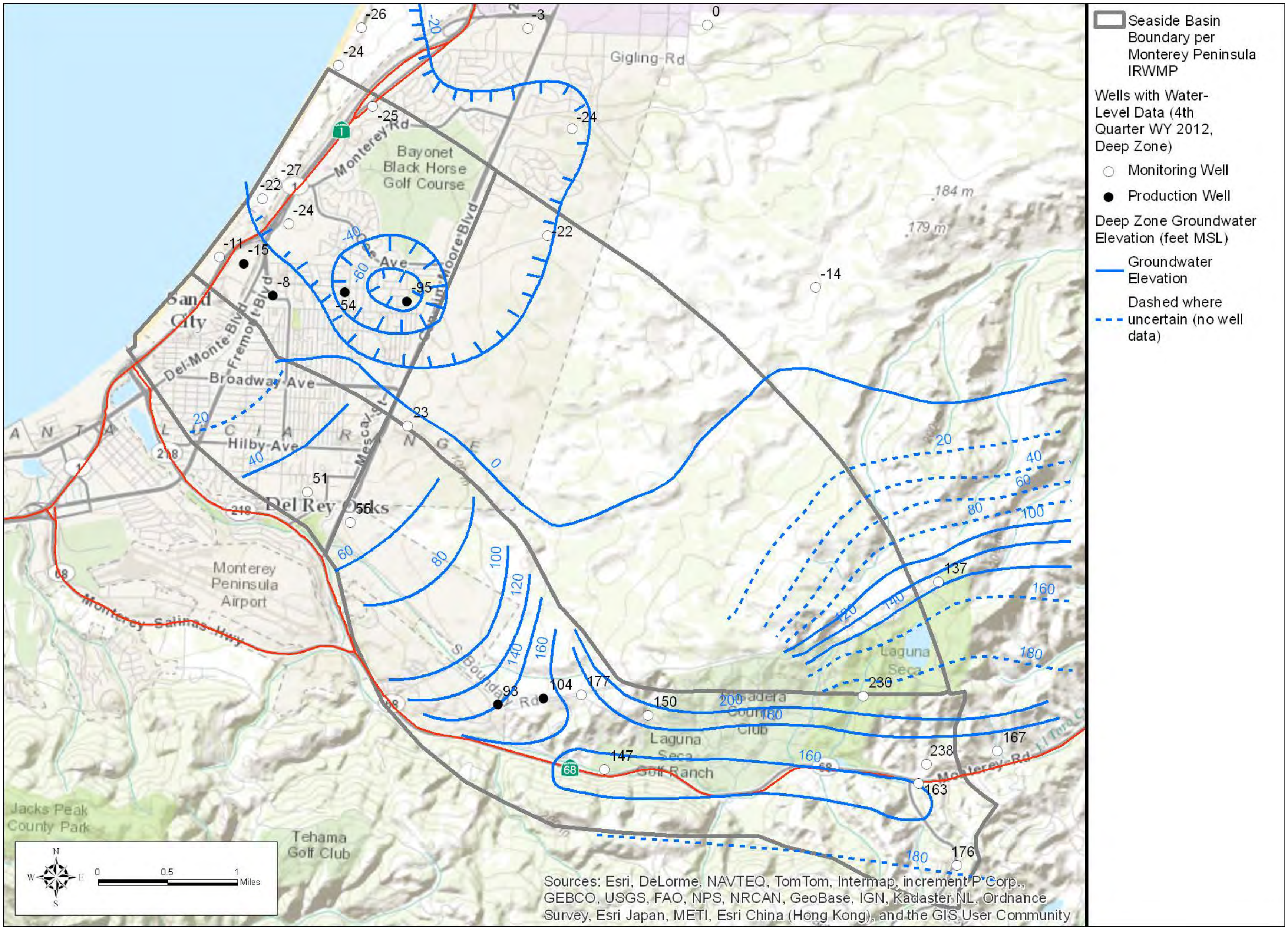


Figure 7: Deep Groundwater Elevation Map – July/August 2012

3.8 LAND USES AND LAND COVER

Land use along the coastal area east of Highway 1 comprises an approximately 1.5 mile wide strip of residential, light industrial, commercial and institutional facilities (Figure 8). The Bayonet and Black Horse Golf Courses are also found within this developed strip.

The other main developed artery is alongside Highway 68 (Monterey Salinas Highway) in the Laguna Sea area. Residential land use predominates, but there is also some industrial and commercial land use. Two golf courses, the Laguna Seca Golf Ranch and the Nicklaus Club-Monterey are found in this area. The Laguna Seca Recreation Area and Raceway is located north of Highway 68.

The Toro area is an additional developed hub in the southeast corner of the basin which extends beyond the basin's eastern boundary and along Highway 68. The main developed land use is residential housing.

The central part of the basin comprises open space that was formerly part of the Fort Ord military facility. Although there are plans to develop a small amount of former Fort Ord land near the already developed area east of Seaside, the remainder of the open space will stay undeveloped.

Figure 8 shows land use and land cover compiled from the 2010 adopted General Plan for Monterey County and City of Seaside's General Plan. Longer-term plans indicate some development along Fort Ord's western boundary. These areas are indicated with a cross-hatch pattern.

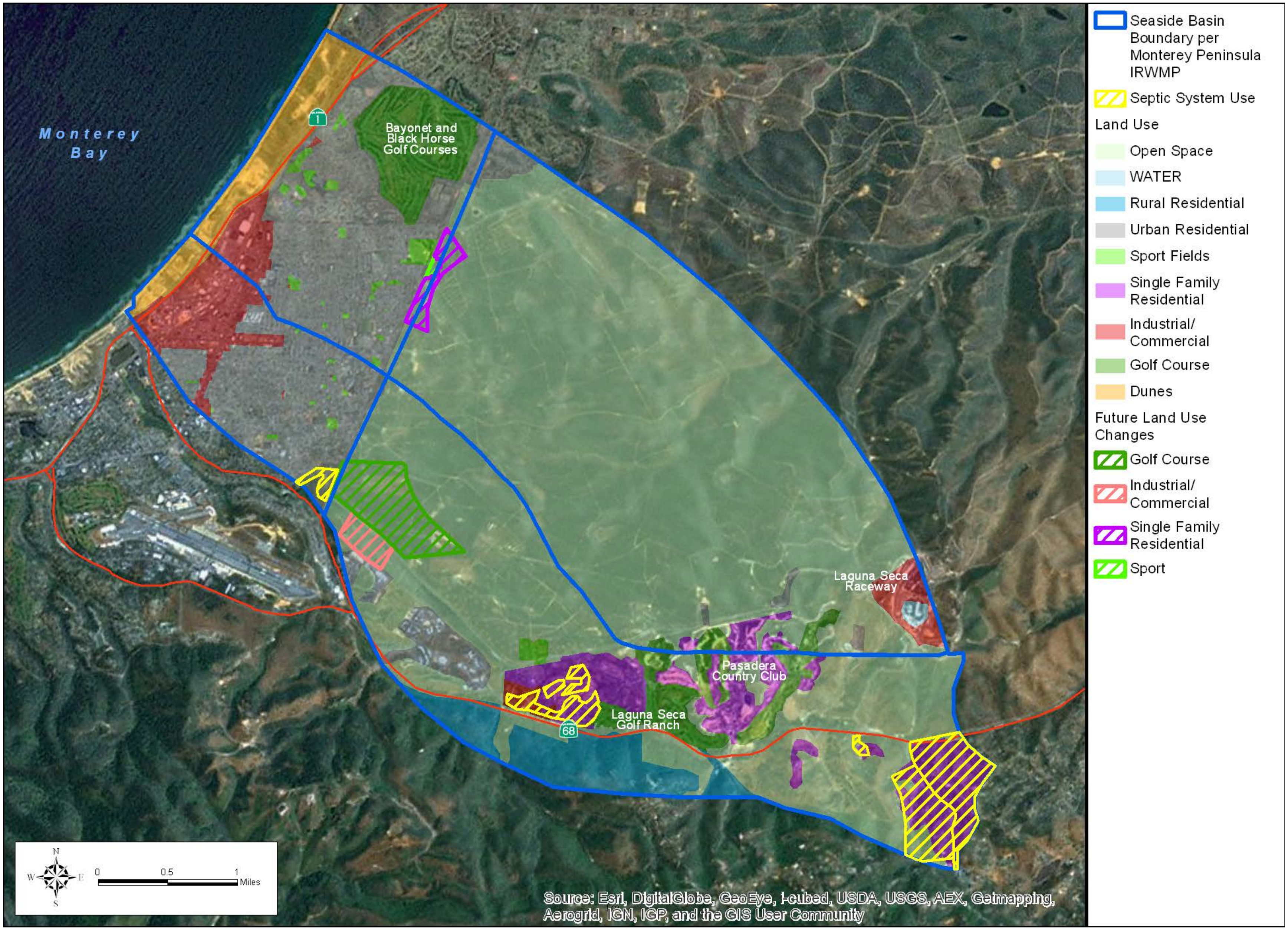


Figure 8: Land Use

3.9 Beneficial Water Uses

Per the Central Coast RWQCB's Basin Plan (2011a), beneficial uses for surface water in the Seaside basin are identified in Table 1. Note that Laguna Grande and Roberts Lakes do not fall directly within the basin boundary, however their watersheds do include part of the Seaside basin.

Table 1: Seaside Basin Beneficial Uses

	Municipal and domestic	Agricultural	Industrial	Contact water recreation	Non-contact water recreation	Wildlife habitat	Cold fresh water habitat	Warm fresh water habitat	Commercial and sport fishing
Laguna Grande/Roberts Lake	X			X	X	X	X	X	X
Any Other Surface Water	X			X	X	X			
Groundwater	X	X	X						

The Basin Plan does not specifically identify beneficial uses for groundwater in the Seaside Basin. It does however state that groundwater throughout the Central Coast Basin, with one exception in another groundwater basin, is suitable for agricultural, municipal and domestic, and industrial uses.

3.10 Surface / Storm Water Quality

As described previously, there is little surface water in the Seaside basin. This section describes the quality of water contained in Roberts Lake and storm water. Although there are several storm water percolation locations in the basin, there are no water quality data available for them. These ponds collect storm water from: the Seaside Highlands development, Monterey Peninsula Regional Park (Frog Pond Wetland Preserve), and the Ryan Ranch development off Highway 68 (Figure 2). Within the City of Seaside there are two percolation systems beneath parking lots: at Edgewater shopping center (Costco) and the other at Auto Center (Figure 2).

The only storm water quality data are collected by the Monterey Bay Sanctuary Citizen Watershed Monitoring Network. The network includes two sites in the Seaside basin (Figure 2). One site is near the Best Western hotel at Roberts Lake

(Hotel) and the second is from a storm water outfall near Bay Street (Bay St). Samples are collected at different times of the year. Dry run samples are storm water samples collected after a dry weather rainfall event, and first flush is collected from water flowing into the ocean during the first major storm of the season. Samples are also collected during dry weather in spring and summer.

The catchment for the Hotel monitoring site is much larger than the Bay St catchment; it encompasses almost the entire Laguna Seca subarea, and extends beyond the basin boundary (Figure 9). The land use within the catchment of the Hotel monitoring site includes former Fort Ord open space, urban and rural residential, the Nicklaus Club-Monterey and Laguna Seca golf courses, and a minor amount of industrial and commercial. It also contains the southern portion of the groundwater basin which has the basin's highest native groundwater TDS. Outside of the basin, the Hotel site catchment includes a portion of the Monterey Peninsula Airport, the Tehama Golf Course, urban and rural residential, open space, and industrial and commercial land uses.

The catchment for the Bay St. monitoring site includes almost all the basin's industrial and commercial land, and over half the basin's urban residential area.

Typical ranges in water quality from the two monitored sites are summarized in Table 2. Generally, the spring and summer water quality falls within the ranges for dry run and first flush data, and therefore were not included in Table 2.

The water quality observed at each of the sites is typical of quality expected from each of their respective land uses. The Bay St. site collects more storm water from developed areas than the Hotel site. Because of the permeable nature of the sediments in the basin, areas that are not developed with impervious surfaces have less storm water runoff and more percolation into the basin. As a result, urea, nitrate-nitrogen, metals, TSS, and bacteriological concentrations at Bay St. are greater than those measured at the Hotel site. The Hotel monitoring site has higher conductivity than Bay St., which is probably due to its catchment containing the Laguna Seca subarea where the occurrence of shallow Monterey Shale produces groundwater with higher conductivity and TDS, as described in Section 3.11.

Although the storm water monitored at the two sites is discharged to the ocean and does not have an opportunity to percolate into the basin, the water quality is representative of other storm water generated in similar environments throughout the basin.

Table 2: 2009 - 2012 Range in Storm Water Quality Collected by Monterey Bay Sanctuary Citizen Watershed Monitoring Network

Constituent	Water Quality Criterion	Dry Run 2009-2012 Range		First Flush 2009-2012 Range	
		Bay St	Hotel	Bay St	Hotel
Conductivity, µS/cm	-	NF	NA	70 - 240	36 – 1,480
Urea, µg/L	-	NF	26	62 - 284	37
Nitrate-Nitrogen (NO_3-N), mg/L	≤ 2.25[2]	NF	0.025	0.22 – 0.74	0.025
o-Phosphate as P, mg/L	≤ 0.12[2]	NF	0.14 – 0.51	0.17 – 0.34	0.22 – 0.53
Total Copper, µg/L	≤ 30[1]	NF	6 - 12	52 - 126	7 – 21
Total Zinc, µg/L	≤ 200[1]	NF	2.5	28.0 – 32.5	ND
Total Lead, µg/L	≤ 30[1]	NF	6 - 11	219 - 345	10 – 21
Total Suspended Solids, mg/L	≤ 500[2]	NF	9 - 23	59 - 173	12 – 25
***E. Coli*, MPN/100 ml**	≤ 235[3]	NF	20 - 100	34,162 – 64,900	273 – 2,393
Enterococcus, MPN/100 ml	≤ 104[3]	NF	20 - 100	47,396 – 90,327	344 – 1,465

[1] Basin Plan Objective, [2] Central Coast RWQCB, [3] EPA Ambient Water Quality Criteria
ND = non-detect, NF = not flowing, NA = not available
Source of data: Monterey Bay Sanctuary Citizen Watershed Monitoring Network (2012).

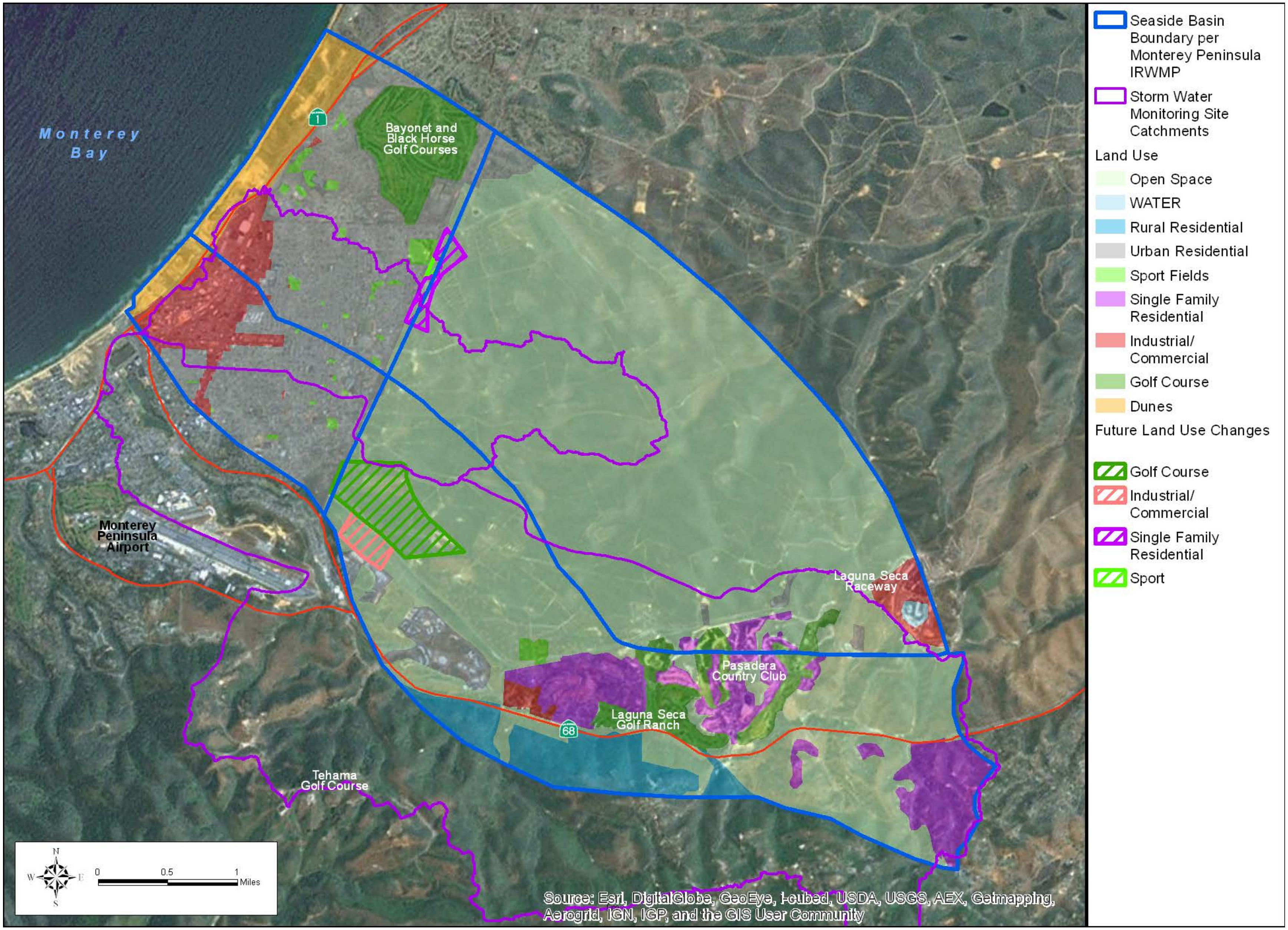


Figure 9: Storm Water Monitoring Site Catchments with Land Use

3.11 GROUNDWATER QUALITY

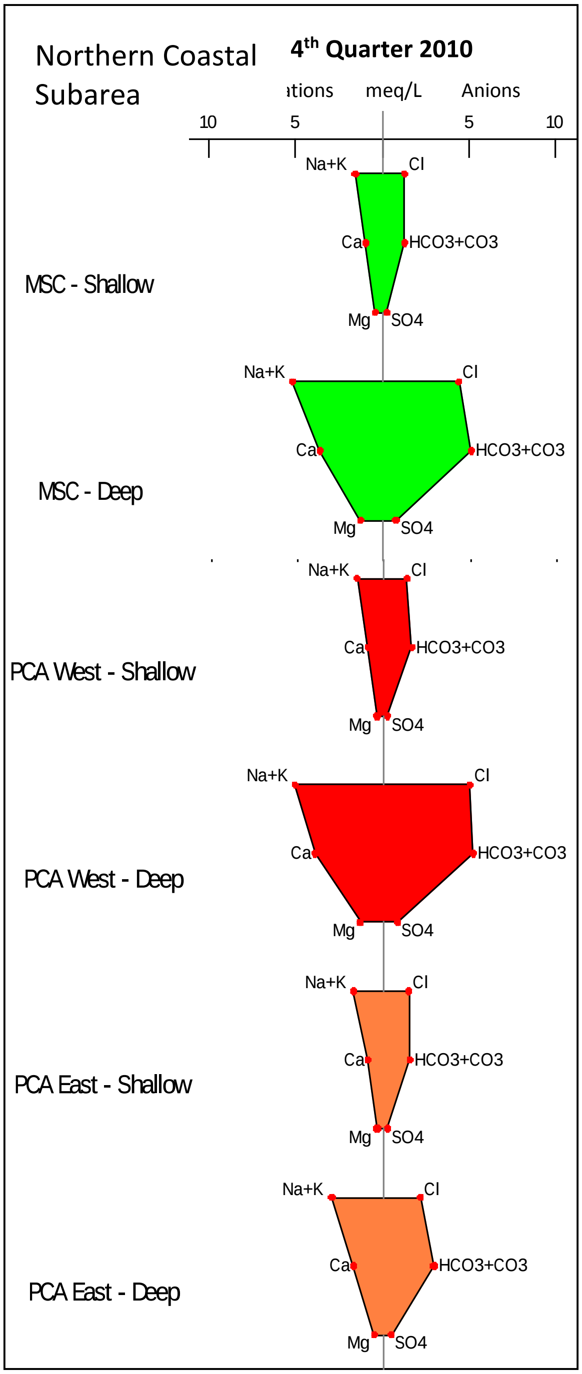
3.11.1 GROUNDWATER QUALITY DESCRIPTION

Groundwater in the basin is divided into two distinct types. The Northern Coastal subarea has sodium-bicarbonate type water, and the Southern Coastal and Laguna Seca subareas have sodium-chloride type waters (Muir, 1982). The shallow and deep aquifers also have differing groundwater qualities. Data used to describe the current groundwater quality in this section is from the Watermaster's database that is described in Section 6.

Data used to show concentration ranges starts in 1990. To characterize groundwater quality for each subarea, median well concentrations for TDS, chloride, and nitrate-N over the past five years (2008 through 2012) were contoured and area-weighted to arrive at an average groundwater quality for each subarea that is representative of current land use practices (Figure 14 through Figure 16). The maps include the wells and their median concentrations used in the analyses. Table 5 summarizes the existing water quality estimated for both the shallow and deep aquifers within each subarea, and also includes an average volume weighted concentration of the shallow and deep aquifers combined.

NORTHERN COASTAL SUBAREA

Stiff diagrams for monitoring wells in the Northern Coastal subarea show that, the shallow or Paso Robles aquifer has a lower anion/cation concentration than the deep or Purisima/Santa Margarita aquifer (Figure 10). As a result, total dissolved solids (TDS) for the Paso Robles aquifer (shallow) in the Northern Coastal subarea typically ranges from 200 to 600 mg/L, while in the Purisima/Santa Margarita (deep) aquifer in the Northern Coastal subarea has a TDS that typically ranges from 250 to 650 mg/L (Figure 11). The TDS of the deep aquifer at the aquifer storage and recovery (ASR) wells located on the eastern boundary of the Northern Coastal subarea has decreased substantially since the start of injection into the deep aquifer by MPWMD in 2010. Figure 12 shows the decrease from 600 to 320 mg/L in monitoring well ASR-MW1 which is located in close proximity to the two existing ASR wells. This conditioning trend is expected to continue and expand in area as Phase II of the program consisting of an additional two wells will be commissioned in 2014. More information on this project can be found in Section 3.12.2.



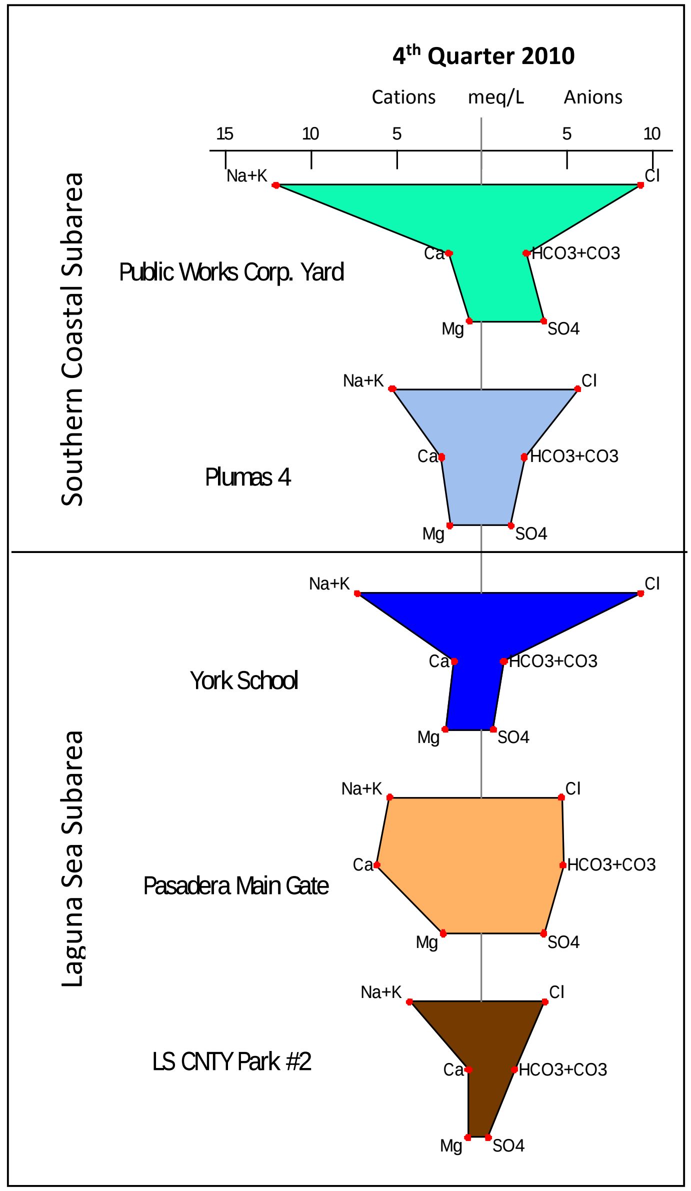


Figure 10: Stiff Diagrams of Monitoring Wells in the Northern Coastal, Southern Coastal, and Laguna Seca subareas

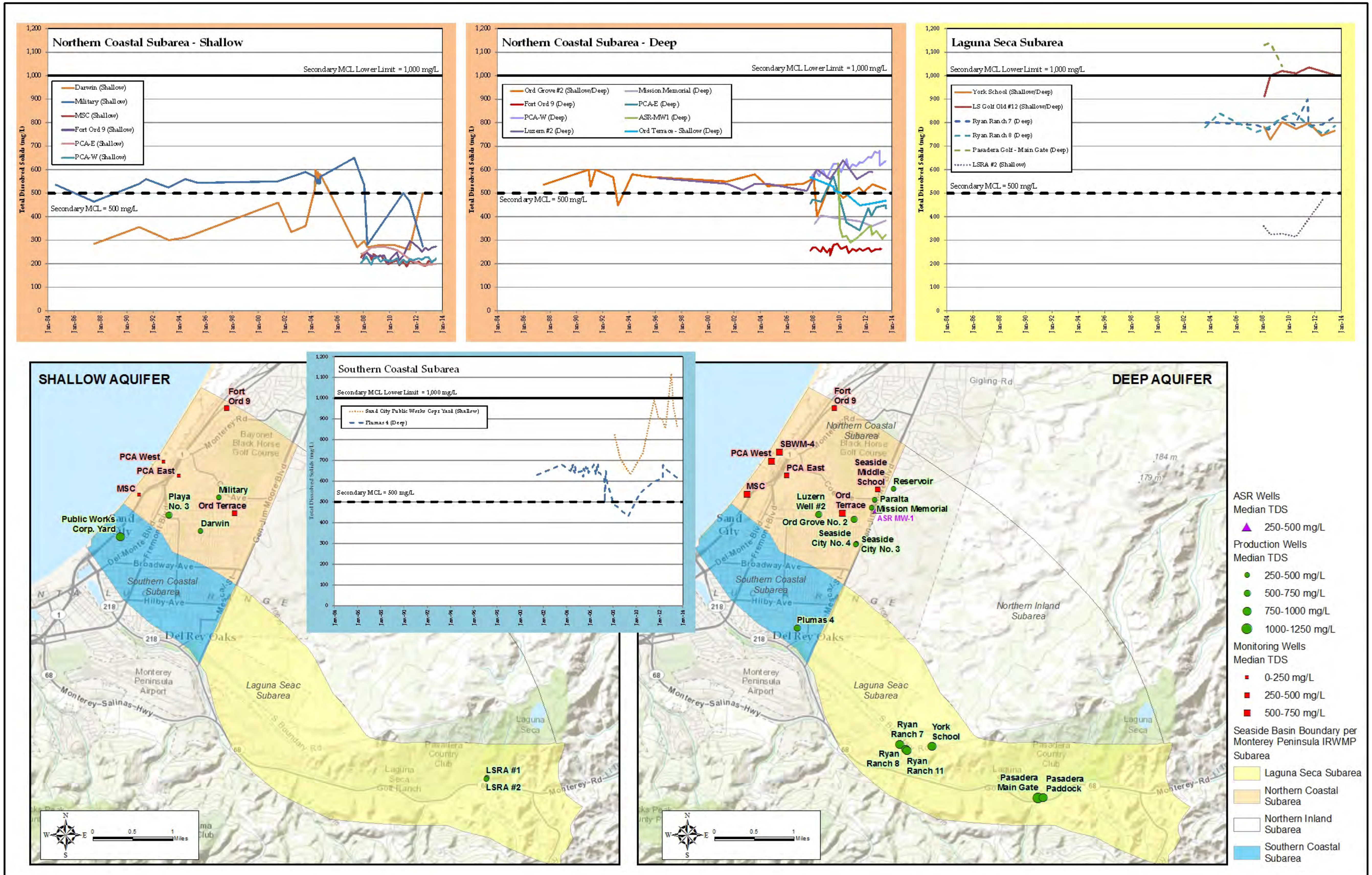


Figure 11: Wells with TDS Data and Selected Graphs of TDS Concentrations over Time

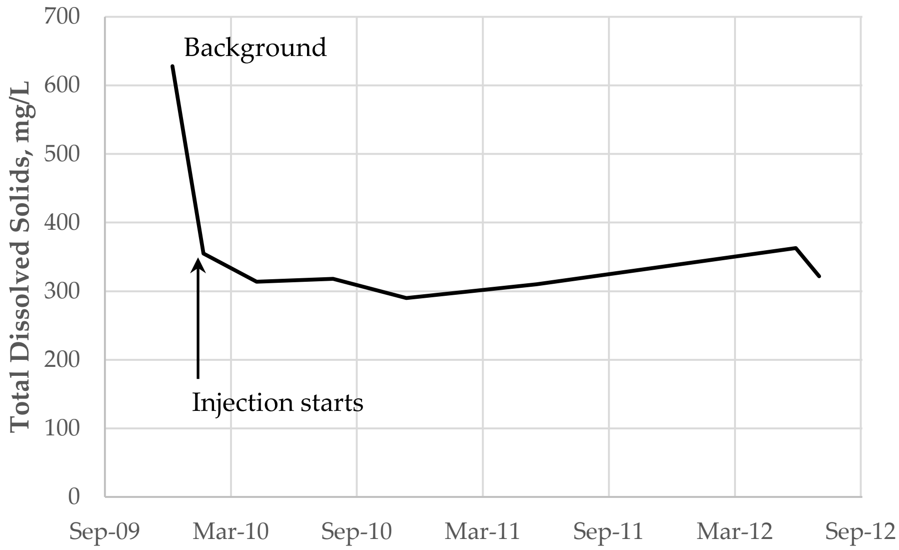


Figure 12: ASR MW-1 Historical TDS Concentrations

Deep aquifer chloride concentrations are slightly higher than the shallow aquifer, and can reach 420 mg/L. Nitrates in a portion the shallow aquifer in the Northern Coastal subarea are relatively high compared to other subareas in the basin (Figure 16), although concentrations have always remained below 10 mg/L nitrate –N (Figure 13). The deep aquifer nitrate-N concentrations are usually non-detect to very low (Figure 13). Wells with the highest nitrates in the subarea are located in an area that was historically used for truck farming before it became urbanized. Furthermore, the dune nature of the soils readily allows nutrients to infiltrate and percolate into the shallow groundwater system.

Hardness is high in the Northern Coastal subarea, although not as high as in the Laguna Seca subarea. Table 3 provides a hardness classification for reference.

Table 4 summarizes the ranges in water quality for each subarea.

Table 3: Hardness Classification

Hardness	mg/L as $CaCO_3$
Soft	0 – 60
Moderate	61 – 120
Hard	121 – 180
Very Hard	> 180

Source: http://water.usgs.gov/owq/hardness-alkalinity.html

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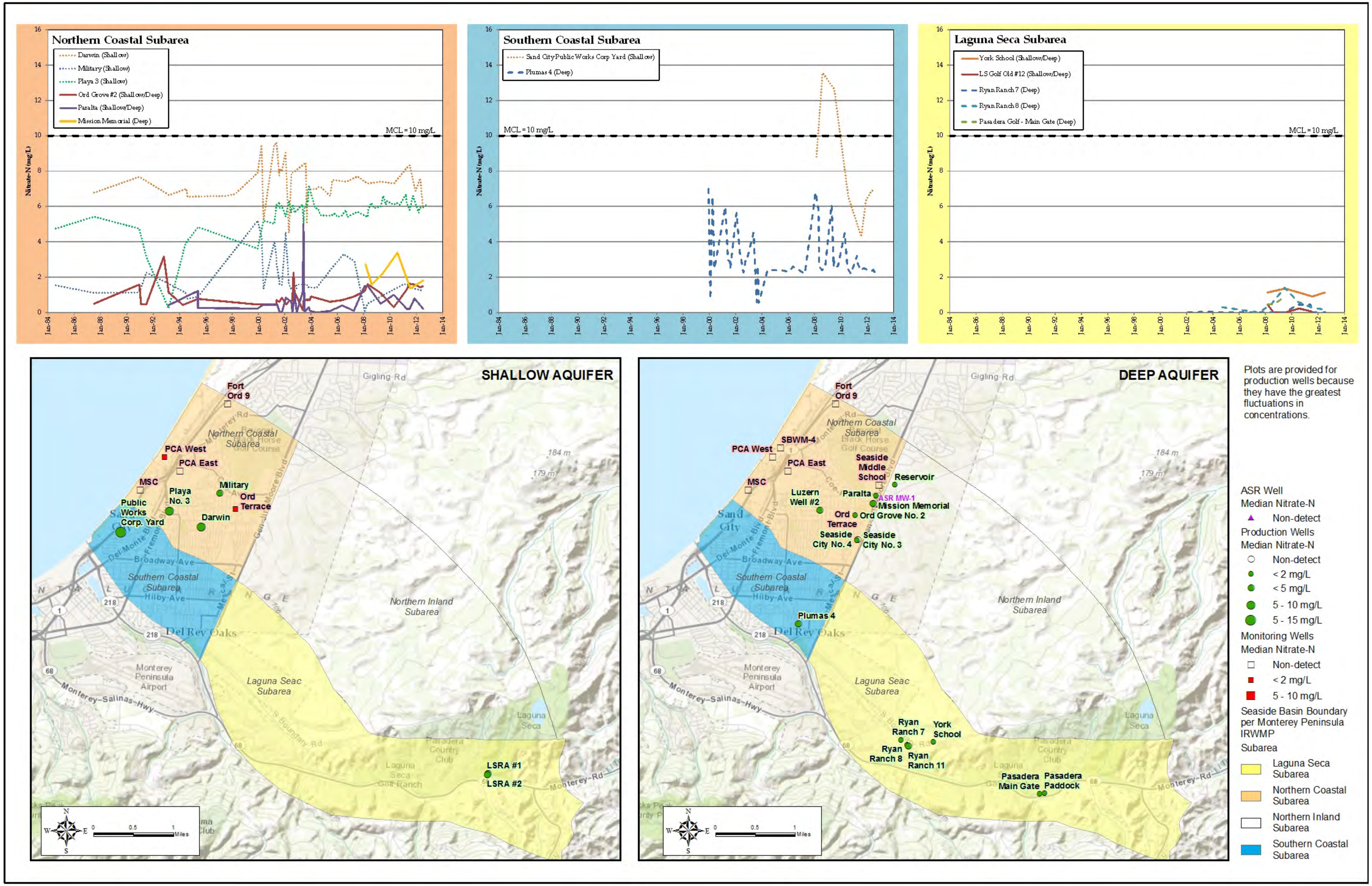

Figure 13: Wells with Nitrate Data and Graphs of Nitrate-N Concentrations over Time

Table 4: Seaside Basin Groundwater Quality Ranges

Constituent	Maximum Contaminant Level (MCL)	Northern Coastal Subarea		Northern Inland Subarea	Southern Coastal Subarea	Laguna Seca Subarea	
		Shallow	Deep			Shallow	Deep
TDS, mg/L	500-1,000*	200-600	250-650	150-630	450-990	300-800	750-1,100
Sulfate, mg/L	250-500*	10-270	10-370	10-100	40-180	10-110	30-250
Chloride, mg/L	250-500*	30-230	30-420	50-180	70-330	80-290	190-350
Sodium, mg/L	-	30-140	30-260	35-105	60-310	80-160	120-170
Magnesium, mg/L	-	2-60	1-80	5-25	5-25	10-30	25-40
Calcium, mg/L	-	10-90	10-180	15-80	30-50	10-65	30-160
Potassium, mg/L	-	ND - 10	ND - 50	2.2-5.5	ND - 5	ND - 20	ND - 6
Hardness as $CaCO_3$, mg/L	-	40-250	25-350	50-280	110-210	60-200	190-530
Nitrate as NO_3, mg/L	45	ND - 40	ND - 20	ND - 3	5 - 60	ND - 4	ND - 6
Nitrate-N (NO_3-N), mg/L	10	ND - 6	ND - 6	ND – 0.2	ND – 13	ND – 1.2	ND – 1.2
Ammonia-N, mg/L	-	ND - 1.9	ND - 1.6	ND	ND – 1.3	ND – 0.4	ND – 0.18
o-Phosphate as PO_4, mg/L	-	ND	ND	NS	ND	NS	ND – 1.69
o-Phosphate as P, mg/L	-	ND – 1.63	ND – 1.63	ND – 0.1	ND – 0.4	ND – 1.16	ND – 1.35
Arsenic, mg/L	0.010	NS	0.006-0.079	ND	NS	NS	NS
Iron, µg/L	0.3	ND - 5	ND - 25	ND – 2.3	ND – 0.1	0.1-4.0	ND – 4.0
Manganese, µg/L	0.05	ND – 1.0	ND – 2.0	ND – 0.1	ND – 0.03	ND – 0.2	ND – 0.6

* lower end of range is recommended
ND = non-detect, NS = no samples

SOUTHERN COASTAL AND LAGUNA SECA SUBAREAS

The southern subareas, i.e., Southern Coastal and Laguna Seca, have higher TDS than the rest of the basin. The Sand City's Public Works Corporation well, in the Southern Coastal subarea, has anomalous TDS, chloride and nitrate concentrations which are not consistent with nearby wells. In 2013, the Watermaster attempted to study the likely source of these anomalous concentrations but were unsuccessful sourcing historical groundwater quality data for the well or nearby wells. The well's sodium/chloride ratio suggests seawater is not the source of chloride. Historically, this area was used for truck farming which could account for the elevated nitrates. It should be noted, however, that this well is not screened in either the deep or shallow aquifers but in a water-bearing zone above these aquifers that is treated separately in the adjudicated Decision. Limited data for the only other well in the Southern Coastal subarea (Plumas 4) shows TDS is higher than the Northern Coastal subarea with chlorides just above 300 mg/L and nitrates being non-detect to very low (Figure 11 and Figure 13, respectively).

The inland Laguna Seca subarea has naturally occurring poorer groundwater quality than the rest of the basin. TDS typically ranges between 750 and 1,100 mg/L and chloride ranges between 190 – 350 mg/L in deeper wells, i.e., Cal-Am's Ryan Ranch wells (Figure 11). The cause of the higher TDS is likely connate water from the underlying Monterey shale formation mixing with the groundwater (Muir, 1982). Shallow wells in the Laguna Seca subarea have slightly lower TDS (300 – 800 mg/L) and chloride (80 – 290 mg/L) than deep wells (Table 4). Nitrate-N is non-detect to very low in both shallow and deep wells (Figure 13). Hardness is very high throughout the subarea, but particularly in deeper wells.

Hard to very hard water occurs throughout the basin and has compounding impacts on the basin. To improve hardness, residential water softeners use an ion exchange process which requires the addition of salts. These salts are disposed of to the sanitary sewer thereby increasing the salt load to wastewater treatment plants. This is the case with the Pasadera Wastewater Facility, which is located within the Laguna Seca subarea, as described in Section 4.1.8.

NORTHERN INLAND SUBAREA

Limited groundwater quality data exist for the Northern Inland subarea, which contains the former Fort Ord. From the few wells for which there are data, it appears that the groundwater quality is similar to the aquifers of the Northern Coastal subarea (Table 4).

3.11.2 EXISTING GROUNDWATER QUALITY

To characterize existing groundwater quality for each subarea of the Seaside basin, median well concentrations for TDS, chloride, and nitrate-N over the past five years (2008 through 2012) were delineated into zones and area-weighted to arrive at an average groundwater quality for each subarea that is representative of current land use practices (Figure 14 through Figure 16). The maps include the wells and their median concentrations used in the analyses. Table 5 summarizes the existing water quality estimated for both the shallow and deep aquifers within each subarea, and also includes an average of both aquifers based on the relative saturated thickness of each aquifer. The saturated thicknesses were collected from average groundwater levels over the last five years (2005-2009) of the calibrated Seaside Basin groundwater model (HydroMetrics LLC, 2009b).

Table 5: Seaside Basin Existing Groundwater Quality

Constituent		TDS mg/L	Chloride mg/L	Nitrate –N mg/L
Northern Coastal Subarea	**Shallow**	302	72	0.83
	Deep	437	102	0.30
	All	362	85	0.59
Southern Coastal Subarea	**Shallow**	839	260	6.9
	Deep	628	199	0.05
	All	702	221	2.4
Northern Inland Subarea	**Shallow**	344	63	0.43
	Deep	327	61	0.53
	All	336	62	0.48
Laguna Seca Subarea	**Shallow**	781	237	0.85
	Deep	855	241	0.48
	All	824	239	0.63

Concentration for "All" category is a volumetric-weighted average of shallow and deep aquifer concentrations.

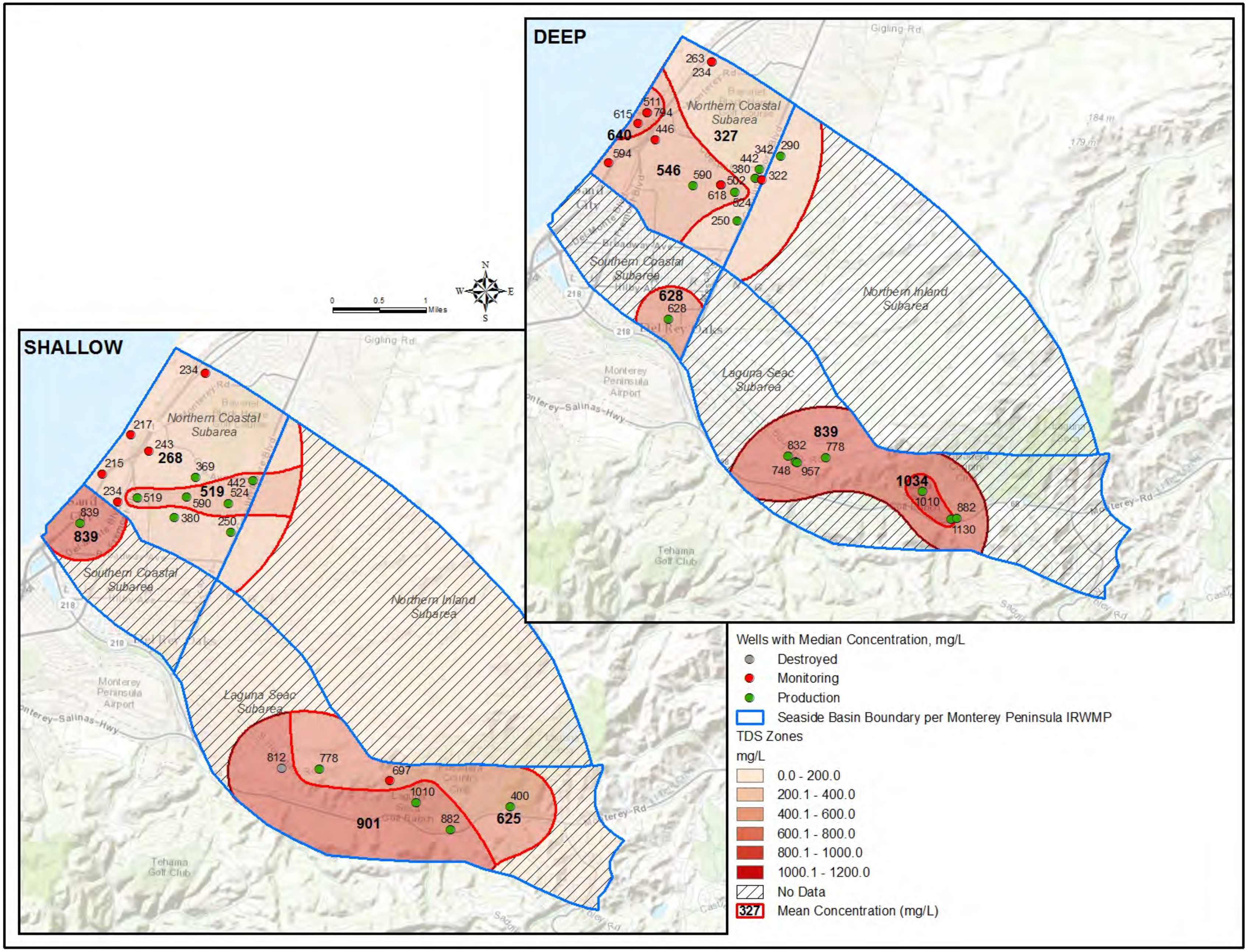

Figure 14: Water Quality Zones for Total Dissolved Solids

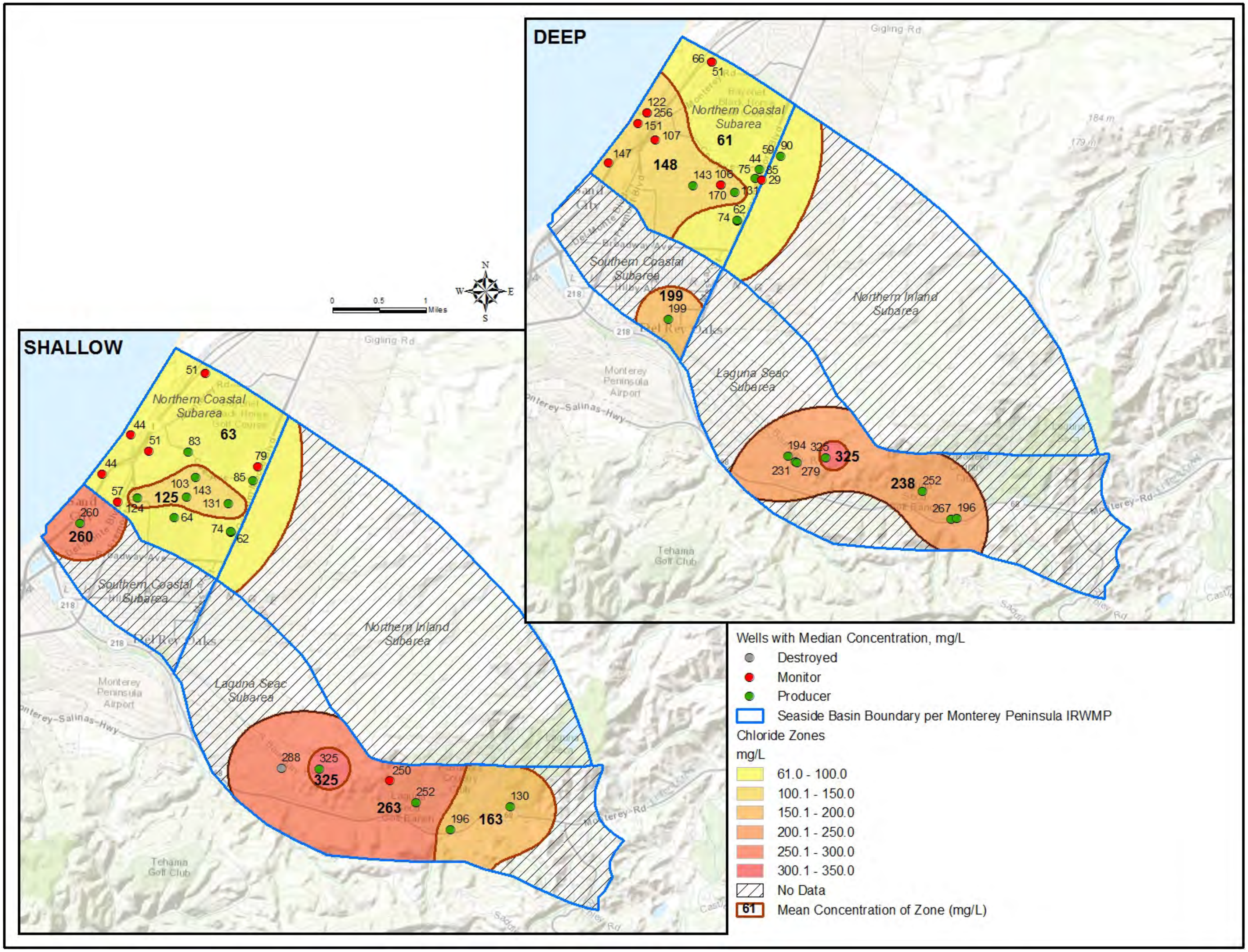

Figure 15: Water Quality Zones for Chloride

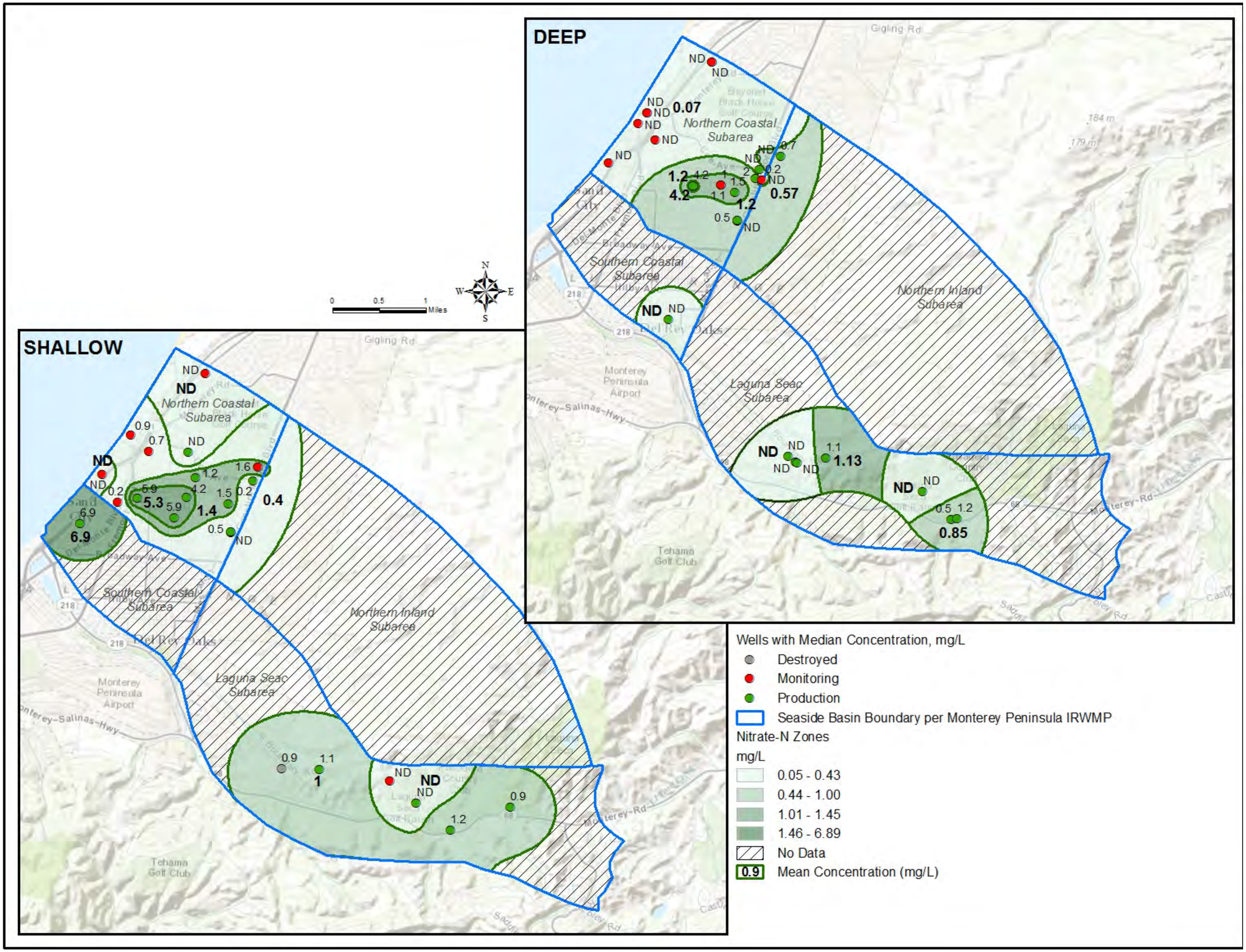

Figure 16: Water Quality Zones for Nitrate-N

3.11.3 HISTORICAL GROUNDWATER QUALITY

The earliest published groundwater quality data for the Seaside basin only dates back to 1982. This is the United States Geological Survey (USGS) report by Muir (1982), which includes groundwater quality for a number of wells in the Northern Coastal subarea. Based on state well numbers, most of these wells have since been destroyed. However, it was possible to substitute active wells completed within corresponding aquifers and within the same section to compare water quality. This comparison indicates that historical groundwater quality is similar to the existing groundwater quality in the Northern Coastal subarea (Table 6), with the exception of nitrate-N which appears to have increased, although it is still below the MCL. Figure 13 shows the concentrations of nitrate-N over time for each subarea. The data shown for the Northern Coastal subarea indicate the only well to exhibit a slight increase in nitrate-N from 1984 to 2012 is Cal-Am's Playa 3 well.

Historical data were not available for the other three subareas.

Table 6: Comparison of 1979/1980 Water Quality with Current Water Quality

Constituent	Playa 3		PCA Production		Luzern		Target		Ord Grove	
	22B3 Feb 1979	Playa 3 Jul 2012	PCA 15K1 Sep 1980	PCA-W Shallow Sep 2012	23D1 Feb 1979	Luzern New Jul 2011	22C2 Sep 1980	MSC Shallow/ Deep Sep 2012	Ord Grove 23B1 Feb 1979	Ord Grove 2 Jul 2012
TDS, mg/L	584	540	-	-	588	532	-	-	640	538
Specific Conductivity, µS/cm	920	878	380	325	920	905	651	300/1,018	1,000	904
Sulfate, mg/L	93	94.6	-	-	61	81.2	-	-	84	61.4
Chloride, mg/L	134	124.4	56	42	139	133.3	130	41/143	133	129.4
Sodium, mg/L	98	90.1	-	-	97	94.6	-	-	97	85.9
Magnesium, mg/L	22	17	-	-	19	18	-	-	21	19
Calcium, mg/L	63	56	-	-	75	66	-	-	87	68
Hardness as $CaCO_3$, mg/L	248	212	-	-	265	239	-	-	304	223
Nitrate as NO_3, mg/L	12.4	26.2	-	-	5.6	20.2	-	-	1.6	6.6
Nitrate-N (NO_3-N), mg/L converted from nitrate as NO_3	2.8	5.9	-	-	1.3	4.5	-	-	0.4	1.5
Iron, mg/L	0.03	< 0.1	-	-	0.09	< 0.1	-	-	0.06	< 0.1

S/D = shallow/deep

3.11.4 GROUNDWATER WATER QUALITY OBJECTIVES

The Seaside basin is not specifically included in the table of median groundwater quality objectives in the Central Coast RWQCB's Basin Plan (Chapter 3). For basins not specifically listed, quality objectives must meet the water's beneficial use. For the Seaside basin, beneficial uses are municipal, industrial, and agricultural. For the constituents of concern in this SNMP (TDS, chloride, and nitrate as N), the standards for municipal water contained in the California Code of Regulation (CCR) Title 22, Chapter 15 are the most stringent of the beneficial uses. Table 7 lists the water quality objectives (WQOs) used in this report.

Table 7: Seaside Basin Groundwater Quality Objectives

Constituent	Source	Seaside Basin Groundwater Quality Objective mg/L
TDS	Recommended Limit of Secondary MCL	500
Chloride	Recommended Limit of Secondary MCL	250
Nitrate-N	Primary MCL	10

3.12 IMPORTED WATER QUALITY

There are two sources of imported water to the Seaside basin: Salinas Valley groundwater and Carmel River system water.

3.12.1 SALINAS VALLEY GROUNDWATER

Water imported by the City of Seaside for irrigation of the Bayonet and Black Horse golf courses is supplied by Marina Coast Water District (MCWD) from groundwater pumped from the deep aquifer in the Salinas Valley groundwater basin. This use is per an in-lieu replenishment agreement that will expire tentatively in May 2018 (personal communications, Rick Riedl). Additionally, MCWD's service area includes a portion of the Seaside basin around the Bayonet and Black Horse golf courses.

MCWD's 2012 water quality is summarized in Table 8. None of the constituents exceed the basin's WQO.

Table 8: Imported Salinas Valley Water Quality for Bayonet and Black Horse Golf Course Irrigation and Municipal Supply by Marina Coast Water District

Constituent	Seaside Basin WQO mg/L	MCWD Water Quality Range for 2012 mg/L	MCWD Water Quality Averages for 2012 mg/L
TDS, mg/L	500	300 – 600	419
Chloride, mg/L	250	46 – 200	101
Nitrate-N (NO_3-N), mg/L **converted from nitrate as NO_3**	10	ND – 4.4	1.3

ND = non-detect
Source of data: Marina Coast Water District Consumer Confidence Report (2012)

3.12.2 Carmel River System Water

During winter months, Cal-Am imports water from the Carmel Alluvial River Aquifer to: 1) inject into Santa Margarita aquifer ASR wells, and 2) supply to customers in the Seaside basin once flows at the Robles del Rio gage on the Carmel River are greater than 40 cubic feet per second (cfs). Table 9 summarizes the range in selected concentrations from 2009 through 2012 together with the basin's WQOs.

Table 9: Imported Water Quality from the Carmel River System by Cal-Am

Constituent	Seaside Basin WQO mg/L	Carmel River System Water Quality Range mg/L	Carmel River System Water Quality Average mg/L
TDS, mg/L	500	280 – 385	317
Chloride, mg/L	250	23 – 28	26
Nitrate-N (NO_3-N), mg/L	10	ND – 0.3	0.1

ND = non-detect,
Source of data: MPWMD water quality database

Water from the Carmel River system is of higher quality than the native groundwater into which it is injected in the deep Santa Margarita aquifer. In particular, TDS and associated anions and cations, and hardness are substantially lower.

3.13 RECYCLED WATER QUALITY

The only source of recycled water currently used in the Seaside basin is from the Pasadera Wastewater and Recycling Facility that supplies irrigation water to the Nicklaus Club-Monterey (formerly Pasadera Country Club). Recycled water is blended with groundwater produced from two golf course wells (Main Gate and Paddock) at a ratio of approximately ten parts groundwater to one part recycled water before being irrigated. Average effluent water quality delivered in 2012 for irrigation is summarized in Table 10.

Table 10: Nicklaus Club-Monterey Recycled Water Quality for Golf Course Irrigation

Constituent	Seaside Basin WQO mg/L	Pasadera Well Quality* for 2012 mg/L	Recycled Water Quality** Averages for 2012 mg/L	Calculated 10:1 Blended Quality mg/L
TDS, mg/L	500	868	1,241	902
Chloride, mg/L	250	191	375	208
Nitrate-N (NO_3-N), mg/L **converted from nitrate as NO_3**	10	non-detect	2.3	non-detect

Source of Data: Watermaster* and Cal-Am**

3.14 SAND CITY DESALINATION BRINE QUALITY

The City of Sand City has a 300 acre-foot per year capacity desalination plant located in the dunes off Bay Street. The source water for the desalination plant is shallow brackish groundwater from the Southern Coastal subarea extracted by shallow beach wells. Sand City was granted rights to pumping this brackish water in the Amended Decision. Byproduct or reject water from the plant is disposed through a horizontal well beneath the beach in Sand City. The plant has been operating since April 2010 for municipal supply.

The reject water has a TDS similar to seawater and non-detect nitrate. The injected reject water is designed to flow into the ocean beneath the beach, and therefore is designed to have little impact on the basin's groundwater.

3.15 RAINFALL WATER QUALITY

The water quality of rainfall is generally low in salts and nutrients (Table 11). During infiltration into the ground, infiltrating rainwater picks up salts and nutrients that have been deposited on the ground. Atmospheric deposition of nitrogen is one source that has the potential to mobilize nutrients by infiltrating rain. As rainwater percolates through the vadose zone, it can further mobilize salts and nutrients, which increases concentrations.

Table 11: Water Quality of Rain Water

Constituent	Seaside Basin WQO mg/L	Rain Water Average mg/L
TDS, mg/L converted from conductivity (x0.59)	500	2.8
Chloride, mg/L	250	0.5
Nitrate-N (NO_3-N), mg/L converted from nitrate as NO_3	10	0.05

Source of data: National Atmospheric Deposition Program/NTN, Pinnacles National Monument-Bear Valley, San Benito County (CA66).

SECTION 4
SALT AND NUTRIENT SOURCES

4.1 EXISTING SOURCES

Table 12 summarizes the existing salt and nutrient sources that are/could be introduced into Seaside basin groundwater. Each of the sources are discussed in some detail in the subsections below.

Table 12: Summary of Existing Salt and Nutrient Sources

Potential Salt and/or Nutrient Source	How Introduced to the Basin
Rainfall	Infiltration and percolation in permeable areas
Atmospheric deposition	Deposition, infiltration and percolation
Mineral dissolution	Dissolution of Monterey shale formation
Storm water	Infiltration and percolation
Landscape fertilizer	Fertilization, infiltration and percolation
Golf course fertilizer	Nicklaus Club-Monterey (formerly Pasadera Country Club)
	Bayonet and Black Horse Golf Courses
	Laguna Seca Golf Ranch
Carmel River system water	Injection into Santa Margarita aquifer
	Landscape and sports field irrigation
Salinas Valley groundwater	Return flow of irrigation water from Bayonet/Black Horse Golf Courses
	Landscape and sports field irrigation
City of Sand City desalination plant	Brine disposal into coastal groundwater
Irrigation with recycled water from Pasadera Wastewater/Recycling Facility	Return flow of irrigation water from Nicklaus Club-Monterey
Seaside Basin groundwater	Return flow of water from landscape, golf course, and sports field irrigation
Septic tanks	Leaching and percolation
System losses (water and sewer)	Percolation

4.1.1 DEEP PERCOLATION OF RAINFALL

Rainfall falling on impervious surface has an opportunity to infiltrate into the basin. A large portion of the basin is undeveloped and is underlain by permeable sands, which enhances deep percolation of rainfall. The salts and nutrients contained in rainfall are very low and not a significant loading source in themselves. Percolating rainwater mobilizing salts and nutrients in the vadose zone and atmospheric deposition of salts and nutrients on the ground surface are other potential contributors to loading in the basin.

The amount of deep percolation of rainfall was obtained from the Seaside Basin groundwater model (HydroMetrics LLC, 2009b). Average annual deep percolation occurring over the last five years of the calibrated model (2005 – 2009) was outputted from the model for each of the four subareas.

VADOSE ZONE MOBILIZATION

The processes that mobilize salts and nutrients in the vadose zone are assumed to be stable and occurring under steady-state conditions. This source was therefore not included in the salt and nutrient balance.

ATMOSPHERIC DEPOSITION

The type of surface dictates the transport behavior of salts and nutrients from atmospheric deposition. The UC Davis study on addressing nitrate in California's drinking water (2012) assumed atmospheric deposition of nitrogen in natural areas is retained in the ecosystem and leaching into the groundwater basin is negligible. In urban areas, atmospheric deposition on impervious surfaces is removed by storm water or is sequestered by turf grass. Salts deposited by atmospheric processes are assumed to be insignificant.

4.1.2 MINERAL DISSOLUTION

Section 3.11.1 described groundwater in the Laguna Seca and Southern Coastal subareas as having elevated salts because of the shallow occurrence of Monterey shale formation in these areas of the basin. However, groundwater concentrations in the Laguna Seca and Southern Coastal subareas have remained relatively stable over time, which indicates that this process is in equilibrium and should not be included as a continual salt source.

4.1.3 STORM WATER

Collected storm water in the Seaside basin is either percolated into ponds or subsurface galleries, or flows out to the ocean by means of ocean outfalls and Roberts Lake. Only storm water that percolates down into the aquifers is a source of salts and nutrients to the basin. The water quality and hence the salt and nutrient load from storm water varies depending on the land use within the drainage area.

The volume of runoff generated is not as great as would be expected for a basin of the size of the Seaside basin. A large percentage of the land use is undeveloped, with sandy soils that have high permeability that allows for greater infiltration and less runoff.

The catchments for the various storm water outlets are delineated in Figure 2. The Canyon del Rey catchment that drains into Laguna Grande and Roberts Lake, and ultimately the Monterey Bay, only generates runoff from larger, less frequent storms. This is because the watershed during those storms is considered saturated which causes a larger percentage of runoff to occur as streamflow (Monterey County Flood Control and Water Conservation District, 1977). Rainfall and storm water generated in smaller more frequent storms mostly percolates directly into the basin. Within the Canyon Del Rey catchment there are a couple of percolation ponds that collect storm water that is recharged into the basin (Figure 2).

Available storm water quality data are summarized in Table 2.

4.1.4 LANDSCAPE AND GOLF COURSE FERTILIZATION

Fertilizer applied to residential, commercial, recreational, and public landscapes has the potential to infiltrate the ground surface and percolate into the groundwater basin. Nitrogen losses arise from potential losses to the atmosphere, immobilization, and denitrification of applied fertilizer. However, application rates often exceed actual plant uptake and excess water excess irrigation water in a sufficiently permeable soil root zone will cause nitrogen to leach through the soil profile and into the underlying aquifer.

Although some data suggest nitrate does not leach from highly managed turfs because of nitrogen sequestering, isotope studies have shown that there can be less than 1% leaching (UC Davis, 2012). Golf course fertilization rates are typically higher than other applications and according to Wu et al. (2007) can apply in excess of 2,180 pounds of nitrogen per acre per year. The UC Davis study (2012) derived a net leaching rate of 8.9 pounds of nitrogen per acre per year for urban landscapes and golf courses.

Based on the land use map (Figure 8), there are approximately 109 acres of sports fields in the Seaside basin. Given nitrogen leaching rate of 8.9 pounds per acre per year, the estimated annual nitrogen leached in to the groundwater from sports fields in the Seaside Basin is 970 pounds.

The leaching of nitrogen from fertilizers in residential and commercial properties was estimating by determining the number of parcels within the urban and rural residential land uses, and assuming an average landscape area of 770 acres to be irrigated (approximately a quarter of the urban, residential, and commercial acreage).

There are four golf courses in the Seaside basin. Table 13 summarizes the sizes and estimated fertilizer use based on the fertilized acreage determined from aerial photographs.

Table 13: Summary of Estimated Seaside Basin Golf Course Fertilizer Application

Golf Course	Operating Since	Approx. Fertilized Area (acres)	Leached Nitrogen * (pounds)
Nicklaus Club-Monterey (formerly Pasadera Country Club)	2000	100	890
Laguna Seca Golf Ranch	1970	99	881
Bayonet	1954	160	1,424
Black Horse	1964	112	997

* Assuming net leaching rate of 8.9 pounds nitrogen per acre per year (UC Davis, 2012)

4.1.5 CARMEL RIVER SYSTEM WATER

MPWMD/CAL-AM AQUIFER STORAGE PROJECT

Due to stresses on the Carmel River system and the State Water Control Board's order for Cal-Am to reduce diversions from the Carmel River, Cal-Am diverts excess winter and spring Carmel River flows for recharge and storage in the Seaside basin. The water is recovered from the basin by the ASR and other Cal-

Am wells in the dry summer months and delivered to Cal-Am customers. The project has two phases. Phase I, includes two ASR wells that inject a combined 920 AFY, under a water rights permit which has a maximum instantaneous diversion rate of 6.7 cfs, and is owned and operated by MPWMD. This first phase was commissioned in 2008.

Phase II of the ASR project has not yet been completely implemented. It consists of an additional two ASR wells that will inject an estimated 1,080 AFY, under a water rights permit which has a maximum instantaneous diversion rate of 8.0 cfs, and is owned by Cal-Am.

Quality of the water being injected is summarized in Table 9. This water is of higher quality than the native water into which is being injected.

RETURN FLOW FROM IRRIGATION

Water imported into the basin by Cal-Am for delivery to customers is from the Carmel River system. It is used for municipal purposes and mostly exported back out of the basin as wastewater. The portion used for domestic and municipal landscape irrigation within the basin has an opportunity to percolate into the aquifers as return flow.

It is assumed that 23% of Carmel River system water supplied to the Seaside basin is used for irrigation. The loading of salts and nutrients from return flow is estimated from the average concentrations provided for each subarea in Table 5 and the assumed volume of applied water.

4.1.6 SALINAS VALLEY GROUNDWATER WATER

BAYONET AND BLACK HORSE GOLF COURSES IRRIGATION

The Black Horse and Bayonet golf courses are adjacent courses that are owned by the City of Seaside and managed by BSL Golf Corporation. Historically, the City of Seaside has pumped two wells near the golf courses for turf irrigation. Because of their historic over-pumping, the City is currently paying back replenishment water to the Seaside Watermaster by purchasing water from Marina Coast Water District (MCWD) in-lieu of pumping their own wells. The source of water supplied by MCWD is Salinas Valley groundwater. This program started in 2011 and is expected to end in 2018.

RETURN FLOW FROM IRRIGATION

Water imported into the basin by MCWD is from Salinas Valley groundwater. It is used for municipal purposes and is mostly exported back out of the basin as wastewater. The portion used for domestic and municipal landscape irrigation within the basin has an opportunity to percolate into the aquifers as return flow.

It is assumed that 23% of Salinas Valley groundwater supplied is used for irrigation. The loading of salts and nutrients from return flow is estimated from the average concentrations provided for each subarea in Table 5 and the assumed volume of applied water.

4.1.7 CITY OF SAND CITY DESALINATION PLANT

The City of Sand City has a 300 acre-foot per year capacity desalination plant located in the dunes off Bay Street. The source water for the desalination plant is shallow brackish water from the Southern Coastal subarea. Sand City was granted rights to pumping this brackish water in the Amended Decision. Byproduct or reject water from the plant is disposed through a horizontal well beneath the beach in Sand City. The plant has been operating since April 2010 for municipal supply.

The reject water has a TDS and chloride concentration similar to seawater and very low nitrate. It is designed to flow into the ocean after being injected beneath the beach, and therefore is designed to have little impact on the basin's groundwater. Because of this, it is not considered in the loading analysis.

4.1.8 IRRIGATION WITH RECYCLED WATER

The only existing use of recycled water in the basin is for irrigation of the Nicklaus Club-Monterey golf course. The recycled water is provided by the Pasadera wastewater treatment and recycling facility. The wastewater is passed through a tertiary treatment process and disinfected with sodium hypochlorite. All recycled wastewater from the facility is reused on the golf course. The recycled water is stored in a lined storage reservoir where it is blended with well water at a ratio of approximately ten parts well water to one part recycled water before application on the golf course (RWQCB, Central Coast, 2011b). The facility is permitted under Waste Discharge and Recycled Water Producer Requirements Order No. 98-58 and application of the recycled water is permitted under Recycled Water User Requirements Order No. 98-59.

According to the RWQCB (2011b), the facility has had trouble with salt violations of its permit due to:

1. Poor water supply quality. The water supply is local groundwater which has elevated hardness and alkalinity,
2. Widespread use of residential self-regenerating water softeners to combat the hard water which increase the salt load to the wastewater collection system,
3. Spa and pool water discharges to the wastewater collection system,
4. Use of sodium hypochlorite to meet disinfection requirements at the treatment facility, and
5. Effluent concentration limits set in the permit.

Effluent concentration limits for recycled water discharged to the lined storage reservoir are: 600 mg/L for TDS, and 125 mg/L for both sodium and chloride. Table 14 shows how the local groundwater quality regularly exceeds these limits.

Table 14: Comparison of Groundwater Supply, Influent, and Effluent from 2006 - 2010

mg/L	Groundwater Supply			Facility Influent			Facility Effluent		
	TDS	Sodium	Chloride	TDS	Sodium	Chloride	TDS	Sodium	Chloride
Min	639	105	132	853	97	146	1,260	257	428
Max	655	149	179	1,970	264	748	1,890	423	702
Ave	647	130	157	1,249	200	352	1,557	314	562

Data is based on 2006 – 2010 coincident semi-annual monitoring data
Source of data: Central Coast RWQCB, 2011b

The 2012 effluent volumes generated are listed in Table 15.

It is noted that the Court assigned Alternative Producer Allocation for the Nicklaus Club Monterey golf course is less than the amount of groundwater required to meet the 10:1 dilution requirement of Recycled Water User Requirements Order No. 98-59.

Table 15: Pasadera Wastewater Treatment and Recycling Facility Effluent Volumes for 2012

Month	Effluent Volume	
	gallons	Acre-feet
January	1,397,965	4.3
February	1,209,034	3.7
March	1,323,776	4.1
April	1,273,185	3.9
May	1,350,383	4.1
June	1,243,437	3.8
July	1,305,065	4.0
August	1,361,143	4.2
September	1,423,123	4.4
October	1,284,403	3.9
November	1,209,140	3.7
December	1,302,107	4.0
Total	15,682,761	48.1

4.1.9 Seaside Basin Groundwater Return Flow

A portion of the native groundwater used for landscape, golf course, and sports field irrigation will infiltrate the ground surface and percolate into the aquifer. In this report, this water is called return flow. It is assumed that 23% of groundwater pumped in each subarea is used for irrigation. The loading of salts and nutrients from return flow is estimated from the average concentrations provided for each subarea in Table 5 and the assumed volume of applied water.

4.1.10 Septic Systems

Only approximately 10-20% nitrogen removal is achievable in conventional septic systems (Siegrist et. al., 2000). Septic systems are designed to overflow to a leach field buried in approximately three feet of soil. Due to anaerobic conditions in the septic tank, nitrogen is predominantly ammonium, with the remainder in organic form (UC Davis, 2000). A number of other nitrogen transformations can occur beneath the leach field. The UC David study assumed that all nitrogen leaching from properly functioning septic systems reaches groundwater as nitrate.

4.1.11 SYSTEM LOSSES

Within the water purveyor service areas, there are water and sewer distribution system losses that contribute a small amount to groundwater recharge. Water from system losses is assumed to directly recharge the groundwater basin, and is not involved in evapotranspiration (ET).

4.2 PROPOSED SOURCES

Three proposed projects with potential impacts to the Seaside basin are currently in their planning stages. Table 16 summarizes the three projects, which all import water from various sources of better quality than the native groundwater into the Seaside basin.

Table 16: Summary of Foreseeable Salt and Nutrient Sources

Proposed Project	Potential Source of Salt and Nutrients
Regional Urban Water Augmentation Project (RUWAP)	Irrigation of Bayonet/Black Horse Golf Courses with recycled water
Groundwater Replenishment Project by the Monterey Regional Water Pollution Control Agency	Recharge recycled water by injection into both the shallow and deep aquifers
MPWMD/Cal-Am Aquifer Storage Project Phase II	Injection of Carmel River water into the deep aquifer

4.2.1 REGIONAL URBAN WATER AUGMENTATION

The Regional Urban Water Augmentation Project (RUWAP) comprises a recycled water distribution system by MCWD to provide up to 1,727 AFY of recycled water from MRWPCA's existing Salinas Valley Reclamation Plant (SVRP) to urban users within the Ord Community (former Fort Ord) and the Monterey Peninsula. Approximately 300 AFY would be made available to the Monterey Peninsula with the remainder being supplied for redevelopment of Fort Ord. Between 450 and 500 AFY of irrigation water would be provided to the City of Seaside golf courses (Black Horse and Bayonet).

With the exception of a winter storage reservoir, the project design is essentially complete, and most of the right-of-way for the pipelines has been acquired. Some sections of pipeline have already been installed as components of roadway projects constructed under the Fort Ord Reuse Plan. The project is three to five years from completion.

Currently, the Seaside golf courses are being irrigated with Salinas Valley groundwater imported into the Seaside basin by MCWD. The change from Salinas Valley groundwater to recycled water will cause a slight increase in salt and nutrient loading.

4.2.2 GROUNDWATER REPLENISHMENT PROJECT

Monterey Regional Water Pollution Control Agency's (MRWPCA) proposed Groundwater Replenishment Project (GWRP) is currently involved in the California Environmental Quality Act (CEQA) process. The GWRP would produce 3,500 AFY of high quality water for injection into both the shallow Paso Robles (four wells) and deeper Santa Margarita (four wells) aquifers in the Seaside basin. To produce this volume of treated water, the GWRP requires a minimum of 4,321 AFY of raw source waters to feed the proposed new GWRP Advanced Water Treatment (AWT) Facility.

The mechanism of recharge is subject to revision during the CEQA process but has initially been planned as 10% into the Paso Robles aquifer through the use of vadose zone wells and 90% injected into the Santa Margarita aquifer. Advanced treatment of wastewater by the AWT plant will include reverse osmosis and microfiltration. The injection water's expected TDS will be less than 200 mg/L, and total nitrogen will be less than 5 mg/L. This water quality is better than the groundwater quality presently occurring in the area where the project is proposed. This means that the project will not cause additional salt and nutrient loading but contribute to improving the groundwater quality.

4.2.3 MPWMD/CAL-AM AQUIFER STORAGE PROJECT PHASE II

Phase II of the aquifer storage project described in Section 4.1.5 will be operational in 2014. It is owned by Cal-Am, and consists of an additional two ASR wells capable of injecting an annual average of approximately 1,080 AFY, under a water rights permit which has a maximum instantaneous diversion rate of 8.0 cfs from the Carmel River. The water quality of the injected water is summarized in Table 9. This water quality is better than the groundwater quality presently occurring in the Santa Margarita aquifer where the injection is targeted. This means that the project will not cause additional salt and nutrient loading but will contribute to improving the groundwater quality, as shown in Figure 12.

SECTION 5
EXISTING GROUNDWATER MONITORING PROGRAMS

Historical groundwater monitoring in the Seaside basin started in the mid-1950's when some records of coastal municipal well production and groundwater levels were kept. In 1980, the MPWMD established a coordinated program of collecting and reporting groundwater production in the basin. The program required the reporting of groundwater and surface water production from all water sources. In the early 1990's MPWMD pioneered a program to install dedicated monitoring wells completed within targeted aquifers in the coastal areas of the basin to monitor water quality and levels in an effort to monitor potential seawater intrusion. Since that time the MPWMD's monitoring network has been expanded to 25 wells at 18 locations in the Northern and Southern Coastal subareas, and 25 wells in 17 locations within the Laguna Seca and Northern Inland subareas.

As part of the Adjudicated Decision for the Seaside Groundwater Basin, the Watermaster was required to prepare a comprehensive monitoring and management program (MMP) to assist the Court in the administration and enforcement of the Decision and to ensure the basin is protected and managed as a perpetual source of water for beneficial uses. On February 9, 2007, the Court approved the Seaside Basin MMP which has continued to be implemented since that time.

The purpose of the monitoring portion of the MMP is to monitor current overdraft conditions and threat of potential seawater intrusion into the coastal subarea of the basin. Groundwater production, groundwater quality, and groundwater levels are included in the MMP. The MMP provides for groundwater level monitoring on at least a quarterly basis. Coastal monitoring well groundwater levels are measured monthly manually and have dataloggers set to record at least daily. Inland monitoring well groundwater levels are manually measured quarterly with some of the wells equipped with dataloggers set to record at least daily. Data are entered into the MPWMD/Watermaster database quarterly. Wells that are monitored are listed in Table 17 through Table 19. Figure 17 shows the location of all wells monitored.

Coastal monitoring wells are sampled quarterly using dedicated low-flow bladder pumps and tested for full general mineral and physical parameters.

Groundwater quality (full general mineral and physical parameters) is only collected from inland monitoring wells after they are completed and at the request of the Watermaster for special studies.

Producers who are Watermaster members are required to record monthly groundwater levels and production volumes from their production wells and report them to the Watermaster at least quarterly. Water quality samples (full general mineral and physical parameters) from active Watermaster producer coastal production wells are collected in the fourth quarter of each water year. All these data are entered into the MPWMD/Watermaster database quarterly.

The MPWMD/Cal-Am Aquifer Storage Project has a groundwater sampling and analysis plan (SAP) that provides for monitoring of ASR operations. The plan is subject to periodic updates, but essentially requires that MPWMD samples specific wells quarterly during periods the ASR wells are operating (Appendix A). The wells that are monitored as part of the SAP are included in Table 17 through Table 19. Figure 17 shows the location of wells monitored.

Another monitoring program in the area, which overlaps with the monitoring already described, is managed by the California Department of Public Health (CDPH), which requires testing of public water supply wells per the State defined monitoring schedule. See online link below to the CDPH monitoring program.
(http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Monitoring.aspx).
The annual data required by the Watermaster from water purveyors for active production wells exceeds the frequency of the CDPH monitoring schedule.

Table 17: Wells in the Laguna Seca Subarea Included in Existing Monitored Programs

					Watermaster MMP					ASR Monitoring by MPWMD	
Watermaster Number	Common Name	Owner	Well Type	Subarea	WL Monitoring Frequency	WL Network	WQ Monitoring Frequency	WQ Network	Monitored By	WL Monitoring Frequency	WQ Monitoring Frequency
135	**Justin Court**	**California American Water**	**Monitor**	**Laguna Seca**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**	**Quarterly**	**none**
209	Bishop #1 (west)	California American Water	Production	Laguna Seca	Monthly	Watermaster	Annually	Watermaster	CAW		
213	Ryan Ranch #7	California American Water	Production	Laguna Seca	Monthly	Watermaster	Annually	Watermaster	CAW		
215	Ryan Ranch #11	California American Water	Production	Laguna Seca	Monthly	Watermaster	Annually	Watermaster	CAW		
216	Ryan Ranch #8	California American Water	Production	Laguna Seca	Monthly	Watermaster	Annually	Watermaster	CAW		
226	Bay Ridge	California American Water	Production	Laguna Seca	Monthly	Watermaster	none	none	CAW		
242	**CalAm Granite Construction**	**California American Water**	**Monitor**	**Laguna Seca**	**Quarterly**	**Watermaster**	**none**	**none**	**MPWMD**		
262	Bishop #3	CAW	Production	Laguna Seca	Monthly	Watermaster	Annually	Watermaster	CAW		
136	**LS Pistol Range**	**County of Monterey**	**Monitor**	**Laguna Seca**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**		
137	**York Rd-West**	**County of Monterey**	**Monitor**	**Laguna Seca**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**		
138	**Seca Place**	**County of Monterey**	**Monitor**	**Laguna Seca**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**		
139	**Robley Shallow (North)**	**County of Monterey**	**Monitor**	**Laguna Seca**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**		
140	**Robley Deep (South)**	**County of Monterey**	**Monitor**	**Laguna Seca**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**		
141	**LS Driving Range**	**County of Monterey**	**Monitor**	**Laguna Seca**	**Quarterly**	**Watermaster**	**Annually**	**Watermaster**	**MPWMD**		
142	**LS No. 1 Subdivision**	**Laguna Seca Resorts**	**Monitor**	**Laguna Seca**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**		
143	**Blue Larkspur-East End**	**Laguna Seca Resorts**	**Monitor**	**Laguna Seca**	**Quarterly***	**MPWMD**	**none**	**none**	**MPWMD**		
144	LS Golf Old #12	Laguna Seca Resorts	Production	Laguna Seca	Monthly	MPWMD	none	none	LSGR		
196	LSRA #2	Monterey County Parks Department	Production	Laguna Seca	Monthly	Watermaster	none	none	MCPD		
197	LSRA #1	Monterey County Parks Department	Production	Laguna Seca	Monthly	Watermaster	none	none	MCPD		
129	**FO-04-Shallow (E)**	**MPWMD**	**Monitor**	**Laguna Seca**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**		
130	**FO-04-Deep (W)**	**MPWMD**	**Monitor**	**Laguna Seca**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**		
133	**FO-06-Shallow**	**MPWMD**	**Monitor**	**Laguna Seca**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**		
134	**FO-06-Deep**	**MPWMD**	**Monitor**	**Laguna Seca**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**		
204	Pasadera Golf - Paddock	Pasadera Country Club, LLC	Production	Laguna Seca	Monthly	Watermaster	none	none	Pasadera		
208	Pasadera Golf - Main Gate	Pasadera Country Club, LLC	Production	Laguna Seca	Monthly	Watermaster	none	none	Pasadera		
212	York School 2001	York School	Production	Laguna Seca	Monthly	Watermaster	Annually	Watermaster	MPWMD		

Bold indicates monitoring well

Table 18: Wells in the Northern Coastal Subarea Included in Existing Monitored Programs

					Watermaster MMP					ASR Monitoring by MPWMD	
Watermaster Number	Common Name	Owner	Well Type	Subarea	WL Monitoring Frequency	WL Network	WQ Monitoring Frequency	WQ Network	Monitored By	WL Monitoring Frequency	WQ Monitoring Frequency
107	**Ord Grove Test**	**California American Water**	**Monitor**	**Northern Coastal**	**Monthly**	**MPWMD**	**none**	**none**	**MPWMD**	**Daily***	**Quarterly**
151	Military	California American Water	Production	Northern Coastal	Monthly	Watermaster	none	none	CAW		
153	Ord Grove #2	California American Water	Production	Northern Coastal	Monthly	Watermaster	Annually	Watermaster	CAW		**Quarterly**
159	Luzern #2	California American Water	Production	Northern Coastal	Monthly	Watermaster	Annually	Watermaster	CAW		
162	Playa #3	California American Water	Production	Northern Coastal	Monthly	Watermaster	Annually	Watermaster	CAW		
163	**Playa #4**	**California American Water**	**Monitor**	**Northern Coastal**	**Monthly**	**CAW**	**none**	**none**	**CAW**		
169	Paralta	California American Water	Production	Northern Coastal	Monthly	Watermaster	Annually	Watermaster	CAW		**Quarterly**
231	**Del Monte Test**	**California American Water**	**Monitor**	**Northern Coastal**	**Monthly**	**CAW**	**Annually**	**Watermaster**	**CAW**		
243	**Luxton**	**California American Water**	**Monitor**	**Northern Coastal**	**Monthly**	**CAW**	**none**	**none**	**CAW**		
173	Seaside Muni #4	City of Seaside	Production	Northern Coastal	Monthly	Watermaster	Annually	Watermaster	City of Seaside		
174	Seaside Muni #3	City of Seaside	Production	Northern Coastal	Monthly	Watermaster	Annually	Watermaster	City of Seaside		
187	Seaside Golf - Reservoir	City of Seaside	Production	Northern Coastal	Quarterly	Watermaster	Annually	Watermaster	Coty of Seaside		
189	Seaside Golf - Coe	City of Seaside	Production	Northern Coastal	Quarterly	Watermaster	Annually	Watermaster	City of Seaside		
152	Target Well	DBO Development	Production	Northern Coastal	Monthly	MPWMD	none	none	MPWMD		
154	**MMP monitor**	**Mission Memorial Park**	**Monitor**	**Northern Coastal**	**Monthly**	**Watermaster**	**none**	**none**	**MPWMD**		
101	**MSC-Shallow**	**MPWMD**	**Monitor**	**Northern Coastal**	**Monthly**	**MPWMD**	**Quarterly**	**Watermaster**	**MPWMD**		
102	**MSC-Deep**	**MPWMD**	**Monitor**	**Northern Coastal**	**Monthly***	**MPWMD**	**Quarterly***	**Watermaster**	**MPWMD**		
103	**PCA-W Shallow**	**MPWMD**	**Monitor**	**Northern Coastal**	**Quarterly**	**MPWMD**	**Quarterly***	**Watermaster**	**MPWMD**		
104	**PCA-W Deep**	**MPWMD**	**Monitor**	**Northern Coastal**	**Quarterly***	**MPWMD**	**Quarterly***	**Watermaster**	**MPWMD**		
105	**PCA-E Shallow**	**MPWMD**	**Monitor**	**Northern Coastal**	**Monthly**	**MPWMD**	**Annually**	**Watermaster**	**MPWMD**	Daily*	Quarterly
106	**PCA-E Deep**	**MPWMD**	**Monitor**	**Northern Coastal**	**Monthly**	**MPWMD**	**Annually**	**Watermaster**	**MPWMD**	Daily*	Quarterly**
108	**Paralta Test**	**MPWMD**	**Monitor**	**Northern Coastal**	**Monthly**	**MPWMD**	**none**	**none**	**MPWMD**	Daily*	Quarterly
109	**Ord Terrace-Shallow**	**MPWMD**	**Monitor**	**Northern Coastal**	**Annually**	**MPWMD**	**Annually**	**Watermaster**	**MPWMD**	Daily*	Quarterly
110	**Ord Terrace-Deep**	**MPWMD**	**Monitor**	**Northern Coastal**	**Monthly**	**MPWMD**	**Annually**	**Watermaster**	**MPWMD**		
111	**FO-09-Shallow**	**MPWMD**	**Monitor**	**Northern Coastal**	**Monthly***	**MPWMD**	**Quarterly***	**Watermaster**	**MPWMD**		
112	**FO-09-Deep**	**MPWMD**	**Monitor**	**Northern Coastal**	**Monthly***	**MPWMD**	**Quarterly***	**Watermaster**	**MPWMD**		
251	**CDM MW-1**	**MPWMD**	**Monitor**	**Northern Coastal**	**Monthly**	**Watermaster**	**none**	**none**	**MPWMD**		
252	**CDM MW-2**	**MPWMD**	**Monitor**	**Northern Coastal**	**Monthly**	**Watermaster**	**none**	**none**	**MPWMD**		
261	**ASR - 3**	**MPWMD**	**Monitor**	**Northern Coastal**	**Quarterly**	**MPWMD**	**Annually**	**MPWMD**	**MPWMD**	Daily*	Quarterly
283	**ASR - 4**	**MPWMD**	**Monitor**	**Northern Coastal**	**Quarterly**	**MPWMD**	**Annually**	**MPWMD**	**MPWMD**	Daily*	Quarterly
248	**Sentinel MW #4**	**Seaside Watermaster**	**Monitor**	**Northern Coastal**	**Monthly**	**Watermaster**	**Annually**	**Watermaster**	**MPWMD**		
171	PCA Production	Security National Guaranty Inc	Production	Northern Coastal	Monthly	Watermaster	none	none	Craig Evans		
259	**Seaside Middle School (S)**	**MPWMD**	**Monitor**	**Northern Coastal**						Monthly	Quarterly
260	**Seaside Middle School (D)**	**MPWMD**	**Monitor**	**Northern Coastal**						Monthly	Quarterly**

Bold indicates monitoring well
* in water level column indicates datalogger is installed
** in water quality column indicates low-flow bladder pump is installed for sampling

Table 19: Wells in the Northern Inland and Southern Coastal Subareas Included in Existing Monitored Programs

					Watermaster MMP					ASR Monitoring by MPWMD	
Watermaster Number	Common Name	Owner	Well Type	Subarea	WL Monitoring Frequency	WL Network	WQ Monitoring Frequency	WQ Network	Monitored By	WL Monitoring Frequency	WQ Monitoring Frequency
115	**FO-01-Shallow**	**MPWMD**	**Monitor**	**Northern Inland**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**		
116	**FO-01-Deep**	**MPWMD**	**Monitor**	**Northern Inland**	**Quarterly**	**MPWMD**	**none**	**none**	**MPWMD**		
118	**FO-07-Shallow**	**MPWMD**	**Monitor**	**Northern Inland**	**Monthly**	**MPWMD**	**none**	**none**	**MPWMD**	**Daily***	**Quarterly**
119	**FO-07-Deep**	**MPWMD**	**Monitor**	**Northern Inland**	**Monthly**	**MPWMD**	**none**	**none**	**MPWMD**	**Daily***	**Quarterly**
188	**ASR - 1**	**MPWMD**	**Monitor**	**Northern Inland**	**Quarterly**	**MPWMD**	**Annually**	**MPWMD**	**MPWMD**	**Daily***	**Quarterly**
256	**ASR - 2**	**MPWMD**	**Monitor**	**Northern Inland**	**Quarterly**	**Watermaster**	**none**	**none**	**MPWMD**	**Daily***	**Quarterly**
257	**ASR MW-1**	**MPWMD**	**Monitor**	**Northern Inland**	**Quarterly**	**Watermaster**	**none**	**none**	**MPWMD**	**Daily***	**Quarterly**
177	Plumas #4	California American Water	Production	Southern Coastal	Monthly	Watermaster	Annually	Watermaster	CAW		
184	La Salle #2	California American Water	Production	Southern Coastal	Monthly	CAW	Annually	Watermaster	CAW		
244	**Hilby MGT**	**California American Water**	**Monitor**	**Southern Coastal**	**Monthly**	**Watermaster**	**none**	**none**	**CAW**	**Daily***	
165	Sand City Corp Yard	City of Sand City	Production	Southern Coastal	Monthly	Watermaster	Annually	Watermaster	MPWMD		
167	Design Ctr.	City of Sand City	Production	Southern Coastal	Monthly	Watermaster	Annually	Watermaster	MPWMD		
150	Cypress Pacific Production	King Venture	Production	Southern Coastal	Monthly	Watermaster	Annually	Watermaster	MPWMD		
156	Mission Memorial	Mission Memorial Park	Production	Southern Coastal	Quarterly	Watermaster	Annually	MPWMD	MPWMD		
124	**Plumas Test 1990**	**MPWMD**	**Monitor**	**Southern Coastal**	**Monthly**	**MPWMD**	**none**	**none**	**MPWMD**		
125	**K-Mart**	**MPWMD**	**Monitor**	**Southern Coastal**	**Monthly**	**MPWMD**	**none**	**none**	**MPWMD**		
238	**CDM MW-4**	**MPWMD**	**Monitor**	**Southern Coastal**	**Monthly**	**Watermaster**	**none**	**none**	**MPWMD**		
239	**CDM MW-3**	**MPWMD**	**Monitor**	**Southern Coastal**	**Monthly**	**Watermaster**	**none**	**none**	**MPWMD**		
240	**MW-BW-08-A**	**U.S.A. Fort Ord**	**Monitor**	**Southern Coastal**	**Monthly**	**Watermaster**	**none**	**none**	**MPWMD**		
241	**MW-BW-09-180**	**U.S.A. Fort Ord**	**Monitor**	**Southern Coastal**	**Monthly**	**Watermaster**	**none**	**none**	**MPWMD**		

Bold indicates monitoring well
* in water level column indicates datalogger is installed
** in water quality column indicates low-flow bladder pump is installed for sampling

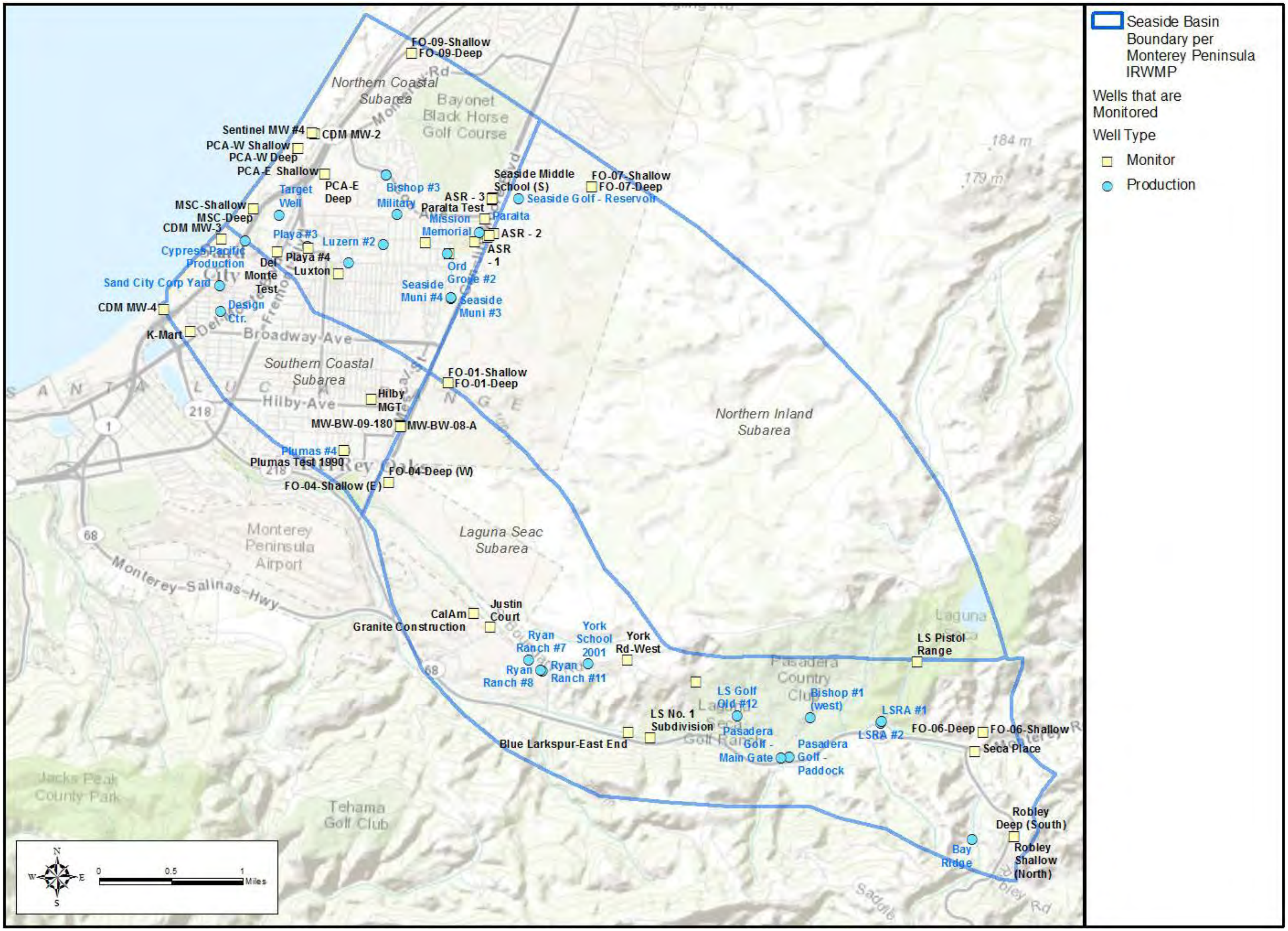

Figure 17: Location of Wells Monitored (Production and Dedicated Monitoring Wells)

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SECTION 6
EXISTING DATABASES

6.1 EXISTING DATABASE IDENTIFICATION AND DESCRIPTION

MPWMD, working with the Watermaster has developed a database that contains groundwater quality and groundwater level data collected within the Seaside Groundwater Basin. The database is in 2010 MS Access format and has been adapted from an earlier database initially developed by Watermaster consultants in 2006. MPWMD maintains the database on a quarterly basis. The database is backed up weekly, with backup tapes rotated, and kept in an off-site lockbox.

Water quality data contained in the MPWMD database includes data collected for Watermaster required monitoring, Carmel River system specific monitoring, ASR specific monitoring, and remaining areas within the MPWMD service area.

Groundwater level data contained in the database includes groundwater levels collected since 2008 for Watermaster-required monitoring and all data MPWMD has historically collected prior to the establishment of the Watermaster and in connection with regulatory requirements for ASR. The database does not contain groundwater level data recorded by dataloggers.

A streamflow database developed and maintained by the MPWMD is separate from the MS Access groundwater database. The streamflow database includes flows and water quality. Of relevance to the Seaside basin is the streamflow record of Arroyo Del Rey at Del Rey Oaks. This streamflow monitoring gage has been maintained by MPWMD since October 2002.

6.2 RECOMMENDED DATABASE

It is recommended that the current MPWMD/Watermaster database be used as the data storage location for any groundwater data collected as part of salt and nutrient monitoring. The database provides a comprehensive, maintained, well-established location for groundwater data collected for the Seaside basin.

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SECTION 7
SALT AND NUTRIENT EVALUATION

7.1 WATER BALANCE

7.1.1 CONCEPTUAL MODEL

The conceptual model used for this salt and nutrient management plan is a simplified representation of the essential features of the basin's physical system, its hydrologic behavior, and man-made components that influence the water balance. These data, interpretations, and simplifications form the basis of the salt and nutrient balance that follows.

The water balance consists of developing quantitative estimates of all of the inflows and outflows for the basin, both natural and man-made. The water balance developed for the Seaside Basin groundwater model (HydroMetrics LLC, 2009b) is used as a primary source with water imports and exports from the basin also included, as these were not part of the original hydrologic water balance prepared for the groundwater flow model. A graphical conceptual depiction of the water balance is provided in Figure 18. The following sections describe each of the water balance components. Table 20 summarizes the annual average water balance components.

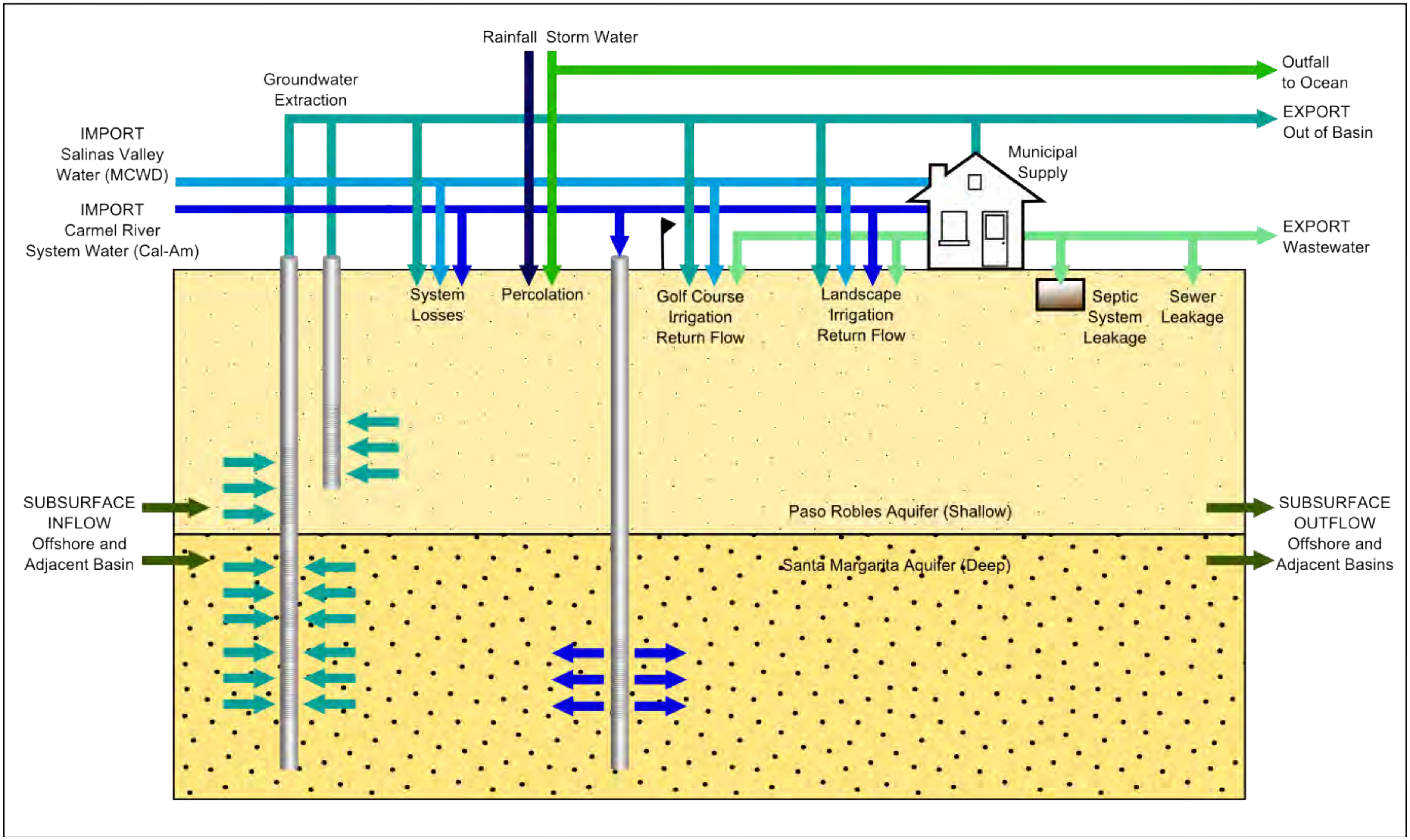

Figure 18: Conceptual Water Balance

7.1.2 INFLOWS

Inflows to the Seaside basin include all water that is naturally and artificially brought into the basin. Natural inflow mechanisms adding water to the groundwater system include:

1. Deep percolation of rainfall, and
2. Underflow from onshore and offshore areas (inflow).

Water introduced into the groundwater basin by artificial or man-made means include:

1. Imported water from outside the basin,
2. Losses from water distribution systems,
3. Losses from sewer system,
4. Septic systems,
5. Return flow from irrigation,
6. Infiltration from storm water ponds.

Although a general discussion of each of the inflow terms have already been included in Section 4, more detail on the quantity and source of flow data is provided in this section.

DEEP PERCOLATION OF RAINFALL

The amount of deep percolation occurring in each subarea of the Seaside basin was extracted from the calibrated Seaside basin groundwater flow model (HydroMetrics LLC, 2009b). The primary source of data for the model was daily rainfall data were obtained from Monterey Co-op Station 45795 and Salinas Co-op Station 47668 (Figure 3). The resultant amount of deep percolation from rainfall was calculated at each model cell using a combination of daily rainfall, monthly evapotranspiration, land use type, and soil classifications. The amount of deep percolation of rainfall in the Seaside basin is approximately 2,258 AFY (Table 20).

Table 20: Seaside Basin Water Balance

Water Balance Component	Northern Coastal	Northern Inland	Southern Coastal	Laguna Seca	Basin Total
Inflows (AFY)					
Precipitation	78	1,450	30	700	2,258
Groundwater Underflow					
From Onshore	2,850	0	450	180	180*
From Offshore	100	0	0	0	100
ASR Wells (Injection)	625	0	0	0	625
Water Distribution System Losses	411	0	21	46	478
Sewer Distribution System Losses	77	0	9	19	105
Septic Systems	0	0	5	22	27
Irrigation Infiltration					
Golf Courses	85	0	0	88	173
Landscaping	461	0	52	114	627
Recycled Water Irrigation	0	0	0	9	9
Storm Water	68	0	37	0	105
Total Inflow	***4,754***	***1,450***	***604***	***1,177***	***7,985***
Outflows (AFY)					
Groundwater Pumping	4,278	0	227	869	5,374
Groundwater Underflow					
To Onshore	0	2,060	790	450	0*
To Offshore	70	0	30	0	100
Total Outflow	***4,348***	***2,060***	***1,047***	***1,319***	***8,774***
Storage Change (Inflow - Outflow)	**406**	**-610**	**-443**	**-142**	**-789**

* This value is not equal to the sum of the four subarea columns; it is a summary for the entire basin which is made up of all four subareas combined. The subarea columns are a summary of the water balance for each subarea. The four subarea columns include exchanges of groundwater between subareas, as they are an important source of loading and removal of salts and nutrients for individual subareas. The basin-wide value, however, only considers inputs to or outputs from the entire basin. The net values (total groundwater inflow less total groundwater outflow) derived from each approach are equivalent.

Underflow from Onshore and Offshore Areas

Inflow to the basin from adjacent basins is limited to the northeastern boundary connection to the Salinas Valley. Between subareas there is also groundwater underflow. The estimated underflow into each subarea is shown on Table 20. A total of 180 AFY of water enters the basin as groundwater underflow from inland areas. The southern basin boundary is considered a no-flow boundary because it coincides with the Chupines Fault that marks the southernmost extent of the Seaside basin.

A minor amount of groundwater underflow (100 AFY) occurs from the ocean into the basin. This does not constitute seawater intrusion as the basin's aquifers extend offshore. The source of these data is the water balance included in the Seaside basin groundwater flow model report (HydroMetrics LLC, 2009b).

IMPORTED WATER

Approximately 625 AFY of Carmel River system water is imported by MPWMD/Cal-Am for direct injection into the Santa Margarita aquifer. This amount is dependent on water availability in the Carmel River and therefore changes, sometimes significantly, each year.

Municipal and irrigation water is imported into the basin by both Cal-Am and MCWD. The amounts imported over the past two years average: 186 AFY for Cal-Am (Carmel River system water) and 927 AFY for MCWD (Salinas Valley water). The MCWD water is used in the Northern Coastal subarea by the Bayonet and Black Horse golf courses and the residential areas north of Coe Ave. Cal-Am uses its imported water to supply its customers in all the basin's subareas.

Water imported for use in the basin is not a recharge component to the water balance. Various uses of the water become recharge components, such as distribution system losses and irrigation return flow. These are discussed in the following sub-sections.

LOSSES FROM WATER DISTRIBUTION SYSTEMS

Within the water purveyor service areas, there are system losses that contribute a small amount to groundwater recharge. A loss of 8.5% of water distributed to customers by water purveyors was assumed for the water balance. Volumes were provided by MPWMD (groundwater), MCWD (imported Salinas Valley water), and Cal-Am (groundwater and imported Carmel River system water). Water from system losses is assumed to directly recharge the groundwater basin, and is not involved in evapotranspiration. Losses from water distribution systems account for approximately 478 AFY of recharge to the basin (Table 20).

LOSSES FROM SEWER DISTRIBUTION SYSTEMS

The volume of sewer system losses was estimated as 5% of the amount of water remaining from imported water and local groundwater after system losses and irrigation return flow are accounted for. For the Seaside basin this amount is estimated as 105 AFY (Table 20).

SEPTIC SYSTEMS

To estimate the amount of groundwater recharge by septic systems, water use of 140 gallons per day per capita was assumed, with 40% of that use being indoor use that gets disposed in the septic system. The number of people residing in each of the septic tank areas was estimated using 2010 census data. The average recharge from septic systems is 27 AFY.

RETURN FLOW FROM IRRIGATION

Return flow from irrigation was estimated separately for golf courses and landscape irrigation. For golf courses, it was assumed that irrigation efficiencies are 80% and therefore 20% of applied water becomes return flow and recharges the basin. For urban, residential, industrial, and commercial landscape irrigation, it was assumed that of the amount of imported and local groundwater water distributed by water purveyors and private landowners less system losses, 23% becomes irrigation return flow and recharges the groundwater basin. Of the recycled water that is diluted with local groundwater for irrigation of the Nicklaus Club-Monterey golf course, it was assumed that because the recycled water is stored in an open pond, 10% evaporates, and then of the remaining portion, an 80% irrigation efficiency was applied.

Estimates of irrigation return flow as shown in Table 20 are 173 AFY from golf courses, 627 AFY from landscape irrigation, and 9 AFY of recycled water irrigation.

INFILTRATION FROM STORM WATER PONDS

Infiltration of storm water into five storm water ponds in the groundwater basin (Figure 2) was extracted from the groundwater flow model (HydroMetrics LLC, 2009b). The ponds are constructed to capture storm runoff and allow for percolation into the groundwater. Each percolation pond has a catchment area defined within the model area. Runoff from the catchment is diverted to its corresponding storm water pond. Water diverted to storm water ponds in the area typically infiltrates within 48 hours. Consequently, losses of recharge to ET are assumed to be negligible, and water recharged through the ponds is applied directly to groundwater recharge.

Based on output from the Seaside basin groundwater flow model, the average groundwater recharge from storm water ponds between 2008 and 2012 was 68 AFY for ponds in the northern area and 37 AFY in the southern area.

7.1.3 OUTFLOWS

Outflows from the Seaside basin include all discharge mechanisms that remove water from the groundwater system. Discharge components include:

1. Groundwater pumping by water agencies and private landowners,
2. Underflow to onshore and offshore areas (outflow).
3. Exported wastewater

GROUNDWATER PUMPING BY WATER AGENCIES AND PRIVATE LANDOWNERS

The Seaside basin groundwater producers include Cal-Am, City of Seaside, and a number of private pumpers. Production is reported to the Watermaster annually. For the water balance, it was estimated that based on production data for 2011 and 2012, an average of 5,374 AFY was extracted from the basin. Of note, approximately 60% of groundwater pumped by Cal-Am in the Seaside basin is exported out of the basin.

UNDERFLOW TO ONSHORE AND OFFSHORE AREAS

The same onshore and offshore sources as described in the inflow section above apply to the outflows that occur in the Seaside basin, i.e., across the northeastern boundary and to the ocean. In the water balance, approximately 100 AFY of water flows out of the basin and into onshore and offshore areas (Table 20). The source of these data is the water balance included in the Seaside basin groundwater flow model report (HydroMetrics LLC, 2009b).

EXPORT OF WASTEWATER

Like water imported into the basin, wastewater exported is not part of the groundwater balance but it is used to estimate sewer distribution system losses. Wastewater from the City of Seaside, Del Rey Oaks, Sand City, and Monterey is exported out of the basin to the MRWPCA's wastewater treatment plant to the north of the basin. After system losses, irrigation and consumptive uses are removed from the water imported from outside the basin and pumped from the basin, the remaining amount is assumed to be wastewater that is exported from the Seaside basin (approximately 1,900 AFY).

7.2 SALT AND NUTRIENT BALANCES

The salt and nutrient balance consists of developing quantitative estimates of all of the loadings and removals of salts and nutrients for the Seaside basin, both natural and man-made. The loadings and removals that comprise the salt and nutrient balance follow the components of the water balance. Salts and nutrients are carried into the basin with each of the different sources of water, of which each has a natural quantity of salts and nutrients and possibly an additional man-made source. Salts and nutrients are carried out of the basin with natural outflows and exports of water. A graphical conceptual depiction of the salt and nutrient balance is provided in Figure 19. The following sections describe each of the salt and nutrient balance components.

7.2.1 LOADING

Loadings to the Seaside basin include all salts and nutrients that are naturally and artificially brought into the basin. Natural mechanisms of salt and nutrient loading to the groundwater system include those carried by:

1. Deep percolation of rainfall, and
2. Underflow from onshore and offshore areas (inflow).

Salts and nutrients introduced into the groundwater basin by artificial or man-made means include those carried by:

3. Injection of imported water,
4. Losses from water distribution systems,
5. Losses from sewer systems,
6. Septic systems,
7. Return flow from irrigation,
8. Fertilizer application,
9. Infiltration from storm water ponds.

Although a general discussion of each of the sources has already been included in Section 4, more detail on the data and assumptions used to estimate loading are provided in this section. Table 21 through Table 23 summarize the salt and nutrient balances estimated for the Seaside basin, and Table 24 summarizes the different water source concentrations.

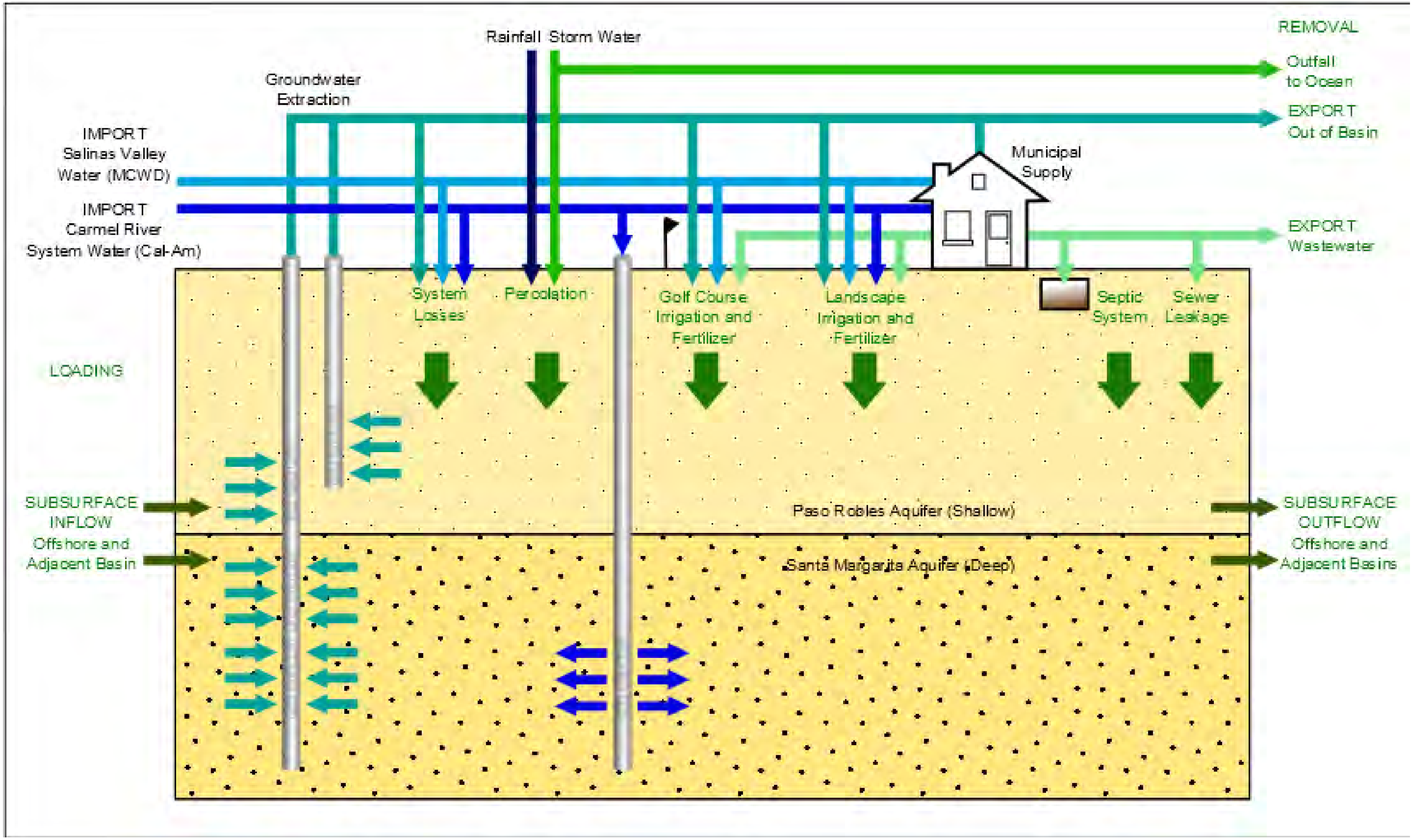

Figure 19: Conceptual Salt and Nutrient Balance

Table 21: Seaside Basin TDS Balance

Salt and Nutrient Balance Component	Northern Coastal	Northern Inland	Southern Coastal	Laguna Seca	Basin Total
Inflows (lb/yr)					
Precipitation	593	11,041	230	5,328	17,191
Groundwater Underflow					
From Onshore	3,388,324	0	1,008,928	193,836	292,260*
From Offshore	98,423	0	0	0	98,423
ASR Wells (Injection)	538,343	0	0	0	538,343
Water Distribution System Losses	408,175	0	38,184	89,934	536,293
Sewer Distribution System Losses	218,731	0	24,527	53,988	297,246
Septic Systems	0	0	13,694	62,423	76,116
Irrigation Infiltration					
Golf Courses	435,570	0	0	0	435,570
Landscaping	462,509	0	94,538	222,666	779,713
Recycled Water Irrigation	0	0	0	29,218	29,218
Storm Water	20,034	0	52,670	0	72,704
Total Inflow	***5,570,702***	***11,041***	***1,232,772***	***657,392***	***7,471,907***
Outflows (lb/yr)					
Groundwater Pumping	4,210,062	0	433,187	1,948,353	6,591,602
Groundwater Underflow					
To Onshore	0	1,880,759	1,507,566	1,008,928	0*
To Offshore	68,896	0	57,249	0	126,146
Total Outflow	***4,278,959***	***1,880,759***	***1,998,001***	***2,957,281***	***11,115,000***
Storage Change (Inflow - Outflow)	**1,291,743**	**-1,869,718**	**-765,230**	**-2,299,889**	**-3,643,094**

* This value is not equal to the sum of the four subarea columns; it is a summary for the entire basin which is made up of all four subareas combined. The subarea columns are a summary of the water balance for each subarea. The four subarea columns include exchanges of groundwater between subareas, as they are an important source of loading and removal of salts and nutrients for individual subareas. The basin-wide value, however, only considers inputs to or outputs from the entire basin. The net values (total groundwater inflow less total groundwater outflow) derived from each approach are equivalent.

Table 22: Seaside Basin Chloride Balance

Salt and Nutrient Balance Component	Northern Coastal	Northern Inland	Southern Coastal	Laguna Seca	Basin Total
Inflows (lb/yr)					
Precipitation	106	1,972	41	951	3,070
Groundwater Underflow					
From Onshore	821,494	0	293,331	41,117	64,270*
From Offshore	23,156	0	0	0	23,156
ASR Wells (Injection)	44,154	0	0	0	44,154
Water Distribution System Losses	94,286	0	11,682	24,440	130,408
Sewer Distribution System Losses	64,518	0	7,235	15,925	87,677
Septic Systems	0	0	4,039	18,412	22,452
Irrigation Infiltration					
Golf Courses	92,505	0	0	0	92,505
Landscaping	104,495	0	28,924	60,511	193,930
Recycled Water Irrigation	0	0	0	8,829	8,829
Storm Water	5,539	0	14,708	0	20,247
Total Inflow	***1,250,252***	***1,972***	***359,960***	***170,186***	***1,782,369***
Outflows (lb/yr)					
Groundwater Pumping	990,482	0	136,124	566,454	1,693,060
Groundwater Underflow					
To Onshore	0	347,760	473,734	293,331	0*
To Offshore	16,209	0	17,990	0	34,199
Total Outflow	***1,006,691***	***347,760***	***627,847***	***859,785***	***2,842,084***
Storage Change (Inflow - Outflow)	**243,561**	**-345,789**	**-267,888**	**-689,600**	**-1,059,715**

* This value is not equal to the sum of the four subarea columns; it is a summary for the entire basin which is made up of all four subareas combined. The subarea columns are a summary of the water balance for each subarea. The four subarea columns include exchanges of groundwater between subareas, as they are an important source of loading and removal of salts and nutrients for individual subareas. The basin-wide value, however, only considers inputs to or outputs from the entire basin. The net values (total groundwater inflow less total groundwater outflow) derived from each approach are equivalent.

Table 23: Seaside Basin Nitrate-N Balance

Salt and Nutrient Balance Component	Northern Coastal	Northern Inland	Southern Coastal	Laguna Seca	Basin Total
Inflows (lb/yr)					
Precipitation	11	197	4	95	307
Groundwater Underflow					
From Onshore	7,927	0	776	783	950*
From Offshore	162	0	0	0	162
ASR Wells (Injection)	170	0	0	0	170
Water Distribution System Losses	781	0	128	65	975
Sewer Distribution System Losses	514	0	14,554	603	15,672
Septic Systems	0	0	700	3,193	3,893
Irrigation Infiltration					
Golf Courses	1,748	0	0	0	1,748
Landscaping	1,033	0	318	162	1,513
Fertilizer Application					
Golf Courses	2,421	0	0	1,771	4,192
Sports Fields	587	0	103	280	970
Commercial and Residential Landscaping	2,492	445	2,136	1,780	6,853
Recycled Water Irrigation	0	0	0	54	54
Storm Water	5	0	49	0	53
Total Inflow	***17,850***	***445***	***18,769***	***8,787***	***45,851***
Outflows (lb/yr)					
Groundwater Pumping	6,919	0	1,507	1,499	9,924
Groundwater Underflow					
To Onshore	0	2,683	5,243	776	0*
To Offshore	113	0	199	0	312
Total Outflow	***7,032***	***2,683***	***6,949***	***2,275***	***18,939***
Storage Change (Inflow - Outflow)	**10,818**	**-2,238**	**11,820**	**6,512**	**26,912**

* This value is not equal to the sum of the four subarea columns; it is a summary for the entire basin which is made up of all four subareas combined. The subarea columns are a summary of the water balance for each subarea. The four subarea columns include exchanges of groundwater between subareas, as they are an important source of loading and removal of salts and nutrients for individual subareas. The basin-wide value, however, only considers inputs to or outputs from the entire basin. The net values (total groundwater inflow less total groundwater outflow) derived from each approach are equivalent.

Table 24: Source Concentrations used for Salt and Nutrient Loading Calculations

Constituent	Imported Water		Rain Water	Recycled Water Irrigation	Storm Water		Sewer and Septic Systems
	Salinas Valley	Carmel System			Bay St.	Hotel	
TDS, mg/L	396	317	2.8	1,241	109	519	1,043
Chloride, mg/L	84	26	0.5	375	30	144	308
Nitrate-N, mg/L	1.6	0.1	0.05	2.3	0.025	0.75	2.45

Deep Percolation of Rainfall

Deep percolation of rainfall carries salts and nutrients into the groundwater system at the concentration of natural rainfall. While percolation of rainfall may actually mobilize salts and nutrients introduced to the soil through fertilizers or other means, these loading sources are discussed separately from rainfall.

Loading estimates were made using concentration values of 2.8 mg/L TDS, 0.5 mg/L chloride, and 0.05 mg/L nitrate-N from Table 24 and volumes of percolation of rainfall from the Seaside basin groundwater flow model. Average annual totals of 17,190 pounds/year TDS, 3,070 pounds/year chloride, and 310 pounds/year nitrate-N are estimated to enter the groundwater system by deep percolation of rainfall.

Underflow from Onshore and Offshore Areas

Salts and nutrients are carried into the groundwater basin through groundwater inflow from adjacent onshore and offshore areas. Onshore groundwater inflow takes place only from the Salinas River Valley along the northeastern boundary of the basin. The quality of this groundwater underflow was obtained from wells along the boundary in the Salinas Valley. Underflow from offshore was considered to have the same water quality as the adjacent onshore area. This assumption was made because coastal monitoring shows no evidence of seawater intrusion (HydroMetrics WRI, 2013), and thus the freshwater aquifer extends some distance offshore. The concentrations of TDS, chloride, and nitrate-N in groundwater from Table 5 were used for groundwater for each subarea.

Groundwater underflow from onshore areas has concentrations of 396 mg/L TDS, 84 mg/L chloride, and 1.6 mg/L nitrate-N. Groundwater inflow from offshore to the Northern Coastal subarea has concentrations of 362 mg/L TDS, 85 mg/L chloride, and 0.59 mg/L nitrate-N. Groundwater inflow from offshore to the Southern Coastal subarea has concentrations of 702 mg/L TDS, 221 mg/L chloride, and 2.4 mg/L nitrate-N.

From the concentrations provided above, an average of 292,260 pounds/year TDS, 64,270 pounds/year chloride, and 950 pounds/year nitrate-N are estimated to be loaded into the groundwater system through groundwater underflow from onshore and offshore areas.

Injection of Imported Water

Some salts and nutrients are introduced into the Seaside basin with Carmel River system water that is imported for direct injection into the Santa Margarita aquifer by MPWMD/Cal-Am. Carmel River system water has concentrations of 317 mg/L TDS, 26 mg/L chloride, and 0.1 mg/L nitrate-N. From these concentrations and volumes described in Section 7.1.2, average annual totals of 538,340 pounds/year TDS, 44,154 pounds/year chloride, and 3,890 pounds/year nitrate-N were estimated to be injected into the groundwater system by the ASR wells.

It should be noted that although the injected water contains salts and nutrients, and is a source of loading to the aquifer, this water is of much better quality than the native groundwater. The injected water has been shown to dilute the salt and nutrient concentrations of the native groundwater and improve its quality (Figure 12).

Losses from Water Distribution Systems

The sources of water that are lost by leakage from water distribution systems include local groundwater, Salinas Valley groundwater, and Carmel River System water. The water qualities applied to each of these sources to estimate salt and nutrient loading are shown in Table 5 and Table 24.

From these concentrations and volumes in Table 20, average loadings of 536,290 pounds/year TDS, 130,410 pounds/year chloride, and 980 pounds/year nitrate-N are estimated to occur through delivery system losses.

Losses from Sewer Distribution Systems

The quality of the water lost from sewer systems is based upon the quality of untreated influent accepted by the Pasadera Wastewater Facility and Regional

Wastewater Treatment Plant. Using a sewer system loss of 105 AFY and concentrations of 1,040 mg/L TDS, 306 mg/L chloride, and 2.5 mg/L nitrate-N, average loadings of 297,250 pounds/year TDS, 87,680 pounds/year chloride, and 15,670 pounds/year nitrate-N are estimated to occur through sewer system losses.

SEPTIC SYSTEMS

The quality of the water leached from septic systems was assumed to be the same as that lost from sewer distribution systems. Using a leached volume of 27 AFY, average loadings of 76,120 pounds/year TDS, 22,450 pounds/year chloride, and 3,890 pounds/year nitrate-N are estimated to occur from septic system leaching.

RETURN FLOW FROM IRRIGATION

All water used for irrigation contains salts and nutrients, regardless of whether or not fertilizer is added. As a result, fertilizer is treated as an independent loading source and irrigation return flow includes only the salts and nutrients that are present in the water before it is applied as irrigation. The amount of salts and nutrients in this water is based upon the quality of the source water. These sources include Salinas Valley groundwater, Carmel River System Water, local groundwater, and recycled water from the Pasadera Wastewater Treatment Plant. The quality of these water sources are listed in Table 5 and Table 24.

Using the volume irrigation return flow from Table 20, an average of 1,244,500 pounds/year TDS, 295,260 pounds/year chloride, and 3,320 pounds/year nitrate-N are estimated to be added to the basin from irrigation return flow.

FERTILIZER APPLICATION

Fertilizer application was considered independently of irrigation water and was assumed to only be a source of nitrate-N loading to the groundwater system. As described in Section 4.1.4, fertilizer loading is assumed to occur in the land use categories of residential, commercial, golf course, and sports fields.

Using a net leaching rate of 8.9 pounds of nitrogen per acre per year for urban landscapes and golf courses (UC Davis, 2012), and land use shown in Figure 8, the nitrogen loading from fertilizer application was estimated.

- From the approximately 109 acres of sports fields in the Seaside basin, the estimated annual nitrogen leached in to the groundwater is 970 pounds.

- Approximately one quarter of urban, residential, and commercial acreage was assumed to be fertilized. From the average landscaped area of 770 acres, 6,850 pounds of nitrogen was estimated to be leached into groundwater.

- There are four golf courses in the Seaside basin. Table 13 summarizes the sizes and estimated fertilizer use based on the fertilized acreage determined from aerial photographs.

Table 25: Summary of Estimated Seaside Basin Golf Course Fertilizer Application

Golf Course	Operating Since	Approx. Fertilized Area (acres)	Leached Nitrogen * (pounds)
Nicklaus Club-Monterey (formerly Pasadera Country Club)	2000	100	890
Laguna Seca Golf Ranch	1970	99	881
Bayonet	1954	160	1,424
Black Horse	1964	112	997

* Assuming net leaching rate of 8.9 pounds nitrogen per acre per year (UC Davis, 2012)

A total average annual total of 12,020 pounds/year nitrate-N was estimated to be introduced into the groundwater system through fertilizer application.

INFILTRATION FROM STORM WATER PONDS

The quality of infiltrating storm water was derived from the storm water quality data collected by Monterey Bay Sanctuary Citizen Watershed Monitoring Network and listed in Table 2. Water quality data from the Bay St. sampling location was applied to all storm water ponds within the Northern Coastal subarea. Water quality data from the Hotel sampling location was applied to all storm water ponds within the Southern Coastal subarea.

For each of the two sampling locations, the average water quality of infiltrating water was assumed to fall at the center of the ranges listed for the "First Flush 2009-2012." Of the three water quality parameters covered in this SNMP, only nitrate-N was measured directly in the storm water. Therefore, it was required to estimate TDS and chloride concentrations by other means. The average concentration of TDS in the storm water was estimated (in mg/L) by applying a factor of 0.7 to the electrical conductivity (in μS/cm). The average concentration of chloride in the storm water was then estimated by deriving a relationship between chloride and TDS using other available water quality data from the basin. The derived relationship was: chloride = 0.278 x TDS.

The estimated water quality of the Hotel sampling location was 519 mg/L TDS, 144 mg/L chloride, and 0.75 mg/L nitrate-N. The estimated water quality of the Bay St. sampling location was 109 mg/L TDS, 30 mg/L chloride, and 0.025 mg/L nitrate-N. Using a volume of 105 AFY of infiltrating storm water, average loadings of 72,700 pounds/year TDS, 20,250 pounds/year chloride, and 53 pounds/year nitrate-N are estimated.

7.2.2 REMOVAL

Two mechanisms were identified by which salts and nutrients are removed from the basin.

1. Groundwater pumping by water agencies and private landowners,
2. Underflow to onshore and offshore areas (outflow).

GROUNDWATER PUMPING BY WATER AGENCIES AND PRIVATE LANDOWNERS

Salts and nutrients are removed from the groundwater system when groundwater is pumped. Some of this water is exported out of the basin entirely and some of the water is reapplied within the basin. The loading associated with reapplication of pumped groundwater within the basin is covered by the descriptions of the loading sources in the previous section.

Groundwater pumping removes salts and nutrients from the groundwater system according to the concentration of the native groundwater in the subarea of pumping. Groundwater quality for each subarea is listed in Table 5. From the groundwater extracted from the basin each year, an average of 6,591,600 pounds/year TDS, 1,693,060 pounds/year chloride, and 9,920 pounds/year nitrate-N are estimated to be removed from the basin.

UNDERFLOW TO ONSHORE AND OFFSHORE AREAS

Salts and nutrients are removed from the basin as groundwater flows out of the basin and into adjacent areas. Salts and nutrients are removed at the native quality of the groundwater in the subarea from which outflow occurs. Groundwater underflow occurs from the basin through the Northern Coastal and Southern Coastal subareas at the concentrations listed in Table 5.

An average of 100 AFY of groundwater underflow takes place from the basin. Average annual totals of 126,150 pounds/year TDS, 34,200 pounds/year chloride, and 310 pounds/year nitrate-N were estimated to be removed from the groundwater system through groundwater pumping.

7.2.3 DISCUSSION OF OVERALL SALT AND NUTRIENT LOADING

The difference between salt and nutrient loading and removal from the Seaside basin shown at the bottom of Table 21 through Table 23 suggests that there is a net removal of salts (TDS and chloride) from the basin and a net loading of nutrients into the basin.

The net removal of salts is being driven by groundwater pumping. Overall, pumping extracts native groundwater that is relatively high in salts and exports a significant portion of that water away from the basin – to outside customers or to the regional wastewater treatment plant. Groundwater pumping alone, however, will not improve the quality of the basin's groundwater unless a source of imported water is adding higher quality water to the basin's aquifers. Simply removing groundwater will only draw down groundwater levels without improving quality. The ASR project, with its injection of Carmel River water, is a major source of imported high-quality water that complements the extraction of groundwater and leads to a sustainable net removal of salts from the basin. Other future projects, such as the GWRP, provided they import better quality water than the native groundwater will further improve the salt content of groundwater in the Seaside basin.

The nitrate balance suggests a net addition of nitrates to the basin. This is because the groundwater in the basin does not have significantly different nitrate-N concentrations than other imported sources of water, and thus dilution like what occurs with salts does not take place at a noticeable level. Nutrient loading from sewer system losses and fertilization are the largest man-made sources of nutrients to the basin. The estimate of nitrogen loading by fertilization may be overestimated because it is unlikely all residents fertilize their lawns regularly.

7.3 Assimilative Capacity

Because assimilative capacity is determined for the entire Seaside basin, the existing groundwater quality estimated for the four subareas in Section 3.11.2 are area-weight averaged to estimate the groundwater quality of the entire basin. Table 26 shows that the basin does not have assimilative capacity for TDS, but there is assimilative capacity remaining for chloride and nitrate-N. The poor TDS quality is influenced mostly by the two southern subareas (i.e., Southern Coastal and Laguna Seca subareas).

Table 26: Seaside Basin Assimilative Capacity

Constituent	Existing Water Quality	Water Quality Objective	Assimilative Capacity
TDS, mg/L	540	500	**-40**
Chloride, mg/L	140	250	**110**
Nitrate-N, mg/L	0.7	10	**9.3**

When looking to implement future water projects in the basin, it is important to ensure that imported or recycled water being irrigated or recharged needs to have a water quality that is better (i.e., lower WQO parameter values) than the native groundwater that will be influenced by the project. Current plans to use recycled water in the basin will generally improve groundwater quality by diluting the native groundwater with better quality water (e.g., GWRP advanced tertiary treated, less than 200 mg/L TDS). Storm water quality generated within the basin is also of better quality than the native groundwater and would contribute to improving the basin's general water quality with appropriate pre-treatment. Carmel River system water imported by MPWMD/Cal-Am is generally less than 385 mg/L TDS and has already been proven to improve the groundwater quality in the area around the existing ASR wells into which it is injected.

7.4 ANTI-DEGRADATION ANALYSIS

This section is not required because native Seaside basin groundwater quality is not a high quality water resource described in the state's Anti-Degradation Policy, Resolution No. 68-16. The three potential projects planned for the Seaside basin will all have positive water quality impacts because they use imported water of better quality than the native groundwater.

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SECTION 8
SALT AND NUTRIENT MANAGEMENT STRATEGIES

8.1 ACTIONS TO MANAGE SALT AND NUTRIENT LOADING

The objective of this section is to develop strategies to manage salt and nutrient loadings on a sustainable basis in order to maintain a long term supply for the basin's beneficial uses. Per the Recycled Water Policy, these strategies should be site specific and have the purpose of:

- Pollution prevention,
- Source load reductions to groundwater basins,
- Treatment and management of areas of impaired water quality,
- Increasing groundwater recharge by storm water, and
- Increasing recycled water use.

In the Seaside basin there is a net export of salts and nutrients from the basin because over 2,400 AFY of groundwater is used outside of the basin. Additionally, the bulk of wastewater generated in the basin is exported to a regional plant outside of the basin. Together with injection of Carmel River system water into the basin, these activities improve the groundwater quality of the basin.

Based on our source assessment in Section 4, the following activities currently contribute salts and nutrients to the basin above what would naturally occur:

- Fertilization in urban areas and golf courses – loads from fertilizers are transported with water from irrigation or precipitation.
- Septic systems and leaking sewer pipes – loads in septic system outflows or leaky septic tanks infiltrate into the groundwater.
- Irrigation of recycled water at the Nicklaus Club-Monterey golf course – recycled water generated at the Pasadera wastewater treatment and recycling facility is diluted with groundwater. The wastewater treated by this facility has a high salt load partly because of the use of residential water softeners in the area.

There are currently no management measures and activities instituted in the basin for reducing either salt or nutrient loads. Management strategies that could be considered are summarized in Table 27.

8.2 MANAGEMENT TRIGGERS

For seawater intrusion in the basin, the Watermaster has developed a Seawater Intrusion Response Plan (SIRP) as a contingency plan for responding to seawater intrusion in the Seaside Groundwater Basin, if and when it occurs (HydroMetrics LLC, 2009a). The SIRP details both the indicators of seawater intrusion, and a list of recommended actions to be taken if seawater intrusion is observed.

Management triggers for salts and nutrients generated by current land use activities are not necessary because of the net export of salts and nutrients from the basin. Future projects such as the GWRP will be permitted by relevant authorities, which will include setting monitoring requirements, limits, and triggers.

Table 27: Proposed Salt and Nutrient Management Measures

Management Measure	Agency/Action	Description	Effect
Source control of nutrients from residential fertilizer	City of Seaside, Laguna Seca subarea landowners, Monterey Peninsula Water Management District, City of Sand City, California American Water, City of Del Rey Oaks, Monterey County/Monterey County Water Resources Agency, Coastal subarea landowners, and the City of Monterey	Outreach on effective use of fertilizers.	Reduces the load of nitrogen that is transported by runoff to surface waters and by infiltration to groundwater.
Source control of salts and nutrients from septic systems	Toro community, City of Seaside - Prohibit installation of new septic tanks	Prohibit installation of new septic tanks. Require tie-in of a septic tank to the sewer if located within 200 feet of a sewer line. Or Consideration of a septic system conversion program to reduce the number of septic systems in the basin.	Reduces the volume of septic system leachate that percolates into shallow groundwater.
Source control of salts in wastewater and recycled water quality from Pasadera WTF	Cal-Am – water softener ban	Outreach, removal and incentive program aimed at reducing the number of self-regenerating water softeners.	Fewer self-regenerating water softeners (or other treatment devices that produce a high mineral waste) will reduce the salt load in residential wastewater.
Storm water recharge	City of Seaside, Laguna Seca subarea landowners,	Storm water is infiltrated onsite where it is generated or conveyed	Provides dilution of groundwater through recharge of surface water

Management Measure	Agency/Action	Description	Effect
	Monterey Peninsula Water Management District, City of Sand City, California American Water, City of Del Rey Oaks, Monterey County/Monterey County Water Resources Agency, Coastal subarea landowners, and the City of Monterey	to a nearby recharge facility.	(flood and storm flows) to potentially lower salt and nutrient concentrations.
Irrigation with recycled water	City of Seaside, City of Sand City	Urban irrigation of schools, parks, golf courses and other locations. Recycled water permit establishes concentration limits for irrigation water that should be lower than native groundwater concentrations.	Limits the concentrations of salts and nutrients in irrigation water.

SECTION 9
SALT AND NUTRIENT MONITORING PROGRAM

9.1 GOALS AND OBJECTIVES

The goals of a salt and nutrient monitoring program for the Seaside basin are:

1. Develop a program that provides an adequate spatial network of monitoring locations through the Seaside basin;
2. Develop a cost-effective means of determining whether the concentrations of salts, nutrients, and other constituents of concern as identified in this salt and nutrient plan are consistent with applicable water quality objectives;
3. Focus monitoring near public water supply wells and large recycled water projects; and
4. Per the Recycled Water Policy, use existing monitoring features where possible.

9.2 LOCATION OF MONITORING FEATURES

The current monitoring features in the Seaside basin described in Section 5 are all recommended as monitoring features for this SNMP. These monitoring features have an adequate spatial distribution to determine impacts from current recycled water use in the basin.

In addition to the wells currently sampled under the Watermater's MMP and MPWMD monitoring programs, there are some dedicated monitoring wells in the Laguna Seca subarea that are excluded from those schedules. These are: FO-4 shallow and deep, and FO-6 shallow and deep.

The RWQCB will require additional monitoring features when future recycled water projects are implemented. These should be included as part of salt and nutrient monitoring for the basin.

9.3 CONSTITUENTS TO BE MONITORED

For all wells in the monitoring network, the same constituents that are required under the Watermaster's MMP are recommended for testing. This is general physical and minerals, which includes TDS, chloride, nitrate as NO_3, nitrate as N, and nitrite as N.

Per the SWRCB's Recycled Water Policy (2013), CEC monitoring requirements are not designated for recycled water used for landscape irrigation due to the low risk for ingestion of the water. However, the CEC monitoring requirements prescribed in the Recycled Water Policy pertain to the production and use of recycled water for groundwater recharge by surface and subsurface application methods. Currently there are no active projects in the Seaside basin that fall into this category. The proposed GWRP described in Section 4.2.2 is the only planned project that proposes to use recycled water for groundwater recharge. Prior to the implementation of this project, or any other future proposed groundwater recharge with recycled water project, the appropriate agency (or agencies) will monitor the water for CECs as prescribed in the Recycled Water Policy, as applicable, unless an alternative monitoring plan is proposed and approved by the RWQCB.

9.4 Sampling Frequency

The groundwater sampling frequency will be at least annually.

9.5 Stakeholder Roles and Responsibilities

The Seaside basin stakeholders' current responsibilities for collecting and providing production, groundwater levels, and groundwater quality data to the Watermaster are described in Section 5. Because these roles and responsibilities are already in place and well established, it is recommended that the SNMP adopt them and therefore no changes are required.

9.6 Reporting

The monitoring data collected will be reported to the RWQCB every three years. The SNMP stakeholders will be responsible for preparing the monitoring report. The monitoring report will include relevant monitoring data, comparisons to historical/baseline values, comparisons to applicable water quality objectives, and an update of relevant projects and implementation information.

SECTION 10
IMPLEMENTATION MEASURES

Based on the Seaside basin's native groundwater quality and limited number of recycled water projects, managing salt and nutrient loadings on a sustainable basis is feasible with minimal implementation measures. Best Management Practices (BMPs) and public outreach are recommended implementation measures. If necessary, based on future monitoring results, the implementation measures identified in the following sub-sections will be reevaluated and updated measures recommended for future implementation.

10.1 TOTAL DISSOLVED SOLIDS

Implementation measures to reduce TDS concentrations in groundwater that could be considered include:

- All water imported into the basin should have lower TDS than the native groundwater of the area in which the water is to be used for irrigation or recharge,
- Reducing the amount of salts added to groundwater via source water – wastewater treatments, modified processes such as increased retention time, or blending prior to use for irrigation or basin recharge, and
- Reducing the amount of salts added to water via anthropogenic sources – BMPs, public outreach, and land management guidelines.

10.2 CHLORIDE

Implementation measures to reduce chloride concentrations in groundwater that could be considered include:

- Reducing the amount of chlorides added to water via anthropogenic sources – BMPs, public outreach, and land management guidelines,
- Water softener ordinance or ban, and
- Reducing the amount of chlorides in wastewater - modified processes such as incorporating UV and MF/RO to remove chlorides.

10.3 NITRATE

Implementation measures to reduce nitrate concentrations in groundwater that could be considered include developing BMPs such as limiting excess landscape fertilizing and eliminating over-irrigation to curtail the leaching transport process.

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APPENDIX A:

MONTEREY PENINSULA AQUIFER STORAGE AND RECOVERY PROJECT – SAMPLING AND ANALYSIS PLAN

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water resources

MONTEREY PENINSULA
AQUIFER STORAGE AND RECOVERY PROJECT

SAMPLING AND ANALYSIS PLAN

Prepared for:

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

December 2012

MONTEREY PENINSULA
AQUIFER STORAGE AND RECOVERY PROJECT

GROUNDWATER SAMPLING AND ANALYSIS PLAN

INTRODUCTION

This Groundwater Sampling and Analysis Plan (SAP) has been developed for the Monterey Peninsula Aquifer Storage and Recovery (ASR) Project. The project is cooperatively implemented by the Monterey Peninsula Water Management District (MPWMD or District) and California American Water (CAW), and generally involves the diversion of excess winter/spring flows from the Carmel River system for recharge, storage and subsequent recovery in the Seaside Groundwater Basin (SGB). Treated (potable) drinking water from the CAW distribution system is injected into the Santa Margarita Sandstone aquifer in the SGB via three existing ASR wells located at two ASR facilities in the SGB. The injected water is stored within the aquifer and subsequently recovered into the CAW distribution system during dry periods. The overall objective of the project is to facilitate the conjunctive use of water supplies in the Carmel River system and SGB that will benefit the resources of both systems.

ASR operations generally consist of three components or phases: (1) injection of drinking-quality water into the aquifer through the ASR wells; (2) storage of the injected water within the aquifer; and, (3) recovery of the stored water by pumping at one or more of the ASR wells. Periodic samples of the injected, stored, and recovered waters are to be collected from the ASR wells and associated monitoring wells and analyzed for a variety of water-quality constituents pursuant to requirements of the Central Coast Regional Water Quality Control Board (RWQCB) for the project. The purpose of this SAP is to identify the locations, sample collection frequency, and parameters to be monitored as part of the project's ongoing water-quality data collection program. The project location and associated wells in the SGB are shown on **Figure 1** – Project Location Map.

GROUNDWATER MONITORING

Groundwater Monitoring Wells

ASR Project On-Site Wells. There are two ASR facilities located in the SGB; the Santa Margarita and Seaside Middle School ASR Facilities. Groundwater monitoring wells for collection of on-site water-quality samples include three ASR wells and two associated monitoring wells that have been constructed at the two ASR facilities. Two of the ASR wells are located at the Santa Margarita (SM) ASR Facility and are designated as SM ASR-1 and SM ASR-2. This facility is also referred to as the Phase 1 ASR Project. The third existing ASR well is located at the Seaside Middle School (SMS) ASR Facility and is designated as SMS ASR-3.

This facility is also referred to as the Phase 2 ASR Project[1]. All three existing ASR wells are completed solely within the Santa Margarita Sandstone (Tsm) aquifer.

In addition to the ASR wells, there are two on-site monitoring wells (one located at each ASR facility) that are also completed solely within the Tsm aquifer. SM MW-1 is located at the SM ASR Facility and is located in between SM ASR-1 and SM ASR-2, at distances of approximately 90 and 190 feet, respectively. SMS Deep MW is located at the SMS ASR Facility at a distance of approximately 20 feet from SMS ASR-3. An additional monitoring well is also located at the SMS ASR Facility that is completed within the overlying Paso Robles aquifer, designated as SMS Shallow MW. This well is instrumented with a submersible water-level transducer/data logger unit to observe the water-level response of this aquifer to ASR operations (it is not designed or equipped for collection of water-quality samples). The locations of the ASR wells and on-site monitoring wells are shown on **Figure 2** – Site Location Map. A summary of the on-site wells is presented in **Table 1** below:

Table 1. On-Site Wells Summary

Well ID	Distance from ASR Well (feet)			Aquifer Completed
	SM ASR-1	SM ASR-2	SMS ASR-3	
SM ASR-1	--	280	1,380	Tsm
SM ASR-2	280	--	1,235	Tsm
SM MW-1	90	190	1,325	Tsm
SMS ASR-3	1,380	1,235	--	Tsm
SMS Deep MW	1,380	1,240	20	Tsm
SMS Shallow MW	1,415	1,265	25	QTp

Table 1 Notes:

Tsm – Santa Margarita Sandstone aquifer
QTp – Paso Robles aquifer

Off-Site SGB Wells In addition to the on-site wells at the two ASR facility sites, submersible water-level transducer/data logger units have been installed at seven off-site District monitoring well sites in the SGB to observe the water-level response of the aquifer system to ASR operations. The locations of the off-site monitoring wells are shown on **Figure 1**. The distances from each of the project sites and aquifers monitored by the off-site wells are summarized in **Table 2** below:

[1] The Phase 2 ASR Project will consist of two ASR wells and associated facilities at the SMS ASR Facility. SMS ASR-4 is currently planned to be installed during summer/fall of 2012 and will be added to the SAP when completed and equipped for operation.

Table 2. Off-site Monitoring Wells Summary

Well ID	Distance from ASR Site (feet)		Aquifer Monitored
	SM	SMS	
Paralta Test	680	740	QTp & Tsm
Ord Grove Test	1,540	2,535	QTp & Tsm
Ord Terrace (Deep)	2,275	2,910	Tsm
FO-7 (Deep)	4,265	3,700	Tsm
FO-7 (Shallow)			QTp
PCA East (Deep)	6,390	6,200	Tsm
PCA East (Shallow)			QTp
FO-9 (Deep)	7,290	6,125	Tsm
FO-8 (Deep)	7,585	6,450	Tsm

Table 2 Notes:

Monitoring well distances are measured to centroid of each ASR site.
Tsm – Santa Margarita Sandstone aquifer
QTp – Paso Robles aquifer

In addition to water-level monitoring at the above off-site monitoring wells, CAW's Paralta well and PCA East Deep have been designated as off-site monitoring wells for periodic water-quality sampling as part of this SAP (refer to **Table 4**).

Groundwater Monitoring Equipment

The equipment required to perform the groundwater monitoring as prescribed in the SAP includes:

- Sampling Pumps
- Pressure Transducers/Data Loggers
- Electric Water Level Sounder
- Field Water Quality Monitoring Devices
- Flow-Thru Cell Device(s)
- Sample Containers
- Coolers and Ice

Each of the on-site wells is equipped with a dedicated pump. The ASR wells are equipped with water-lubricated, vertical line-shaft turbine pumps. SM MW-1, SMS Deep MW, and PCA East Deep are equipped with submersible sampling pumps. The flow rates for each monitored wells are measured using in-line flow meters. Sampling ports on the well-head piping at each well allow for the collection of grab samples during injection and pumping operations.

Field water-quality monitoring is to be performed using various instruments that allow for the field analysis of a variety of constituents, including but not limited to: chlorine residual, conductivity, dissolved oxygen, pH, temperature, redox/ORP, and Silt Density Index (SDI). The field water-quality monitoring devices are to be routinely calibrated as prescribed in the operating procedures manual for each device.

All of the ASR and monitoring wells are instrumented with dedicated pressure/level transducers and dataloggers. Reference-point elevations have been established by surveying on each of the monitored wells. Static water-levels in each of the wells are to be measured with an electric sounder on a quarterly basis (minimum) and the transducers calibrated accordingly. The transducers are to be programmed with the reference static water-level and the data-collection interval, which will measure and record the water level in each of the wells a minimum of four times per day.

Purging and Sampling

During injection periods, samples of the injectate are to be collected directly at one of the ASR wellheads while active injection is occurring. During storage periods, each of the ASR wells that has been utilized for injection during the season will be periodically purged and sampled. During recovery periods, one or more of the ASR well pumps will be operating and purging is continuous and sustained. Groundwater samples are also to be collected routinely during all three ASR periods (i.e., injection, storage and recovery) from both the on-site monitoring wells (SM MW-1 and SMS Deep MW) and periodically from the far-field off-site monitoring wells (Paralta and PCA-E Deep).

The existing pumps will be used to purge a volume equivalent to a minimum of three (3) casing volumes from the well prior to sampling. Purge water from the ASR wells during backflushing and sampling is to be discharged to the backflush pit at the SM ASR Facility and percolated back into the SGB. Water produced by the ASR well(s) during recovery period operations is to be discharged to the CAW potable water supply system (in accordance with Department of Public Health approvals). Purge water from the monitoring wells will be directed to either the SM backflush pit or to the ground away from the wellheads and percolated back into the SGB.

During purging and prior to sampling, field water-quality parameters of temperature, pH and specific conductance are to be monitored. Stabilization of these water-quality parameters will indicate when collection of a representative sample is obtainable.

Chain-of-Custody, Sample Handling, and Transport

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. All sample shipments for analyses will be accompanied by a chain-of-custody record. Forms will be completed and sent with the samples for each shipment. The chain-of-custody form will identify the contents of each shipment and maintain the custodial integrity of the samples. Samples will be placed in a cooler for delivery to the laboratory.

Documentation Procedures

Field data will be recorded by field personnel on the attached Field Sampling Log Form and routinely submitted to the Project Manager for review and QA/QC. Field data will include the completed field sampling-log form and chain-of-custody records. At a minimum, documentation of each monitoring and sampling event will include the following information:

- Sample location and description
- Sampler's name(s)
- Date and time of sample collection
- Type of sampling equipment used
- Field instrument calibration procedures and results
- Field instrument readings
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)
- Sample preservation
- Shipping arrangements
- Name(s) of recipient laboratory
- Any deviations from SAP procedures

Project information will be filed by Water Year. The project file will contain project field data, correspondence, survey reports, laboratory reports, charts, tables, permits, and other project-related information. This information will be utilized in the preparation of the annual Summary of Operations Reports for the project.

LABORATORY PROGRAM

A complete list of constituents and constituent "groups" to be monitored as part of the ASR Project for injected, stored, and recovered waters is presented in **Table 3** below. **Table 4** summarizes the planned sample constituent group frequencies for each source for the injection, storage, and recovery periods.

Table 3. Analytic Testing Program Constituent Summary

Constituent	PQL	General Parameters	Disinfection Byproducts	Supple-mental	Field[1]
Group ID		G-1	DBP	S-1	F-1
Major Cations					
Calcium (Ca)	1 mg/L	✓			
Magnesium (Mg)	1 mg/L	✓			
Sodium (Na)	1 mg/L	✓			
Potassium (K)	0.5 mg/L	✓			
Major Anions					
Total Alkalinity (as $CaCO_3$)	10 mg/L	✓			
Sulfate (SO_4)	1 mg/L	✓			
Chloride	1 mg/L	✓	✓		
Nitrate as (NO3)	1 mg/L	✓			
Nitrite as (Nitrogen)	0.1 mg/L	✓			
General Physical					
pH	0.1 units	✓			✓
Temperature	0.5 ^{o}C				✓
Specific Conductance (EC)	10 uS	✓			✓
ORP (redox potential / Eh)[2]	10 mV				✓
Total Dissolved Solids (TDS)	10 mg/L	✓			
Metals					
Arsenic (As)	1 ug/L			✓	
Barium (Ba)	0.5 mg/L			✓	
Iron (Fe) (Total and Dissolved)	50 ug/L	✓			
Lithium (Li)	5 ug/L			✓	
Manganese (Mn) (Total and Dissolved)	10 ug/L	✓			
Molybdenum (Mo)	5 ug/L			✓	
Nickel (Ni)	10 ug/L			✓	
Selenium (Se)	5 ug/L			✓	
Strontium (Sr)	5 ug/L			✓	
Uranium (U)	1 pCi/L			✓	
Vanadium (V)	5 ug/L			✓	
Zinc (Zn)	0.5 ug/L			✓	
Miscellaneous					
Ammonia (as N)	0.05 mg/L	✓			
Boron (B)	0.05 mg/L	✓			
Chlorine residual (free)	0.1 mg/L				✓

Constituent	PQL	General Parameters	Disinfection Byproducts	Supple-mental	Field[1]
Group ID		G-1	DBP	S-1	F-1
Chloramines	50 ug/L		✓		
Dissolved Methane	0.5 ug/L			✓	
Dissolved Oxygen (DO)[2]	0.025 mg/L				✓
Gross Alpha	1 pCi/L			✓	
Hydrogen Sulfide (H_2S)	0.05 mg/L				✓
Total Nitrogen (N)	0.2 mg/L	✓			
Total Phosphorous	0.05 mg/L	✓			
Orthophosphate as P	0.05 mg/L	✓			
Radium 226	1 pCi/L			✓	
Silt Density Index (SDI)	0.1 units				✓
Total Kjehldahl N (TKN)	0.2 mg/L	✓			
Organic Analyses					
Total trihalomethanes	1 ug/L		✓		
Bromodichloromethane	1 ug/L		✓		
Bromoform	1 ug/L		✓		
Chloroform	1 ug/L		✓		
Dibromochloromethane	1 ug/L		✓		
Haloacetic Acids (HAA)	1 ug/L		✓		
Monobromoacetic Acid	1 ug/L		✓		
Monochloroacetic Acid	1 ug/L		✓		
Dibromoacetic Acid	1 ug/L		✓		
Dichloroacetic Acid	1 ug/L		✓		
Trichloroacetic Acid	1 ug/L		✓		
Total organic carbon (TOC)	0.1 mg/L	✓			
Dissolved organic carbon (DOC)	0.1 mg/L	✓			

Table 3 Notes:

1 – Field Parameters (Group F-1) must be taken concurrently with collection of all laboratory samples.
2 – ORP and DO must be analyzed utilizing a flow-thru cell device.

Table 4. Analytic Testing Program Schedule

<table>
<tr><th colspan="8">INJECTION PERIOD (active injection)</th></tr>
<tr><th>Analyte Group</th><th colspan="3">Injectate</th><th>SM MW-1</th><th>SMS Deep MW</th><th colspan="2">PCA East (deep)</th></tr>
<tr><td>F-1</td><td colspan="3">Bi-Weekly</td><td>Bi-Weekly</td><td>Bi-Weekly</td><td colspan="2">Semiannually</td></tr>
<tr><td>DBP</td><td colspan="3">Monthly</td><td>Quarterly</td><td>Quarterly</td><td colspan="2">Semiannually</td></tr>
<tr><td>G-1</td><td colspan="3">Quarterly</td><td>Quarterly</td><td>Quarterly</td><td colspan="2">Semiannually</td></tr>
<tr><td>S-1</td><td colspan="3">Quarterly</td><td>Quarterly</td><td>Quarterly</td><td colspan="2">Semiannually</td></tr>
<tr><th colspan="8">STORAGE PERIOD (one month duration or longer)</th></tr>
<tr><th>Analyte Group</th><th>SM ASR-1</th><th>SM ASR-2</th><th>SMS ASR-3</th><th>SM MW-1</th><th>SMS Deep MW</th><th colspan="2">PCA East (deep)</th></tr>
<tr><td>F-1</td><td>Monthly</td><td>Monthly</td><td>Monthly</td><td>Quarterly</td><td>Quarterly</td><td colspan="2">Semiannually</td></tr>
<tr><td>DBP</td><td>Quarterly</td><td>Quarterly</td><td>Quarterly</td><td>Quarterly</td><td>Quarterly</td><td colspan="2">Semiannually</td></tr>
<tr><td>G-1</td><td>Quarterly</td><td>Quarterly</td><td>Quarterly</td><td>Semiannually</td><td>Semiannually</td><td colspan="2">Semiannually</td></tr>
<tr><td>S-1</td><td>Quarterly</td><td>Quarterly</td><td>Quarterly</td><td>Semiannually</td><td>Semiannually</td><td colspan="2">Semiannually</td></tr>
<tr><th colspan="8">RECOVERY PERIOD</th></tr>
<tr><th>Analyte Group</th><th>SM ASR-1[1]</th><th>SM ASR-2</th><th>SMS ASR-3</th><th>SM MW-1</th><th>SMS Deep MW</th><th>Paralta</th><th>PCA East (deep)</th></tr>
<tr><td>F-1</td><td>Bi-Weekly</td><td>Monthly</td><td>Monthly</td><td>Quarterly</td><td>Quarterly</td><td>Semiannually[2]</td><td>Semiannually</td></tr>
<tr><td>DBP</td><td>Quarterly</td><td>Quarterly</td><td>Quarterly</td><td>Semiannually</td><td>Semiannually</td><td>Semiannually[2]</td><td>Semiannually</td></tr>
<tr><td>G-1</td><td>Quarterly</td><td>Quarterly</td><td>Quarterly</td><td>Semiannually</td><td>Semiannually</td><td>Semiannually[2]</td><td>Semiannually</td></tr>
<tr><td>S-1</td><td>Quarterly</td><td>Quarterly</td><td>Quarterly</td><td>Semiannually</td><td>Semiannually</td><td>Semiannually[2]</td><td>Semiannually</td></tr>
</table>

Table 4 Notes:

1 – SM ASR-1 is currently the only ASR well authorized by DPH to recover into the CAW distribution system.
2 – Near the beginning and end of the SGB production/recovery season (e.g., in June and November).

December 2012
Project No. 06-0025

PUEBLO water resources

FIGURE 1. PROJECT LOCATION MAP
Monterey Peninsula ASR Project
Sampling and Analysis Plan

December 2012
Project No. 06-0025

PUEBLO
water resources

FIGURE 2. SITE LOCATION MAP
Monterey Peninsula ASR Project
Sampling and Analysis Plan

HydroMetrics LLC

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

PUEBLO water resources

Monterey Peninsula ASR Project
Field Sampling Log Form
Water Year: _______________

Well ID: ____________________
Observer: ____________________
Date: ____________________
Observation Period: Start: ____________ Stop: ____________
Weather:

Purging & Water-Level Data		Notes:
ASR Period (injection, storage, recovery)		
Well Status (injecting, idle, pumping)		
Purge Rate (gpm)		
Totalizer Reading Start (gals)		
Totalizer Reading at Sampling (gals)		
Purge Volume (gals)		
Totalizer Reading End (gals)		
Static Water Level (ft btoc)[1]		
Datalogger Water Level (ft btoc)		

Field Water-Quality Parameter Data

Time:						
Elapsed Time:						
Temperature (^oC)						
Conductivity (umhos/cm)						
pH						
ORP (mV)[2]						
Free Chlorine Residual (mg/L)						
Dissolved Oxygen (mg/L)[2]						
Silt Density Index						
Gas Volume (mL)						
H2S (mg/L)						
Visual Observations						

Sampling and Laboratory Data

Collection Time	Laboratory	Laboratory Analyses Requested (analyte group or other constituents)

Additional Information and Observations

Notes:
1 - Pump must be off a minimum of 10 minutes prior to measuring.
2 - ORP and Dissolved Oxygen must be analyzed utilizing a flow-thru cell device

APPENDIX B:
WATER BALANCE SPREADSHEET

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Water Type	Subarea	Water Source	Component	Imported AFY	Exported AFY	Volume Back into Groundwater AFY	Groundwater Volume Extracted AFY
Imported Salinas Valley	Northern Coastal	Salinas Valley Groundwater	Bayonet and Black Horse Golf Courses	400	0	80	0
			Municipal Supply	527	0	0	0
			Water System Losses	0	0	45	0
			Irrigation Return Flow	0	0	111	0
		Sewer	Sewer Losses	0	0	19	0
			Regional Waste Water Treatment Plant	0	353	0	0
Imported Carmel River System	Northern Coastal	Carmel River System Alluvial Aquifer	Santa Margarita Injection	625	0	625	0
			Municipal Supply	56	0	0	0
			Water System Losses	0	0	5	0
			Irrigation Return Flow	0	0	12	0
		Sewer	Sewer Losses	0	0	2	0
			Regional Waste Water Treatment Plant	0	37	0	0
	Southern Coastal	Carmel River System Alluvial Aquifer	Municipal Supply	19	0	0	0
			Water System Losses	0	0	2	0
			Irrigation Return Flow	0	0	4	0
		Sewer	Sewer Losses	0	0	1	0
			Regional Waste Water Treatment Plant	0	12	0	0
	Laguna Seca	Carmel River System Alluvial Aquifer	Municipal Supply	112	0	0	0
			Water System Losses	0	0	9	0
			Irrigation Return Flow	0	0	23	0
		Sewer	Sewer Losses	0	0	4	0
			Regional Waste Water Treatment Plant	0	75	0	0

Water Type	Subarea	Water Source	Component	Imported AFY	Exported AFY	Volume Back into Groundwater AFY	Groundwater Volume Extracted AFY
Recycled Water	Laguna Seca	Pasadera WTF Recycled Water	Nicklaus Club-Monterey Golf Course Irrigation	0	0	9	0
Precipitation	Northern Coastal	Precipitation	Deep Percolation of Precipitation	0	0	68	0
	Southern Coastal			0	0	30	0
	Laguna Seca			0	0	607	0
	Northern Inland			0	0	1,450	0
Storm Water	Northern Coastal	Storm Water	Storm Water Infiltration	0	0	68	0
	Southern Coastal			0	0	37	0
	Laguna Seca			0	0	0	0

Water Type	Subarea	Water Source	Component	Imported AFY	Exported AFY	Volume Back into Groundwater AFY	Groundwater Volume Extracted AFY
Seaside Basin Groundwater	Northern Coastal	Groundwater	Municipal Supply from Wells	0	0	0	4,278
			Water System Losses	0	0	364	0
			Irrigation Return Flow	0	0	348	0
			Groundwater Exported out of Basin	0	2,421	0	0
		Underflow	Groundwater Inflow - From Onshore	0	0	2,850	0
			Groundwater Inflow - From Offshore	0	0	100	0
			Groundwater Outflow	0	0	0	70
		Sewer	Sewer Losses	0	0	57	0
			Regional Waste Water Treatment Plant	0	1,076	0	0
	Southern Coastal	Groundwater	Municipal Supply from Wells	0	0	0	227
			Water System Losses	0	0	19	0
			Irrigation Return Flow	0	0	48	0
		Underflow	Groundwater Inflow - From Onshore	0	0	450	0
			Groundwater Inflow - From Offshore	0	0	0	0
			Groundwater Outflow	0	0	0	820
		Sewer	Sewer Losses	0	0	8	0
			Regional Waste Water Treatment Plant	0	147	0	0
			Septic Systems	0	0	5	0

Water Type	Subarea	Water Source	Component	Imported AFY	Exported AFY	Volume Back into Groundwater AFY	Groundwater Volume Extracted AFY
Seaside Basin Groundwater	Laguna Seca	Groundwater	Municipal Supply from Wells	0	0	0	869
			Water System Losses	0	0	74	0
			Irrigation Return Flow	0	0	183	0
			Laguna Seca and Nicklaus Club-Monterey Golf Course Irrigation	0	0	88	0
		Underflow	Groundwater Inflow - From Onshore	0	0	180	0
			Groundwater Outflow	0	0	0	450
		Sewer	Sewer Losses	0	0	31	0
			Regional Waste Water Treatment Plant	0	217	0	0
			Septic Systems	0	0	22	0
	Northern Inland	Underflow	Groundwater Inflow - From Onshore	0	0	0	0
			Groundwater Outflow	0	0	0	2,060

APPENDIX C:
SALT AND NUTRIENT LOADING SPREADSHEETS

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Water Type	Subarea	Salt and/or Nutrient Source	Component	TDS In, lb	TDS Out, lb	Chloride In, lb	Chloride Out, lb	Nitrate-N In, lb	Nitrate-N Out, lb
Imported Salinas Valley	Northern Coastal	Salinas Valley Groundwater	Bayonet and Black Horse Golf Courses	430,747	0	91,371	0	1,740	0
			Municipal Supply	0	0	0	0	0	0
			Water System Losses	48,281	0	10,241	0	195	0
			Irrigation Return Flow	119,539	0	25,357	0	483	0
		Sewer	Sewer Losses	52,677	0	15,538	0	124	0
			Regional Waste Water Treatment Plant	0	0	0	0	0	0
Imported Carmel River System	Northern Coastal	Carmel River System Alluvial Aquifer	Santa Margarita Injection	538,343	0	44,154	0	170	0
			Municipal Supply	0	0	0	0	0	0
			Water System Losses	4,089	0	335	0	1	0
			Irrigation Return Flow	10,123	0	830	0	3	0
		Sewer	Sewer Losses	5,572	0	1,644	0	13	0
			Regional Waste Water Treatment Plant	0	0	0	0	0	0
	Southern Coastal	Carmel River System Alluvial Aquifer	Municipal Supply	0	0	0	0	0	0
			Water System Losses	1,363	0	112	0	0	0
			Irrigation Return Flow	3,374	0	277	0	1	0
		Sewer	Sewer Losses	1,857	0	548	0	4	0
			Regional Waste Water Treatment Plant	0	0	0	0	0	0
	Laguna Seca	Carmel River System Alluvial Aquifer	Municipal Supply	0	0	0	0	0	0
			Water System Losses	8,177	0	671	0	3	0
			Irrigation Return Flow	20,245	0	1,661	0	6	0
		Sewer	Sewer Losses	11,145	0	3,287	0	26	0
			Regional Waste Water Treatment Plant	0	0	0	0	0	0

Water Type	Subarea	Salt and/or Nutrient Source	Component	TDS In, lb	TDS Out, lb	Chloride In, lb	Chloride Out, lb	Nitrate-N In, lb	Nitrate-N Out, lb
Recycled Water	Laguna Seca	Pasadera WTF Recycled Water	Nicklaus Club-Monterey Golf Course Irrigation	29,218	0	8,829	0	54	0
Precipitation	Northern Coastal	Precipitation	Deep Percolation of Precipitation	516	0	92	0	9	0
	Southern Coastal			230	0	41	0	4	0
	Laguna Seca			4,623	0	825	0	83	0
	Northern Inland			11,041	0	1,972	0	197	0
Storm Water	Northern Coastal	Storm Water Infiltration	Percolation Pond	20,034	0	5,539	0	5	0
	Southern Coastal			52,670	0	14,708	0	49	0
	Laguna Seca			0	0	0	0	0	0

Water Type	Subarea	Salt and/or Nutrient Source	Component	TDS In, lb	TDS Out, lb	Chloride In, lb	Chloride Out, lb	Nitrate-N In, lb	Nitrate-N Out, lb
Seaside Basin Groundwater	Northern Coastal	Groundwater	Municipal Supply from Wells	0	4,210,062	0	990,482	0	6,919
			Water System Losses	357,855	0	84,191	0	588	0
			Irrigation Return Flow	342,745	0	80,636	0	563	0
		Underflow	Groundwater Inflow - From Onshore	3,388,324	0	821,494	0	7,927	0
			Groundwater Inflow - From Offshore	98,423	0	23,156	0	162	0
			Groundwater Outflow	0	68,896	0	16,209	0	113
		Sewer	Sewer Losses	162,233	0	47,853	0	381	0
			Regional Waste Water Treatment Plant	0	0	0	0	0	0
	Southern Coastal	Groundwater	Municipal Supply from Wells	0	433,187	0	136,124	0	1,507
			Water System Losses	36,821	0	11,570	0	128	0
			Irrigation Return Flow	91,164	0	28,647	0	317	0
		Underflow	Groundwater Inflow - From Onshore	1,008,928	0	293,331	0	776	0
			Groundwater Inflow - From Offshore	0	0	0	0	0	0
			Groundwater Outflow	0	1,564,815	0	491,724	0	5,443
		Sewer	Sewer Losses	22,670	0	6,687	0	14,550	0
			Regional Waste Water Treatment Plant	0	0	0	0	0	0
			Septic Systems	13,694	0	4,039	0	700	0

Water Type	Subarea	Salt and/or Nutrient Source	Component	TDS In, lb	TDS Out, lb	Chloride In, lb	Chloride Out, lb	Nitrate-N In, lb	Nitrate-N Out, lb
Seaside Basin Groundwater	Laguna Seca	Groundwater	Municipal Supply from Wells	0	1,948,353	0	566,454	0	1,499
			Water System Losses	165,610	0	48,149	0	127	0
			Irrigation Return Flow	410,031	0	119,210	0	315	0
			Golf Course Irrigation	197,302	0	57,362	0	152	0
		Underflow	Groundwater Inflow - From Onshore	193,836	0	41,117	0	783	0
			Groundwater Outflow	0	1,008,928	0	293,331	0	776
		Sewer	Sewer Losses	86,785	0	25,598	0	577	0
			Regional Waste Water Treatment Plant	0	0	0	0	0	0
			Septic Systems	62,423	0	18,412	0	3,193	0
	Northern Inland	Underflow	Groundwater Inflow - From Onshore	0	0	0	0	0	0
			Groundwater Outflow	0	1,880,759	0	347,760	0	2,683
Fertilizer	Laguna Seca	Fertilization (Nitrate-N only)	Laguna Seca and Nicklaus Golf-Monterey Golf Course Fertilization	0	0	0	0	1,771	0
			Sports Fields Fertilization	0	0	0	0	280	0
			Residential and Commercial Landscaping Fertilization	0	0	0	0	1,780	0
	Northern Coastal		Bayonet and Black Horse Golf Course Fertilization	0	0	0	0	2,421	0
			Sports Fields Fertilization	0	0	0	0	587	0
			Residential and Commercial Landscaping Fertilization	0	0	0	0	2,492	0
	Southern Coastal		Sports Fields Fertilization	0	0	0	0	103	0
			Residential and Commercial Landscaping Fertilization	0	0	0	0	2,136	0
	Northern Inland		Sports Fields Fertilization	0	0	0	0	0	0
			Residential and Commercial Landscaping Fertilization	0	0	0	0	445	0